TECHNICAL PROGRAM

# SPIE. DEFENSE+ COMMERCIAL SENSING

21–25 APRIL 2024 | GAYLORD NATIONAL RESORT & CONVENTION CENTER
NATIONAL HARBOR, MARYLAND, USA

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# SPIE. DEFENSE+ COMMERCIAL SENSING

THE EVENT FOR SENSOR RESEARCH AND TECHNOLOGIES TO ENHANCE CAPABILITIES FOR INDUSTRIAL, SECURITY, AND GOVERNMENT APPLICATIONS

- Cutting-Edge Research
- Exhibition
- Industry Program
- Training and Education

**Conferences and Courses: 21–25 April 2024**
**Exhibition: 23–25 April 2024**
Gaylord National Resort & Convention Center
National Harbor, Maryland, USA

## Experience the energy of SPIE Defense + Commercial Sensing

Get ready to enjoy real conversations, hear the latest breakthroughs, and make important connections in person. Hear cutting-edge research in sensors, infrared, laser systems, spectral imaging, radar, lidar, autonomous systems, and other findings from the community.

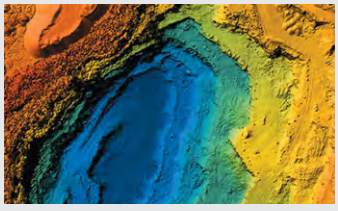
## CONTENTS

**Conference track: Materials and devices,** PAGE 16

Presentations that showcase IR materials, image sensors, photon counting, energy harvesting, and quantum technologies. The applications include wearables, cybersecurity, information processing, energy storage, and drones.

**Conference track: Imaging and analytics,** PAGE 17

Presentations on spectral imaging, computational image processing, metrology, and 3D imaging. Applications include security and defense, climate monitoring, big data, deep learning, machine vision, target detection, and tracking.



**Conference track: Advanced sensing and imaging,** PAGE 18

Presentations featuring research on IR and thermal imaging, fiber optic sensors, lidar, radar, laser radar, x-ray detection and imaging, advanced optics for imaging, and image processing using AI/ML. Applications include novel defense and security systems for intelligence, surveillance, and reconnaissance, infrastructure monitoring, energy, autonomous vehicles, and remote sensing.

**Conference track: Next-generation sensor systems and applications,** PAGE 19

Presentations highlighting cutting-edge research focused on emerging technologies for specific applications such as autonomous systems, CBRNE, agriculture and food safety, CPS/IoT, and more.

**Application tracks**—PAGES 20–21

Application tracks enable attendees to explore presentations across conferences and plan their event schedules around the topic of interest. Use the SPIE App for marking which presentations you want to see.

# GAYLORD PALMS RESORT & CONVENTION CENTER

## National Harbor Conference Rooms

- A — National Harbor Conference Rooms

## Ballroom Level

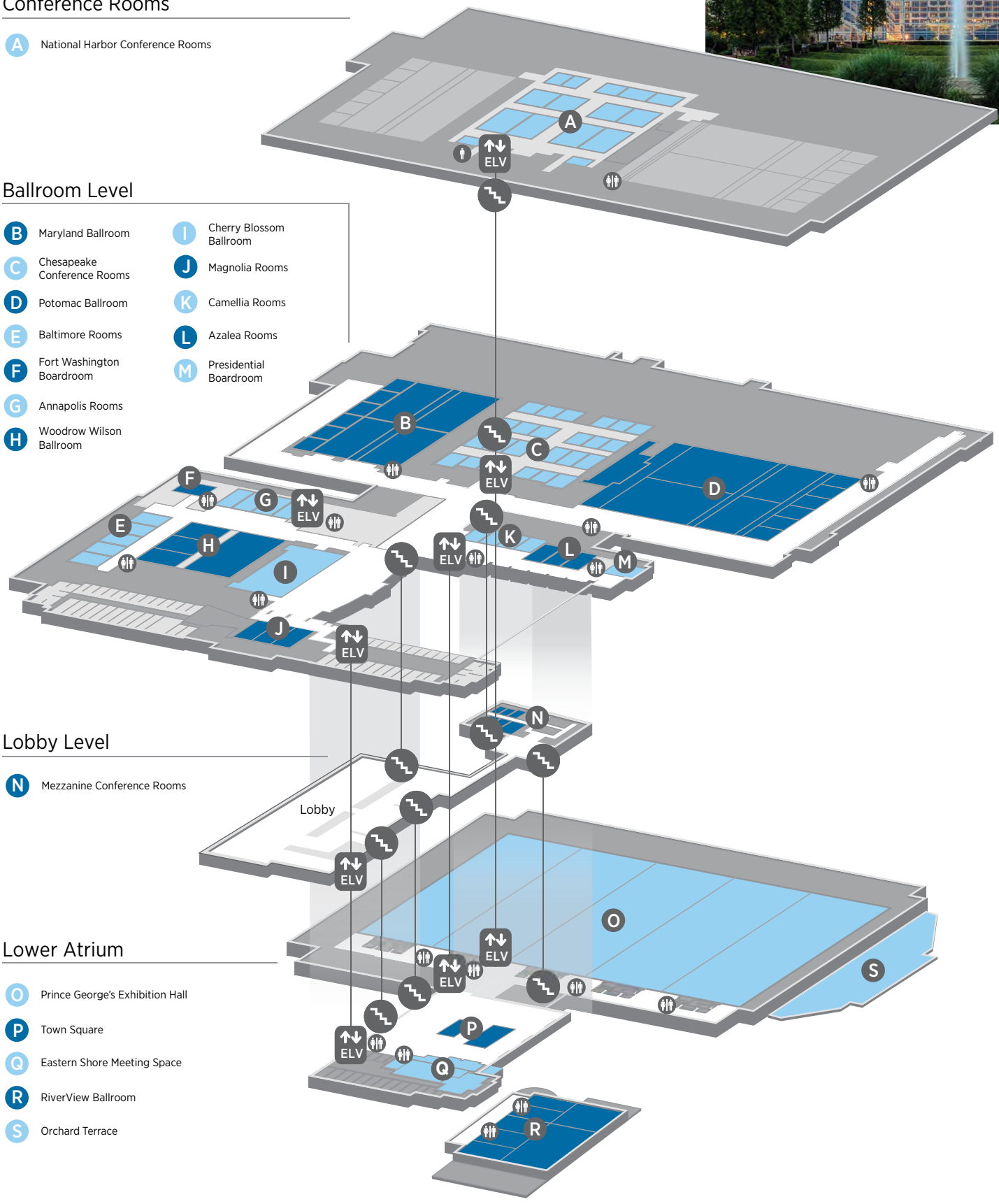
- B — Maryland Ballroom
- C — Chesapeake Conference Rooms
- D — Potomac Ballroom
- E — Baltimore Rooms
- F — Fort Washington Boardroom
- G — Annapolis Rooms
- H — Woodrow Wilson Ballroom
- I — Cherry Blossom Ballroom
- J — Magnolia Rooms
- K — Camellia Rooms
- L — Azalea Rooms
- M — Presidential Boardroom

## Lobby Level

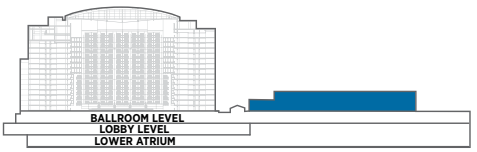
- N — Mezzanine Conference Rooms

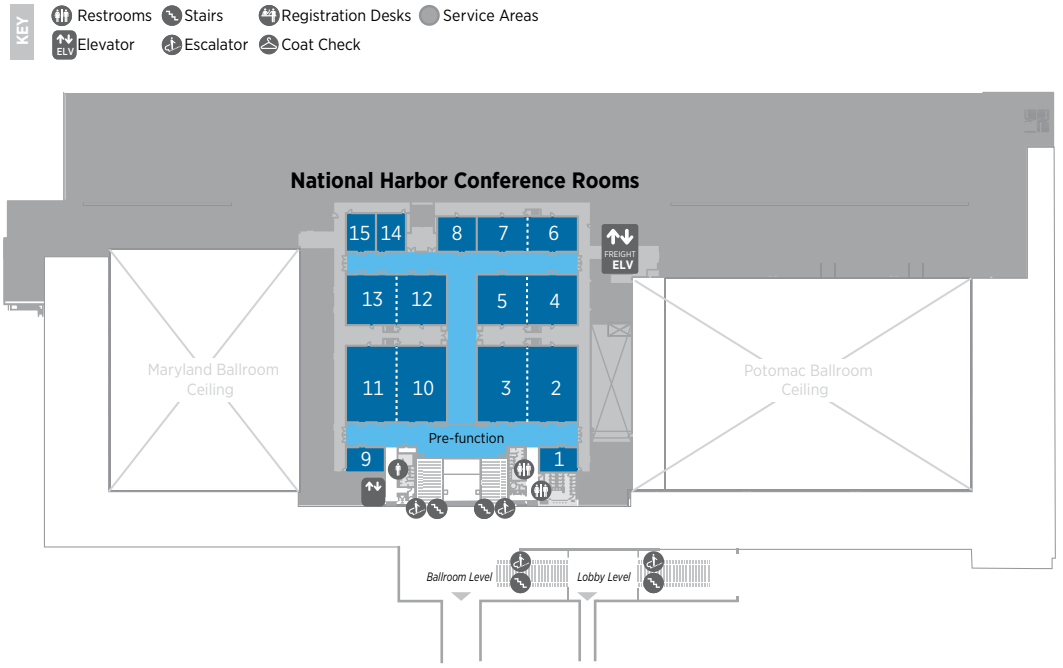
## Lower Atrium

- O — Prince George's Exhibition Hall
- P — Town Square
- Q — Eastern Shore Meeting Space
- R — RiverView Ballroom
- S — Orchard Terrace



# NATIONAL HARBOR CONFERENCE ROOMS
(Lower Atrium)





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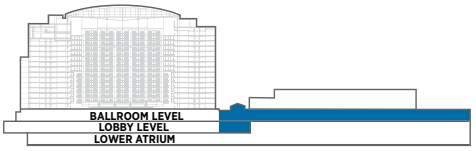
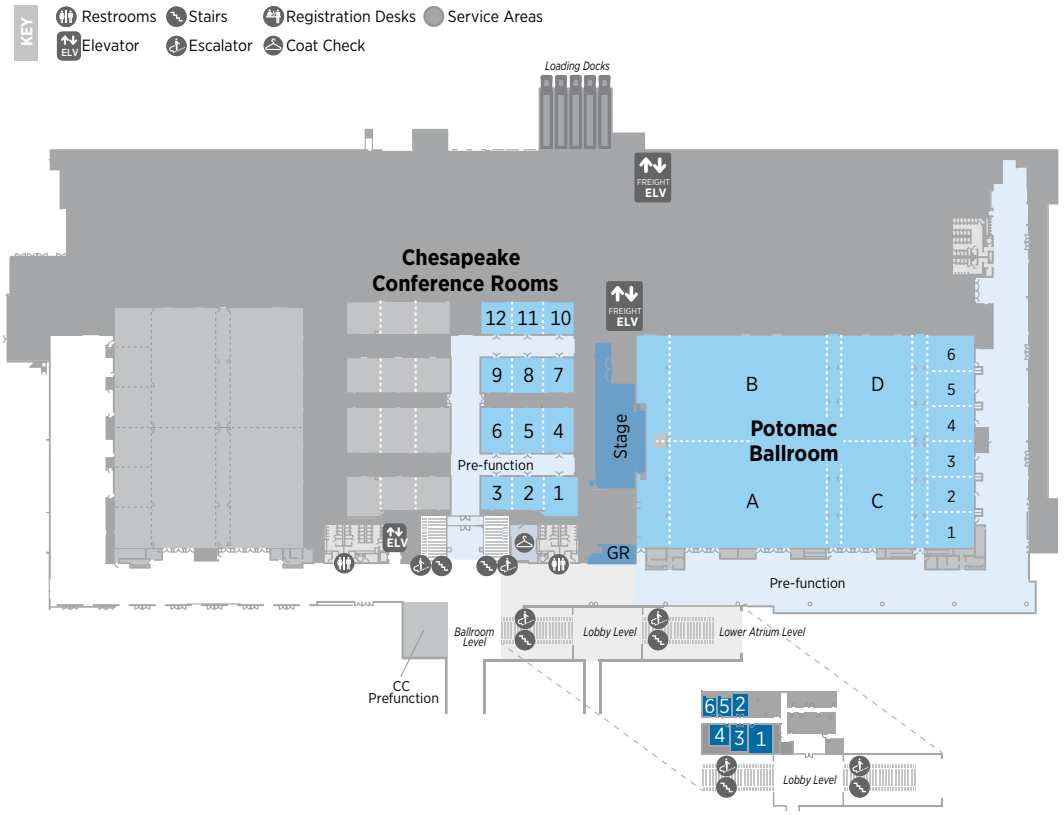
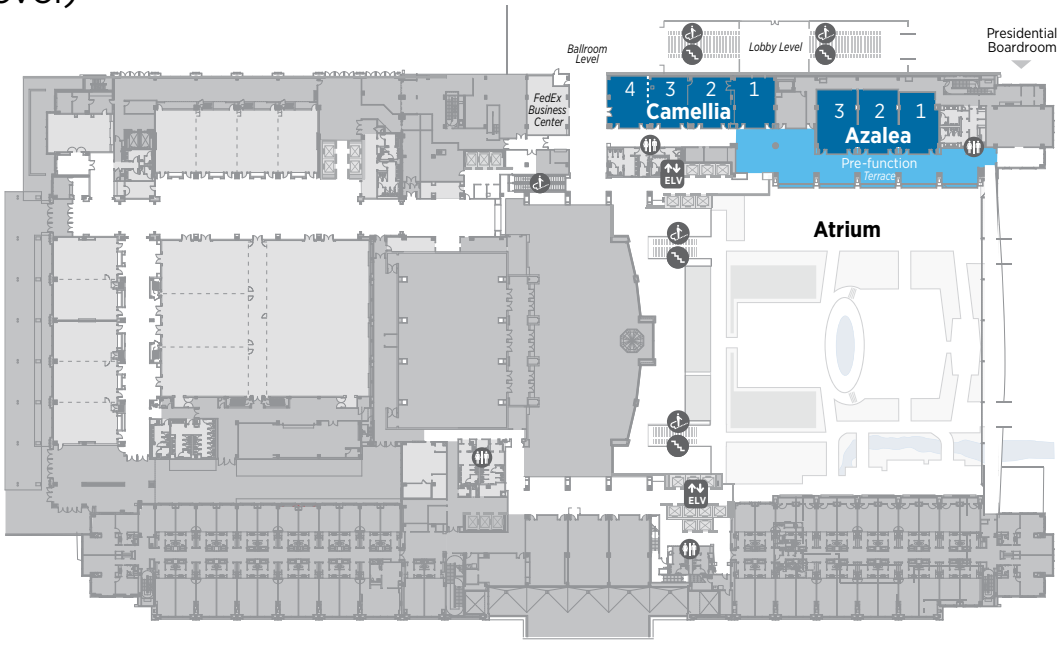
## CHESAPEAK & MEZZANINE CONFERENCE ROOMS POTOMAC & MARYLAND BALLROOMS
(Ballroom Level)

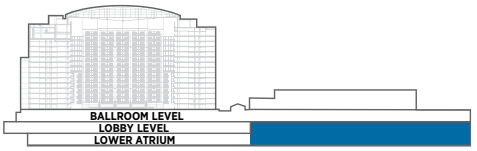


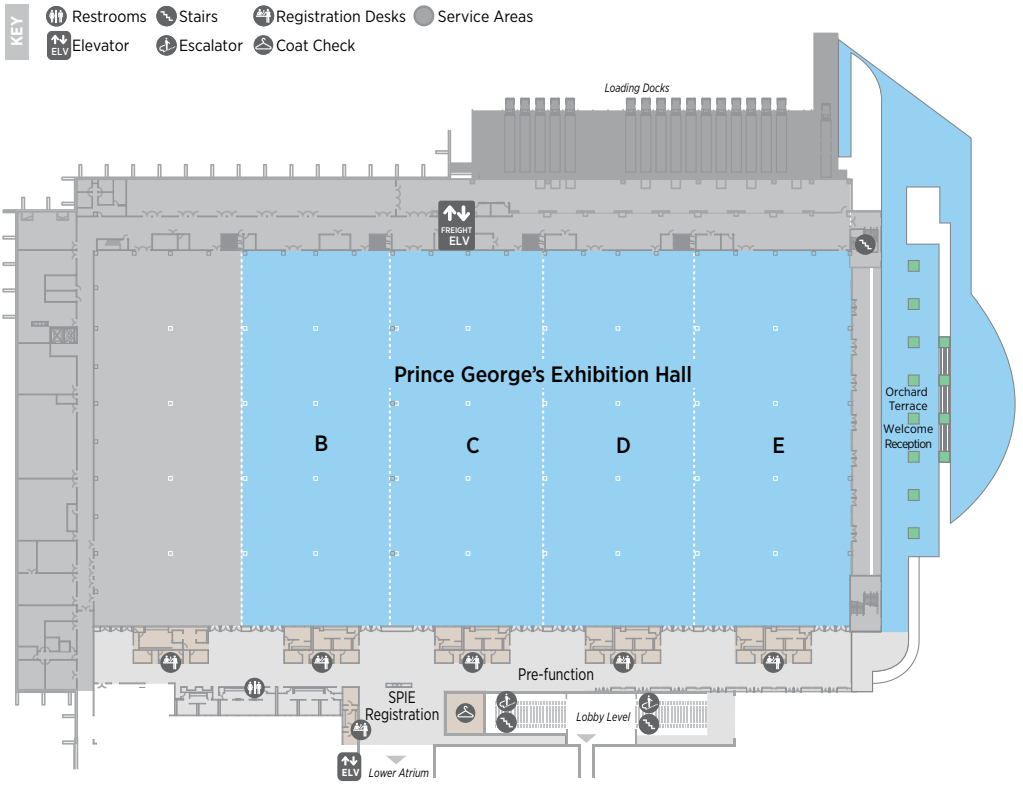




## CHERRY BLOSSOM MEETING SPACE
(Ballroom Level)

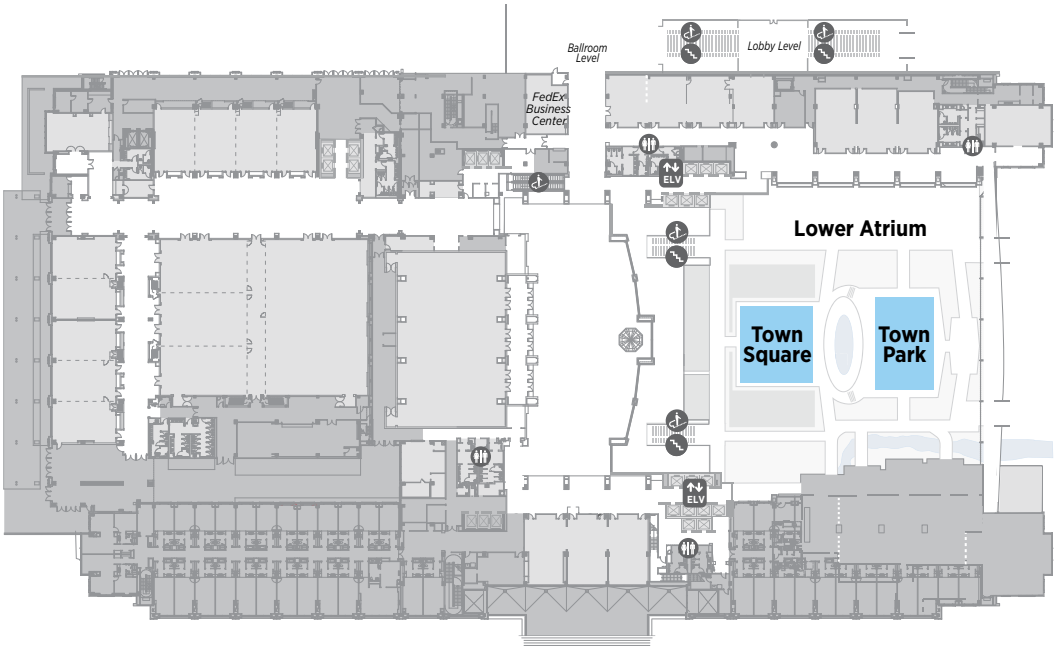


## PRINCE GEORGE'S EXHIBITION HALL
(Lower Atrium)




## INDOOR EVENT SPACE
(Lower Atrium)




# PLENARY EVENTS

Defense + Commercial Sensing plenary sessions will feature speakers presenting on a wide range of topics from across the defense, academic, and industrial sectors. Plenary sessions are open to all paid conference attendees.

## Symposium Plenary

**22 April 2024 • 5:00 PM - 6:30 PM | Potomac A**

Attend the Defense + Commercial Sensing symposium plenary session and hear Dev Shenoy speak and Deeph Chana introduce NATO DIANA, a case study for reimagining defense innovation.

**5:00 PM - 5:05 PM:**

**Welcome and opening remarks**

**Tien Pham**
The MITRE Corp. (USA)
2024 SPIE Symposium Chair

**Doug Droege**
L3Harris Technologies, Inc. (USA)
2024 SPIE Symposium Chair

**Presentation of the Joseph W. Goodman Book Writing Award**
Presented for authorship of an outstanding book in the field of optics and photonics, that has contributed significantly to research, teaching, or the optics and photonics industry.

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**5:05 PM - 5:45 PM:**

**Dev Shenoy**
Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (USA)

**5:50 PM - 6:30 PM:**

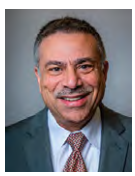
**NATO DIANA: a case study for reimagining defence innovation**

**Deeph Chana**
Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)

## Symposium Panel on Microelectronics Commercial Crossover

**23 April 2024 • 8:30 AM - 10:00 AM | Potomac A**

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications. Experts representing the Microelectronics Commons program, government R&D, commercial industry, DoD industry, and academia will discuss what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.



Moderator

**John Pellegrino**
Director, Electro-Optical Systems Laboratory
Georgia Tech Research Institute (retired) (USA)

Panelists

**Shamik Das**
Chief Engineer, MITRE Labs.
The MITRE Corporation (USA)

**Erin Gawron-Hyla**
Microelectronics Commons Workforce Development Technical Execution Area Lead
Office of the Under Secretary of Defense, Research and Engineering (USA)

**Carl McCants**
Special Assistant to the DARPA Director, Microelectronics Policy
Defense Advanced Research Projects Agency (USA)

**Kyle Squires**
Dean of the Ira A. Fulton Schools of Engineering
Senior Vice Provost for Engineering, Computing and Technology
Founding CEO, Southwest Advanced Prototyping (SWAP) Hub (USA)

**Olivier Franza**
Chief Architect, Principal Investigator of the Aurora Supercomputer, Intel Corporation (USA)

## Symposium Plenary on AI/ML + Sustainability

**24 April 2024 • 8:30 AM - 10:00 AM | Potomac A**

This plenary session will focus on the SPIE Defense + Commercial Sensing application tracks of AI/ML and Sustainability, discussing use of artificial intelligence, machine learning, and deep learning to create and implement intelligent systems across multiple sectors, technologies, and applications, and sustainability, highlighting the use of optics and photonics for renewable energy, natural resource management, sustainable manufacturing, and greenhouse gas mitigation in support of the UN Sustainable Development Goals.

**8:30 AM - 8:40 AM:**

**Welcome and opening remarks**

**Latasha Solomon**
DEVCOM ARL (USA)
2024 SPIE Track Chair

**Ann Marie Raynal**
Sandia National Labs. (USA)
2024 SPIE Symposium Co-Chair

**8:40 AM - 9:20 AM:**

**AI/ML track plenary**

**John M. Bradsher**
Director, Operations and Integration, Army, DCoS, G2 (USA)

**9:20 AM - 10:00 AM:**

**Sustainability track plenary**

# INDUSTRY EVENTS

Attend sessions focused on the business side of the optics and photonics industry, including defense and security applications. These events are open to all attendees, including exhibition visitors.

## Thermosense Vendor Session XX

**22 April 2024 • 1:00 PM - 4:30 PM | Chesapeake 6**

This session is located in the technical conference area and access requires one of either: paid technical badge (Chair, Committee, Speaker, Author, Student, Instructor, or Attendee type) and/or an Exhibitor Technical Pass.

*Session Chairs:* **Beate Oswald-Tranta,** Univ.of Leoben (Austria); **Giovanni Ferrarini,** Istituto per le Tecnologie della Costruzione (Italy)

This special session provides an early opportunity for exhibitors to highlight their latest technology and newest products to the Thermosense, infrared industry, and SPIE DCS technical audience prior to the opening of the Expo.

PRESENTATIONS ARE LISTED IN ORDER OF PRESENTATION:

**Telops Inc.** (Booth 441 / 13047-701)

**G&H | StingRay** (Booth 913 / 13047-702)

**SWIR Vision Systems** (Booth 541 / 13047-703)

**Omega Optical LLC** (Booth 1005 / 13047-704)

**HGH USA – Formerly Electro Optical Industries** (Booth 540 / 13047-705)

**IRnova AB** (Booth 418 / 13047-706)

**Thales Cryogenics BV** (Booth 1012 / 13047-707)

**Chroma Technology Corp.** (Booth 1214 / 13047-708)

**SCD USA Infrared, LLC** (Booth 813 / 13047-709)

**RICOR & RICOR USA** (Booth 407 / 13047-710)

**RP Optical USA** (Booth 826 / 13047-711)

## Keynote: Overview of the Joint Directed Energy Transition Office

**23 April 2024 • 11:00 AM - 11:45 AM**
**Prince George Exhibition Hall, Industry Stage**

The Joint Directed Energy Transition Office (JDETO) funds basic research, applied research, and advanced technology development in optics and photonics with academic, industry, and government partners, both domestic and international. This talk will provide an overview of the JDETO with an emphasis on how it maps to the DoD Directed Energy Roadmap.

Presenter
**Mark F. Spencer**
Director
Joint Directed Energy Transition Office (JDETO)
OUSD(R&E)/OASD(CT)/AT/DE (USA)

## Infrared for Industrial Machine Vision – Opportunities and Challenges

**23 April 2024 • 1:30 PM - 2:00 PM**
**Prince George Exhibition Hall, Industry Stage**

In recent years, the industrial ecosystem has shown a growing interest in cameras that operate in non-visible wavelengths, driven by new needs related to the semiconductor industry and automotive electrification, for example. In different ways, this represents a significant opportunity for defense-oriented companies as well as more traditional industrial players. At the same time, the path to mass adoption is not yet clear due to a temporary market downturn expected to last until 2025 and the high price of technology platforms. This presentation will explore these opportunities and challenges.

Presenter
**Axel Clouet**
Technology and Market Analyst – Imaging
Yole Group (France)

## Keynote: Accelerating Research to Impact

**23 April 2024 • 2:15 PM - 3:00 PM**
**Prince George Exhibition Hall, Industry Stage**

The U.S. National Science Foundation (NSF) invests in the full spectrum of fundamental research across all areas of science and engineering. With the exciting recent creation of the Directorate for Technology, Innovation and Partnerships (TIP), the NSF is spurring innovation that will rapidly address societal and economic challenges, open opportunities for all Americans and accelerate the creation of critical technologies. Please join us to learn more about how TIP will expand and transform the nation's research and innovation ecosystem, launch deep tech startups, nurture the future workforce, and grow the nation's competitiveness and security for decades to come.

Presenter
**Mara Schindelholz**
Program Director
SBIR/STTR National Science Foundation (USA)

## Keynote: Opportunities for Innovative Sensing and Imaging Technologies at ARPA-E

**23 April 2024 • 3:15 PM - 4:00 PM**
**Prince George Exhibition Hall, Industry Stage**

ARPA-E has a broad research space that involves decreasing emissions and exports, while improving efficiency, nuclear waste management, and grid resiliency. Courtesy this mission breadth, several broader programs and individual projects have leveraged innovations in the sensing and imaging technology space. This talk will focus on recent successes and potential areas of opportunity with respect to sensing and imaging technologies.

Presenter
**Jenifer Shafer**
Associate Director of Technology and Program Director
ARPA-E (USA)

## Keynote: NASA's CIS Office: Embracing the Aerospace Community Through Strategic Engagement

**23 April 2024 • 4:15 PM - 5:00 PM**
**Prince George Exhibition Hall, Industry Stage**

NASA'S Space Communications and Navigations (SCaN) Projects Division consists of two networks, the Near Space Network and the Deep Space Network. The Near Space Network, which operates out of Goddard Space Flight Center, is looking to the future and is interested in building partnerships with the aerospace community. The Commercialization, Innovation, and Synergies (CIS) Office is part of NASA's Near Space Network and is dedicated to nurturing opportunities for collaboration between NASA, Industry, academia, and other government agencies. As CIS's Industry Engagement Lead, Ali Hale is strategically connecting experts from industry with NASA to create partnerships and exchange ideas on new and innovative technologies for the Near Space Network. She will share paths of engagement with NASA, with the eventual goal of infusing new and existing technologies to provide for a robust marketplace with creative, cost-effective solutions.

Presenter

**Alexandra Hale**
NASA Industry Engagement Lead &
Senior Technical Advisor
The Aerospace Corporation (USA)

## Panel Discussion on Directed Energy: Industrial Base Readiness to support Directed Energy Programs of Record

**24 April 2024 • 10:30 AM - 12:00 PM**
**Prince George Exhibition Hall, Industry Stage**

Hear the latest on funding and technical developments, as well as challenges and opportunities, from leaders from industry, academia, and government offices. Panelists will address key areas critical to the future success and adoption of directed energy systems.

Moderator

**Robert Walker**
Vice President of Strategy
and Business Development
Leonardo (USA)

Panelists

**Sandra Biedron**
Chief Scientist
Element Aero
(USA)

**Frank E. Peterkin**
Principal Director
for Directed
Energy
OUSD (R&E)
(USA)

**Wilson Miles**
Associate
Research Fellow
NDIA Emerging
Technologies
Institute (USA)

## Commercial Technology Transfer/ Integration to Government Panel

**24 April 2024 • 1:15 PM - 2:45 PM**
**Prince George Exhibition Hall, Industry Stage**

Opportunities abound for SME's, small businesses, and start-ups to engage with government agencies to provide innovative technology solutions enabling government programs to achieve their missions. Understanding how best and with which agencies to engage can be a challenging proposition for players in the commercial sector. In this panel discussion, representatives of key government agencies employing rapid, direct, and non-traditional methods of funding, technology transfer, and insertion to accomplish their mission objectives will share their offices' roles, processes, and opportunities. This session will inform and educate the commercial sector on the optimal ways to work with these agencies to mutual benefit.

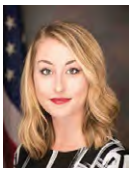
Moderator

**Teresa Pace**
Engineering Fellow
L3Harris (USA)

Panelists

**Matthew Willis**
Director
Office of Army Prize Competitions and Army
Applied SBIR Program
Office of the Assistant Secretary of the Army for
Acquisition, Logistics and Technology (USA)

**Matthew Turek**
Deputy Director
Information Innovation Office DARPA (USA)



**Alexandra Hale**
NASA Industry Engagement Lead & Senior
Technical Advisor
The Aerospace Corporation (USA)

**Robert B. Meltzer**
Technical Executive
National Geospatial-Intelligence Agency (USA)

## Evaluating the Health of the Directed Energy Weapon Industrial Base

**24 April 2024 • 3:15 PM - 3:45 PM**
**Prince George Exhibition Hall, Industry Stage**

Directed energy weapons (DEWs), including high energy lasers (HELs) and high-power microwaves (HPMs), have emerged as potentially transformative weapons on the modern battlefield. Recent advancements have made DEWs more viable than ever, with many systems possessing the power and range necessary to engage a wide variety of threats, more affordably than current systems. Recent conflicts in the Middle East and Europe have highlighted the importance of munitions capacity as well as the need to both efficiently and effectively counter different kinetic threats. The ability of some DEW systems to engage many targets at once with an "unlimited" magazine could yield enormous economic and tactical benefits.

In January 2024, the National Defense Industrial Association's Emerging Technologies Institute (ETI) released its latest report, "Directed Energy Weapons: Securing the Path to the Future," which assessed the supply chains for both high-energy lasers and high-powered microwaves. The report examines four aspects of the supply chain: 1) Critical Raw Materials and Goods, 2) Manufacturing Base and Workforce, 3) Supply Chain Security and Vulnerabilities, and 4) International Partnerships and Allied Nearshoring. ETI will present the key findings and recommendations from this report.

Presenter
**Wilson Miles**
Associate Research Fellow
NDIA Emerging Technologies Institute (USA)

## Lidar Performance Benchmarking Technical Discussion

**24 April 2024 • 4:00 PM - 5:00 PM**
**Prince George Exhibition Hall, Industry Stage**

Today there are no vendor-independent standards for automotive lidar performance, such as range, resolution, accuracy, field of view, etc. Attend this discussion to learn about and contribute to field testing of multiple lidar systems on an identical range. Join this working group to discuss lessons learned in the lidar performance benchmarking process and explore ways to improve the lidar performance tests in the future.

Presenter
**Paul McManamon**
President
Exciting Technology LLC (USA)

## Panel Discussion: Keeping National Security AI Trustworthy

**25 April 2024 • 11:00 AM - 12:00 PM**
**Prince George Exhibition Hall, Industry Stage**

This panel discussion will explore some of the ethical quandaries and hazards AI-assisted technologies present for national security/defense, including on the battlefield in active conflicts. Many of these capabilities are offered as contract services to militaries, adding another layer of complexity to issues that must be managed to leverage the success promised by AI.
Topics the panel will include:

» Who controls access to private satellite data?
» Hallucinations and AI risk management
» Lethal decision-making by AI machines
» Fighting AI disinformation in global conflict
» Trustworthiness of datasets

Moderator
**William Schulz**
Managing Editor of *Photonics Focus*
SPIE (USA)


Visit SPIE Defense + Commercial Sensing Exhibition. Browse the floor and engage with these exhibiting companies to view and discuss their most current exciting new technical possibilities and offerings. SPIE helps connect researchers, scientists, engineers, and buyers with potential suppliers, while educating the community about new technical possibilities.

**23 April 2024 • 10:00 AM - 5:00 PM**
**24 April 2024 • 10:00 AM - 5:00 PM**
**25 April 2024 • 10:00 AM - 2:00 PM**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# TECHNICAL EVENTS

Colleagues gather to explore topics in depth. Attend workshops, poster sessions, panel discussions, and training opportunities.

## Panel Discussion: Edge-Based Computing Challenges and Opportunities for Sensor Fusion

**22 April 2024 • 1:20 PM - 4:45 PM | Chesapeake 9**

Please join the Signal Processing, Sensor/Information Fusion, and Target Recognition conference for this exciting panel discussion!

Panel Moderators:
**Lynne Grewe,** California State Univ. (USA)
**Ivan Kadar**, Interlink Systems Sciences, Inc. (USA)

Panelists:
**Andreas Savakis,** Rochester Institute of Technology (USA)
**Yu Chen,** Binghamton University (SUNY) (USA)
**Genshe Chen,** Intelligent Fusion, Inc (USA)
**Yufeng Zheng,** University of Mississippi Medical Center (USA)

## Panel Discussion on Agriculture: Status Quo, Challenges and Future Commercial Sensors for UAVs and UGVs

**22 April 2024 • 1:30 PM - 3:00 PM | National Harbor 14**

Generative AI promises nearly endless possibilities for myriad use cases, with potential applications cutting across nearly every business and research sector. From advertising and art to algorithm training, generative AI is making waves and becoming more and more popular. In this panel discussion, we invite panel members to explore the current state of generative AI, its shortcomings and strengths, and look to the future by positing how we might make improvements in the field, and how the technology may be used to further benefit in the future. We will be accepting some audience questions, so please come curious!

Moderator: **Alex Thomasson,** Mississippi State Univ. (USA)

Panelists:
**Trond Loke,** HySpex, Norsk Elektro Optikk AS (Norway)
**Eric Johnson,** Planet (USA)
**Liu Rohan,** PepsiCo (USA)
**Christoph Bauer,** KWS SAAT SE & Co. KGaA (Germany)

## Panel Discussion: Generative Models

**23 April 2024 • 10:30 AM - 11:30 AM | Potomac 6**

Generative AI promises nearly endless possibilities for myriad use cases, with potential applications cutting across nearly every business and research sector. Join this panel as we explore the current state of generative AI and its future potential.

Moderator: **Kimberly E. Manser,** DEVCOM C5ISR (USA)

Panelists:
**Raghuveer Rao,** Army Research Lab. (USA)
**Colin Reinhardt,** Naval Intelligence Warfare Ctr. (USA)
**Corban Rivera,** Johns Hopkins Univ., Applied Physics Lab. (USA)
**Sek Chai,** Latent AI (USA)
**Alex Hauptmann,** Carnegie Mellon Univ. (USA)

## Infrared Technology and Applications Conference Keynote

**23 April 2024 • 10:30 AM - 11:10 AM | National Harbor 2**

Join Whitney Mason for the Infrared Technology and Applications conference keynote on the future of infrared efforts at DARPA.

**The future of infrared efforts at DARPA**

**Whitney Mason**
Deputy Director of the Strategic Technology Office at DARPA (USA)

## Autonomous Systems Conference Keynote

**23 April 2024 • 1:10 PM - 1:50 PM EDT | National Harbor 10**

Please join the Autonomous Systems: Sensors, Processing, and Security for Ground, Air, Sea, and Space Vehicles and Infrastructure conference. In his keynote address, the Deputy Under Secretary of Defense, Dr. David Honey, will offer insights into AI, autonomy, and other critical technologies, alongside detailing how the Research and Engineering (R&E) office is streamlining processes to facilitate smoother collaboration with companies interested in doing business with the Department.

**Trusted AI and autonomy for today's warfighter**

**David Honey**
Deputy Under Secretary of Defense for Research and Engineering (USA)

## Panel Discussion: Machine Learning for Automatic Target Recognition

**23 April 2024 • 1:30 PM - 3:00 PM | National Harbor 5**

Automatic Target Recognition (ATR), traditionally rooted in predefined algorithms and rule-based systems, has long been a cornerstone in defense operations. Join experts in ATR technologies as they discuss ML for automatic target recognition.

Moderator: **Asif Mehmood,** Chief Digital and Artificial Intelligence Office (USA)

Panelists:
**Zhu Li,** University of Missouri (USA)
**Shuvra Bhattacharyya,** University of Maryland (USA)
**Edmund Zelnio,** Air Force Research Lab. (USA)
**Peter A. Torrione,** Covar, LLC (USA)

## Panel Discussion: Infrared in Automotive Applications

**23 April 2024 • 1:30 PM - 2:30 PM | National Harbor 2**

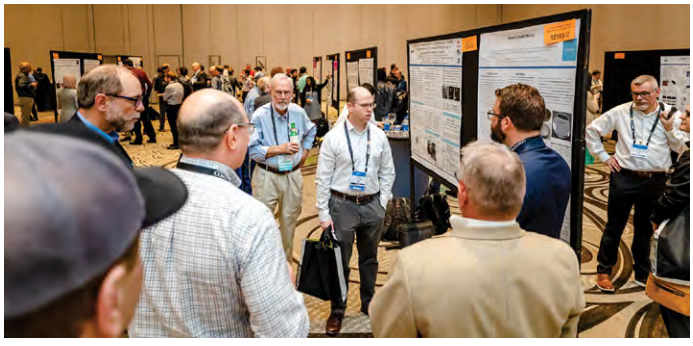
Thermal imaging technology is poised to become widespread in advanced driver assistance systems for pedestrian detection and as part of the sensor stack, along with visible cameras, lidar, radar and other sensors, for future autonomous vehicles.

Panelists:
**David Cheskis,** TriEye Ltd. (Israel)
**John Hong,** Obsidian Sensors, Inc. (USA)
**Andrew Hood,** Attollo Engineering (USA)
**Stuart Klapper,** Magna International Inc.
**Ethan Klem,** SWIR Vision Systems (USA)
**Fushuai Liu,** IRay/Raytron Technology Co., Ltd. (China)
**Jeffrey Shay,** VALEO North America Inc. (USA)
**Sebastien Tinnes,** Lynred (France)
**Mike Walters,** Teledyne FLIR LLC (USA)

## Algorithms for Synthetic Aperture Radar Imagery Poster and Panel Session I

**23 April 2024 • 3:00 PM - 5:10 PM | National Harbor 11**

Join the Algorithms for Synthetic Aperture Radar Imagery conference for a poster session and panel discussion to talk about topics from the days presentations.



## Poster Session

**23 April 2024 • 6:00 PM - 7:30 PM | Potomac C**

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE Defense + Commercial Sensing posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup: Tuesday 12:00 PM - 5:30 PM**

Poster authors, view poster presentation guidelines and set-up instructions at **http://spie.org/DCSPosterGuidelines**.

## Infrared Imaging Systems Round-Table: Current Modeling Limitations

**24 April 2024 • 2:00 PM - 3:00 PM | National Harbor 3**

Join this Infrared Imaging Systems conference round-table discussion on current modeling limitations.

Moderator: **Michael Soel,** Teledyne FLIR Systems, Inc. (USA)

Panelists:
**Ronald Driggers,** The Univ. of Arizona (USA)
**Orges Furxhi,** True Colors Infrared Imaging (USA)
**Brian P. Teaney,** DEVCOM C5ISR (USA)
**Daniel Wegner,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

## Thermosense Conference Keynote

**24 April 2024 • 2:10 PM - 2:50 PM | Chesapeake 6**

Join Andreas Mandelis from the Univ. of Toronto's Center for Advanced Diffusion-Wave and Photoacoustic Technologies and Institute for Advanced Non-Destructive and Non-Invasive Diagnostic Technologies for the Thermosense conference keynote.

**Three-dimensional thermophotonic super-resolution imaging with biomedical and NDI applications by spatiotemporal diffusion-reversal methods**

**Andreas Mandelis**
Center for Advanced Diffusion-Wave and Photoacoustic Technologies and Institute for Advanced Non-Destructive and Non-Invasive Diagnostic Technologies, Univ. of Toronto (Canada)

## Algorithms for Synthetic Aperture Radar Imagery Poster and Panel Session II

**24 April 2024 • 3:10 PM - 5:20 PM | National Harbor 11**

Join the Algorithms for Synthetic Aperture Radar Imagery conference for a poster session and panel discussion to talk about topics from the days presentations.

## Panel Discussion: DECEIVER

**24 April 2024 • 5:45 PM - 6:15 PM | National Harbor 6**

Join this panel discussion on DECEIVER: Disseminating, Education on Counteracting, Erroneous, Information, Verifying, Evidence, and Reporting, to learn about detecting and deterring misinformation and deception.

## Panel Discussion: Cryogenic Technologies

**25 April 2024 • 10:20 AM - 11:30 AM | National Harbor 2**

Join this panel comprising top-level users and customers of cryogenic technology. The objective is to provide users with a platform to express their wish-lists, forecasts, and future needs, encouraging the posing of "uncomfortable" questions.

Moderator: **Eric Costard,** CTO, IRnova AB (Sweden)

Panelists:
**Rob Wilson,** Head of Research and Development, Leonardo Electronics (United Kingdom)
**Chris Alicandro,** Senior Director of Sales, Teledyne FLIR-Components (USA)
**Ed Huang,** Sr. Director Cooled Products and Programs, Attollo Engineering, LLC (USA)
**David Billon-Lanfrey,** Strategy Director, Lynred (France)
**HolgerLutz,** Head of System Design, AIM Infrarot Module (Germany)
**An-Jong Kang,** Director of Cooled Detector Division, i3system, Inc. (Republic of Korea)
**Oğuz Altun,** Director, ASELSAN A.S. (Turkey)
**Carl S. Kirkconnell,** President, West Coast Solutions (USA)

## Infrared Imaging Systems Round-Table: Future Testing Requirements

**25 April 2024 • 1:30 PM - 2:30 PM | National Harbor 3**

Join this Infrared Imaging Systems conference round-table discussion on future testing requirements.

Moderator: **Curtis M. Webb,** L3Harris Technologies, Inc. (USA)

Panelists:
**Stephen Burks,** DEVCOM C5ISR (USA)
**Chris Durell,** Remote Sensing Labsphere, Inc. (USA)
**Ilya Koshkin,** CI Systems (USA)
**Jeffrey T. Meier,** US Army Redstone Technical Test Ctr. (USA)
**Austin Richards,** Oculus Photonics (USA)
**Nathalie Roy,** Defence Research and Development Canada, Valcartier (Canada)

# NETWORKING AND COMMUNITY EVENTS

Connect with colleagues in variety of ways throughout the week. Interactive sessions give you the opportunity to network, learn, and discuss your work with optics and photonics professionals from around the world. Advance your network with purpose and build your community.

## SPIE Fellow and Student Luncheon

**22 April 2024 • 12:00 PM - 1:00 PM | Potomac C**

SPIE Fellow Members and student conference attendees are invited to this engaging networking lunch, giving students an opportunity to network with SPIE Fellows who will share their insights into career paths in defense, security, and sensing.

## All-Symposium Welcome Reception

**22 April 2024 • 6:30 PM - 8:00 PM | Orchard Terrace**

Join your colleagues for food and beverages as we welcome each other to SPIE Defense and Commercial Sensing 2024.

## SPIE Senior Member and Early Career Networking Breakfast

**23 April 2024 • 7:00 AM - 8:00 AM | Potomac C**

*Open to Senior Members and early career professionals with a paid registration badge.*

Start your conference day off with a good breakfast and network building. All early career professionals and SPIE Senior Members are invited to attend this informal event to connect with the volunteer leadership of SPIE and your peers. A breakfast buffet will be provided. Seating is limited and will be granted on a first-come, first-served basis.

## Lunch & Learn: Navigating Difficult Conversations

**23 April 2024 • 12:00 PM - 1:00 PM**
**Prince George Exhibition Hall, Hall E Stage**

Join us for a lunch and an education session. This hour lunch and learn will delve into the relationship between equity and inclusion and difficult conversations, with an emphasis on how to prepare for effectively navigate conversations related to inclusion and identity. Participants will engage with case scenarios and be provided with resources to continue learning post the workshop.

Presenter:

**Dr. Alexis J. Stokes**
Founder and Chief Consultant
Stokes Strategy & Consulting (SSC) (USA)

## Publications Volunteer Reception

**23 April 2024 • 5:00 PM - 6:00 PM**
**Pose Rooftop Lounge Club Level (Floor 19)**

The volunteers for SPIE Publications are invited to a private reception.

## LGBTQ+ Meetup

**23 April 2024 • 7:00 PM - 8:00 PM**
**Lower Atrium, Town Square**

Come join us and socialize and network with other LGBTQ+ attendees, students, scientists, and allies in the defense and commercial sensing community.

## Women in Optics Meetup

**24 April 2024 • 3:00 PM - 4:00 PM**
**Lower Atrium, Town Square**

Join other women in the field for informal discussions and networking.

# CONFERENCE SCHEDULE

| 21 April 2024 | 22 April 2024 | 23 April 2024 | 24 April 2024 | 25 April 2024 |
|---|---|---|---|---|
| | | **Symposium Panel on Microelectronics Commercial Crossover**<br>8:30 AM - 10:00 AM<br>Potomac A<br>*See page 6 for details.* | **Symposium Plenary on AI/ML + Sustainability**<br>8:30 AM - 10:00 AM<br>Potomac A<br>*See page 7 for details.* | |
| **Materials and Devices —** Program track chair: **Nibir K. Dhar,** Virginia Commonwealth Univ. (USA) | | | | |
| | | CONFERENCE 13025: **Advanced Photon Counting Techniques XVIII,**Chairs: Mark A. Itzler; Joshua C. Bienfang; K. Alex McIntosh<br>National Harbor 12 | | |
| | CONFERENCE 13026: **Next-Generation Spectroscopic Technologies XV,** Chairs: Richard A. Crocombe; Luisa T. M. Profeta; Steven M. Barnett<br>National Harbor 4 | | | |
| | CONFERENCE 13027: **Energy Harvesting and Storage: Materials, Devices, and Applications XIV,** Chairs: Zunaid Omair; Naresh C. Das<br>Potomac 1 | | | |
| | CONFERENCE 13028: **Quantum Information Science, Sensing, and Computation XVI,** Chairs: Eric Donkor; Michael Hayduk; Michael L. Fanto; Carlos M. Torres Jr.<br>Chesapeake 7 | | | |
| | | CONFERENCE 13029: **Laser Technology for Defense and Security XIX,** Chairs: Mark Dubinskii; Rita D. Peterson<br>Chesapeake 1 | | |
| | CONFERENCE 13030: **Image Sensing Technologies: Materials, Devices, Systems, and Applications XI,** Chairs: Nibir K. Dhar; Achyut K. Dutta; Sachidananda R. Babu<br>Chesapeake 4 | | | |
| | **Symposium Plenary**<br>5:00 PM - 6:30 PM<br>Potomac A<br>*See page 6 for details.* | **Poster Session**<br>6:00 PM - 7:30 PM<br>Potomac C<br>*See page 13 for details.* | | |

**SYMPOSIUM CHAIRS**

**Tien Pham**
The MITRE Corporation (USA)

**Doug Droege**
L3Harris (USA)

**SYMPOSIUM CO-CHAIRS**

**Ann Marie Raynal**
Sandia National Labs. (USA)

**Ravi Ravichandran**
BAE Systems (USA)

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| **Imaging and Analytics —** Program track chair: **David W. Messinger,** Rochester Institute of Technology (USA) | | | | |
| | CONFERENCE 13033: **Multimodal Image Exploitation and Learning 2024,** Chairs: Sos S. Agaian; Vijayan K. Asari; Stephen P. DelMarco; Sabah A. Jassim<br>National Harbor 10 | CONFERENCE 13031: **Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imaging XXX,** Chairs: Miguel Velez-Reyes; David W. Messinger<br>Potomac 1 | | |
| | | CONFERENCE 13032: **Algorithms for Synthetic Aperture Radar Imagery XXXI,** Chairs: Edmund Zelnio; Frederick D. Garber<br>National Harbor 11 | | |
| | CONFERENCE 13034: **Real-Time Image Processing and Deep Learning 2024,** Chairs: Nasser Kehtarnavaz; Mukul V. Shirvaikar<br>National Harbor 3 | | | |
| | CONFERENCE 13035: **Synthetic Data for Artificial Intelligence and Machine Learning: Tools, Techniques, and Applications II,** Chairs: Kimberly E. Manser; Christopher L. Howell; Raghuveer M. Rao; Celso De Melo<br>Potomac 6 | | | |
| | CONFERENCE 13036: **Big Data VI: Learning, Analytics, and Applications,** Chairs: Panos P. Markopoulos; Bing Ouyang; George Sklivanitis<br>National Harbor 8 | | | CONFERENCE 13037: **Geospatial Informatics XIV,** Chairs: Kannappan Palaniappan; Gunasekaran Seetharaman<br>Potomac 1 |
| | | | CONFERENCE 13038: **Dimensional Optical Metrology and Inspection for Practical Applications XIII,** Chairs: Kevin G. Harding; Song Zhang; Jae-Sang Hyun; Beiwen Li; Andrés G. Marrugo<br>Potomac 2 | |
| | CONFERENCE 13039: **Automatic Target Recognition XXXIV,** Chairs: Kenny Chen; Riad I. Hammoud; Timothy L. Overman<br>National Harbor 5 | | | |
| | CONFERENCE 13041: **Three-Dimensional Imaging, Visualization, and Display 2024,** Chairs: Bahram Javidi; Xin Shen; Arun Anand<br>Potomac 3 | | CONFERENCE 13040: **Pattern Recognition and Prediction XXXV,** Chais: Mohammad S. Alam; Vijayan K. Asari<br>Potomac 3 | |
| | **Symposium Plenary**<br>5:00 PM - 6:30 PM<br>Potomac A<br>*See page 6 for details.* | **Poster Session**<br>6:00 PM - 7:30 PM \|<br>Potomac C<br>*See page 13 for details.* | | |

**Event Schedule continued on next page**

## CONFERENCE SCHEDULE

| 21 April 2024 | 22 April 2024 | 23 April 2024 | 24 April 2024 | 25 April 2024 |
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| **Advanced Sensing and Imaging —** Program track chair: **Raja Suresh,** ASU Research Enterprise (ASURE) (USA) | | | | |
| | CONFERENCE 13042: **Advanced Optics for Imaging Applications: UV through LWIR IX,** Chairs: Jay N. Vizgaitis; Peter L. Marasco; Jasbinder S. Sanghera<br>Potomac 5 | | CONFERENCE 13043: **Anomaly Detection and Imaging with X-Rays (ADIX) IX,** Chairs: Amit Ashok; Joel A. Greenberg; Michael E. Gehm<br>National Harbor 7 | |
| | CONFERENCE 13044: **Optical Waveguide and Laser Sensors III,** Chairs: Robert A. Lieberman; Glen A. Sanders; Michael P. Buric<br>National Harbor 7 | | | |
| | | CONFERENCE 13045: **Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XXXV,** Chairs: David P. Haefner; Gerald C. Holst<br>National Harbor 3 | | |
| CONFERENCE 13046: **Infrared Technology and Applications L,** Chairs: Gabor F. Fulop; Michael H. MacDougal; David Z. Ting<br>National Harbor 2 | | | | |
| | CONFERENCE 13047: **Thermosense: Thermal Infrared Applications XLVI,** Chairs: Fernando López; Nicolas P. Avdelidis; Giovanni Ferrarini<br>Chesapeake 6 | | | |
| | CONFERENCE 13048: **Radar Sensor Technology XXVIII,** Chairs: Abigail S. Hedden; Gregory J. Mazzaro<br>Chesapeake 8 | | | |
| | CONFERENCE 13050: **Polarization: Measurement, Analysis, and Remote Sensing XVI,** Chairs: David B. Chenault; Meredith K. Kupinski; Bradley M. Ratliff<br>Chesapeake 1 | | CONFERENCE 13049: **Laser Radar Technology and Applications XXIX,** Chairs: Gary W. Kamerman; Lori A. Magruder; Monte D. Turner<br>National Harbor 4 | |
| | **Symposium Plenary**<br>5:00 PM - 6:30 PM<br>Potomac A<br>*See page 6 for details.* | **Poster Session**<br>6:00 PM - 7:30 PM<br>Potomac C<br>*See page 13 for details.* | | |




See full details and updates at **spie.org/dcs** or on the **SPIE App**

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| **Next Generation Sensor Systems and Applications —** Program track chair: **Latasha Solomon,** DEVCOM Army Research Lab. (USA) | | | | |
| | CONFERENCE 13051: **Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications VI,** Chairs: Peter J. Schwartz; Benjamin Jensen; Myron E. Hohil<br>Potomac 4 | | | |
| | CONFERENCE 13052: **Autonomous Systems: Sensors, Processing, and Security for Ground, Air, Sea, and Space Vehicles and Infrastructure 2024,** Chairs: Michael C. Dudzik; Stephen M. Jameson; Theresa J. Axenson<br>National Harbor 12 | | | |
| | CONFERENCE 13053: **Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping IX,** Chairs: J. Alex Thomasson; Christoph Bauer<br>National Harbor 14 | | | |
| | CONFERENCE 13054: **Assurance and Security for AI-enabled Systems,** Chairs: Joshua D. Harguess; Nathaniel D. Bastian; Teresa L. Pace<br>National Harbor 8 | | | |
| | | CONFERENCE 13055: **Unmanned Systems Technology XXVI,** Chairs: Hoa G. Nguyen; Paul L. Muench; Robert Diltz<br>National Harbor 10 | | |
| | CONFERENCE 13056: **Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XXV,** Chairs: Jason A. Guicheteau; Christopher R. Howle; Tanya L. Myers<br>Chesapeake 5 | | | |
| | CONFERENCE 13057: **Signal Processing, Sensor/Information Fusion, and Target Recognition XXXIII,** Chairs: Ivan Kadar; Erik P. Blasch; Lynne L. Grewe; Bhashyam Balaji; Thia Kirubarajan<br>Chesapeake 9 | | | |
| | CONFERENCE 13058: **Disruptive Technologies in Information Sciences VIII,** Chairs: Misty Blowers; Bryant T. Wysocki; Gaby Rossi<br>National Harbor 6 | | | |
| | CONFERENCE 13059: **Smart Biomedical and Physiological Sensor Technology XXI,** Chairs: Brian M. Cullum; Douglas Kiehl; Eric S. McLamore<br>National Harbor 11 | | | |
| | CONFERENCE 13060: **Sensing for Agriculture and Food Quality and Safety XVI,** Chairs: Moon S. Kim; Byoung-Kwan Cho; Fartash Vasefi<br>National Harbor 15 | | | |
| | | CONFERENCE 13061: **Ocean Sensing and Monitoring XV,** Chairs: Weilin Hou; Linda J. Mullen; Alexander Ignatov<br>Potomac 5 | | |
| | | CONFERENCE 13062: **Sensors and Systems for Space Applications XVII,** Chairs: Genshe Chen; Khanh D. Pham<br>National Harbor 8 | | |
| | **Symposium Plenary**<br>5:00 PM - 6:30 PM<br>**Potomac A**<br>*See page 6 for details.* | **Poster Session**<br>6:00 PM - 7:30 PM \|<br>**Potomac C**<br>*See page 13 for details.* | | |

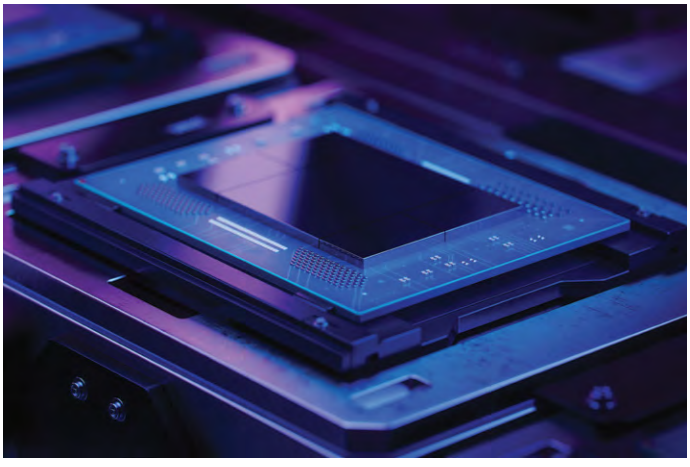
# APPLICATION TRACKS

Application tracks enable attendees to group and explore presentations in the conference programs to more easily plan their event schedule around the topic of interest. Application track filters span across all conferences at an SPIE event. The ability to group presentations together across the entire event in this way helps participants more easily locate a presentation in their area of interest and has the reciprocal benefit of helping authors' presentations be more easily found.

### Three application tracks to explore

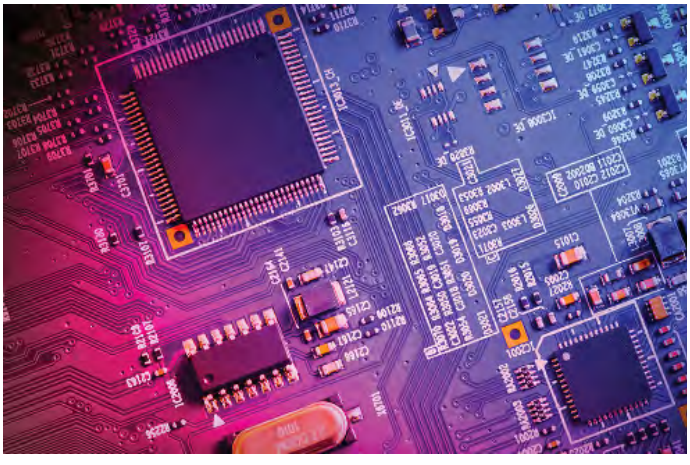
## Sustainability

Papers that highlight the use of optics and photonics for renewable energy, natural resource management, sustainable manufacturing, and greenhouse gas mitigation in support of the UN Sustainable Development Goals.



## AI/ML

Papers that highlight the use of artificial intelligence, machine learning, and deep learning to create and implement intelligent systems across multiple sectors, technologies, and applications.



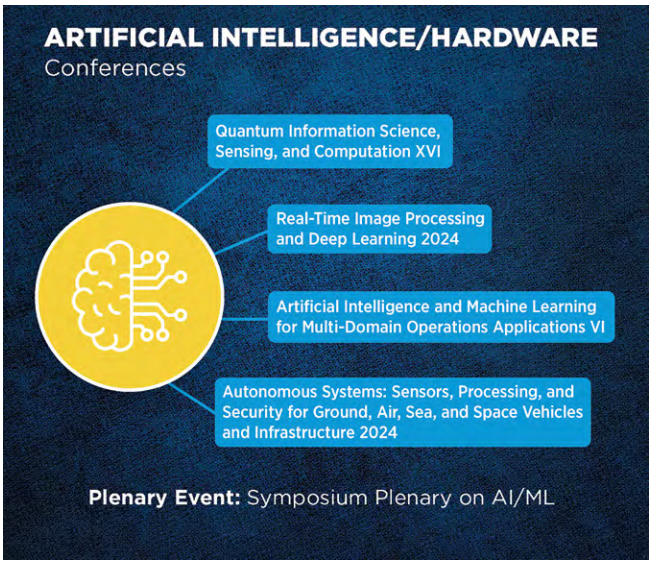
## Microelectronics

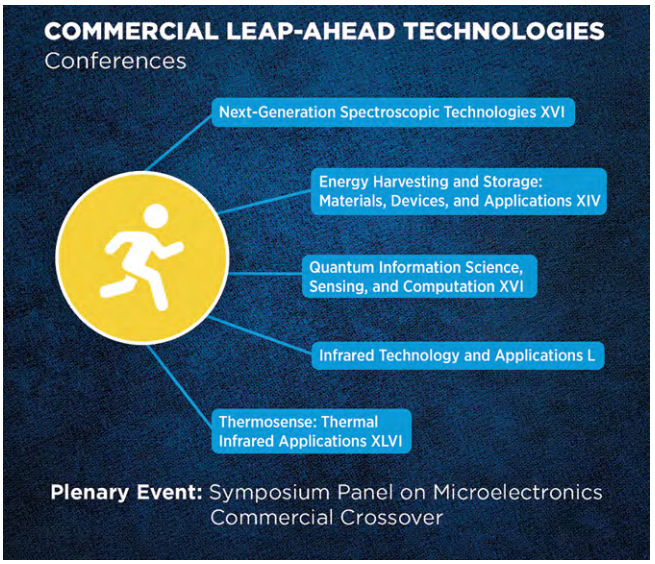
Papers that highlight advances in materials, design, fabrication, integration, and applications of silicon or compound semiconductor microelectronics for use in the security and defense sectors and the commercial marketplace.

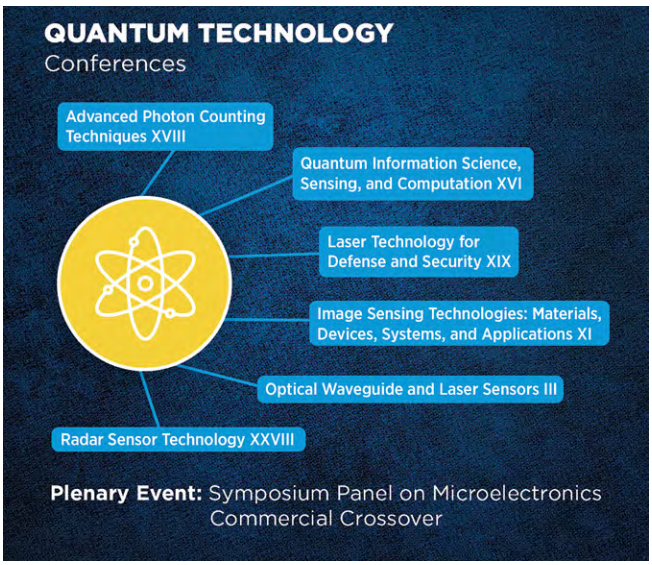
# The Microelectronics Commons

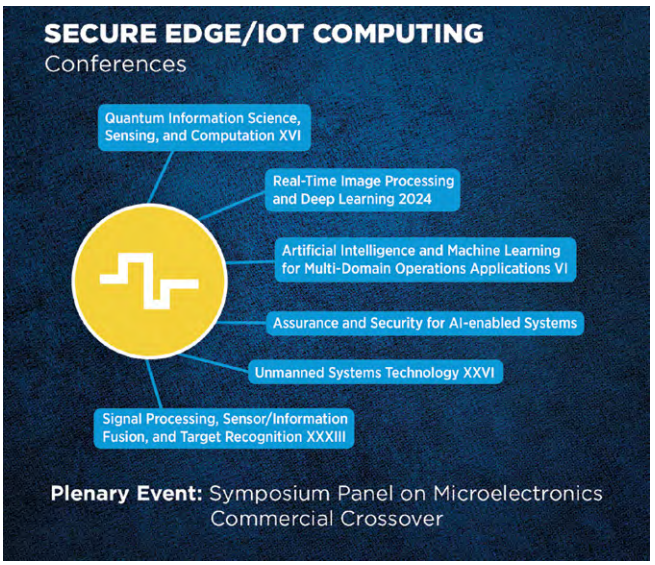
SPIE Defense + Commercial Sensing is highlighting its alignment of relevant conferences, talks, and courses that highlight the six key technology areas identified by the Microelectronics Commons, which is creating a direct pathway to reduce the United States' reliance on foreign microelectronics and safeguard against supply chain risks.

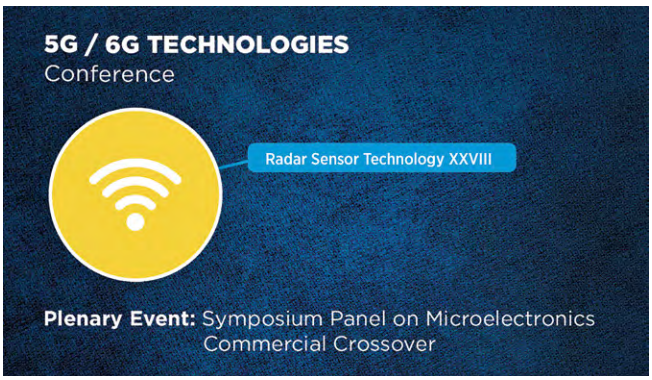
Below are some selections of the program that address the importance of microelectronics research, development, and advancement. Learn more: **spie.org/microelectronics**

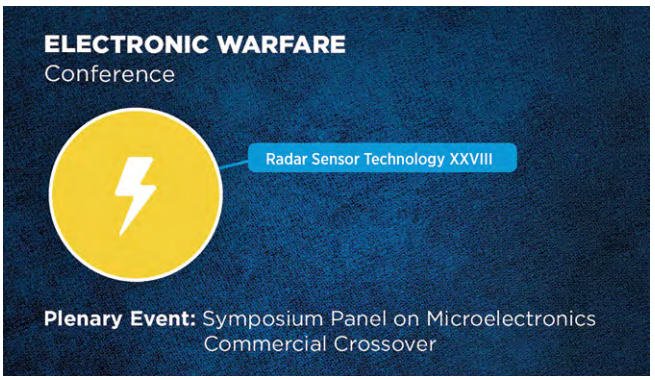


# COURSE SCHEDULE

Courses complement and expand your Defense + Commercial Sensing experience. Take advantage of this great opportunity to meet face-to-face with an expert instructor and a group of people with similar goals and challenges. See SPIE cashier or register online.

Price key: SPIE Member / Non-Member / Student Member

| SUNDAY 21 April 2024 | MONDAY 22 April 2024 | TUESDAY 23 April 2024 | WEDNESDAY 24 April 2024 | THURSDAY 25 April 2024 |
|---|---|---|---|---|
| SC014 • Day 1<br>**Introduction to Optomechanical Design**<br>Daniel Vukobratovich, Raytheon Missile Systems (USA)<br>8:30 AM - 5:30 PM<br>$1,555 \| $1,835 \| $834 | SC014 • Day 2<br>**Introduction to Optomechanical Design**<br>Daniel Vukobratovich, Raytheon Missile Systems (USA)<br>8:30 AM - 5:30 PM | SC152<br>**Infrared Focal Plane Arrays**<br>John E. Hubbs, Ball Aerospace & Technologies Corp. (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | SC1336<br>**Current Trends in Miniature Camera Technology from Visible to Infrared: Optimization for Performance, Size, and Cost**<br>Kevin J. Matherson, Microsoft Corp. (USA), David A. Dorn, Consultant (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | |
| SC160<br>**An Introduction to Precision Stabilized Pointing and Tracking Systems**<br>James M. Hilkert, Alpha-Theta Technologies (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | SC156<br>**Basic Optics for Engineers**<br>Glenn D. Boreman, The Univ. of North Carolina at Charlotte (USA)<br>8:30 AM - 5:30 PM<br>$880 \| $1,020 \| $508 | SC1327<br>**Optical Turbulence and Laser Beam Propagation**<br>Italo Toselli, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | SC003<br>**Practical Optical System Design**<br>Richard N. Youngworth, Riyo LLC (USA), S. Craig Olson, L3Harris Technologies, Inc. (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | |
| SC1215<br>**Deep Learning Architectures for Defense and Security**<br>Nasser M. Nasrabadi, West Virginia Univ. (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | SC154<br>**Electro-Optical Imaging System Performance**<br>Gerald C. Holst, JCD Publishing (USA)<br>8:30 AM - 5:30 PM<br>$905 \| $1,045 \| $518 | | SC900<br>**Uncooled Thermal Imaging Detectors and Systems**<br>Charles M. Hanson, SenseIR Solutions, LLC (USA)<br>8:30 AM - 5:30 PM<br>$880 \| $1,020 \| $508 | |
| SC1241<br>**Fundamentals of Infrared Sensing**<br>Glenn D. Boreman, The Univ. of North Carolina at Charlotte (USA)<br>8:30 AM - 5:30 PM<br>$875 \| $1,015 \| $506 | SC1246<br>**Infrared Imaging Technology Basics**<br>Austin A. Richards, Oculus Photonics LLP (USA)<br>10:30 AM - 12:30 PM<br>$335 \| $360 \| $244 | | SC1342<br>**Technologies and Applications for Miniature Optical Spectrometers and Spectroscopic Sensors**<br>Richard A. Crocombe, Crocombe Spectroscopic Consulting, LLC (USA)<br>1:30 PM - 5:30 PM<br>$515 \| $595 \| $338 | |

**MONEY-BACK GUARANTEE**

We are confident that once you experience an SPIE course for yourself you will look to us for your future education needs. However, if for any reason you are dissatisfied, we will gladly refund your money. We just ask that you tell us what you did not like; suggestions for improvement are always welcome.

**Digital badges and certificates**

SPIE awards digital badges and certificates to participants who attend courses and complete the evaluation and quiz. Digital credentials are always accessible, easily shareable, printable at any time, and verified. For more information visit spie.org/digital-badges

SPIE reserves the right to cancel a course due to insufficient advance registration.

## Onsite courses

View course descriptions and register online.

**SPIE Members and Student Members receive discounts on courses.**

| SUNDAY 21 April 2024 | MONDAY 22 April 2024 | TUESDAY 23 April 2024 | WEDNESDAY 24 April 2024 | THURSDAY 25 April 2024 |
|---|---|---|---|---|
| SC1268<br>**Interpreting Deep Learning Networks**<br>Raghuveer M. Rao, DEVCOM Army Research Lab. (USA)<br>8:30 AM - 12:30 PM<br>$515 \| $595 \| $338 | SC1170<br>**A Hands-On Introduction to Optics**<br>Damon Diehl, NextCorps Luminate (USA)<br>1:30 PM - 5:30 PM<br>$515 \| $595 \| $338 |  | | |
| SC067<br>**Testing and Evaluation of E-O Imaging Systems**<br>Gerald C. Holst, JCD Publishing (USA)<br>8:30 AM - 5:30 PM<br>$840 \| $980 \| $492 | SC015<br>**Fastening Optical Elements with Adhesives**<br>John G. Daly, Vector Engineering (USA)<br>1:30 PM - 5:30 PM<br>$515 \| $595 \| $338 | | | |
| SC710<br>**NIR and SWIR Imaging Applications**<br>Instructor(s): Austin A. Richards, Oculus Photonics LLP (USA)<br>1:30 PM - 5:30 PM<br>$570 \| $650 \| $360 | | | | |
| SC1288<br>**Problems in Autonomous Vehicle Imaging Systems**<br>Barbara G. Grant, Grant Drone Solutions, LLC (USA)<br>1:30 PM - 5:30 PM<br>$560 \| $640 \| $356 | | | | |
| SC1343<br>**Quaternion Neural Networks for Robust Scene Perception**<br>Sos S. Agaian, The Graduate Ctr., CUNY (USA)<br>1:30 PM - 5:30 PM<br>$515 \| $595 \| $338 | | | | |


See full details and updates at **spie.org/dcs** or on the **SPIE App**

## Badge pick up and registration hours

**Location: Gaylord National, Exhibition Level, Hall B/C Foyer**

| | |
|---|---|
| Sunday 21 April | 7:30 AM–5:00 PM |
| Monday 22 April | 7:30 AM–5:00 PM |
| Tuesday 23 April | 7:30 AM–5:00 PM |
| Wednesday 24 April | 7:30 AM–5:00 PM |
| Thursday 25 April | 7:30 AM–2:00 PM |

## SPIE Cashier

**Location: Gaylord National, Exhibition Level, Hall C Lobby**
**Open during registration hours**

### Registration payments

If you are planning to register onsite, please do so at the "Need to Register" laptop station.

Your credit card payment will be processed during registration.

If you wish to pay with cash or check, you will be directed to the Cashier once you have completed registration except for final payment.

If you have already registered and wish to add a course, workshop, or special event, you may do this online by signing into your SPIE account.

### Receipt and Certificate of Attendance

Preregistered attendees who need an SPIE-stamped receipt or attendees who need a Certificate of Attendance may obtain those at the Cashier.

### Badge Corrections

Badge corrections can be made at the Cashier. Please remove your badge from its holder and mark your badge with your changes before approaching the counter.

## Speaker Check-in and Preview Station

**Location: Gaylord National, Ballroom Level, Chesapeake 2/3**

| | |
|---|---|
| Sunday 21 April | 11:00 AM–5:00 PM |
| Monday 22 April | 7:30 AM–5:00 PM |
| Tuesday 23 April | 7:30 AM–5:00 PM |
| Wednesday 24 April | 7:30 AM–5:00 PM |
| Thursday 25 April | 7:30 AM–4:00 PM |

All speakers must stop at Speaker Check-In to upload and preview their slide presentation files at least two hours before their scheduled session or the day before if you present in the first session. Speakers are not able to present using their own devices. All conference rooms are equipped with a laptop, projector, screen, lapel microphone, and laser pointer.

SPIE will record the audio plus screen content of all presentations. Recordings will be published in the Proceedings of SPIE on the SPIE Digital Library.

## Internet access

Complimentary wireless internet access provided in meeting rooms and lobbies on the conference room level and in the exhibition hall. Instructions will be posted onsite.

## SPIE health and safety products

Stop by registration to pick up complimentary face masks, hand sanitizer, and other safety products all free from SPIE.

## SPIE Conference app information

**Location: Gaylord National, Ballroom Level, Potomac Foyer**

Our SPIE App developer will be onsite and available to answer any questions on its use or navigation and how to get the best user experience. We welcome your feedback.

This useful tool allows you to search and browse the program, special events, participants, exhibitors, courses, and more. It is free and available for iPhone and Android users. Download the SPIE App: spie.org/apps

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## SPIE Bookstore

**Location: Gaylord National, Exhibition Hall**

| | |
|---|---|
| Tuesday 23 April | 10:00 AM–5:00 PM |
| Wednesday 24 April | 10:00 AM–5:00 PM |
| Thursday 25 April | 10:00 AM–2:00 PM |

Stop by the SPIE Bookstore to browse the latest SPIE Press Books. While there, get a t-shirt or educational toy to bring home to the family.

Credit and debit cards only will be accepted; no cash.

## SPIE Course materials

**Location: Gaylord National, Exhibition Level, Hall B/C Foyer**
**Open during registration hours but closed Thursday**

Browse course offerings or learn more about SPIE courses available in portable formats such as online and customizable, in-company courses.

## SPIE luggage and coat check

Complimentary luggage, package, and coat storage are available in the hotel lobby.

## Business Center Office and FedEx Office

**Location: Gaylord National, Hotel Lobby**

**Daily . . . . . 7:00 AM–7:00 PM**

### Printing services available

Services include photocopying, faxing, printing services, and shipping. Office supplies are also available.

## Child care services

**White House Nannies, Inc.**
White House Nannies is the #1 recommended babysitting service for guests visiting the DC area.

SPIE does not imply an endorsement nor recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

## ATM and cash services

Gaylord National is a cashless facility. Cash to card kiosks and ATM machines are available in the hotel lobby.

## Gender inclusive restroom

Gender neutral restrooms available. Location: Ballroom Level next to SPIE Chair Services.

## Quiet Room

**Location: Gaylord National Hotel and Convention Center, Mezzanine Room 5**
**Open during registration hours**

The Quiet Room is intended for silent meditation, reflection, or prayer. No mobile devices or computer use is allowed, and no food or beverages are allowed.

## Mothers' Room

**Location: Gaylord National Hotel, behind the Concierge Desk**

The Mothers' Room is provided and managed by the hotel. Seating and a sink are available. See hotel front desk for access.

## Lost and Found

**Location: SPIE Cashier**
**(Gaylord National, Exhibition Level, Hall C Lobby)**
**Open during registration hours**

Found items will be kept at SPIE Cashier in the Registration area during the meeting and available only during registration hours. At the end of the meeting, all found items will be turned over to the National Harbor Security.

## Food and beverage services

**Complimentary Coffee**

| | | |
|---|---|---|
| Sunday | 1:00 PM–4:00 PM | National Harbor Foyer |
| Monday | 7:30 AM–4:00 PM | Potomac Foyer |
| Tuesday & Wednesday | 7:30 AM–9:30 AM | Potomac Foyer |
| Tuesday & Wednesday | 10:00 AM–4:00 PM | Exhibition Hall |
| Thursday | 7:30 AM–9:30 AM | Potomac Foyer |
| Thursday | 10:00 AM–2:00 PM | Exhibition Hall |
| Thursday | 2:00 PM–4:00 PM | Potomac Foyer |

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## Food and beverage services

**Concessions: Exhibition Hall E**

**Tuesday and Wednesday . . . . . 11:00 AM–2:00 PM**

**Thursday . . . . . 11:00 AM–1:30 PM**

## Nearby dining

Find dining options in National Harbor:
nationalharbor.com/dine-drink/

## Acceptance of policies and registration conditions

The following policies and conditions apply to all SPIE events, both online and in person. As a condition of registration, you will be required to acknowledge and accept the SPIE policies and conditions contained herein.

SPIE has established a confidential reporting system for all SPIE event participants to raise concerns about possible unethical or inappropriate behavior within our community. When at an SPIE event, you may contact any SPIE staff with concerns. If you feel that you are in immediate danger, please dial the local emergency number for police intervention.

### Agreement to hold harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

### Be well agreement

You acknowledge that attending an event involves some risk of exposure to COVID-19 or other communicable diseases. You voluntarily assume this risk and agree not to hold SPIE or any of its affiliates liable for any illness you may contract. You also agree not to attend the event if you feel ill or have had recent exposure to a COVID-19 case.

SPIE will provide hand sanitizer locations and disposable face masks upon request.

### Anti-harassment policy

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated. This policy applies to all locations and situations where SPIE business is conducted and to all SPIE-sponsored activities and events.

*Read complete policy:*
*https://spie.org/about-spie/the-society/policies-and-reporting*

### SPIE Conferences app messaging policy

The SPIE Conferences app supports attendee-to-attendee messaging to facilitate professional networking among meeting participants. This feature should not be used to push high-volume solicitations, and messaging will be disabled for attendees who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use via the app reporting feature. SPIE will also monitor for high-volume patterns suggesting improper use.

### SPIE Conferences app connect feature

The connect feature in the SPIE Conferences app is a personal networking tool that allows individuals to share their contact information with other attendees via their phones while using the SPIE app. This tool should not be used for systematic scanning of badges for managing sales leads. Inappropriate use is a violation of event policy.

### SPIE Conferences app lead retrieval feature

The lead retrieval feature in the SPIE Conferences app is a lead generation tool that allows attendees to share their contact information with SPIE exhibitors. Exhibitor representatives using the lead retrieval app may scan attendee badges in the exhibition or supporting company events after receiving permission from an attendee. It should not be used in the technical conference area. The lead retrieval feature will be disabled for exhibitor representatives who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use by notifying staff or contacting support via the help link in the app.

### Attendee registration and admission policies

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry of or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

### Capture and use of a person's image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness, including incidental capture of any individuals in your household or workplace, by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE purpose. By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify, and hold harmless SPIE from and against any claims, damages, or liability arising from or related to the use of the images, recordings, or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion, or use in composite form that may occur or be produced in taking, processing, reduction, or production of the finished product, its publication or distribution.

### Code of conduct

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

*Read complete code:*
*https://spie.org/about-spie/the-society/policies-and-reporting*

### Event and course cancellation by SPIE

If for some unforeseen reason, SPIE should have to cancel a course or an entire event, processed registration fees for the canceled activity will be refunded to registrants. Registrants will be responsible for the cancellation of travel arrangements or housing reservations and the applicable fees.

### Family-friendly policy

**CONFERENCE EVENTS:** all conference technical and networking events require a badge for admission. Registered attendees may bring children with them if they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

**EXHIBITION HALL:** everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

### Identification requirement

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials. Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

For online events, SPIE requires individuals to register with their legal identity.

### Laser-pointer safety policy

SPIE events are subject to the applicable laser safety rules and regulations of the host location. SPIE supplies industry-standard Class 2 presentation laser pointers for all conference and other meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers. The use of a personal laser pointer represents the user's acceptance of liability for any damage or injuries to the presenter or others.

### No smoking policy

Attendees will observe all non-smoking regulations that are publicly posted by the facilities used by the event.

## Online commenting policy

SPIE moderates all comments posted in an online event. We encourage robust discussion, the exchange of scientific ideas, and the sharing of multiple, diverse perspectives. We expect the discussion to be consistent with the norms of scholarly research community interactions at events. Online event participants should report any comments or content that falls short of those community norms. We will remove comments, content, or people that are considered inappropriate by SPIE standards or that:

- are defamatory, libelous, obscene, indecent, abusive, or threatening to others
- infringe the copyright, trademark, or other rights of a third party
- upload viruses or are a cybersecurity hazard
- are off-topic or inappropriately commercial in nature
- are in violation of any applicable laws or regulations

## Payment policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks, and wire transfers. Onsite registrations can also be paid with cash.

## Recording policy

**CONFERENCES AND POSTER SESSIONS:** audio and video recordings are prohibited without prior written consent of SPIE and the presenter. Consent forms are available at Speaker Check-in, SPIE Registration, or the Chair Services Desk. Individuals not complying with this policy will be asked to surrender their recording media and leave the conference room. Refusal to comply with such requests is grounds for expulsion from the event. Please see the SPIE code of conduct.

**COURSES:** audio and video recordings are prohibited without explicit permission from SPIE and the instructor. Individuals not complying with this policy will be asked to surrender their recording media and leave the classroom. Refusal to comply with such requests is grounds for expulsion from the event.

**EXHIBITION:** attendees may not record interviews on the exhibition floor nor record or photograph exhibitor booth displays and/or products without explicit permission from SPIE and on-site company representatives. Consent forms are available at Exhibitor Assistance. Individuals not complying with this policy will be asked to surrender their recording media and leave the exhibition hall. Refusal to comply with such requests is grounds for expulsion from the event.

## Unauthorized solicitation

Unauthorized solicitation in the exhibition hall is prohibited. Any non-exhibiting organization observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

## Unsecured items

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

## Wireless internet service

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other kinds of computer damage.

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SPIE.

SPIE is the international society for optics and photonics. We bring together engineers, scientists, students, and industry leaders, strengthening the global optics and photonics community through conferences, publications, and professional development. Inspired by the transformative power of photonics to enhance life around the globe, over the past five years SPIE has contributed more than $24 million to the international optics community.



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# TECHNICAL CONFERENCES

## CONTENTS

# CONFERENCE 13025

# Advanced Photon Counting Techniques XVIII

**23 - 24 April 2024 | National Harbor 12**

***Conference Chair(s):*** **Mark A. Itzler,** Luminar Technologies, Inc. (United States); **Joshua C. Bienfang,** National Institute of Standards and Technology (United States); **K. Alex McIntosh,** MIT Lincoln Lab. (United States)

***Program Committee:*** **Giulia Acconcia,** Politecnico di Milano (Italy); **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom); **Robert H. Hadfield,** Univ. of Glasgow (United Kingdom); **Michael A. Krainak,** Relative Dynamics, Inc. (United States); **Robert A. Lamb,** Leonardo MW Ltd. (United Kingdom); **Abigail S. Licht,** MIT Lincoln Lab. (United States); **Alan L. Migdall,** National Institute of Standards and Technology (United States); **Ivan Rech,** Politecnico di Milano (Italy); **Michael Wahl,** PicoQuant GmbH (Germany)

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS

23 April 2024 • 10:30 AM - 10:35 AM | National Harbor 12
*Session Chair(s):* **Mark A. Itzler**, Luminar Technologies, Inc. (United States)
Opening remarks for Advanced Photon Counting Techniques XVIII.

### SESSION 1: SINGLE-PHOTON DETECTION

23 April 2024 • 10:35 AM - 11:35 AM | National Harbor 12
*Session Chair(s):* **Mark A. Itzler**, Luminar Technologies, Inc. (United States)

13025-2 • 10:35 AM - 10:55 AM
**Afterpulsing in 1550nm Geiger-mode avalanche photodiodes**
*Author(s):* **Zachary M. Farhm**, **Hermanus S. Pretorius**, **K. Alexander McIntosh, Erik K. Duerr,** MIT Lincoln Lab. (United States)

13025-3 • 10:55 AM - 11:15 AM

**Active area measurement of 1064nm InGaAsP/InP Geiger mode avalanche photodiodes**
*Author(s):* **Caroline Tally**, **Abigail S. Licht**, **Zachary E. Kranefeld**, **Jonathan M. Richardson**, **Denis M. Nothern**, **Kyle A. McIntosh, Erik K. Duerr,** MIT Lincoln Lab. (United States)

13025-4 • 11:15 AM - 11:35 AM
**High sensitivity AlGaAsSb avalanche photodiodes with a fast overload recovery and high damage threshold**
*Author(s):* **Ye Cao**, **Benjamin M. Sheridan**, **David M. Price**, **Xiao Collins, Benjamin S. White,** Phlux Technology Ltd. (United Kingdom)

**Lunch/Exhibition Break 11:35 AM - 01:05 PM**

## SESSION 2: SUPERCONDUCTING SINGLE-PHOTON DETECTORS

23 April 2024 • 01:05 PM - 02:45 PM | National Harbor 12
*Session Chair(s):* **Joshua C. Bienfang**, National Institute of Standards and Technology (United States)

13025-5 • 01:05 PM - 01:30 PM
**Advances in superconducting nanowire devices for UV to mid-infrared single-photon detection** *(Invited Paper)*
*Author(s):* **Vidur Raj**, **Dmitry Morozov**, **Mahmoud Ahtaiba**, **Ewan Mackenzie**, **Ciaran Lennon**, **Bernard Cooper**, **Daniel Kuznesof**, **Gregor G. Taylor, Robert H. Hadfield,** Univ. of Glasgow (United Kingdom)

13025-6 • 01:30 PM - 01:55 PM
**New frontiers for commercial SNSPDs** *(Invited Paper)*
*Author(s):* **Tim Rambo**, **Jeremy Doredla,** Quantum Opus, LLC (United States); **Hudson Jones**, **Leo Oshiro**, **Amy R Conover,** Quantum Opus (United States); **Stephanie Boyd, Aaron J. Miller,** Quantum Opus, LLC (United States)

13025-7 • 01:55 PM - 02:20 PM
**Progress in the realization of multi-channels waveguide-integrated photon number resolving detectors** *(Invited Paper)*
*Author(s):* **Simone Ferrari,** Kirchhoff-Institut für Physik, Ruprecht-Karls-Univ. Heidelberg (Germany); **Oliver Page**, **Iurii Konyshev,** Ruprecht-Karls-Univ. Heidelberg (Germany); **Wolfram P. Pernice,** Ruprecht-Karls-Univ. Heidelberg (Germany), Univ. Münster (Germany); **Vincent Spreter,** Kirchhoff-Institut für Physik (Germany); **Roland Jaha,** Univ. Münster (Germany); **Erik Jung,** Kirchhoff-Institut für Physik (Germany)

13025-8 • 02:20 PM - 02:45 PM
**Trap-integrated superconducting nanowire single-photon detectors for trapped-ion qubit state readout** *(Invited Paper)*
*Author(s):* **Benedikt Hampel,** National Institute of Standards and Technology (United States), Univ. of Colorado Boulder (United States); **Daniel H. Slichter**, **Dietrich G. Leibfried**, **Richard P. Mirin**, **Sae Woo Nam, Varun B. Verma,** National Institute of Standards and Technology (United States)

**Coffee Break 02:45 PM - 03:15 PM**

## SESSION 3: PHOTON-COUNTING IMAGING TECHNIQUES

23 April 2024 • 03:15 PM - 04:25 PM | National Harbor 12
*Session Chair(s):* **Mark A. Itzler**, Luminar Technologies, Inc. (United States)

13025-10 • 03:15 PM - 03:40 PM
**Time-resolved single-photon imaging with superconducting nanowire detector arrays** *(Invited Paper)*
*Author(s):* **Emanuel Knehr**, **Boris Korzh**, **Jason P. Allmaras**, **Andrew D. Beyer**, **Emma E. Wollman**, **Ioana Craiciu**, **Gregor G. Taylor,** Jet Propulsion Lab. (United States); **Sahil Patel,** Jet Propulsion Lab. (United States), Caltech (United States); **Jamie Luskin,** Jet Propulsion Lab. (United States), Univ. of Maryland, College Park (United States); **Andrew Mueller,** Jet Propulsion Lab. (United States), Caltech (United States); **Bruce Bumble, Matthew D. Shaw,** Jet Propulsion Lab. (United States)

13025-11 • 03:40 PM - 04:05 PM
**Single photon avalanche diode detector arrays for underwater profiling** *(Invited Paper)*
*Author(s):* **Aurora Maccarone**, **Rui Zhang**, **Kristofer Drummond,** Heriot-Watt Univ. (United Kingdom); **Germán Mora Martin,** The Univ. of Edinburgh (United Kingdom); **Ulrich K. Steinlehner**, **Aongus McCarthy,** Heriot-Watt Univ. (United Kingdom); **Robert K. Henderson,** The Univ. of Edinburgh (United Kingdom); **Yoann Altmann,** Heriot-Watt Univ. (United Kingdom); **Istvan Gyongy,** The Univ. of Edinburgh (United Kingdom); **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom)

13025-12 • 04:05 PM - 04:25 PM
**Multichannel-GaAsP-photomultiplier-based fiber bundle ISM-STED microscope**
*Author(s):* **Marcus Babin**, **Erik Beckert**, **Simone Fabian,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Michael Reibe,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Institut für Angewandte Physik, Friedrich-Schiller-Univ. Jena (Germany); **Lukas Spantzel, Michael Börsch,** Universitätsklinikum Jena (Germany)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 4: SINGLE-PHOTON COMMUNICATIONS

24 April 2024 • 10:30 AM - 12:10 PM | National Harbor 12
*Session Chair(s):* **K. Alexander McIntosh**, MIT Lincoln Lab. (United States)

13025-13 • 10:30 AM - 10:55 AM
**Photon-counting for deep space optical communications** *(Invited Paper)*
*Author(s):* **Abhijit Biswas**, **Meera Srinivasan**, **Emma E. Wollman**, **Erik Alerstam**, **Ryan Rogalin**, **Kenneth S Andrews, Jason P Allmaras,** Jet Propulsion Lab. (United States)

13025-14 • 10:55 AM - 11:20 AM
**A photon counting ground receiver for free-space optical communications** *(Invited Paper)*
*Author(s):* **Jennifer N. Downey,** NASA Glenn Research Ctr. (United States)

13025-15 • 11:20 AM - 11:45 AM
**Precision synchronization for satellite quantum communication** *(Invited Paper)*
*Author(s):* **Neal W. Spellmeyer,** MIT Lincoln Lab. (United States)

13025-16 • 11:45 AM - 12:10 PM
**fiber polarization characterization and stabilization in a quantum network** *(Invited Paper)*
*Author(s):* **Yicheng Shi**, **Thomas Gerrits, Oliver Slattery,** National Institute of Standards and Technology (United States)

**Lunch/Exhibition Break 12:10 PM - 01:50 PM**

### SESSION 5: SINGLE-PHOTON SOURCES

24 April 2024 • 01:50 PM - 03:00 PM | National Harbor 12
*Session Chair(s):* **Giulia Acconcia**, Politecnico di Milano (Italy)

13025-17 • 01:50 PM - 02:15 PM
**Temperature-insensitive source for entangled time-frequency quantum photonic states** *(Invited Paper)*
*Author(s):* **Daniel J. Gauthier, Andrew Rockovich,** The Ohio State Univ. (United States)

13025-18 • 02:15 PM - 02:40 PM
**Atomic vapor quantum memory for on-demand semiconductor single photon sources** *(Invited Paper)*
*Author(s):* **Esteban Gómez-López**, **Anja Jovicevic,** Humboldt-Univ. zu Berlin (Germany); **Karol Winkler**, **Jonathan Jurkat**, **Moritz Meinecke,** Julius-Maximilians-Univ. Würzburg (Germany); **Janik Wolters,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany), Institut für Optik und Atomare Physik, Technische Univ. Berlin (Germany); **Tobias Huber-Loyola**, **Sven Höfling,** Julius-Maximilians-Univ. Würzburg (Germany); **Oliver Benson,** Humboldt-Univ. zu Berlin (Germany)

13025-19 • 02:40 PM - 03:00 PM
**Advances in entangled-photon sources and single-photon avalanche diodes for quantum technologies in the SWIR**
*Author(s):* **Frank Rutz**, **Thorsten Passow**, **Andreas Wörl**, **Raphael Müller**, **Quankui K. Yang**, **Vivienne Leidel**, **Andreas Bächle**, **Elke Diwo-Emmer**, **Jasmin Niemasz**, **Silvia Giudicatti**, **Volker Daumer, Robert Rehm,** Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 6: PHOTON-COUNTING APPLICATIONS AND METROLOGY

24 April 2024 • 03:30 PM - 05:35 PM | National Harbor 12
*Session Chair(s):* **Alan L. Migdall**, National Institute of Standards and Technology (United States)

13025-20 • 03:30 PM - 03:55 PM
**A dictionary for single photonics** *(Invited Paper)*
*Author(s):* **Joshua C. Bienfang**, **Paulina Kuo**, **Thomas Gerrits**, **Alan L. Migdall**, **Sergey V. Polyakov, Oliver Slattery,** National Institute of Standards and Technology (United States)

13025-21 • 03:55 PM - 04:20 PM
**Multi-mode Gaussian state analysis with one photon counter** *(Invited Paper)*
*Author(s):* **Arik Avagyan**, **Scott Glancy, Emanuel Knill,** National Institute of Standards and Technology (United States)

13025-22 • 04:20 PM - 04:45 PM
**Experimental principles of quantum spectroscopy of materials with entangled photons** *(Invited Paper)*
*Author(s):* **Ajay Ram Srimath Kandada,** Wake Forest Univ. (United States)

13025-23 • 04:45 PM - 05:10 PM
**Advances in diffuse correlation spectroscopy for functional brain imaging and clinical neuromonitoring applications** *(Invited Paper)*
*Author(s):* **Stefan A. Carp,** Massachusetts General Hospital (United States), Harvard Medical School (United States)

13025-24 • 05:10 PM - 05:35 PM
**New constraint-less methodology to avoid distortion at any speed in time correlated single photon counting** *(Invited Paper)*
*Author(s):* **Giulia Acconcia**, **Ivan Rech,** Politecnico di Milano (Italy); **Alessandro Cominelli,** Tecnosens S.p.A. (Italy)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13025-9
**Fractal superconducting nanowire single-photon detectors and their applications in polarimetric imaging** *(Invited Paper)*
*Author(s):* **Xiaolong Hu**, **Yun Meng**, **Kai Zou**, **Nan Hu**, **Zifan Hao**, **Yifan Feng**, **Liang Xu**, **Xiaojian Lan**, **Xiaoming Chi**, **Yuhao Cheng**, **Chao Gu**, **Xiaotian Zhu,** Tianjin Univ. (China); **Thomas Descamps**, **Adrian Iovan**, **Stephan Steinhauer**, **Samuel Gyger**, **Julien Zichi, Val Zwiller,** KTH Royal Institute of Technology (Sweden)

# CONFERENCE 13026

# Next-Generation Spectroscopic Technologies XVI

**22 - 23 April 2024 | National Harbor 4**

***Conference Chair(s):*** **Richard A. Crocombe,** Crocombe Spectroscopic Consulting, LLC (United States); **Luisa T. M. Profeta,** Rigaku Analytical Devices (United States)

***Conference Co-Chair(s):*** **Steven M. Barnett,** Barnett Technical Services, LLC (United States)

***Program Committee:*** **Abul K. Azad,** The Ctr. for Integrated Nanotechnologies (United States); **David Blair,** Headwall Photonics, Inc. (United States); **Anshuman J. Das,** MIT Media Lab. (United States); **Andrea Fiore,** Technische Univ. Eindhoven (Netherlands); **Willem Hoving,** Photonics Consultancy (Netherlands); **Vassili Karanassios,** Univ. of Waterloo (Canada); **Ellen V. Miseo,** TeakOrigin, Inc. (United States); **Dario Polli,** Politecnico di Milano (Italy); **Thomas P. Rasmussen,** Great Fun Learning (Denmark); **Dilusha Silva,** The Univ. of Western Australia (Australia); **H. Ted Stinson,** DRS Daylight Solutions (United States); **Ulrike Willer,** Energie-Forschungszentrum Niedersachsen (Germany)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:00 AM - 08:10 AM | National Harbor 4

### SESSION 1: NEW SPECTROSCOPIC TECHNOLOGIES I

22 April 2024 • 08:10 AM - 10:00 AM | National Harbor 4
*Session Chair(s):* **Luisa T. M. Profeta**, Rigaku Analytical Devices (United States)

13026-1 • 08:10 AM - 08:40 AM
**Next-generation infrared photonics: from biodiagnostics to food safety** *(Invited Paper)*
*Author(s):* **Boris Mizaikoff,** Univ. Ulm (Germany), Hahn-Schickard (Germany)

13026-2 • 08:40 AM - 09:00 AM
**TeraFET Spectrometer**
*Author(s):* **Michael S. Shur**, **Xueqing Liu,** Rensselaer Polytechnic Institute (United States); **Trond Ytterdal,** Norwegian Univ. of Science and Technology (Norway)

13026-3 • 09:00 AM - 09:20 AM
**Multi-octave coherent mid-infrared supercontinuum generation out to 11 µm via intra-pulse difference frequency generation in ZGP**
*Author(s):* **Ankita Khanolkar**, **Chenchen Wan**, **DongFeng Liu,** Thorlabs, Inc. (United States); **Sterling Backus,** Thorlabs, Inc. (United States), Colorado State Univ. (United States); **Peter Fendel, Reza Salem,** Thorlabs, Inc. (United States)

13026-4 • 09:20 AM - 09:40 AM
**UV-VIS chip-scale polarization spectrometer**
*Author(s):* **Juhyeon Kim**, **Jiyi Chen**, **Pengyu Li**, **Yutong Wang**, **Qing Qu, Pei-Cheng Ku,** Univ. of Michigan (United States)

13026-5 • 09:40 AM - 10:00 AM
**Optical and thermal properties of thin film novel Chalcogenide materials and optical design for trace-gas sensing**
*Author(s):* **Ibrahim Elkholy**, **Al R. Alexis, Mohammad A. Khan,** Delaware State Univ. (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: NEW SPECTROSCOPIC TECHNOLOGIES II

22 April 2024 • 10:30 AM - 11:40 AM | National Harbor 4
*Session Chair(s):* **Richard A. Crocombe**, Crocombe Spectroscopic Consulting, LLC (United States)

13026-6 • 10:30 AM - 11:00 AM
**Evaluation of compact spectroscopic sensors in the VIS/NIR wavelength range for quality control and material analysis** *(Invited Paper)*
*Author(s):* **Thomas Arnold**, **Martin De Biasio, Barbara Oliveira,** Silicon Austria Labs. GmbH (Austria)

13026-7 • 11:00 AM - 11:20 AM
**FT-NIR spectroscopy for process automation technology**
*Author(s):* **John D. Gilmore**, **Slawomir Piatek, Stephanie Butron,** Hamamatsu Corp. (United States)

13026-9 • 11:20 AM - 11:40 AM
**Quantum dots for selected environmental analysis applications**
*Author(s):* **Vassili Karanassios**, **U. Dayal, M. J. W. Thiessen,** Univ. of Waterloo (Canada)

**Lunch Break 11:40 AM - 01:40 PM**

## SESSION 3: NEW SPECTROSCOPIC TECHNOLOGIES III

22 April 2024 • 01:40 PM - 02:40 PM | National Harbor 4
*Session Chair(s):* **Luisa T. M. Profeta**, Rigaku Analytical Devices (United States)

13026-11 • 01:40 PM - 02:00 PM
**Near-field scanning terahertz spectroscopy of plasmonic surface waves**
*Author(s):* **Weili Zhang**, **Ruxue Wei**, **Soren Petersen, Jasmine Taplin,** Oklahoma State Univ. (United States)

13026-12 • 02:00 PM - 02:20 PM
**A Sagnac-Fourier spectrometer**
*Author(s):* **Matthias Lenzner,** Lenzner Research LLC (United States)

13026-13 • 02:20 PM - 02:40 PM
**"Snapshot" active detection of target chemicals using spatial heterodyne spectroscopy**
*Author(s):* **Christopher A. Kendziora, Tyler J. Huffman,** U.S. Naval Research Lab. (United States)

**Coffee Break 02:40 PM - 03:10 PM**

## SESSION 4: NEW SPECTROSCOPIC APPLICATIONS I

22 April 2024 • 03:10 PM - 04:00 PM | National Harbor 4
*Session Chair(s):* **Luisa T. M. Profeta**, Rigaku Analytical Devices (United States)

13026-14 • 03:10 PM - 03:40 PM
**Mid infrared spectroscopy applications using quantum cascade lasers for the identification of microplastic contaminants in aqueous solution** *(Invited Paper)*
*Author(s):* **H. Ted Stinson**, **Jason Sorger**, **Eric Takeuchi**, **Taylor Stathopoulos, Matthew Mitchell,** DRS Daylight Solutions (United States)

13026-17 • 03:40 PM - 04:00 PM
**Graphene, a two-dimensional (2D) nano-material, for chemical speciation in the field**
*Author(s):* **Vassili Karanassios**, **D. Cebula**, **U. Dayal,** Univ. of Waterloo (Canada); **M. J. W. Thiessen,** Univ. of Waterloo, Chem Nano (Canada); **C Dismore,** Univ. of Waterloo (Canada)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 5: NEW SPECTROSCOPIC APPLICATIONS II

23 April 2024 • 10:30 AM - 11:50 AM | National Harbor 4
*Session Chair(s):* **Luisa T. M. Profeta**, Rigaku Analytical Devices (United States)

13026-18 • 10:30 AM - 10:50 AM
**Multipass Raman spectroscopy applied to qualitative and quantitative combustion gas diagnostic**
*Author(s):* **Riccardo Dal Moro,** CNR-Istituto di Fotonica e Nanotecnologie (Italy), Univ. degli Studi di Padova (Italy); **Fabio Melison**, **Lorenzo Cocola, Luca Poletto,** CNR-Istituto di Fotonica e Nanotecnologie (Italy)

13026-19 • 10:50 AM - 11:10 AM
**Natural gas and hydrogen-enriched natural gas composition measurements by industrial-grade Raman spectroscopy**
*Author(s):* **Fabio Melison**, **Lorenzo Cocola,** CNR-Istituto di Fotonica e Nanotecnologie (Italy); **Elena Meneghin**, **Daniele Rossi,** Pietro Fiorentini SpA (Italy); **Luca Poletto,** CNR-Istituto di Fotonica e Nanotecnologie (Italy)

13026-20 • 11:10 AM - 11:30 AM
**Artificial intelligence (and related topics, e.g., machine learning, deep learning, Artificial Neural Networks or ANNs) as applied to the teaching and to the practice of analytical spectrochemistry**
*Author(s):* **Vassili Karanassios, Celine Tat,** Univ. of Waterloo (Canada)

13026-21 • 11:30 AM - 11:50 AM
**Leak detection tools for the decarbonization and demethanization infrastructure**
*Author(s):* **Nicholas F. Aubut**, **Shin-Juh Chen**, **Michael B. Frish,** Physical Sciences Inc. (United States); **Roy M. Massengale,** EnRUD Resources, Inc. (United States)

**Lunch/Exhibition Break 11:50 AM - 03:30 PM**

## SESSION 6: NEXT-GENERATION AND CBRNE SENSING: JOINT SESSION WITH CONFERENCES 13026 AND 13056

23 April 2024 • 03:30 PM - 05:10 PM | National Harbor 4
*Session Chair(s):* **Augustus W. Fountain**, Univ. of South Carolina (United States); **Richard A. Crocombe**, Crocombe Spectroscopic Consulting, LLC (United States)

13056-27 • 03:30 PM - 03:50 PM
**The Hyper-Cam Nano next generation LWIR hyperspectral imaging system**
*Author(s):* **Joseph Carrock,** Telops Inc. (United States); **Antoine Dumont,** Telops Inc. (Canada); **Benjamin Saute,** Telops, Inc. (Canada); **Mark Norman**, **Martin Lariviere-Bastien, Martin Chamberland,** Telops Inc. (Canada)

13056-28 • 03:50 PM - 04:10 PM
**Evaluation of emerging chemical sensors for food protection and chemical sensing**
*Author(s):* **Jerry B. Cabalo, Rabih E. Jabbour,** DHS Chemical Security and Analysis Ctr. (United States)

13056-29 • 04:10 PM - 04:30 PM
**Resonant cavity enhanced infrared photodiode array for bio-chemical sensing and identification: Solid state spectrometer**
*Author(s):* **Adam Craig,** Amethyst Research Ltd. (United Kingdom), Lancaster Univ. (United Kingdom); **Mark Carmichael,** Amethyst Research Ltd. (United Kingdom); **Terry Golding,** Amethyst Research Inc. (United Kingdom); **Andrew Marshall,** Lancaster Univ. (United Kingdom)

13026-23 • 04:30 PM - 04:50 PM
**Integrated Raman sensor smart robot for swift and remote on-site forensic analysis**
*Author(s):* **Eddie Tan**, **Sam Heng Lum**, **Yan Ling Lau**, **Shi Yi Liang**, **Hansel Tay**, **Kiat Nern Yeo**, **M. K. Michael Tay**, **Justin Tan**, **Chiew Yung Yang**, **Gee Wah Ng, Chin Chin Lim,** Home Team Science and Technology Agency (Singapore)

13026-24 • 04:50 PM - 05:10 PM
**Real-time particle analysis of aerosols and hazardous substances using single-particle mass spectrometry and deep learning**
*Author(s):* **Heinrich Ruser**, **Guanzhong Wang**, **Thomas Adam,** Univ. der Bundeswehr München (Germany); **Johannes Passig,** Helmholtz Zentrum München GmbH (Germany), Univ Rostock (Germany); **Sven Ehlert, Andreas Walte,** PHOTONION GmbH (Germany)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13026-16 • 06:00 PM - 07:30 PM
**Non-destructive thickness measurement of the individual layers of end-of-life photovoltaic modules to enable optimized layer separation**
*Author(s):* **Martin De Biasio,** Silicon Austria Labs GmbH (Austria); **Anika Gassner**, **Gabriele Eder,** Austrian Research Institute for Chemistry and Technology (Austria); **Lukas Neumaier,** Silicon Austria Labs GmbH (Austria)

13026-30 • 06:00 PM - 07:30 PM
**Detection of Polymer Residues on the Glass Surface of Recycled EoL Photovoltaic Modules using Near-Infrared Hyper-Spectral Imaging**
*Author(s):* **Martin De Biasio,** Silicon Austria Labs. GmbH (Austria); **Gabriele C. Eder,** Austrian Research Institute for Chemistry and Technology (Austria); **Thomas Arnold, Lukas Neumaier,** Silicon Austria Labs. GmbH (Austria)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13026-25
**Mapping the growth of supercontinuum applications in modern spectroscopy**
*Author(s):* **Khaled Obaideen, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

## CONFERENCE 13027

# Energy Harvesting and Storage: Materials, Devices, and Applications XIV

**22 April 2024 | Potomac 1**

***Conference Chair(s):*** **Zunaid Omair,** Stanford Univ. (United States); **Naresh C. Das,** CCDC Army Research Lab. (United States)

***Program Committee:*** **Md Zunaid Baten,** Bangladesh Univ. of Engineering and Technology (Bangladesh); **Peter Bermel,** Purdue Univ. (United States); **Paul Boieriu,** EPISOLAR, Inc. (United States); **Deryn Chu,** U.S. Army Research Lab. (United States); **Nibir K. Dhar,** Virginia Commonwealth Univ. (United States); **Achyut K. Dutta,** Banpil Photonics, Inc. (United States); **M. Saif Islam,** Univ. of California, Davis (United States); **Nobuhiko P. Kobayashi,** Univ. of California, Santa Cruz (United States); **Hidenori Mimura,** Shizuoka Univ. (Japan); **Jagjit Nanda,** Oak Ridge National Lab. (United States); **Vijay Parameshwaran,** U.S. Army Research Lab. (United States); **Sunmi Shin,** National Univ. of Singapore (Singapore); **Siva Sivananthan,** EPIR Technologies (United States); **Ashok K. Sood,** Magnolia Optical Technologies, Inc. (United States); **Patrick J. Taylor,** U.S. Army Research Lab. (United States); **Sudhir B. Trivedi,** Brimrose Corp. of America (United States); **Chunlei Wang,** Univ. of Miami (United States); **Priyalal Wijewarnasuriya,** Teledyne Imaging Sensors (United States); **Sheng Xu,** Univ. of California, San Diego (United States)

## Monday 22 April 2024

### SESSION 1: ENERGY HARVESTING AND STORAGE I

22 April 2024 • 08:00 AM - 10:20 AM | Potomac 1
*Session Chair(s):* **Zunaid Omair**, Banpil Photonics, Inc. (United States)

13027-1 • 08:00 AM - 08:30 AM
**Examining stability in organo-halide perovskite solar cells** *(Invited Paper)*
*Author(s):* **Anupama B. Kaul,** Univ. of North Texas (United States)

13027-2 • 08:30 AM - 08:50 AM
**Steering oxygen evolution reaction to accelerate electrocatalytic hydrogen production via water electrolysis**
*Author(s):* **Jiangtian Li**, **Deryn D. Chu,** DEVCOM Army Research Lab. (United States); **Blake Smith, Enoch Nagelli,** U.S. Military Academy (United States)

13027-4 • 08:50 AM - 09:10 AM
**Device simulations of HgCdTe thermo-radiative diodes for energy harvesting**
*Author(s):* **Zhi-Gang Yu**, **Srini Krishnamurthy**, **Paul Boieriu,** Sivananthan Labs., Inc. (United States); **Shanhui Fan,** Stanford Univ. (United States); **Richard Pimpinella, Jamie Howell,** Sivananthan Labs. (United States)

13027-5 • 09:10 AM - 09:30 AM
**Bipolar electrochem graphene micro-supercaps**
*Author(s):* **Chunlei Wang,** Univ. of Miami (United States)

13027-16 • 09:30 AM - 09:50 AM
**AlGaN-based junctions for alphavoltaic energy conversion**
*Author(s):* **Vijay Parameshwaran**, **LeighAnn S. Larkin**, **Mihee Ji**, **John D. Demaree**, **Michael Wraback, Marc S. Litz,** DEVCOM Army Research Lab. (United States)

13027-15 • 09:50 AM - 10:20 AM
**Radiative cooling and two-phase cooling architectures for high-power electronics** *(Invited Paper)*
*Author(s):* **Peter Bermel,** Purdue Univ. (United States)

**Coffee Break 10:20 AM - 10:50 AM**

## SESSION 2: ENERGY HARVESTING AND STORAGE II

22 April 2024 • 10:50 AM - 11:50 AM | Potomac 1
*Session Chair(s):* **Naresh C. Das**, CCDC Army Research Lab. (United States)

13027-8 • 10:50 AM - 11:10 AM
**Hydrogen fuel cell application for a tactical hybridized energy network**
*Author(s):* **Robert S. Jane**, **Gail T. Vaucher, Michael Lee**, **Morris Berman**, **Michael D'Arcy,** DEVCOM Army Research Lab. (United States); **Enoch Nagelli, Corey James,** United States Military Academy Department of Chemistry and Life Sciences (United States)

13027-9 • 11:10 AM - 11:30 AM
**Multi-source energy harvesting technology using piezoelectric and thermoelectric materials**
*Author(s):* **Narasimha S. Prasad,** NASA Langley Research Ctr. (United States); **Bed Poudel**, **Sumanta Kumar Karan**, **Amin Nozariasbmarz**, **Wenjie Li, Yu Zhang,** The Pennsylvania State Univ. (United States)

13027-10 • 11:30 AM - 11:50 AM
**Theoretical Investigation on Harvesting Thermal Energy Beyond the Visible Spectrum in Ta-Doped Monolayer MoS2**
*Author(s):* **Fatima Rehman**, **Shahzad Ahmad**, **Qasim Mehmood,** Information Technology Univ. of the Punjab (Pakistan); **Usman Younis,** Information Technology Univ of the Punjab (Pakistan); **Saira Khanam,** Information Technology Univ. of the Punjab (Pakistan)

**Lunch Break 11:50 AM - 01:40 PM**

## SESSION 3: ENERGY HARVESTING AND STORAGE III

22 April 2024 • 01:40 PM - 03:10 PM | Potomac 1
*Session Chair(s):* **Peter Bermel**, Purdue Univ. (United States)

13027-14 • 01:40 PM - 02:00 PM
**An inverse design approach for two-dimensional periodic structures for multifunctional optical devices**
*Author(s):* **Zunaid Omair**, **Kwong-Kit Choi, Achyut Dutta,** Banpil Photonics, Inc. (United States)

13027-11 • 02:00 PM - 02:30 PM
**Water jet-assisted green recycling of Si-Solar cell modules waste** *(Invited Paper)*
*Author(s):* **Mool C. Gupta**, **Pawan K. Kanaujia,** Univ. of Virginia (United States); **Michael Owen-Bellini**, **Michael Woodhouse, David L. Young,** National Renewable Energy Lab. (United States)

13027-12 • 02:30 PM - 02:50 PM
**Development and analysis of reformed ethanol fuel cell system for power generation**
*Author(s):* **Deryn D. Chu,** DEVCOM Army Research Lab. (United States)

13027-13 • 02:50 PM - 03:10 PM
**alpha-induced radio-luminescent energy conversion in scintillating materials**
*Author(s):* **Marc S. Litz**, **Vijay Parameshwaran**, **John D. Demaree**, **LeighAnn S. Larkin, Michael Wraback,** DEVCOM Army Research Lab. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13027-18 • 06:00 PM - 07:30 PM
**Beyond conventional predictions: unfolding the ensemble Kalman filter's publications in renewable energy**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Mohammad AlShabi,** Univ. of Sharjah (United Arab Emirates)

13027-19 • 06:00 PM - 07:30 PM
**Luminosity of Scintillators**
*Author(s):* **Nusrat H. Sarwahrdy,** Univ. of Maryland, College Park (United States), U.S. Army Research Lab. (United States)

13027-30 • 06:00 PM - 07:30 PM
**Engineering stability of perovskite under environmental stress through interfaces and low-dimensionality absorbers**
*Author(s):* **Brendan Jones**, **Sujan Aryal,** Univ. of North Texas (United States); **Anirudha V. Sumant,** Argonne National Lab. (United States); **Qinglong Jiang,** Univ. of Arkansas at Pine Bluff (United States); **Anupama B. Kaul,** Univ. of North Texas (United States)

13027-20 • 06:00 PM - 07:30 PM
**Modeling of scintillator damage by [alpha]-particles**
*Author(s):* **Thomas Bone, Jason Barbier,** U.S. Army Research Lab. (United States)

### DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13027-17
**Optimization of capacitive deionization electrode features and materials using artificial intelligence-based modeling**
*Author(s):* **Abdelrahman Khalil**, **Mohammad A. AlShabi**, **Khalil Abdelrazek, Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13028

# Quantum Information Science, Sensing, and Computation XVI

**22 - 25 April 2024 | Chesapeake 7**

***Conference Chair(s):*** **Eric Donkor,** Univ. of Connecticut (United States); **Michael Hayduk,** Air Force Research Lab. (United States)

***Conference Co-Chair(s):*** **Michael L. Fanto,** Air Force Research Lab. (United States); **Carlos M. Torres,** Naval Information Warfare Ctr. Pacific (United States)

***Program Committee:*** **Paul M. Alsing,** Air Force Research Lab. (United States); **Radhakrishnan Balu,** DEVCOM Army Research Lab. (United States); **Mishkatul Bhattacharya,** Rochester Institute of Technology (United States); **Wes Campbell,** Univ. of California, Los Angeles (United States); **Jerry Chow,** IBM Thomas J. Watson Research Ctr. (United States); **Michael R. Frey,** Bucknell Univ. (United States); **Durdu O. Guney,** Michigan Technological Univ. (United States); **Louis H. Kauffman,** Univ. of Illinois at Chicago (United States); **Prem Kumar,** Northwestern Univ. (United States); **Samuel J. Lomonaco,** Univ. of Maryland, Baltimore County (United States); **Alexander V. Sergienko,** Boston Univ. (United States); **Kathy-Anne Soderberg,** Air Force Research Lab. - Rome (United States); **Neal E. Solmeyer, Yaakov S. Weinstein,** The MITRE Corp. (United States)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:30 AM - 08:35 AM | Chesapeake 7
*Session Chair(s):* **Michael J. Hayduk**, Air Force Research Lab. (United States)
Opening remarks for Quantum Information Science, Sensing, and Computation XVI.

### SESSION 1: QUANTUM SENSORS, CLOCKS, AND SYSTEMS I

22 April 2024 • 08:35 AM - 09:55 AM | Chesapeake 7
*Session Chair(s):* **Michael J. Hayduk**, Air Force Research Lab. (United States)

13028-1 • 08:35 AM - 09:15 AM
**Advances in neutral atom quantum computing** (Keynote Presentation)
*Author(s):* **Benjamin Bloom,** Atom Computing, Inc. (United States)

13028-2 • 09:15 AM - 09:35 AM
**Demonstration of a field-deployable vector magnetometer using synchronous coherent population trapping and feedback compensation mechanism**
*Author(s):* **Renu Tripathi, Gour Pati, Mauricio Pulido,** Delaware State Univ. (United States)

13028-3 • 09:35 AM - 09:55 AM
**Investigations of coherent population trapping and Ramsey interrogations towards cold atom-based clock development**
*Author(s):* **Gour S. Pati**, **Renu Tripathi**, **Gustavo Acosta, Mauricio Pulido,** Delaware State Univ. (United States)

**Coffee Break 09:55 AM - 10:25 AM**

### SESSION 2: QUANTUM SENSORS, CLOCKS, AND SYSTEMS II

22 April 2024 • 10:25 AM - 12:05 PM | Chesapeake 7
*Session Chair(s):* **Michael J. Hayduk**, Air Force Research Lab. (United States)

13028-4 • 10:25 AM - 10:55 AM
**Ruggedized low-SWaP optical frequency combs and laser modules for next-generation optical atomic clocks with pathways to operation in extreme radiation environments** *(Invited Paper)*
*Author(s):* **Kevin Knabe**, **Henry Timmers**, **Andrew Attar**, **Bennett Sodergren**, **Cole Smith**, **Evan Barnes**, **Alina Spiess, Kurt Vogel,** Vescent Technologies, Inc. (United States)

13028-5 • 10:55 AM - 11:15 AM
**Rare-earth element detection using nitrogen vacancies in nanodiamonds**
*Author(s):* **Gary R. Lander**, **Scott Crawford**, **Hari Paudel**, **Jeffrey Wuenschell**, **Michael Buric, Yuhua Duan,** National Energy Technology Lab. (United States)

13028-6 • 11:15 AM - 11:45 AM
**Strongly cavity-coupled solid-state sensors** *(Invited Paper)*
*Author(s):* **Matthew Trusheim,** DEVCOM Army Research Lab. (United States)

13028-7 • 11:45 AM - 12:05 PM
**Magneto-optical systems for quantum transduction and sensing**
*Author(s):* **Bulat Rameev,** Gebze Technical Univ. (Turkey), Kazan State Power Engineering Univ. (Russian Federation); **Maksut Maksutoglu**, **Gunes Saribas**, **Elif Avinca**, **Farkhad Zainullin**, **Çigdem Ç. Yorulmaz**, **Sinan Kazan**, **Sergey I. Tarapov, Fikret Yıldiz,** Gebze Technical Univ. (Turkey)

**Lunch Break 12:05 PM - 01:35 PM**

## SESSION 3: QUANTUM SENSORS, CLOCKS, AND SYSTEMS III

22 April 2024 • 01:35 PM - 02:55 PM | Chesapeake 7
*Session Chair(s):* **Carlos M. Torres**, Naval Information Warfare Ctr. Pacific (United States)

13028-8 • 01:35 PM - 01:55 PM
**Dual rare-earth qubits and correlated long-lived coherence in epitaxial thin-film crystals**
*Author(s):* **Tian Zhong,** The Univ. of Chicago (United States)

13028-9 • 01:55 PM - 02:25 PM
**Addressing trapped ions with semiconductor optical waveguides** *(Invited Paper)*
*Author(s):* **Clayton Craft**, **Paul M. Alsing**, **Nicholas J. Barton**, **Andrew Brownell,** Air Force Research Lab. (United States); **Venkatesh Deenadayalan,** Rochester Institute of Technology (United States); **Mike L. Fanto,** Air Force Research Lab. (United States); **Gregory A. Howland,** Rochester Institute of Technology (United States); **David Hucul,** Air Force Research Lab. (United States); **Andrew Klug**, **Michael Macalik**, **Evan Manfreda-Schulz**, **Garrett Percevault**, **Nikola Porto,** Air Force Research Lab. (United States); **Stefan F. Preble,** Rochester Institute of Technology (United States); **Anthony J. Rizzo**, **Kenneth Scalzi,** Air Force Research Lab. (United States); **James Schneeloch,** Air Force Research Lab. (United States); **Erin Sheridan,** Air Force Research Lab. (United States); **Vijay S. S. Sundaram,** Rochester Institute of Technology (United States); **Amos M. Smith**, **Zachary S. Smith**, **Christopher C. Tison,** Air Force Research Lab. (United States); **Kathy-Anne B. Soderberg,** Air Force Research Lab. (United States)

13028-10 • 02:25 PM - 02:55 PM
**Rare-earth ion-integrated silicon photonics for quantum networks** *(Invited Paper)*
*Author(s):* **Robert Pettit,** memQ Inc. (United States); **Cheng Ji**, **Michael Solomon,** Argonne National Lab. (United States); **Ananthesh Sundaresh**, **Max Olberding**, **Skylar Deckoff-Jones**, **Shobhit Gupta**, **Manish Kumar Singh,** memQ Inc. (United States); **Alan Dibos,** Argonne National Lab. (United States); **Sean E. Sullivan,** memQ Inc. (United States)

**Coffee Break 02:55 PM - 03:25 PM**

## SESSION 4: QUANTUM SENSORS, CLOCKS, AND SYSTEMS IV

22 April 2024 • 03:25 PM - 04:45 PM | Chesapeake 7
*Session Chair(s):* **Carlos M. Torres**, Naval Information Warfare Ctr. Pacific (United States)

13028-11 • 03:25 PM - 04:05 PM
**Chip-scale technology for high-performance and scalable trapped-ion quantum computer systems** (Keynote Presentation)
*Author(s):* **Jeremy M. Sage,** IonQ, Inc. (United States)

13028-12 • 04:05 PM - 04:25 PM
**Improving performance of hyper-entangled and multiphoton entangled systems via wavefront design and quantum networks**
*Author(s):* **James F. Smith,** U.S. Naval Research Lab. (United States)

13028-13 • 04:25 PM - 04:45 PM
**Photoluminescence of Er-doped YIG crystal**
*Author(s):* **Saime Ç. Yorulmaz**, **Elif Avinca,** Gebze Technical Univ. (Turkey); **Farkhad Zainullin,** Gebze Technical University (Turkey); **Ozan Arı,** Hacettepe University (Turkey); **Maksut Maksutoğlu,** Gebze Technical University (Turkey); **Rustam Khaibullin,** Zavoisky Physical-Technical Institute (Russian Federation); **Bulat Z Rameev,** Gebze Technical University (Turkey)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:15 AM

## OPENING REMARKS

23 April 2024 • 10:15 AM - 10:20 AM | Chesapeake 7
*Session Chair(s):* **Michael J. Hayduk**, Air Force Research Lab. (United States)
Opening remarks Quantum Information Science, Sensing, and Computation XVI.

## SESSION 5: QUANTUM INFORMATION SCIENCE I

23 April 2024 • 10:20 AM - 11:50 AM | Chesapeake 7
*Session Chair(s):* **Michael J. Hayduk**, Air Force Research Lab. (United States)

13028-14 • 10:20 AM - 11:00 AM
**Fault-tolerant quantum computing with photonics** (Keynote Presentation)
*Author(s):* **Mercedes Gimeno-Segovia,** PsiQuantum Corp. (United States); **Hugo V. Cable,** PsiQuantum Corp. (United Kingdom)

13028-50 • 11:00 AM - 11:30 AM
**Silicon photonics for LiDAR sensors, AR displays, trapped-ion systems, and beyond** *(Invited Paper)*
*Author(s):* **Jelena Notaros,** Massachusetts Institute of Technology (United States)

13028-15 • 11:30 AM - 11:50 AM
**Asymptotic compression rate of quantum autoencoders**
*Author(s):* **Alexei Kaltchenko,** Wilfrid Laurier Univ. (Canada)

**Lunch/Exhibition Break 11:50 AM - 01:50 PM**

## SESSION 6: QUANTUM INFORMATION SCIENCE II

23 April 2024 • 01:50 PM - 03:00 PM | Chesapeake 7
*Session Chair(s):* **Michael L. Fanto**, Air Force Research Lab. (United States)

13028-18 • 01:50 PM - 02:10 PM
**Hamiltonian engineering using coupled cavity arrays**
*Author(s):* **Arka Majumdar, Arnab Manna,** Univ. of Washington (United States)

13028-19 • 02:10 PM - 02:30 PM
**Quantum inference engine: an architecture for quantum artificial intelligence**
*Author(s):* **Xiangdong Li,** New York City College of Technology (United States); **Nan Wu, Fangming Song,** Nanjing Univ. (China)

13028-20 • 02:30 PM - 03:00 PM
**Heterodyne detection of bi-photon spectra** *(Invited Paper)*
*Author(s):* **Christopher C. Tison,** Air Force Research Lab. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 7: CYBERSECURITY

23 April 2024 • 03:30 PM - 05:00 PM | Chesapeake 7
*Session Chair(s):* **Michael L. Fanto**, Air Force Research Lab. (United States)

13028-21 • 03:30 PM - 04:10 PM
**AIM photonics quantum technology offered with a quantum flex PDK to be used for quantum development and multi project wafer runs at the Albany nanotech facility** (Keynote Presentation)
*Author(s):* **Gerald Leake,** SUNY Polytechnic Institute (United States)

13028-22 • 04:10 PM - 04:40 PM
**Designing a photonic physically unclonable function having resilience to machine learning attacks** *(Invited Paper)*
*Author(s):* **Elena R. Henderson**, **Jessie M. Henderson**, **Hiva Shahoei,** Southern Methodist Univ. (United States); **William V. Oxford,** Anametric, Inc. (United States); **Eric C. Larson**, **Duncan L. MacFarlane, Mitchell A. Thornton,** Southern Methodist Univ. (United States)

13028-23 • 04:40 PM - 05:00 PM
**Quantum machine learning for feature selection in Internet of Things network intrusion detection**
*Author(s):* **Patrick J. Davis**, **Sean Coffey**, **Lubjana Beshaj, Nathaniel D. Bastian,** U.S. Military Academy (United States)

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## OPENING REMARKS

24 April 2024 • 10:30 AM - 10:35 AM | Chesapeake 7
*Session Chair(s):* **Eric Donkor**, Univ. of Connecticut (United States)
Opening remarks for Quantum Information Science, Sensing, and Computation XVI.

## SESSION 8: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY I

24 April 2024 • 10:35 AM - 11:55 AM | Chesapeake 7
*Session Chair(s):* **Eric Donkor**, Univ. of Connecticut (United States)

13028-25 • 10:35 AM - 11:15 AM
**Developing ultrafast optical frequency conversion for high intensity and quantum applications** (Keynote Presentation)
*Author(s):* **Jeffrey Moses,** Cornell Univ. (United States)

13028-26 • 11:15 AM - 11:35 AM
**Ruggedized mode-hop-free frequency-stabilized external-cavity diode laser (ECDL) for quantum information science applications**
*Author(s):* **Alex Whitmore,** DRS Daylight Solutions (United States)

13028-27 • 11:35 AM - 11:55 AM
**Automated quantum circuit generation for computing inverse hash functions**
*Author(s):* **Elena R. Henderson**, **Jessie M. Henderson,** Southern Methodist Univ. (United States); **William V. Oxford,** Anametric, Inc. (United States); **Mitchell A. Thornton,** Southern Methodist Univ. (United States)

**Lunch/Exhibition Break 11:55 AM - 01:25 PM**

## SESSION 9: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY II

24 April 2024 • 01:25 PM - 03:05 PM | Chesapeake 7
*Session Chair(s):* **Carlos M. Torres**, Naval Information Warfare Ctr. Pacific (United States)

13028-28 • 01:25 PM - 01:55 PM
**Towards a photonic integrated circuit realization of polarization-encoded qubits** *(Invited Paper)*
*Author(s):* **Duncan L. MacFarlane**, **Adam Helmy**, **Hiva Shahoei**, **Mitchell A. Thornton,** Southern Methodist Univ. (United States); **Evan Stewart**, **Wil Oxford,** Anametric, Inc. (United States); **Tim LaFave,** Southern Methodist Univ. (United States)

13028-29 • 01:55 PM - 02:15 PM
**Modulation of the vibrational and emission spectrum in 2D $WSe_2$ through defect generation schemes**
*Author(s):* **Utsab Kafley,** Univ. of North Texas (United States); **Anirudha Sumant,** Argonne National Lab. (United States); **Anupama Kaul,** Univ. of North Texas (United States)

13028-30 • 02:15 PM - 02:35 PM
**Multi-pair production in packaged foundry-fabricated silicon spiral photon pair sources**
*Author(s):* **Vijay Soorya Shunmuga Sundaram**, **Joseph A. Monteleone**, **Vincent Fittos**, **Gregory A. Howland**, **Matthew van Niekerk**, **Mario Ciminelli,** Rochester Institute of Technology (United States); **Gerald L. Leake**, **Daniel Coleman,** SUNY Polytechnic Institute (United States); **Michael L. Fanto,** Air Force Research Lab. (United States); **Stefan F. Preble,** Rochester Institute of Technology (United States)

13028-31 • 02:35 PM - 03:05 PM
**Broadband polarization-entangled photon pairs from a bidirectionally pumped silicon microring resonator** *(Invited Paper)*
*Author(s):* **Alexander Miloshevsky,** Oak Ridge National Lab. (United States); **Karthik V. Myilswamy**, **Lucas M. Cohen,** Purdue Univ. (United States); **Hsuan-Hao Lu,** Oak Ridge National Lab. (United States); **Saleha Fatema,** Purdue Univ. (United States); **Muneer Alshowkan,** Oak Ridge National Lab. (United States); **Andrew M. Weiner,** Purdue Univ. (United States); **Joseph M. Lukens,** Arizona State Univ. (United States), Oak Ridge National Lab. (United States)

**Coffee Break 03:05 PM - 03:20 PM**

## SESSION 10: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY III

24 April 2024 • 03:20 PM - 04:30 PM | Chesapeake 7
*Session Chair(s):* **Carlos M. Torres**, Naval Information Warfare Ctr. Pacific (United States)

13028-32 • 03:20 PM - 04:00 PM
**Quantum photonic state engineering with nonlinear integrated photonics** (Keynote Presentation)
*Author(s):* **Galan Moody,** Univ. of California, Santa Barbara (United States)

13028-41 • 04:00 PM - 04:30 PM
**Co-design of quantum photonic and electronic circuits for differential homodyne detection** *(Invited Paper)*
*Author(s):* **Ryan M. Camacho,** Brigham Young Univ. (United States)

## Thursday 25 April 2024

### CLOSING REMARKS

25 April 2024 • 08:30 AM - 08:40 AM | Chesapeake 7
*Session Chair(s):* **Eric Donkor**, Univ. of Connecticut (United States)
Closing remarks for Quantum Information Science, Sensing, and Computation XVI.

### SESSION 11: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY IV

25 April 2024 • 08:40 AM - 10:40 AM | Chesapeake 7
*Session Chair(s):* **Eric Donkor**, Univ. of Connecticut (United States)

13028-34 • 08:40 AM - 09:20 AM
**Quantum integrated photonics chips and packaging** (Keynote Presentation)
*Author(s):* **Stefan F. Preble,** Rochester Institute of Technology (United States)

13028-35 • 09:20 AM - 09:50 AM
**Polarization–frequency hyperentangled photons: generation, characterization, and applications** *(Invited Paper)*
*Author(s):* **Hsuan-Hao Lu,** Oak Ridge National Lab. (United States); **Karthik V. Myilswamy,** Purdue Univ. (United States); **Muneer Alshowkan,** Oak Ridge National Lab. (United States); **Andrew M. Weiner,** Purdue Univ. (United States); **Joseph M. Lukens,** Oak Ridge National Lab. (United States), Arizona State Univ. (United States); **Nicholas A. Peters,** Oak Ridge National Lab. (United States)

13028-36 • 09:50 AM - 10:10 AM
**A proposed design for a quantum spatial frequency processor**
*Author(s):* **Evan Manfreda-Schulz, Gregory A. Howland,** Rochester Institute of Technology (United States)

13028-33 • 10:10 AM - 10:40 AM
**Integrated nonlinear nanophotonics for deployable quantum technologies** *(Invited Paper)*
*Author(s):* **Kartik Srinivasan,** National Institute of Standards and Technology (United States)

**Coffee Break 10:40 AM - 11:10 AM**

### SESSION 12: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY V

25 April 2024 • 11:10 AM - 12:40 PM | Chesapeake 7
*Session Chair(s):* **Michael L. Fanto**, Air Force Research Lab. (United States)

13028-37 • 11:10 AM - 11:40 AM
**Tunable quantum emitters and coherent modulation on foundry integrated photonics** *(Invited Paper)*
*Author(s):* **Hugo Larocque,** Massachusetts Institute of Technology (United States); **Mustafa Atabey Buyukkaya,** Univ. of Maryland, College Park (United States); **Carlos Errando-Herranz,** Massachusetts Institute of Technology (United States); **Samuel Harper,** Univ. of Maryland, College Park (United States); **Jacques Carolan,** Massachusetts Institute of Technology (United States); **Chang-Min Lee**, **Christopher J. K. Richardson,** Univ. of Maryland, College Park (United States); **Gerald L. Leake**, **Daniel J. Coleman,** SUNY Polytechnic Institute (United States); **Michael L. Fanto,** Air Force Research Lab. (United States); **Edo Waks,** Univ. of Maryland, College Park (United States); **Dirk Englund,** Massachusetts Institute of Technology (United States); **Dashiell L.P. Vitullo,** DEVCOM Army Research Laboratory (United States); **Alexander Sludds**, **Camille Papon**, **Max Tao,** Massachusetts Institute of Technology (United States); **Hamed Sattari,** CSEM (Switzerland); **Ian Christen,** Massachusetts Institute of Technology (United States); **Gregory Choong**, **Ivan Prieto**, **Jacopo Leo**, **Homa Zarebidaki,** CSEM (Switzerland); **Sanjaya Lohani,** University of Illinois Chicago (United States); **Brian T. Kirby**, **Oney Soykal,** DEVCOM Army Research Laboratory (United States); **Moe Soltani,** Raytheon BBN Technologies (United States); **Amir H. Ghadimi,** CSEM (Switzerland); **Mikkel Heuck,** Technical University of Denmark (Denmark)

13028-38 • 11:40 AM - 12:10 PM
**Heterogeneous integration of quantum dot and nonlinear materials on 300mm silicon photonic wafers for communications, sensing, and quantum applications** *(Invited Paper)*
*Author(s):* **Jonathan Klamkin,** Aeluma, Inc. (United States)

13028-39 • 12:10 PM - 12:40 PM
**Quantum networking research at the Army Research Laboratory** *(Invited Paper)*
*Author(s):* **Brian Kirby,** U.S. Army Research Lab. (United States)

**Lunch/Exhibition Break 12:40 PM - 02:10 PM**

## SESSION 13: QUANTUM COMMUNICATION, NETWORKS, AND CRYPTOGRAPHY VI

25 April 2024 • 02:10 PM - 03:50 PM | Chesapeake 7
*Session Chair(s):* **Michael L. Fanto**, Air Force Research Lab. (United States)

13028-40 • 02:10 PM - 02:40 PM
**On-chip pump filtering of a ring-resonator-based bi-photon source using tunable dual Mach-Zehnder interferometers** *(Invited Paper)*
*Author(s):* **Richard J. Birrittella,** Booz Allen Hamilton Inc. (United States), Air Force Research Lab. (United States); **Christopher C. Tison**, **Michael L. Fanto**, **Paul M. Alsing**, **Nick Barton**, **Andrew Brownell,** Air Force Research Lab. (United States); **Stefan F. Preble,** Rochester Institute of Technology (United States); **Gerald Leake, Daniel Coleman,** AIM Photonics (United States)

13028-42 • 02:40 PM - 03:10 PM
**Foundry-scale quantum photonic integrated circuits (QPICs): heterogeneous integration of qubit technologies** *(Invited Paper)*
*Author(s):* **Michael L. Fanto,** Air Force Research Lab. (United States)

13028-43 • 03:10 PM - 03:50 PM
**Compiling deep learning tasks onto (quantum-) optical systems** (Keynote Presentation)
*Author(s):* **Dirk R. Englund,** Massachusetts Institute of Technology (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13028-16
**Quantum tomographic reconstruction: a Bayesian approach using the extended Kalman filter**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates); **S. Andrew Gadsden,** McMaster University (Canada); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13029

# Laser Technology for Defense and Security XIX

**23 - 24 April 2024 | Chesapeake 1**

***Conference Chair(s):*** **Mark Dubinskii,** DEVCOM Army Research Lab. (United States); **Rita D. Peterson,** Univ. of Dayton (United States)

***Program Committee:*** **Colin C. Baker,** U.S. Naval Research Lab. (United States); **Scott Christensen,** IPG Photonics Corp. (United States); **Chris Ebert,** Freedom Photonics, LLC (United States); **Thomas Ehrenreich,** Defense Advanced Research Projects Agency (United States); **Alan Martinez,** Air Force Research Lab. (United States); **Daniel Matyas,** U.S. Army Space and Missile Defense Command (United States); **Timothy C. Newell,** ManTech International Corp. (United States)

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS

23 April 2024 • 10:30 AM - 10:40 AM | Chesapeake 1
*Session Chair(s):* **Mark Dubinskii**, DEVCOM Army Research Lab. (United States)
Opening remarks for Laser Technology for Defense and Security XIX.

### SESSION 1: SEMICONDUCTOR LASERS

23 April 2024 • 10:40 AM - 11:40 AM | Chesapeake 1
*Session Chair(s):* **Timothy C. Newell**, ManTech International Corp. (United States)

13029-2 • 10:40 AM - 11:00 AM
**An approach to realize passively coupled PCSEL arrays**
*Author(s):* **Chhabindra Gautam,** The Univ. of Texas at Arlington (United States); **Mingsen Pan,** The Univ. of Texas at Arlington (United States), Semergytech, Inc. (United States); **Yudong Chen,** The Univ. of Texas at Arlington (United States); **Thomas J. Rotter**, **Ganesh Balakrishnan,** The Univ. of New Mexico (United States); **Weidong Zhou,** The Univ. of Texas at Arlington (United States)

13029-4 • 11:00 AM - 11:20 AM
**Robust high-power single-mode semiconductor optical amplifiers at 1550 nm**
*Author(s):* **Michelle Labrecque**, **Jenna Campbell**, **Kevin McClune**, **Elliot Burke**, **Thomas Liu**, **Henry Garrett**, **Matthew Larkins**, **Sarah Kinney**, **Milan Mashanovitch**, **Leif Johansson, Paul Leisher,** Freedom Photonics, LLC (United States)

13029-5 • 11:20 AM - 11:40 AM
**Advancements in high brightness direct semiconductor lasers**
*Author(s):* **Jeffrey Shattuck**, **Robin Huang**, **Mike Cruz, Merlin Hoffman,** Forward Photonics, LLC (United States)

**Lunch/Exhibition Break 11:40 AM - 01:30 PM**

## SESSION 2: LASER TECHNIQUES AND APPLICATIONS

23 April 2024 • 01:30 PM - 03:00 PM | Chesapeake 1
*Session Chair(s):* **Rita D. Peterson**, Univ. of Dayton (United States)

13029-6 • 01:30 PM - 02:00 PM
**Coherent field transformations: applications for laser power scaling and dynamic beam engineering** *(Invited Paper)*
*Author(s):* **Yakov Soskind,** Coherent Photonics, LLC (United States)

13029-7 • 02:00 PM - 02:20 PM
**Large-scale monolithic lens arrays for coherent beam combination**
*Author(s):* **Mitchell Soufleris**, **Mark McElhinney,** PowerPhotonic Inc. (United States); **Paul Blair**, **Brian Mann, Paul Graham,** PowerPhotonic Ltd (United Kingdom)

13029-25 • 02:20 PM - 02:40 PM
**High-pulse energy 1550 nm seed laser technology for time-of-flight LiDAR systems**
*Author(s):* **Hannah R. Grant,** Freedom Photonics, LLC (United States); **Alex Sincore**, **Andrew Trucks,** Luminar Technologies, Inc. (United States); **Ali Abdulfattah**, **Sabrina Wagner,** Freedom Photonics, LLC (United States); **Cheng Zhu**, **Tony Drummer**, **Lawrence Shah**, **Richmond Hicks,** Luminar Technologies, Inc. (United States); **Rob Still**, **Jon Faue**, **Depeesh Bangera,** Black Forest Engineering (United States); **Joseph LaChapelle**, **Jason Eichenholz,** Luminar Technologies, Inc. (United States); **Milan Mashanovitch,** Freedom Photonics, LLC (United States); **Paul O. Leisher,** Luminar Technologies, Inc. (United States); **Steven B. Estrella,** Freedom Photonics, LLC (United States)

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 3: DEVELOPMENT OF NOVEL LASER MATERIALS AND COMPONENTS

24 April 2024 • 10:30 AM - 01:00 PM | Chesapeake 1
*Session Chair(s):* **Daniel Matyas**, U.S. Army Space and Missile Defense Command (United States)

13029-11 • 10:30 AM - 11:00 AM
**Nonlinear and electrooptic materials for high performance lasers LiB3O5 and RbTiOPO4 optical components development and state of art** *(Invited Paper)*
*Author(s):* **Denis Balitski**, **Philippe Villeval, Dominique Lupinski,** Cristal Laser S.A. (France)

13029-12 • 11:00 AM - 11:20 AM
**Crystal fibers for laser applications**
*Author(s):* **Daniel J. Gibson,** U.S. Naval Research Lab. (United States); **Robert Nicol,** Jacobs Engineering Group Inc. (United States); **Woohong Kim**, **Shyam Bayya,** U.S. Naval Research Lab. (United States); **Frederic Kung,** Univ. Research Foundation (United States); **Daniel Rhonehouse**, **Jason Myers**, **Leslie Shaw, Jasbinder Sanghera,** U.S. Naval Research Lab. (United States)

13029-13 • 11:20 AM - 11:40 AM
**Challenges in fabricating laser fibers with reduced thermo-optic coefficients**
*Author(s):* **Bailey Meehan,** Clemson Univ. (United States); **Alex Pietros,** Univ. of Illinois (United States); **Brian Topper**, **Thomas W. Hawkins,** Clemson Univ. (United States); **Peter D. Dragic,** Univ. of Illinois (United States); **John Ballato,** Clemson Univ. (United States)

13029-14 • 11:40 AM - 12:00 PM
**Mid-IR fluorescence characteristics of low-phonon praseodymium doped Ternary chloride-based single crystals**
*Author(s):* **Ei E. Brown**, **Zackery Fleischman**, **Jason McKay**, **Larry Merkle,** DEVCOM Army Research Lab. (United States); **Uwe Hommerich,** Hampton Univ. (United States); **Witold Palosz,** Brimrose Technology Corp. (United States); **Sudhir B. Trivedi,** Brimrose Corp. of America (United States); **Mark Dubinskii,** DEVCOM Army Research Lab. (United States)

13029-15 • 12:00 PM - 12:20 PM
**Reduction of radiation induced gain degradation in Erbium doped fiber**
*Author(s):* **Colin C. Baker**, **Woohong Kim,** U.S. Naval Research Lab. (United States); **Tony Zhou**, **Fred Kung,** Univ. Research Foundation (United States); **Daniel Rhonehouse, Jasbinder Sanghera,** U.S. Naval Research Lab. (United States)

13029-16 • 12:20 PM - 12:40 PM
**Comparing the diode-pumped ~3.0 µm laser potential of different Rare-Earth doped chalcogenide glasses**
*Author(s):* **Zackery D. Fleischman**, **Ei E. Brown**, **Mark Dubinskii**, **Larry Merkle**, **Jason McKay,** DEVCOM Army Research Lab. (United States); **Uwe Hommerich,** Hampton Univ. (United States); **Sudhir Trivedi, Witold Palosz,** Brimrose Technology Corp. (United States)

13029-17 • 12:40 PM - 01:00 PM
**Transparent ceramic gain media**
*Author(s):* **Steve A. Payne**, **Nerine J. Cherepy,** Lawrence Livermore National Lab (United States); **Ross A. Osborne**, **Thomas J. Rudzik**, **Alexander D. Drobshoff**, **Zachary Seeley**, **Timothy D. Yee, Tyler J. Wineger,**Lawrence Livermore National Lab. (United States)

**Lunch/Exhibition Break 01:00 PM - 02:30 PM**

## SESSION 4: ADVANCED LASER DESIGNS AND UNDERLYING PHYSICS

24 April 2024 • 02:30 PM - 03:30 PM | Chesapeake 1
*Session Chair(s):* **Chris Ebert**, Freedom Photonics, LLC (United States)

13029-18 • 02:30 PM - 02:50 PM
**Efficient Raman fiber laser combiner**
*Author(s):* **Charles Yu**, **Andrew Yandow**, **Paul Pax**, **Matthew J. Cook**, **Victor Khitrov,** Lawrence Livermore National Lab. (United States); **S. Wu,** Lawrence Livermore National Laboratory (United States); **W. Moore**, **M. Runkel**, **Michael Messerly**, **Jay Dawson,** Lawrence Livermore National Lab. (United States); **Zhuo Jiang, Mark Dubinskii,** DEVCOM Army Research Lab. (United States)

13029-20 • 02:50 PM - 03:10 PM
**Additively manufactured self Q-switched Nd Cr:YAG laser rods**
*Author(s):* **Ross Osborne**, **Stephen A. Payne**, **Nerine J. Cherepy**, **Ian Phillips**, **Zachary Seeley**, **Ray Beach, Timothy Yee,** Lawrence Livermore National Lab. (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13029-10
**Fiber lasers in focus: bibliometric analysis of a growing field**
*Author(s):* **Khaled Obaideen, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13030

# Image Sensing Technologies: Materials, Devices, Systems, and Applications XI

**22 - 24 April 2024 | Chesapeake 4**

***Conference Chair(s):*** **Nibir K. Dhar,** Virginia Commonwealth Univ. (United States); **Achyut K. Dutta,** Banpil Photonics, Inc. (United States); **Sachidananda R. Babu,** NASA Earth Science Technology Office (United States)

***Program Committee:*** **Houtong Chen,** Los Alamos National Lab. (United States); **Arvind I. D'Souza,** Leonardo DRS (United States); **Samiran Ganguly,** Virginia Commonwealth Univ. (United States); **Michael D. Gerhold,** U.S. Army Research Office (United States); **Randy Jacobs**, **Marvin Jaime-Vasquez,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Margaret Kim,** The Univ. of Alabama (United States); **Sanjay Krishna,** The Ohio State Univ. (United States); **Rihito Kuroda,** Tohoku Univ. (Japan); **Hidenori Mimura,** Shizuoka Univ. (Japan); **Willie Padilla,** Duke Univ. (United States); **Vijay Parameshwaran,** U.S. Army Research Lab. (United States); **Mukti M. Rana,** Delaware State Univ. (United States); **Siva Sivananthan,** EPIR Technologies, Inc. (United States); **K. Kay Son,** HRL Labs., LLC (United States); **Ashok K. Sood,** Magnolia Optical Technologies, Inc. (United States); **Priyalal S. Wijewarnasuriya,** Teledyne Imaging Sensors (United States)

## Monday 22 April 2024

### SESSION 1: ADVANCED PHOTODETECTORS AND IMAGE SENSORS I

22 April 2024 • 08:30 AM - 10:10 AM | Chesapeake 4
*Session Chair(s):* **Parminder Ghuman**, NASA Earth Science Technology Office (United States); **Nibir K. Dhar**, Virginia Commonwealth Univ. (United States)

13030-1 • 08:30 AM - 09:10 AM
**Accelerating discovery of tunable optical materials (ATOM)** (Keynote Presentation)
*Author(s):* **Rohith Chandrasekar, Trish Veeder,**Defense Advanced Research Projects Agency (United States)

13030-2 • 09:10 AM - 09:40 AM
**Applications of T2SL barrier infrared detectors in Earth observational instruments** *(Invited Paper)*
*Author(s):* **Sarath D. Gunapala**, **William Johnson**, **David Ting**, **Alexander Soibel**, **Sir (Don) Rafol**, **Sam Keo**, **Brian Pepper**, **Cory Hill**, **Olga Kalashnikova**, **Michael Garay**, **Ashley Davies,** Jet Propulsion Lab. (United States); **Ashok Sood**, **John Zeller,** Magnolia Optical Technologies, Inc. (United States); **Paul Lucey**, **Robert Wright**, **Miguel Nunes,** Univ. of Hawai'i (United States); **Sachidananda Babu, Parminder Ghuman,** NASA (United States)

13030-9 • 09:40 AM - 10:10 AM
**Intelligent imaging microsystems realized by 3D electronic-photonic integrated circuits with embedded neuromorphic computing** *(Invited Paper)*
*Author(s):* **S. J. Ben Yoo,** Univ. of California, Davis (United States)

**Coffee Break 10:10 AM - 10:40 AM**

### SESSION 2: ADVANCED PHOTODETECTORS AND IMAGE SENSORS II

22 April 2024 • 10:40 AM - 12:10 PM | Chesapeake 4
*Session Chair(s):* **Nibir K. Dhar**, Virginia Commonwealth Univ. (United States); **Parminder Ghuman**, NASA Earth Science Technology Office (United States)

13030-5 • 10:40 AM - 11:20 AM
**New opportunities enabled by heterogenous integration** (Keynote Presentation)
*Author(s):* **Anna Tauke-Pedretti,** Defense Advanced Research Projects Agency (United States)

13030-6 • 11:20 AM - 11:40 AM

**Radiation hardened mid-wavelength infrared FPAs and cameras**
*Author(s):* **Isaac Chang**, **Sushant Sonde**, **Silviu Velicu**, **Yong Chang,** EPIR, Inc. (United States); **Thomas K. Kroc,** Fermi National Accelerator Lab. (United States)

13030-7 • 11:40 AM - 12:10 PM
**Visible to SWIR eAPD Performance** *(Invited Paper)*
*Author(s):* **Arvind I. D'Souza,** Leonardo DRS (United States); **Les Hipwood**, **Ian Baker, Chris Maxey,** Leonardo UK Ltd. (United Kingdom)

**Lunch Break 12:10 PM - 01:30 PM**

## SESSION 3: ADVANCED INTEGRATION AND IMAGING TECHNOLOGIES I

22 April 2024 • 01:30 PM - 02:40 PM | Chesapeake 4
*Session Chair(s):* **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13030-8 • 01:30 PM - 02:10 PM
**Obtaining capability advantages with integrated photonics** (Keynote Presentation)
*Author(s):* **Justin D. Cohen,** Defense Advanced Research Projects Agency (United States)

13030-10 • 02:10 PM - 02:40 PM
**Realizing petabit/s IO and sub-pJ/bit interconnect with silicon photonics** *(Invited Paper)*
*Author(s):* **Keren Bergman, Vignesh Gopal,** Columbia Univ. (United States)

**Coffee Break 02:40 PM - 03:10 PM**

## SESSION 4: ADVANCED INTEGRATION AND IMAGING TECHNOLOGIES II

22 April 2024 • 03:10 PM - 04:30 PM | Chesapeake 4
*Session Chair(s):* **Arvind I. D'Souza**, Leonardo DRS (United States); **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13030-3 • 03:10 PM - 03:40 PM
**Advanced spectral management in image sensors with inverse-designed infrared anti-reflection coatings** *(Invited Paper)*
*Author(s):* **Zunaid Omair**, **Varun Menon**, **Patrick Oduor**, **Kwong-Kit Choi, Achyut Dutta,** Banpil Photonics, Inc. (United States)

13030-11 • 03:40 PM - 04:00 PM
**Micro-compound parabolic concentrator arrays as alternatives to microlens arrays**
*Author(s):* **Benjamin A. Cohen**, **Zachary J. Darling**, **Robert R. Johnson,** MIT Lincoln Lab. (United States); **Madhavi Seetamraju,** MIT Lincoln Laboratory (United States); **James B. Johnson, Christopher M. Roberts,** MIT Lincoln Lab. (United States)

13030-12 • 04:00 PM - 04:30 PM
**Recent progress in quantum imaging at INRIM** *(Invited Paper)*
*Author(s):* **Marco Genovese,** Istituto Nazionale di Ricerca Metrologica (Italy)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 5: METASURFACE AND METASTRUCTURE FOR IMAGING I

23 April 2024 • 10:30 AM - 12:00 PM | Chesapeake 4
*Session Chair(s):* **Parminder Ghuman**, NASA Earth Science Technology Office (United States); **Nibir K. Dhar**, Virginia Commonwealth Univ. (United States)

13030-13 • 10:30 AM - 11:00 AM
**Reconfigurable metasurface optics at NASA LaRC towards space image sensing** *(Invited Paper)*
*Author(s):* **Hyun Jung Kim,** NASA Langley Research Ctr. (United States)

13030-15 • 11:00 AM - 11:30 AM
**Reconfigurable infrared metasurfaces with phase-change materials** *(Invited Paper)*
*Author(s):* **Jeong-Sun Moon**, **Kyung-ah Son**, **Ryan Quarfoth**, **Hwa-chang Seo**, **Chuong Dao**, **Eli Flores**, **Hanseung Lee, Dave Chow,** HRL Labs., LLC (United States)

13030-19 • 11:30 AM - 12:00 PM
**Optical metasurfaces for imaging, sensing and metrology** *(Invited Paper)*
*Author(s):* **Ramón Paniagua Domínguez,** A*STAR Institute of Materials Research and Engineering (Singapore)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

### SESSION 6: METASURFACE AND METASTRUCTURE FOR IMAGING II

23 April 2024 • 01:30 PM - 03:00 PM | Chesapeake 4
*Session Chair(s):* **Nibir K. Dhar**, Virginia Commonwealth Univ. (United States); **Parminder Ghuman**, NASA Earth Science Technology Office (United States)

13030-16 • 01:30 PM - 02:00 PM
**Inverse design of metasurface-integrated image sensors with full-field simulations** *(Invited Paper)*
*Author(s):* **Hyun Sung Park**, **Sookyoung Roh**, **Sungmo Ahn**, **Sang-Eun Mun**, **Sangyun Lee**, **Junho Lee**, **Choonlae Cho, Seokho Yun,** SAMSUNG Electronics Co., Ltd. (Korea, Republic of)

13030-17 • 02:00 PM - 02:30 PM
**Dynamically reconfigurable metaphotonic structures** *(Invited Paper)*
*Author(s):* **Ali Adibi**, **Mahmoodreza Marzban**, **Hamed Abiri**, **Ashkan Zandi**, **Mohammad R. Tavakol Harandi**, **Amin Khavasi, Sajjad Abdollahramezani,** Georgia Institute of Technology (United States)

13030-14 • 02:30 PM - 03:00 PM
**Metalens-enabled wide field-of-view imaging and sensing** *(Invited Paper)*
*Author(s):* **Juejun Hu,** Massachusetts Institute of Technology (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 7: METASURFACE AND METASTRUCTURE FOR IMAGING III

23 April 2024 • 03:30 PM - 05:10 PM | Chesapeake 4
*Session Chair(s):* **K. Kay Son**, HRL Labs., LLC (United States); **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13030-21 • 03:30 PM - 03:50 PM
**In-scene material detection for real-time autonomous hyperspectral reflectance correction**
*Author(s):* **Randall Pietersen,** Massachusetts Institute of Technology (United States); **Brian M Robinson,** Torch Technologies (United States); **Robert Diltz,** Air Force Civil Engineer Ctr. (United States); **Herbert H. Einstein,** Massachusetts Institute of Technology (United States)

13030-22 • 03:50 PM - 04:10 PM
**Characterizing metasurfaces for polarization demultiplexing: an imaging reconstruction using stokes parameters**
*Author(s):* **Anirban Swakshar**, **Cooper Coldwell**, **Karsten Schnier**, **Matthew Pompa**, **Sevgi Gurbuz**, **Seongsin Margaret M. Kim, Patrick Kung,** The Univ. of Alabama (United States)

13030-23 • 04:10 PM - 04:40 PM
**Innovations in all-optical image processing: the promise of meta-optics** *(Invited Paper)*
*Author(s):* **Lukas Wesemann**, **Shaban B. Sulejman**, **Niken Priscilla**, **Lincoln Clark**, **Haiwei Wang,** The Univ. of Melbourne (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Iryna Khodasevych,** Univ. of Technology, Sydney (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Krishna M. Nair,** RMIT Univ. (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Md. Ataur Rahman,** RMIT Univ. (Australia); **Timothy J. Davis,** The Univ. of Melbourne (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Michele Cotrufo**, **Andrea Alù,** The City Univ. of New York (United States); **Francesca Iacopi,** Univ. of Technology, Sydney (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Madhu Bhaskaran,** RMIT Univ. (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia); **Ann Roberts,** The Univ. of Melbourne (Australia), ARC Ctr. of Excellence for Transformative Meta-Optical Systems (Australia)

13030-24 • 04:40 PM - 05:10 PM
**New machine learning paradigms for knowledge discovery and inverse design of photonic nanostructures** *(Invited Paper)*
*Author(s):* **Ali Adibi**, **Mohammadreza Zandehshahvar**, **Mohammad Hadighehjavani**, **Yashar Kiarashi**, **Mahmoodreza Marzban, Mohammad R. Tavakol Harandi,** Georgia Institute of Technology (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13030-32 • 06:00 PM - 07:30 PM
**Modeling optimized reduced spectra of diffuse reflectance for NIR-SWIR absorbing-dye formulations**
*Author(s):* **Rachel Viger**, **Scott Ramsey**, **Troy Mayo, Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States)

13030-33 • 06:00 PM - 07:30 PM
**CubeSat constellation study for Earth observation mission over Sharjah city, United Arab Emirates**
*Author(s):* **Abdulrahman Sulaiman,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Tarifa Alkaabi,** Sharjah Academy for Astronomy (United Arab Emirates); **Ahmed Altunaiji**, **Fatima Alketbi,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Antonios Manousakis,** Sharjah Academy for Astronomy (United Arab Emirates); **Hamid Alnaimiy,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates)

13030-34 • 06:00 PM - 07:30 PM
**A hyperspectral thermal imager based on a low order scanning Fabry-Pérot interferometer**
*Author(s):* **Mads N. Larsen,** Univ. of Southern Denmark (Denmark), Newtec Engineering A/S (Denmark); **Anders L. Jørgensen**, **Victor Petrunin,** Newtec Engineering A/S (Denmark); **Jakob Kjelstrup-Hansen,** Univ. of Southern Denmark (Denmark); **Bjarke Jørgensen,** Newtec Engineering A/S (Denmark)

13030-36 • 06:00 PM - 07:30 PM
**Photoluminescent characteristics of PbSe thin film grown by chemical bath deposition (CBD) and pulsed laser deposition (PLD) for low cost MWIR detector application**
*Author(s):* **Eunsung Shin**, **Guru Subramanyam,** Univ. of Dayton (United States); **Richard S. Kim, Jeung Hun Park,** Univ. of California, Los Angeles (United States)

13030-37 • 06:00 PM - 07:30 PM
**VTR: an optimized vision transformer for SAR ATR acceleration on FPGA**
*Author(s):* **Sachini Wickramasinghe**, **Dhruv Parikh**, **Bingyi Zhang,** The Univ. of Southern California (United States); **Rajgopal Kannan,** DEVCOM Army Research Lab. (United States); **Viktor Prasanna,** The Univ. of Southern California (United States); **Carl Busart,** DEVCOM Army Research Lab. (United States)

13030-39 • 06:00 PM - 07:30 PM
**First-principles study of the electronic properties of strained Hg1-xCdxTe alloys**
*Author(s):* **Fatimah Alowa**, **Masahiko Matsubara,** Boston Univ. (United States); **Chris Schaake,** Leonardo DRS (United States); **Enrico Bellotti,** Boston Univ. (United States)

13030-40 • 06:00 PM - 07:30 PM
**Comparison of Nano holes and Nano pillars moth eye structures for MID-Wave infrared.**
*Author(s):* **Rachit Sood**, **Chaoran Tu,** Univ. of Maryland, Baltimore County (United States); **Douglas Bamford**, **Joel Hensley**, **David Woolf,** Physical Sciences Inc. (United States); **Curtis Menyuk**, **Fow-Sen Choa, N.B. Singh,** Univ. of Maryland, Baltimore County (United States)

13030-41 • 06:00 PM - 07:30 PM
**Object Detection through Obscurants using Partially Coherent Fields Generated by Perfect Optical Vortex Beams**
*Author(s):* **Kang-Min Lee**, **Cristian Hernando Acevedo, Aristide Dogariu,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13030-43 • 06:00 PM - 07:30 PM
**Performance enhancement of a triple band SWIR-MWIR-LWIR photodetector**
*Author(s):* **Arash Dehzangi,** Northwestern Univ. (United States), ECS Federal, LLC (United States)

13030-52 • 06:00 PM - 07:30 PM
**A systematic approach to develop high-performance colloidal quantum dot infrared photodetectors**
*Author(s):* **Matthew M. Ackerman,** QDIR, Inc. (United States); **Philippe Guyot-Sionnest, John Peterson,** The Univ. of Chicago (United States)

13030-53 • 06:00 PM - 07:30 PM
**Overview of the on-going industry trends driving technical innovation in advanced imaging modalities**
*Author(s):* **Axel Clouet,** Yole Group (France)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 8: DARPA OPTIM PROGRAM

24 April 2024 • 10:30 AM - 01:15 PM | Chesapeake 4
*Session Chair(s):* **K. Kay Son**, HRL Labs., LLC (United States); **Achyut K. Dutta**, Banpil Photonics, Inc. (United States)

13030-25 • 10:30 AM - 11:10 AM
**The DARPA OpTIm program: infrared imaging at the quantum limits** (Keynote Presentation)
*Author(s):* **Mukund Vengalattore,** Defense Advanced Research Projects Agency (United States)

13030-26 • 11:10 AM - 11:35 AM
**Ultrathin trampoline optomechanical resonator pixels for uncooled infrared (IR) detection** *(Invited Paper)*
*Author(s):* **Philip Feng,** Univ. of Florida (United States)

13030-27 • 11:35 AM - 12:00 PM
**Parametric frequency comb generator based AlScN MEMS IR detector for low-power and high-performance applications** *(Invited Paper)*
*Author(s):* **Hussein M Hussein**, **Farah Ben Ayed**, **Aurelio Venditti**, **Pietro Simeoni**, **Zhenyun Qian**, **Cristian Cassella, Matteo Rinaldi,** Northeastern Univ. (United States)

13030-28 • 12:00 PM - 12:25 PM
**Precision sensing and imaging in chip-scale cavity optomechanics** *(Invited Paper)*
*Author(s):* **Chee-Wei Wong**, **Jaime Flor Flores**, **Talha Yerebakan**, **Alexiy Samoylov, Cennet Tugce Turan,** UCLA Samueli School of Engineering (United States)

13030-29 • 12:25 PM - 12:50 PM
**Ultrathin lithium niobate resonators for thermal imaging** *(Invited Paper)*
*Author(s):* **Hong X. Tang,** Yale Univ. (United States)

13030-30 • 12:50 PM - 01:15 PM
**Sensitive infrared detection via optomechanical spring sensing** *(Invited Paper)*
*Author(s):* **Chen Qian**, **Li He,** Univ. of Pennsylvania (United States); **Qiang Lin,** Univ. of Rochester (United States); **Bo Zhen,** Univ. of Pennsylvania (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13030-42
**Utilizing Sharjah-sat-1 optical camera payload for remote sensing applications**
*Author(s):* **Maryam Alansaari**, **Amel Alhammadi**, **Abdulrahman Sulaiman**, **Fatima Alketbi**, **Tarifa Alkaabi**, **Yousuf Faroukh**, **Ilias Fernini,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Hamid H. K. AlNaimiy,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates), Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13031

# Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imaging XXX

**23 - 24 April 2024 | Potomac 1**

***Conference Chair(s):*** **Miguel Velez-Reyes,** The Univ. of Texas at El Paso (United States); **David W. Messinger,** Rochester Institute of Technology (United States)

***Program Committee:*** **Michael T. Eismann**, **Joseph Meola,** Air Force Research Lab. (United States); **Alan P. Schaum,** U.S. Naval Research Lab. (United States); **Torbjørn Skauli,** Univ. of Oslo (Norway); **James Theiler, Amanda K. Ziemann,** Los Alamos National Lab. (United States)

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS

23 April 2024 • 10:30 AM - 10:40 AM | Potomac 1
*Session Chair(s):* **Miguel Velez-Reyes**, The Univ. of Texas at El Paso (United States); **David W. Messinger**, Rochester Institute of Technology (United States)
Opening remarks for Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imaging XXX

### SESSION 1: TARGET AND ANOMALY DETECTION

23 April 2024 • 10:40 AM - 12:00 PM | Potomac 1
*Session Chair(s):* **Amanda K. Ziemann**, Los Alamos National Lab. (United States)

13031-1 • 10:40 AM - 11:00 AM
**Shrinkage estimators for covariance matrices in spectral remote sensing**
*Author(s):* **James P. Theiler,** Los Alamos National Lab. (United States)

13031-2 • 11:00 AM - 11:20 AM
**A likelihood ratio test for shrinkage covariance estimators**
*Author(s):* **Dylan Z. Anderson, John D. van der Laan,** Sandia National Labs. (United States)

13031-3 • 11:20 AM - 11:40 AM
**Multivariate methods to explore system sensitivities for hyperspectral subpixel target detection**
*Author(s):* **Chase Cañas**, **John P. Kerekes, Scott D. Brown,** Rochester Institute of Technology (United States)

13031-4 • 11:40 AM - 12:00 PM
**Understanding the effect of image quality on object detection in aerial images**
*Author(s):* **Binyul Bajracharya, David W. Messinger,** Rochester Institute of Technology (United States)

**Lunch/Exhibition Break 12:00 PM - 02:10 PM**

## SESSION 2: SENSOR DESIGN, DEVELOPMENT, AND CALIBRATION

23 April 2024 • 02:10 PM - 03:30 PM | Potomac 1
*Session Chair(s):* **Torbjørn Skauli**, Univ. of Oslo (Norway)

13031-6 • 02:10 PM - 02:30 PM
**Development of the new MWIR and LWIR hyperspectral imagers at Specim**
*Author(s):* **Hannu Holma**, **Paulus Saari, Timo T. Kolehmainen,** Specim Spectral Imaging Ltd. (Finland)

13031-7 • 02:30 PM - 02:50 PM
**Hyperspectral to multispectral: optimal selection of mission-relevant bands using machine learning**
*Author(s):* **Kedar R. Naik**, **Andrew Wernersbach**, **Michelle F. Nilson**, **Matthew Fisher**, **William Baugh, Gary D. Wiemokly,** Ball Aerospace (United States)

13031-8 • 02:50 PM - 03:10 PM
**Data quality assessment of drone-mounted hyperspectral imaging system for unexploded ordnance (UXO) detection**
*Author(s):* **Randall Pietersen,** Massachusetts Institute of Technology (United States); **Junhyung Park**, **Jonathan Reasoner,** U.S. Air Force Academy (United States); **Brian M. Robinson,** Torch Technologies, Inc. (United States); **Robert Diltz,** Air Force Civil Engineer Ctr. (United States); **Herbert H Einstein,** Massachusetts Institute of Technology (United States)

13031-9 • 03:10 PM - 03:30 PM
**Preserving legacies, pioneering frontiers: multi-sensor image fusion, from medieval transcripts to UAS-based sensing**
*Author(s):* **Amirhossein Hassanzadeh**, **Jose Nazareno Gabriel M. Macalintal, David W. Messinger,** Rochester Institute of Technology (United States)

**Coffee Break 03:30 PM - 04:00 PM**

## SESSION 3: SPECTRAL SENSING FOR SPACE SITUATIONAL AWARENESS: JOINT SESSION WITH CONFERENCES 13031 AND 13062

23 April 2024 • 04:00 PM - 05:00 PM | Potomac 1
*Session Chair(s):* **Miguel Velez-Reyes**, The Univ. of Texas at El Paso (United States); **Jeremy Murray-Krezan**

13062-1 • 04:00 PM - 04:20 PM
**Spectral characteristics of generation after next satellite navigational sensors**
*Author(s):* **Jeremy Murray-Krezan**, **Mark Bolden,** Trusted Space, Inc. (United States); **Erin Griggs,** Trusted Space (United States)

13031-13 • 04:20 PM - 04:40 PM
**Hyperspectral optical modeling of resident space objects at high spatial resolution**
*Author(s):* **Eric Coiro**, **Ugo Tricoli**, **François Margall, Cyril Petit,** ONERA (France)

13031-14 • 04:40 PM - 05:00 PM
**Using neural networks to classify hyperspectral signatures of unresolved resident space objects**
*Author(s):* **Luis Cedillo**, **Kevin M. Acosta,** The Univ. of Texas at El Paso (United States); **Dan F. DeBlasio,** Carnegie Mellon Univ. (United States); **Miguel Velez-Reyes,** The Univ. of Texas at El Paso (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13031-29 • 06:00 PM - 07:30 PM
**Detection and estimation of hazardous noxious substance thickness based on hyperspectral remote sensing**
*Author(s):* **Jae-Jin Park,** Korea Research Institute of Ships and Ocean Engineering (Korea, Republic of); **Kyung-Ae Park,** Seoul National Univ. (Korea, Republic of); **Pierre-Yves Foucher,** ONERA (France); **Tae-Sung Kim, Moonjin Lee,** Korea Research Institute of Ships and Ocean Engineering (Korea, Republic of)

13031-30 • 06:00 PM - 07:30 PM
**Case studies for inverse spectral analysis and parametric modeling of diffuse reflectance for NIR-SWIR absorbing dyes**
*Author(s):* **Jesse Duncan**, **Rachel Viger**, **Troy B. Mayo**, **Scott Ramsey**, **Edward Michaelchuck, Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States)

13031-31 • 06:00 PM - 07:30 PM
**Hyperspectral VNIR-SWIR image fusion on cultural heritage and remote sensing datasets using image sharpening techniques**
*Author(s):* **Jose Nazareno Gabriel M. Macalintal**, **Amirhossein Hassanzadeh, David W. Messinger,** Rochester Institute of Technology (United States)

13031-32 • 06:00 PM - 07:30 PM
**Investigation of hazardous and noxious substances (HNS) spectra characteristics from in-field hyperspectral measurement**
*Author(s):* **Tae-Sung Kim**, **Moonjin Lee, Jae-Jin Park,** Korea Research Institute of Ships and Ocean Engineering (Korea, Republic of)

13031-33 • 06:00 PM - 07:30 PM
**Application of hyperspectral imaging and machine learning for the automatic identification of microplastics on sandy beaches**
*Author(s):* **Angela Rizzo,** Univ. degli Studi di Bari Aldo Moro (Italy); **Silvia Serranti**, **Paola Cucuzza,** Sapienza Univ. di Roma (Italy); **Stefania Lisco**, **Antonella Marsico,** Univ. degli Studi di Bari Aldo Moro (Italy); **Giuseppe Bonifazi,** Sapienza Univ. di Roma (Italy); **Giuseppe Mastronuzzi,** Univ. degli Studi di Bari Aldo Moro (Italy)

13031-35 • 06:00 PM - 07:30 PM
**Evaluation of hyperspectral data for deep learning model performance**
*Author(s):* **Samantha J. Butler**, **Stanton R. Price**, **Samantha S. Carley, Steven R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13031-36 • 06:00 PM - 07:30 PM
**Characterization of disposable Mater-Bi bioplastic by hyperspectral imaging for anaerobic biodegradation monitoring**
*Author(s):* **Giuseppe Capobianco**, **Marica Falzarano**, **Giuseppe Bonifazi**, **Alessandra Polettini**, **Raffaella Pomi**, **Andreina Rossi, Silvia Serranti,** Sapienza Univ. di Roma (Italy)

13031-23 • 06:00 PM - 07:30 PM
**Towards joint estimation of bathymetry and water-column-corrected spectra with neural ODEs**
*Author(s):* **Luis Cedillo,** The Univ. of Texas at El Paso (United States); **James Koch**, **Timothy J. Doster, Tegan H. Emerson,** Pacific Northwest National Lab. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 4: ATMOSPHERIC MODELING AND COMPENSATION

24 April 2024 • 10:30 AM - 11:10 AM | Potomac 1
*Session Chair(s):* **Michael T. Eismann**, Air Force Research Lab. (United States)

13031-15 • 10:30 AM - 10:50 AM
**Atmospheric correction using diffusion models and MODTRAN for constrained training**
*Author(s):* **David Stelter**, **Ethan Brewer, Robert Sundberg,** Spectral Sciences, Inc. (United States)

13031-17 • 10:50 AM - 11:10 AM
**Operational surface reflectance products retrieval system for hyperspectral remote sensing satellites of China**
*Author(s):* **Hao Zhang,** Aerospace Information Research Institute, Chinese Academy of Sciences (China); **Shuning Zhang, Jianmin Zhou,** Aerospace Information Research Institute (China)

### 30 YEARS CELEBRATION

24 April 2024 • 11:10 AM - 11:50 AM | Potomac 1
*Session Chair(s):* **Miguel Velez-Reyes**, The Univ. of Texas at El Paso (United States); **David W. Messinger**, Rochester Institute of Technology (United States)
Celebrate 30 Years of the Algorithms, Technologies, and Applications for Multispectral and Hyperspectral Imaging conference with cupcakes!

**Lunch/Exhibition Break 11:50 AM - 01:40 PM**

### SESSION 5: SPECTRAL IMAGE PROCESSING

24 April 2024 • 01:40 PM - 03:00 PM | Potomac 1
*Session Chair(s):* **James P. Theiler**, Los Alamos National Lab. (United States)

13031-18 • 01:40 PM - 02:00 PM
**Hyperspectral image analysis to identify of components in municipal solid waste with feedstock potential**
*Author(s):* **Macy Christianson,** Washington State Univ. Tri-Cities (United States); **Maria Garcia-Tovar**, **Zorin Arnedo-Quintana,** Univ. de Puerto Rico Mayagüez (United States); **John Miller**, **Luis De La Torre**, **Bin Yang,** Washington State Univ. Tri-Cities (United States); **Samuel P. Hernández-Rivera,** Univ. de Puerto Rico Mayagüez (United States); **Ivani Patel,** Washington State Univ. Tri-Cities (United States)

13031-19 • 02:00 PM - 02:20 PM
**Variability of infrared optical constants of organic powders from KBr pellets**
*Author(s):* **Kelly A. Peterson**, **Jeremy D. Erickson**, **Schuyler P. Lockwood**, **Timothy J. Johnson, Tanya L. Myers,** Pacific Northwest National Lab. (United States)

13031-20 • 02:20 PM - 02:40 PM
**Real-time data analysis via approximate inference in next-generation spectroscopic and experimental systems**
*Author(s):* **Tyler J. Huffman**, **Christopher J. Breshike**, **Robert Furstenberg**, **Christopher A. Kendziora, R. A. McGill,** U.S. Naval Research Lab. (United States)

13031-21 • 02:40 PM - 03:00 PM **(CANCELLED)**
**Multiview hyperspectral image compression**
*Author(s):* **Timothy Marrinan**, **Timothy J. Doster**, **Tegan H. Emerson, James Koch,** Pacific Northwest National Lab. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 6: MACHINE LEARNING APPLICATIONS IN HYPERSPECTRAL IMAGING

24 April 2024 • 03:30 PM - 05:10 PM | Potomac 1
*Session Chair(s):* **David W. Messinger**, Rochester Institute of Technology (United States)

13031-24 • 03:30 PM - 03:50 PM
**Machine learning algorithms for classifying analytes on surfaces based on simulated infrared spectra**
*Author(s):* **Christopher A. Kendziora,** U.S. Naval Research Lab. (United States); **Edgar Acuna,** Univ. de Puerto Rico Mayagüez (United States); **Robert Furstenberg**, **Christopher J. Breshike,** U.S. Naval Research Lab. (United States); **Drew C. Kendziora,** George Mason Univ. (United States)

13031-25 • 03:50 PM - 04:10 PM
**Chemical signature characterization with hyperspectral imagery: novel deep learning model architectures and physically-motivated data augmentation techniques**
*Author(s):* **Eleanor B. Byler**, **Brenda M. Forland,** Pacific Northwest National Lab. (United States); **Myles McKay,** University of Washington (United States)

13031-26 • 04:10 PM - 04:30 PM
**Adapting self-supervised learning to the hyperspectral domain: methods, challenges, and lessons learned**
*Author(s):* **Noriaki Kono**, **Eleanor B. Byler**, **Charles W. Godfrey**, **Timothy J. Doster, Tegan H. Emerson,** Pacific Northwest National Lab. (United States)

13031-27 • 04:30 PM - 04:50 PM
**Optimizing machine learning algorithms for hyperspectral imaging and trace detection**
*Author(s):* **Christopher J. Breshike**, **Drew C. Kendziora**, **Drew M. Finton**, **Christopher A. Kendziora**, **Tyler J. Huffman, Robert Furstenberg,** U.S. Naval Research Lab. (United States)

13031-28 • 04:50 PM - 05:10 PM
**Multiband remote 3D-ViT data fusion**
*Author(s):* **Aidan G. Kurz**, **Arthur C Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13031-5
**Charting the evolution: bibliometric perspectives on anomaly detection within hyperspectral domains**
*Author(s):* **Khaled Obaideen**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13031-37
**Methodology for forecasting changes in tourist flow in conditions of emergency situations using remote sensing technologies**
*Author(s):* **Maretta Kazaryan,** North Ossetian State Medical Academy (Russian Federation); **Mikhail Shakhramanian,** Financial Univ. under the Government of the Russian Federation (Russian Federation); **Evgeny A. Semenishchev,** Moscow State Univ. of Technology "STANKIN" (Russian Federation)

# CONFERENCE 13032

# Algorithms for Synthetic Aperture Radar Imagery XXXI

**23 - 24 April 2024 | National Harbor 11**

***Conference Chair(s):*** **Edmund Zelnio,** Air Force Research Lab. (United States); **Frederick D. Garber,** Wright State Univ. (United States)

***Program Committee:*** **Joshua N. Ash,** Wright State Univ. (United States); **David Blacknell,** Defence Science and Technology Lab. (United Kingdom); **Mujdat Cetin,** Univ. of Rochester (United States); **Gil J. Ettinger,** Systems & Technology Research (United States); **David A. Garren,** Naval Postgraduate School (United States); **Eric R. Keydel,** Leidos, Inc. (United States); **Benjamin P. Lewis,** Air Force Research Lab. (United States); **Juan Li,** Univ. of Central Florida (United States); **Uttam Kumar Majumder,** U.S. Dept. of Defense (United States); **Michael J. Minardi,** Air Force Research Lab. (United States); **Randolph L. Moses,** The Ohio State Univ. (United States); **Les Novak,** Scientific Systems Co., Inc. (United States); **Christopher Paulson,** Air Force Research Lab. (United States); **Lee C. Potter,** The Ohio State Univ. (United States); **Brian Rigling,** Univ. of Dayton (United States); **Timothy D. Ross,** Leidos, Inc. (United States)

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 1: 3D RECONSTRUCTION

23 April 2024 • 10:30 AM - 11:40 AM | National Harbor 11
*Session Chair(s):* **Jan Rainer M. Jamora**, Air Force Research Lab. (United States)

13032-1 • 10:30 AM - 10:40 AM
**Application of digital beamforming phase calibration techniques in multi-pass interferometric SAR for improved height mapping**
*Author(s):* **Kelly Cheung,** Wright State Univ. (United States); **Brian D. Rigling,** Univ. of Dayton (United States)

13032-2 • 10:40 AM - 10:50 AM
**Three-dimensional spherical SAR template and feature recognition**
*Author(s):* **Matthew P. Pepin,** Sandia Staffing Alliance, LLC (United States)

13032-3 • 10:50 AM - 11:00 AM
**3D model surface modifications increase physics based simulation accuracy**
*Author(s):* **John W. Nehrbass, Michael Carlson,** Univ. of Dayton (United States)

13032-5 • 11:00 AM - 11:10 AM
**Empirical analysis of target responses for understanding SAR to EO translations**
*Author(s):* **Jacob Ross**, **Ryan J. Shaver**, **Eric Young**, **Rajith Weerasinghe,** Etegent Technologies, Ltd. (United States); **Jan Rainer M. Jamora,** Air Force Research Lab. (United States)

13032-6 • 11:10 AM - 11:20 AM
**Analysis of the impact of SSIM parameterization for SAR to EO and 3D reconstruction networks**
*Author(s):* **Rajith Weerasinghe**, **Eric Young**, **Ryan J. Shaver**, **Jacob Ross,** Etegent Technologies, Ltd. (United States); **Jan Rainer M. Jamora,** Air Force Research Lab. (United States)

13032-7 • 11:20 AM - 11:30 AM
**Interferometric spatial filter for 3D synthetic aperture radar via backprojection image formation**
*Author(s):* **Ryan J. Shaver**, **Jacob Ross**, **Rajith Weerasinghe**, **Eric Young,** Etegent Technologies, Ltd. (United States); **Jan Rainer M. Jamora,** Air Force Research Lab. (United States)

13032-9 • 11:30 AM - 11:40 AM
**Efficient high resolution 3D SAR imaging via superresolution spectral estimation methods**
*Author(s):* **Alex W. Batts, Brian D. Rigling,** Univ. of Dayton (United States)

**Lunch/Exhibition Break 11:40 AM - 01:00 PM**

## SESSION 2: ADVANCED RADAR PROCESSING

23 April 2024 • 01:00 PM - 01:50 PM | National Harbor 11
*Session Chair(s):* **Brian D. Rigling**, Univ. of Dayton (United States)

13032-10 • 01:00 PM - 01:10 PM
**Morphology of exoclutter constant velocity surface targets in synthetic aperture radar**
*Author(s):* **David A. Garren,** Naval Postgraduate School (United States)

13032-11 • 01:10 PM - 01:20 PM
**Boot-strapping methods for improved SAR-GMTI**
*Author(s):* **Brian D. Rigling,** Univ. of Dayton (United States); **Uttam Majumder, Edmund G. Zelnio,** Air Force Research Lab. (United States)

13032-12 • 01:20 PM - 01:30 PM
**Efficient and accurate approximation of superresolution spectral estimation methods for SAR imaging**
*Author(s):* **Alex W. Batts, Brian D. Rigling,** Univ. of Dayton (United States)

13032-13 • 01:30 PM - 01:40 PM
**Leveraging structural information for enhanced coherent change detection**
*Author(s):* **Scott Dayton**, **Oliver Milledge**, **Jovana Nikitovic**, **Anne Gelb**, **Dylan Green,** Dartmouth College (United States); **Aditya Viswanathan,** Univ. of Michigan-Dearborn (United States)

13032-36 • 01:40 PM - 01:50 PM
**A generalized gamma copula model for high resolution polarimetric SAR change detection**
*Author(s):* **Stephen Herman, Joshua Ash,** Wright State Univ. (United States)

## SESSION 3: AUTOMATIC TARGET RECOGNITION PERFORMANCE UNDERSTANDING

23 April 2024 • 01:50 PM - 02:30 PM | National Harbor 11
*Session Chair(s):* **Uttam Kumar Majumder**, U.S. Dept. of Defense (United States)

13032-14 • 01:50 PM - 02:00 PM
**Operating condition sampling strategies for evaluating ATR performance**
*Author(s):* **Shaun Stephens**, **Jacob Ross**, **Charles J. Hill**, **William Coleman,** Etegent Technologies, Ltd. (United States); **Matthew Scherreik,** Air Force Research Lab. (United States)

13032-15 • 02:00 PM - 02:10 PM
**Classifier models for SAR ATR performance prediction**
*Author(s):*

13032-16 • 02:10 PM - 02:20 PM
**Performance analysis of SAR AI/ML algorithms using multiple polarization civilian vehicles data**
*Author(s):* **Uttam Kumar Majumder**, **Naisha Patel, Yajushi Gokhale,** U.S. Dept. of Defense (United States)

13032-17 • 02:20 PM - 02:30 PM
**Analysis SAR AI/ML classification under noisy environments**
*Author(s):* **Uttam Kumar Majumder**, **Yajushi Gokhale, Naisha Patel,** U.S. Dept. of Defense (United States)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 4: POSTER SESSION I

23 April 2024 • 03:00 PM - 04:30 PM | National Harbor 11
*Session Chair(s):* **Frederick D. Garber**, Wright State Univ. (United States)
Presenters from the day will gather in the conference room to present a poster for Algorithms for Synthetic Aperture Radar Imagery XXXI conference.

## SESSION 5: PANEL DISCUSSION I

23 April 2024 • 04:30 PM - 05:10 PM | National Harbor 11
*Session Chair(s):* **Edmund G. Zelnio**, Air Force Research Lab. (United States); **Frederick D. Garber**, Wright State Univ. (United States)
Discuss topics from the days oral and poster presentations for Algorithms for Synthetic Aperture Radar Imagery XXXI conference.

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 6: AUTOMATIC TARGET RECOGNITION ALGORITHMS I

24 April 2024 • 10:30 AM - 11:50 AM | National Harbor 11
*Session Chair(s):* **Nathan Inkawhich**, Air Force Research Lab. (United States)

13032-18 • 10:30 AM - 10:40 AM
**Using foundational models to bridge the synthetic-measured gap**
*Author(s):* **Jeremy Cavallo,** Wayne State Univ. (United States); **Edmund G. Zelnio,** Air Force Research Lab. (United States)

13032-19 • 10:40 AM - 10:50 AM
**Learning to fuse with side information for multi-sensor ATR**
*Author(s):* **Zachary Rabin,** The Ohio State Univ. (United States), Air Force Research Lab. (United States); **Matthew Scherreik**, **Benjamin Lewis,** Air Force Research Lab. (United States); **Jim W. Davis,** The Ohio State Univ. (United States)

13032-20 • 10:50 AM - 11:00 AM
**Adversarial physics-based augmentations for robust training using synthetic data**
*Author(s):* **Emma L. Clark,** Univ. of Dayton (United States); **Edmund G. Zelnio, Ellie Walters,** Air Force Research Lab. (United States)

13032-21 • 11:00 AM - 11:10 AM
**Synthetic SAR data domain randomization for unseen SAR ATR**
*Author(s):* **MinJun Kim, SungHo Kim,** Yeungnam Univ. (Korea, Republic of)

13032-22 • 11:10 AM - 11:20 AM
**Using colorization to bridge the synthetic-measured gap**
*Author(s):* **Jeremy Cavallo,** Wayne State Univ. (United States); **Brian D. Rigling,** Univ. of Dayton (United States)

13032-23 • 11:20 AM - 11:30 AM
**Out-of-distribution detection for SAR imagery using ATR systems**
*Author(s):* **Charles J. Hill,** Etegent Technologies, Ltd. (United States)

13032-24 • 11:30 AM - 11:40 AM
**Graph contrastive learning based adversarial training for SAR image classification**
*Author(s):* **Xu Wang**, **Tian Ye,** The Univ. of Southern California (United States); **Rajgopal Kannan,** DEVCOM Army Research Lab. (United States); **Viktor K. Prasanna,** The Univ. of Southern California (United States)

13032-25 • 11:40 AM - 11:50 AM
**Hybrid generative and contrastive approaches to the synthetic-measured gap**
*Author(s):* **Jackson Zaunegger,** The Pennsylvania State Univ. (United States); **Edmund G. Zelnio,** Air Force Research Lab. (United States)

**Lunch/Exhibition Break 11:50 AM - 01:20 PM**

## SESSION 7: AUTOMATIC TARGET RECOGNITION ALGORITHMS II

24 April 2024 • 01:20 PM - 02:40 PM | National Harbor 11
*Session Chair(s):* **Nathan Inkawhich**, Air Force Research Lab. (United States)

13032-26 • 01:20 PM - 01:30 PM
**Implicit coding of scatterer height and other anisotropic behaviors in colorized SAR imagery**
*Author(s):* **Brian D. Rigling,** Univ. of Dayton (United States); **Uttam Majumder,** United States Air Force Research Lab. (United States); **Edmund G. Zelnio,** Air Force Research Lab. (United States)

13032-27 • 01:30 PM - 01:40 PM
**SAR image quantization strategies for improved human amd machine interpretability**
*Author(s):* **Brian D. Rigling,** Univ. of Dayton (United States); **Uttam Majumder, Edmund G. Zelnio,** Air Force Research Lab. (United States)

13032-28 • 01:40 PM - 01:50 PM
**Analysis of SAR object classification by few-shot learning**
*Author(s):* **Uttam Kumar Majumder, Stanley Chen,** U.S. Dept. of Defense (United States)

13032-29 • 01:50 PM - 02:00 PM
**Active learning for SAR data labeling and classification**
*Author(s):* **Uttam Kumar Majumder,** U.S. Dept. of Defense (United States)

13032-30 • 02:00 PM - 02:10 PM
**Scene geometry aided SAR ATR**
*Author(s):* **Uttam Kumar Majumder,** U.S. Dept. of Defense (United States)

13032-31 • 02:10 PM - 02:20 PM
**Small SAR system for AI/ML enable security**
*Author(s):* **Uttam Kumar Majumder, John C. Kirk,** U.S. Dept. of Defense (United States)

13032-32 • 02:20 PM - 02:30 PM
**Calibrated confidences and prediction sets for open set SAR ATR**
*Author(s):* **Sudarshan Chakravarthy,** The Ohio State Univ. (United States); **Mark Ashby,** Air Force Research Lab. (United States)

13032-35 • 02:30 PM - 02:40 PM
**Graph pretraining approach to utilize synthetic data for SAR ATR**
*Author(s):* **Caleb Parks**, **Susan Gauch,** Univ. of Arkansas (United States); **Matthew Scherreik,** Air Force Research Lab. (United States); **Ryan Socha,** Univ. of Arkansas (United States)

**Coffee Break 02:40 PM - 03:10 PM**

## SESSION 8: POSTER SESSION II

24 April 2024 • 03:10 PM - 04:40 PM | National Harbor 11

*Session Chair(s):* **Frederick D. Garber**, Wright State Univ. (United States); **Edmund G. Zelnio**, Air Force Research Lab. (United States)

Presenters from the day will gather in the conference room to present a poster for Algorithms for Synthetic Aperture Radar Imagery XXXI conference.

## PANEL DISCUSSION II

24 April 2024 • 04:40 PM - 05:20 PM | National Harbor 11

*Session Chair(s):* **Frederick D. Garber**, Wright State Univ. (United States); **Edmund G. Zelnio**, Air Force Research Lab. (United States)

Discuss topics from the days oral and poster presentations for Algorithms for Synthetic Aperture Radar Imagery XXXI conference.

# CONFERENCE 13033

# Multimodal Image Exploitation and Learning 2024

**22 April 2024 | National Harbor 10**

***Conference Chair(s):*** **Sos S. Agaian,** College of Staten Island (United States); **Vijayan K. Asari,** Univ. of Dayton (United States); **Stephen P. DelMarco,** BAE Systems (United States)

***Conference Co-Chair(s):*** **Sabah A. Jassim,** The Univ. of Buckingham (United Kingdom)

***Program Committee:*** **David Akopian,** The Univ. of Texas at San Antonio (United States); **Theus H. Aspiras,** Univ. of Dayton (United States); **Colleen P. Bailey,** Univ. of North Texas (United States); **Ravindrnath C. Cherukuri,** CHRIST (Deemed to be Univ.) (India); **Reiner Creutzburg,** Technische Hochschule Brandenburg (Germany); **Arman Darbinyan,** Russian-Armenian Univ. (Armenia); **Johan Debayle,** MINES Saint-Étienne (France); **Yunbin Deng,** BAE Systems (United States); **Eliza Yingzi Du,** Integem (United States); **Frederic Dufaux,** Lab. des Signaux et Systèmes, CNRS (France); **Erlan H. Feria,** The City Univ. of New York (United States); **Artyom M. Grigoryan,** The Univ. of Texas at San Antonio (United States); **Balvinder Kaur,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Karen Panetta,** Tufts Univ. (United States); **Haleh Safavi,** NASA Goddard Space Flight Ctr. (United States); **Harin Sellahewa,** The Univ. of Buckingham (United Kingdom); **Jinshan Tang,** George Mason Univ. (United States); **Thaweesak Trongtirakul,** Rajamangala Univ. of Technology Phra Nakhon (Thailand); **Viacheslav Voronin,** Moscow State Univ. of Technology "STANKIN" (Russian Federation); **Shiqian Wu,** Wuhan Univ. of Science and Technology (China); **Yufeng Zheng,** The Univ. of Mississippi Medical Ctr. (United States)

## Monday 22 April 2024

### SESSION 1: INNOVATIVE IMAGING TECHNIQUES

22 April 2024 • 08:00 AM - 10:00 AM | National Harbor 10
*Session Chair(s):* **Stephen P. DelMarco**, BAE Systems (United States)

13033-32 • 08:00 AM - 08:20 AM
**Immanuel Kant's 300th birth anniversary: the leveraging of mobile VR and AR technologies for a cultural mega-event**
*Author(s):* **Dirk Hagen,** Baden-Württemberg Cooperative State University (Germany); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany), SRH Berlin Univ. of Applied Sciences (Germany); **Eberhard Hasche,** Technische Hochschule Brandenburg (Germany)

13033-1 • 08:20 AM - 08:40 AM
**Adaptive contrast enhancement for improved iceberg detection in SAR imagery**
*Author(s):* **Thaweesak Trongtirakul,** Rajamangala Univ. of Technology Phra Nakhon (Thailand); **Sos S. Agaian,** The Graduate Ctr., CUNY (United States)

13033-2 • 08:40 AM - 09:00 AM
**Brightening the shadows: low-light image feature enhancement**
*Author(s):* **Gavin Halford**, **Arthur C. Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

13033-3 • 09:00 AM - 09:20 AM
**Quaternion Fourier transform-based alpha-rooting color image enhancement in 2 algebras: commutative and non-commutative**
*Author(s):* **Artyom M. Grigoryan, Alexis A. Gomez,** The Univ. of Texas at San Antonio (United States)

13033-4 • 09:20 AM - 09:40 AM
**Image registration refinement using progressively sharpened alpha-rooting parameters**
*Author(s):* **Stephen P. DelMarco,** BAE Systems (United States)

13033-5 • 09:40 AM - 10:00 AM
**Robust and automatic localization method of the macula in both healthy and pathological retinal images**
*Author(s):* **Rostom Kachouri,** ESIEE Paris (France); **Yaroub Elloumi,** Institut Supérieur d'Informatique et des Technologies de Communication Hammam Sousse, Univ. de Sousse (Tunisia)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 2: MACHINE LEARNING I

22 April 2024 • 10:30 AM - 11:50 AM | National Harbor 10
*Session Chair(s):* **Sos S. Agaian**, The Graduate Ctr., CUNY (United States)

13033-6 • 10:30 AM - 10:50 AM
**Multimodal learning based threat detection in dual view, dual energy x-ray images**
*Author(s):* **Renu Rameshan**, **Somya Goel**, **Kuldeep Singh**, **Krishan Sharma, Anoop G. Prabhu,** Vehant Technologies Pvt. Ltd. (India)

13033-8 • 10:50 AM - 11:10 AM
**Heart rate and oxygen level estimation from facial videos using a hybrid deep learning model**
*Author(s):* **Yufeng Zheng,** The Univ. of Mississippi Medical Ctr. (United States)

13033-9 • 11:10 AM - 11:30 AM
**Derivation, optimization, and comparative analysis of support vector machines application to multi-class image data**
*Author(s):* **Avi R. Shekhar,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Amir K. Saeed**, **Benjamin A. Johnson,** Johns Hopkins Univ. (United States); **Benjamin M. Rodriguez,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13033-35 • 11:30 AM - 11:50 AM
**Improving COVID-19 Detection: Leveraging Convolutional Neural Networks in Chest X-Ray Imaging**
*Author(s):* **Mahnoor Jamil**, **John Chukwu Ikechukwu,** Kadir Has Üniv. (Turkey); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany), SRH Berlin Univ. of Applied Sciences (Germany)

**Lunch Break 11:50 AM - 01:20 PM**

## SESSION 3: MACHINE LEARNING II

22 April 2024 • 01:20 PM - 02:40 PM | National Harbor 10
*Session Chair(s):* **Sos S. Agaian**, The Graduate Ctr., CUNY (United States)

13033-10 • 01:20 PM - 01:40 PM
**Elevating aircraft identification: leveraging ViT for rapid and accurate classification**
*Author(s):* **Benjamin Hand, Colleen P. Bailey,** Univ. of North Texas (United States)

13033-11 • 01:40 PM - 02:00 PM
**Phenological development quantification in brassica plants via hyperspectral imaging and deep learning**
*Author(s):* **Abigail A. Stone**, **Srijith Rajeev**, **Shishir P. Rao**, **Karen A. Panetta,** Tufts Univ. (United States); **Sos S. Agaian,** The Graduate Ctr., CUNY (United States)

13033-12 • 02:00 PM - 02:20 PM
**Diffusion model-based generation of arctic sea ice data**
*Author(s):* **Aqsa Sultana**, **Vijayan K. Asari**, **Theus H. Aspiras**, **Ruixu Liu,** Univ. of Dayton (United States); **Ivan Sudakow,** The Open Univ. (United Kingdom); **Lee W. Cooper,** Univ. of Maryland Ctr. for Environmental Science (United States)

13033-13 • 02:20 PM - 02:40 PM
**Unveiling Hidden Marine Debris: Unsupervised Enhancement of SAR Images Using Multilevel Enhancement (EME)**
*Author(s):* **Thaweesak Trongtirakul,** Rajamangala Univ. of Technology Phra Nakhon (Thailand); **Sos S. Agaian,** The Graduate Ctr., CUNY (United States); **Khalifa Djemal**, **Amir Ali Feiz,** Univ. d'Evry Val d'Essonne (France); **Sheli Sinha Chaudhuri,** Jadavpur Univ. (India)

**Coffee Break 02:40 PM - 03:10 PM**

## SESSION 4: INNOVATIVE SIGNAL AND IMAGE PROCESSING

22 April 2024 • 03:10 PM - 04:30 PM | National Harbor 10
*Session Chair(s):* **Stephen P. DelMarco**, BAE Systems (United States)

13033-14 • 03:10 PM - 03:30 PM
**Detecting chaotic dynamics in cardiac signals from laser doppler vibrometry**
*Author(s):* **Stephen P. DelMarco,** BAE Systems (United States)

13033-17 • 03:30 PM - 03:50 PM
**Multibit least significant bit matching: a novel approach to image steganography**
*Author(s):* **Almabrok Essa,** John Carroll Univ. (United States); **Ian Wu,** Cleveland State Univ. (United States)

13033-18 • 03:50 PM - 04:10 PM
**Practical real-time image compression for resource-challenged devices**
*Author(s):* **Kevin Pham**, **Arthur C. Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

13033-33 • 04:10 PM - 04:30 PM
**Object Detection and Scene Perception in Adverse Weather Conditions**
*Author(s):* **Priya Sara George,** SRH Berlin Univ. of Applied Sciences (Germany); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany), SRH Berlin Univ. of Applied Sciences (Germany); **Gerrit Tamm,** SRH Berlin Univ. of Applied Sciences (Germany), Stellenbosch Univ. (South Africa)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13033-19 • 06:00 PM - 07:30 PM
**Multi-Kernel Wiener Local Binary Patterns for Optical Coherrence Tomography Ocular Disease Detections**
*Author(s):* **Alex Liew,** The Graduate Ctr., CUNY (United States)

13033-20 • 06:00 PM - 07:30 PM
**Color Quaternion Modulus and Phase Patterns for Identifying Gastrointestinal Diseases in Wireless Capsule Endoscopic Images and Mitigating Errors caused by Contrast Reduction**
*Author(s):* **Alex Liew,** The Graduate Ctr., CUNY (United States); **Sos S. Agaian,** College of Staten Island of City University of New York (United States); **Liang Zhao,** Lehman College (United States)

13033-22 • 06:00 PM - 07:30 PM
**Methods of calculation of the 2-D quantum Fourier transform of images**
*Author(s):* **Artyom M. Grigoryan**, **Alexis A. Gomez,** The Univ. of Texas at San Antonio (United States); **Sos S. Agaian,** College of Staten Island (United States)

13033-23 • 06:00 PM - 07:30 PM
**An impact study of deep learning-based low-light enhancement in intelligent transportation systems**
*Author(s):* **Obafemi Jinadu**, **Srijith Rajeev**, **Karen A. Panetta,** Tufts Univ. (United States); **Sos S. Agaian,** The Graduate Ctr., CUNY (United States)

13033-27 • 06:00 PM - 07:30 PM
**Enhancing robustness of weather removal: preprocessing-based defense against adversarial attacks**
*Author(s):* **Vladimir A. Frants, Sos S. Agaian,** The Graduate Ctr., CUNY (United States)

13033-28 • 06:00 PM - 07:30 PM
**Comprehensive urban navigation and yielding: video dataset for enhanced collision and anomaly detection in real-world traffic scenarios**
*Author(s):* **Laura Kaplan,** College of Staten Island (United States); **Vladimir A. Frants,** The Graduate Ctr., CUNY (United States); **Sos S. Agaian,** College of Staten Island (United States)

13033-29 • 06:00 PM - 07:30 PM
**PB-UCMNet: partial binarized u-shape network for skin lesion segmentation**
*Author(s):* **Chunyu Yuan**, **Sos S. Agaian,** The Graduate Ctr., CUNY (United States); **Dongfang Zhao, Yanting Hu,** Univ. of Washington (United States)

13033-36 • 06:00 PM - 07:30 PM
**Probabilistic Time Series Forecasting with Transformer Models**
*Author(s):* **Maximilian A. F. Bornstädt**, **Klaus Schwarz,** SRH Berlin Univ. of Applied Sciences (Germany); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany)

13033-38 • 06:00 PM - 07:30 PM
**Web app security: comparative insights on automated penetration testing**
*Author(s):* **Harsh Rathod**, **Navaneeth Shivananjappa,** SRH Berlin Univ. of Applied Sciences (Germany); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany)

13033-39 • 06:00 PM - 07:30 PM
**Securing democracy: a blockchain-based solution for digital voting**
*Author(s):* **Cristean Eremia**, **Navaneeth Shivananjappa,** SRH Berlin Univ. of Applied Sciences (Germany); **Reiner M. Creutzburg,** Technische Hochschule Brandenburg (Germany)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13033-15
**Chaos-based encryption system of DICOM medical images**
*Author(s):* **Wafaa al Nassan**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13033-21
**Real-time underwater video feed enhancement for autonomous underwater vehicles (AUV)**
*Author(s):* **Yusuf Hasan,** Aligarh Muslim Univ. (India); **Mohammad Athar Ali,** The Univ. of Buckingham (United Kingdom)

# CONFERENCE 13034

# Real-Time Image Processing and Deep Learning 2024

**22 - 23 April 2024 | National Harbor 3**

***Conference Chair(s):*** **Nasser Kehtarnavaz,** The Univ. of Texas at Dallas (United States); **Mukul V. Shirvaikar,** The Univ. of Texas at Tyler (United States)

***Program Committee:*** **Arian Azarang,** Univ. of North Carolina at Chapel Hill School of Medicine (United States); **William F. Basener,** Univ. of Virginia (United States); **Chen Chen,** Univ. of Central Florida (United States); **Christos Grecos,** Arkansas State Univ. (United States); **Kui Liu,** Zebra (United States); **Mehrube Mehrubeoglu,** Texas A&M Univ. Corpus Christi (United States); **Volodymyr Ponomaryov,** Instituto Politécnico Nacional (Mexico); **Abhishek Sehgal,** SAMSUNG Research America (United States); **Bogdan Smolka,** Silesian Univ. of Technology (Poland); **Mohammad Zarei,** The MITRE Corp. (United States)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 09:10 AM - 09:20 AM | National Harbor 3
*Session Chair(s):* **Nasser Kehtarnavaz**, The Univ. of Texas at Dallas (United States)
The chair of Real-Time Image Processing and Deep Learning 2024 will introduce the sessions for this conference.

### SESSION 1: REAL-TIME DEEP LEARNING I

22 April 2024 • 09:20 AM - 10:00 AM | National Harbor 3
*Session Chair(s):* **Nasser Kehtarnavaz**, The Univ. of Texas at Dallas (United States)

13034-3 • 09:20 AM - 09:40 AM
**Multi-reward optimization using genetic algorithms for edge AI**
*Author(s):* **Blake Richey,** The Univ. of Texas at Tyler (United States); **Christos Grecos,** Arkansas State Univ. (United States); **Mukul V. Shirvaikar,** The Univ. of Texas at Tyler (United States)

13034-4 • 09:40 AM - 10:00 AM
**A deep learning-based template matching through other field of view infrared image pair for real-time mixed reality**
*Author(s):* **Seungeon Lee**, **Donyung Kim, Sungho Kim,** Yeungnam Univ. (Korea, Republic of)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: REAL-TIME METHODS AND ALGORITHMS I

22 April 2024 • 10:30 AM - 11:50 AM | National Harbor 3
*Session Chair(s):* **Mehrube Mehrubeoglu**, Texas A&M Univ. Corpus Christi (United States)

13034-5 • 10:30 AM - 10:50 AM
**End-to-end system for real-time bidirectional holographic communication**
*Author(s):* **Indranil Sinharoy**, **Madhukar Budagavi,** SAMSUNG Research America (United States); **Esmaeil Faramarzi,** Apple Inc. (United States); **Saifeng Ni, Abhishek Sehgal,** SAMSUNG Research America (United States)

13034-6 • 10:50 AM - 11:10 AM
**Color image denoising: a hybrid approach for mixed Gaussian and impulsive noise**
*Author(s):* **Bogdan Smolka**, **Damian Kusnik,** Silesian Univ. of Technology (Poland); **Milena Smolka,** AGH Univ. of Science and Technology (Poland); **Michal Kawulok,** Silesian Univ. of Technology (Poland); **Boguslaw Cyganek,** AGH Univ. of Science and Technology (Poland)

13034-7 • 11:10 AM - 11:30 AM
**Coupling deep and handcrafted features to assess smile genuineness**
*Author(s):* **Benedykt Pawlus**, **Bogdan Smolka**, **Jolanta Kawulok, Michal Kawulok,** Silesian Univ. of Technology (Poland)

13034-8 • 11:30 AM - 11:50 AM
**Efficient and consistent zero-shot video generation with diffusion models**
*Author(s):* **Ethan Frakes**, **Umar Khalid, Chen Chen,** Univ. of Central Florida (United States)

**Lunch Break 11:50 AM - 01:30 PM**

## SESSION 3: REAL-TIME DEEP LEARNING II

22 April 2024 • 01:30 PM - 02:50 PM | National Harbor 3
*Session Chair(s):* **Mukul V. Shirvaikar**, The Univ. of Texas at Tyler (United States)

13034-9 • 01:30 PM - 01:50 PM
**Comparison of deep generative models for real-time generation of synthesized defective wafer maps**
*Author(s):* **Lamia Alam, Nasser Kehtarnavaz,** The Univ. of Texas at Dallas (United States)

13034-10 • 01:50 PM - 02:10 PM
**BSMO: enhancing multi-task learning through batch swapping optimization**
*Author(s):* **Zephaniah Spencer,** The Univ. of North Carolina at Charlotte (United States); **Gunar Schirner,** Northeastern Univ. (United States); **Hamed Tabkhi,** The Univ. of North Carolina at Charlotte (United States)

13034-11 • 02:10 PM - 02:30 PM
**Edge deployed satellite image classification with TinEViT a X-Cube-AI compatible efficient vision transformer**
*Author(s):* **Gavin Halford**, **Arthur C. Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

13034-12 • 02:30 PM - 02:50 PM
**A design space exploration framework for deployment of resource-constrained deep neural networks**
*Author(s):* **Yan Zhang**, **Lei Pan,** Univ. of Maryland, College Park (United States); **Phillip Berkowitz**, **Mun Wai Lee,** Intelligent Automation, Inc. (United States); **Benjamin Riggan,** Univ. of Nebraska-Lincoln (United States); **Shuvra S. Bhattacharyya,** Univ. of Maryland, College Park (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 4: REAL-TIME METHODS AND ALGORITHMS II

22 April 2024 • 03:20 PM - 04:40 PM | National Harbor 3
*Session Chair(s):* **Bogdan Smolka**, Silesian Univ. of Technology (Poland)

13034-13 • 03:20 PM - 03:40 PM
**IoT-enabled unmanned traffic management system with dynamic vision-based drone detection for sense and avoid coordination**
*Author(s):* **Pablo Rangel**, **Scott Tardif**, **Mehrube Mehrubeoglu**, **Edward St. John**, **Preston Whaley**, **Matthew Salas**, **Daniel Armstrong, Marcial Torres,** Texas A&M Univ. Corpus Christi (United States)

13034-14 • 03:40 PM - 04:00 PM
**Exploring action recognition in endoscopy video datasets**
*Author(s):* **Yuchen Tian,** Turfs University (United States); **Sidike Paheding,** Fairfield Univ. (United States); **Ehsan Azimi, Eung-Joo Lee,** The Univ. of Arizona (United States)

13034-15 • 04:00 PM - 04:20 PM
**Integrating image-based LLMs on edge-devices for underwater robotics**
*Author(s):* **Prabha Sundaravadivel,** The Univ. of Texas at Tyler (United States); **Preetha J. Roselyn,** Dept of EEE, SRM Institute of Science and Technology (India); **Vedachalam Narayanaswamy,** National Institute of Ocean Technology (India); **Vincent I. Jeyaraj**, **Aishree Ramesh,** Dept. of AI and Data Science, Saveetha Engineering College (India); **Aaditya Khanal,** Dept of Chemical Engineering, The Univ. of Texas at Tyler (United States)

13034-16 • 04:20 PM - 04:40 PM
**Age-based clustering of seagrass blades using AI models**
*Author(s):* **Omer Sevinc**, **Mehrube Mehrubeoglu**, **Kirk Cammarata, Chi Huang,** Texas A&M Univ. Corpus Christi (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 5: REAL-TIME METHODS AND ALGORITHMS III

23 April 2024 • 10:30 AM - 11:50 AM | National Harbor 3
*Session Chair(s):* **Eung-Joo Lee**, The Univ. of Arizona (United States)

13034-17 • 10:30 AM - 10:50 AM
**Automated rapid identification of feed materials in total mixed rations for dairy cattle**
*Author(s):* **Vincent Nwaneri**, **Daniel Uyeh**, **Patience Mba, Daniel Morris,** Michigan State Univ. (United States)

13034-18 • 10:50 AM - 11:10 AM
**Layered convolutional neural networks for multi-class image classification**
*Author(s):* **Dzmitry Kasinets**, **Amir K. Saeed**, **Benjamin A. Johnson, Benjamin M. Rodriguez,** Johns Hopkins Univ. (United States)

13034-19 • 11:10 AM - 11:30 AM
**Asymmetric contrast imaging in the presence of a bright interferent**
*Author(s):* **Mauricio Martinez**, **Adriana Stohn, Michael E. Gehm,** Duke Univ. (United States)

13034-20 • 11:30 AM - 11:50 AM
**Nanoscale environmental and biological sensing using lensfree microscopy**
*Author(s):* **Euan McLeod,** Wyant College of Optical Sciences (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13034-21 • 06:00 PM - 07:30 PM
**Eyeball tracking in closed eyes from shadows**
*Author(s):* **Indranil Sinharoy**, **Aditya Dave**, **Lianjun Li**, **Hao Chen,** SAMSUNG Research America (United States); **Doyoon Kim,** SAMSUNG Electronics Co., Ltd. (Korea, Republic of); **Abhishek Sehgal,** SAMSUNG Research America (United States)

13034-22 • 06:00 PM - 07:30 PM
**CAEN: efficient adversarial robustness with categorized ensemble of networks**
*Author(s):* **Aly Sultan**, **Raksha Ramkumar**, **Bruno Morais**, **Mehrshad Zandigohar, Gunar Schirner,** Northeastern Univ. (United States)

13034-24 • 06:00 PM - 07:30 PM
**Improving real-time security screening**
*Author(s):* **Benjamin Hand, Colleen P. Bailey,** Univ. of North Texas (United States)

13034-25 • 06:00 PM - 07:30 PM
**Learning optimum binary color filter arrays for demosaicing with neural networks**
*Author(s):* **Cemre Omer Ayna, Ali Cafer Gurbuz,** Mississippi State Univ. (United States)

13034-26 • 06:00 PM - 07:30 PM
**A deep transfer learning approach for evaluation and categorization of burn degree from human skin burn images**
*Author(s):* **Sayed Asaduzzaman**, **Daniel Newman, Coenen Casey,** Univ. of North Dakota (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13034-23
**Charting the rise of ONNX in swift image processing: a publications exploration**
*Author(s):* **Khaled Obaideen**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

## CONFERENCE 13035

# Synthetic Data for Artificial Intelligence and Machine Learning: Tools, Techniques, and Applications II

**22 - 25 April 2024 | Potomac 6**

***Conference Chair(s):*** **Kimberly E. Manser**, **Christopher L. Howell,** DEVCOM C5ISR (United States); **Raghuveer M. Rao,** DEVCOM Army Research Lab. (United States)

***Conference Co-Chair(s):*** **Celso De Melo,** DEVCOM Army Research Lab. (United States)

***Program Committee:*** **Derek T. Anderson,** Univ. of Missouri (United States); **Rama R. Chellappa,** Johns Hopkins Univ. (United States); **Karen Frech,** U.S. Navy (United States); **Leonidas J. Guibas,** Stanford Univ. (United States); **Kapil Katyal,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Dinesh Manocha,** Univ. of Maryland, College Park (United States); **Jamileh Mogin,** Nevada National Security Site (United States); **Priya Narayanan,** DEVCOM Army Research Lab. (United States); **Colin N. Reinhardt,** Naval Information Warfare Ctr. Pacific (United States); **Stefano Soatto,** Univ. of California, Los Angeles (United States); **Antonio Torralba,** Massachusetts Institute of Technology (United States); **Vincent J. Velten, Lori Westerkamp,** Air Force Research Lab. (United States)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:20 AM - 08:30 AM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)
Opening remarks for Synthetic Data for Artificial Intelligence and Machine Learning: Tools, Techniques, and Applications II.

### SESSION 1: VIRTUAL ASSET CREATION

22 April 2024 • 08:30 AM - 10:30 AM | Potomac 6
*Session Chair(s):* **Vincent J. Velten**, Air Force Research Lab. (United States)

13035-1 • 08:30 AM - 09:10 AM
**Improving visual AI models with synthetic, hybrid, and perturbed training data** (Keynote Presentation)
*Author(s):* **Anthony J. Hoogs,** Kitware, Inc. (United States)

13035-2 • 09:10 AM - 09:30 AM
**Generating synthetic data for data-driven solutions via a digital twin for condition monitoring in machine tools**
*Author(s):* **Brett S. Sicard**, **Quade Butler**, **Yuandi Wu**, **Sepehr M. Abdolahi,** McMaster Univ. (Canada); **Youssef Ziada,** Ford Motor Co. (United States); **Stephen A. Gadsden,** McMaster Univ. (Canada)

13035-3 • 09:30 AM - 09:50 AM
**Acoustic sensing on multi-rotor UAV for target detection using a convolutional neural network**
*Author(s):* **Kevin McKenzie**, **Eddie Jacobs**, **Alf Ramirez, Thomas P. Watson,** The Univ. of Memphis (United States)

13035-4 • 09:50 AM - 10:10 AM
**Comparison of hybrid real and synthetized image sources for training an object detector**
*Author(s):* **Nicolas Hueber, Alexander Pichler,** Institut Franco-Allemand de Recherches de Saint-Louis (France)

13035-5 • 10:10 AM - 10:30 AM
**Wicker scale model lab: rapid generation of ATR training data from 2 years to 3 days**
*Author(s):* **Rachel Kinard**, **Igor Ternovskiy**, **Brandon Kinard,** Air Force Research Lab. (United States); **Robert Schueler**, **James Graham**, **Matthew Rustad,** Riverside Research (United States); **Alexander Mattingly,** Univ. of Maryland, College Park (United States)

**Coffee Break 10:30 AM - 11:00 AM**

## SESSION 2: SYNTHETIC DATA GENERATION TOOLS I

22 April 2024 • 11:00 AM - 12:00 PM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)

13035-6 • 11:00 AM - 11:20 AM
**A unified infrared and radio frequency simulation environment**
*Author(s):* **Keith F. Prussing**, **Christopher E. Cordell, Daniel Levy,** Georgia Tech Research Institute (United States)

13035-8 • 11:20 AM - 11:40 AM
**Generating simulated data with a large language model**
*Author(s):* **Jeffrey Kerley**, **Derek T. Anderson**, **Brendan Alvey, Andrew Buck,** Univ. of Missouri (United States)

13035-9 • 11:40 AM - 12:00 PM
**Combining simulated data, foundation models, and few real samples for training object detectors**
*Author(s):* **Friso G. Heslinga**, **Thijs A. Eker**, **Ella P. Fokkinga**, **Jan Erik van Woerden**, **Frank A. Ruis**, **Richard J. M. den Hollander, Klamer Schutte,** TNO (Netherlands)

**Lunch Break 12:00 PM - 01:40 PM**

## SESSION 3: SYNTHETIC DATA GENERATION TOOLS II

22 April 2024 • 01:40 PM - 03:00 PM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)

13035-11 • 01:40 PM - 02:00 PM
**Whole sky image synthesis for annotated machine learning datasets**
*Author(s):* **Michael S. Lee**, **Gail Vaucher**, **Michael S. D'Arcy**, **Robert Jane, Morris Berman,** DEVCOM Army Research Lab. (United States)

13035-12 • 02:00 PM - 02:20 PM
**Automatic detection and recognition of humans with YOLO-based deep learning using MuSES-generated EO/IR synthetic imagery**
*Author(s):* **Mark D. Klein**, **Zachary J. Edel**, **Corey D. Packard**, **Jacob N. Hendrickson**, **Audrey C. Levanen, Peter L. Rynes,** ThermoAnalytics, Inc. (United States)

13035-13 • 02:20 PM - 02:40 PM
**effects on algorithm performance via improvements in reflective and volumetric rendering**
*Author(s):* **Matthew Rigney,** U.S. Army Combat Capabilities Development Command (United States); **Brad Seal**, **Kyle Bentley, Chris Carter,** Torch Technologies, Inc. (United States)

13035-60 • 02:40 PM - 03:00 PM
**A generative model for synthetic thermal infrared images**
*Author(s):* **Huong Ninh**, **Doan Thinh Vo, Hai Tran Tien,** Viettel Aerospace Institute (Vietnam)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 4: POSE AND GESTURE RECOGNITION

22 April 2024 • 03:30 PM - 04:50 PM | Potomac 6
*Session Chair(s):* **Christopher L. Howell**, DEVCOM C5ISR (United States)

13035-14 • 03:30 PM - 03:50 PM
**Synthetic-to-real adaptation for complex action recognition in surveillance applications**
*Author(s):* **Shuhong Lu**, **Zhangyu Jin,** USC Institute for Creative Technologies (United States); **Vickram Rajendran**, **Michal Harari,** Applied Intuition, Inc. (United States); **Andrew Feng,** USC Institute for Creative Technologies (United States); **Celso M. De Melo,** DEVCOM Army Research Lab. (United States)

13035-15 • 03:50 PM - 04:10 PM
**Multi-modal knowledge distillation for domain-adaptive action recognition**
*Author(s):* **Xiaoyu Zhu**, **Wenhe Liu,** Carnegie Mellon Univ. (United States); **Celso M. De Mello,** DEVCOM Army Research Lab. (United States); **Alexander Hauptmann,** Carnegie Mellon Univ. (United States)

13035-16 • 04:10 PM - 04:30 PM
**An evaluation of large pre-trained models for gesture recognition using synthetic videos**
*Author(s):* **Arun Reddy,** Johns Hopkins Univ. Applied Physics Lab. (United States); **Ketul Shah,** Johns Hopkins Univ. (United States); **Corban Rivera**, **William Paul,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Celso M. De Melo,** DEVCOM Army Research Lab. (United States); **Rama Chellappa,** Johns Hopkins Univ. (United States)

13035-17 • 04:30 PM - 04:50 PM
**Synthetic datasets for microwave dish mensuration via pose estimation in deep learning models**
*Author(s):* **Christopher Liberatore,** Air Force Research Lab. (United States); **Corey Marrs,** Univ. of Missouri-Kansas City (United States), Wright State Univ. (United States); **John Bielas,** Applied Research Solutions, Inc. (United States); **Amanda Baxter**, **Richard Borth,** National Air and Space Intelligence Ctr. (United States); **Ian Matejka**, **Yuki Adams,** Applied Research Solutions, Inc. (United States); **Patrick Benasutti,** Applied Research Solutions (United States); **Rachel Kinard,** Air Force Research Lab. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 5: PANEL DISCUSSION: GENERATIVE MODELS

23 April 2024 • 10:30 AM - 11:30 AM | Potomac 6

Generative AI promises nearly endless possibilities for myriad use cases, with potential applications cutting across nearly every business and research sector. From advertising and art to algorithm training, generative AI is making waves and becoming more and more popular. In this panel discussion, we invite panel members to explore the current state of generative AI, its shortcomings and strengths, and look to the future by positing how we might make improvements in the field, and how the technology may be used to further benefit in the future. We will be accepting some audience questions, so please come curious!

*Moderators:*
**Kimberly E. Manser**, DEVCOM C5ISR (United States)

*Panelists:*
**Raghuveer Rao**, Army Research Laboratory
**Colin Reinhardt**, Naval Intelligence Warfare Center
**Corban Rivera**, Johns Hopkins University, Applied Physics Laboratory
**Sek Chai**, Latent AI
**Alex Hauptmann**, Carnegie Mellon University

## SESSION 6: DATA MANAGEMENT

23 April 2024 • 11:30 AM - 12:00 PM | Potomac 6
*Session Chair(s):* **Christopher L. Howell**, DEVCOM C5ISR (United States)

13035-18 • 11:30 AM - 12:00 PM
**A data management approach to enable efficient AI/ML training** *(Invited Paper)*
*Author(s):* **Michael F. Finch, Mark Jeiran,** DEVCOM C5ISR (United States)

### Lunch/Exhibition Break 12:00 PM - 02:10 PM

## SESSION 7: UNMANNED SYSTEMS

23 April 2024 • 02:10 PM - 03:10 PM | Potomac 6
*Session Chair(s):* **Vincent J. Velten**, Air Force Research Lab. (United States)

13035-19 • 02:10 PM - 02:30 PM
**Real-time human action recognition from aerial videos using autozoom and synthetic data**
*Author(s):* **Ruiqi Xian,** Univ. of Maryland, College Park (United States); **Bryan I. Vogel,** Booz Allen Hamilton Inc. (United States); **Celso M. De Melo**, **Andre V. Harrison,** DEVCOM Army Research Lab. (United States); **Dinesh Manocha,** Univ. of Maryland, College Park (United States)

13035-20 • 02:30 PM - 02:50 PM
**Generating medium-scale synthetic snowy scenes for testing autonomous vehicle navigation**
*Author(s):* **Christopher T. Goodin**, **Daniel Carruth**, **Lalitha Dabbiru**, **Lucas Cagle**, **Nicholas Harvel,** Mississippi State Univ. (United States); **John G. Monroe, Michael W. Parker,** U.S. Army Engineer Research and Development Ctr. (United States)

13035-21 • 02:50 PM - 03:10 PM
**Improved 2D image segmentation for rough terrain navigation using synthetic data**
*Author(s):* **James Uplinger,** U.S. Army Research Lab. (United States); **Adam Goertz,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Vickram Rajendran**, **Nikhil Dev Deshmudre,** Applied Intuition, Inc. (United States); **Celso M. De Melo, Philip Osteen,** U.S. Army Research Lab. (United States)

### Coffee Break 03:10 PM - 03:40 PM

## SESSION 8: GENERATIVE MODELS

23 April 2024 • 03:40 PM - 05:00 PM | Potomac 6
*Session Chair(s):* **Celso De Melo**, DEVCOM Army Research Lab. (United States)

13035-23 • 03:40 PM - 04:00 PM
**Method for training deep neural networks in vehicle detection using drone-captured data and background synthesis**
*Author(s):* **Alexander Pichler, Nicolas Hueber,** Institut Franco-Allemand de Recherches de Saint-Louis (France)

13035-25 • 04:00 PM - 04:20 PM
**Weed Image data augmentation by diffusion models**
*Author(s):* **Boyang Deng, Yuzhen Lu,** Michigan State Univ. (United States)

13035-59 • 04:20 PM - 04:40 PM
**Generative EO/IR multi-scale vision transformer for improved object detection**
*Author(s):* **Jonathan Christian**, **Max Bright**, **Jason Summers,** Applied Research in Acoustics LLC (United States); **Ashley Olson, Timothy C. Havens,** Michigan Technological Univ. (United States)

13035-57 • 04:40 PM - 05:00 PM
**Enhancing human action recognition with GAN-based data augmentation**
*Author(s):* **Prasanna Reddy Pulakurthi,** Rochester Institute of Technology (United States); **Celso M. De Melo**, **Raghuveer Rao,** DEVCOM Army Research Lab. (United States); **Majid Rabbani,** Rochester Institute of Technology (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13035-44 • 06:00 PM - 07:30 PM
**Leveraging synthetic data for star and satellite photometry**
*Author(s):* **Kimmy Chang,** U.S. Space Force (United States); **Alex Cabello**, **Jeff Houchard,** EO Solutions (United States); **Jonathan Gazak, Justin Fletcher,** U.S. Space Force (United States)

13035-45 • 06:00 PM - 07:30 PM
**A new simulation platform for learning-empowered distributed sensing**
*Author(s):* **Sourabh Yadav**, **Thanh Le**, **Shaohua Dong**, **Heng Fan**, **Qing Yang**, **Chenxi Qiu, Yan Huang,** Univ. of North Texas (United States)

13035-46 • 06:00 PM - 07:30 PM
**Evaluation of synthetic Raman spectra for use in virus detection**
*Author(s):* **RyeAnne Ricker,** National Institutes of Health (United States); **Nestor Perea,** The Pennsylvania State Univ. (United States); **Elodie Ghedin,** National Institutes of Health (United States); **Murray Loew,** The George Washington Univ. (United States)

13035-47 • 06:00 PM - 07:30 PM
**Utilizing terrain-generation to derive realistic channel models for automatic modulation recognition**
*Author(s):* **Kenneth Witham,** Kostas Research Institute, Northeastern Univ. (United States); **Nishanth Marer Prabhu**, **Aly Sultan,** Northeastern Univ. (United States); **Marius Necsoiu,** DEVCOM ARL, San Antonio, TX (United States); **Chad Spooner,** NorthWest Research Associates (United States); **Gunar Schirner,** Northeastern Univ. (United States)

13035-48 • 06:00 PM - 07:30 PM
**Data augmentation and synthesis of Radar signatures for ML-based gesture recognition and activity detection from MoCap trajectories**
*Author(s):* **Indranil Sinharoy**, **Aditya Dave,** SAMSUNG Research America (United States); **Gaurav Duggal,** Virginia Polytechnic Institute and State Univ. (United States); **Vutha Va**, **Lianjun Li**, **Hao Chen, Abhishek Sehgal,** SAMSUNG Research America (United States)

13035-49 • 06:00 PM - 07:30 PM
**Overcoming the "pain point" in synthetic data generation: 3D remeshing and automated CAD repair with topological data analysis (TDA) indicators**
*Author(s):* **Rachel Kinard**, **Brandon Kinard**, **Elizabeth Sudkamp,** Air Force Research Lab. (United States); **Joshua Rice,** Applied Research Solutions, Inc. (United States); **Nathan Jones,** The Univ. of Oklahoma (United States); **Alexander Mattingly,** Univ. of Maryland, College Park (United States)

13035-50 • 06:00 PM - 07:30 PM
**ReplicantTM framework for synthetic data generation**
*Author(s):* **Emily Kenul**, **Zachary Havelka**, **Margaret Black**, **Drew Massey**, **Mawia Henkai**, **Kyle Gavin, Luke Shellhorn,** Booz Allen Hamilton Inc. (United States)

13035-51 • 06:00 PM - 07:30 PM
**Synthesizing textured 3D meshes from pose invariant 2D image representations for optimal face recognition**
*Author(s):* **John B. Peace, Benjamin S. Riggan,** Univ. of Nebraska-Lincoln (United States)

13035-63 • 06:00 PM - 07:30 PM
**Generating synthetic objects using deterministic modeling and GenAI to cultivate realistic testbed environments**
*Author(s):* **Hannah Lensing,** Thomson Reuters Special Services, LLC (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 9: MULTI-DOMAIN OPERATIONS

24 April 2024 • 10:30 AM - 12:10 PM | Potomac 6
*Session Chair(s):* **Raghuveer M. Rao**, DEVCOM Army Research Lab. (United States)

13035-26 • 10:30 AM - 10:50 AM
**Coupled dynamical systems data for testing detection of subtle causal dependencies**
*Author(s):* **Stuart W. Card,** Critical Technologies Inc. (United States)

13035-27 • 10:50 AM - 11:10 AM
**Range estimation using machine-learned algorithms for passive sensors**
*Author(s):* **Clint Morris, Jason Zutty,** Georgia Tech Research Institute (United States)

13035-28 • 11:10 AM - 11:30 AM
**Fundamental epistemic error in computational military simulation**
*Author(s):* **Jonathan S. Kent,** Lockheed Martin Corp. (United States)

13035-29 • 11:30 AM - 11:50 AM
**Towards 3D scene reconstruction using WiFi**
*Author(s):* **Guangkun Li**, **Pedro Rodriguez**, **Wayne Shanks, Jovan Barac,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13035-52 • 11:50 AM - 12:10 PM
**Synthetic experience design: using multi-modal and rich media to create artificial experiences constructs for bots**
*Author(s):* **Terry Traylor,** North Dakota State Univ. (United States)

**Lunch/Exhibition Break 12:10 PM - 01:40 PM**

### SESSION 10: INTEGRATED MACHINE LEARNING AND SYNTHESIS PIPELINES

24 April 2024 • 01:40 PM - 02:20 PM | Potomac 6
*Session Chair(s):* **Celso De Melo**, DEVCOM Army Research Lab. (United States)

13035-32 • 01:40 PM - 02:00 PM
**Task-oriented synthetic-to-real image translation for data-efficient learning**
*Author(s):* **Edgar A. Bernal,** FLX AI, Inc. (United States); **Rohan Sharma,** Univ. at Buffalo (United States); **Shanmukha Yenneti,** FLX AI, Inc. (United States); **Javier Malave**, **Derek J. Walvoord, Bernard Brower,** L3Harris Technologies, Inc. (United States)

13035-31 • 02:00 PM - 02:20 PM
**MizSIM: A Headless Open-Source Simulation Framework for Training and Evaluating Artificial Intelligence**
*Author(s):* **Andrii Soloviov**, **Derek T. Anderson**, **Jeffrey Kerley, Brendan Alvey,** Univ. of Missouri (United States)

## Thursday 25 April 2024

### SESSION 11: FIDELITY AND SENSITIVITY ANALYSIS I

25 April 2024 • 08:30 AM - 10:00 AM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)

13035-61 • 08:30 AM - 09:00 AM
**Toward quantifying the real-versus-synthetic imagery training data 'reality gap': analysis and practical applications** *(Invited Paper)*
*Author(s):* **Colin N. Reinhardt,** Naval Information Warfare Ctr. Pacific (United States); **Anthony Hoogs, Rusty Blue,** Kitware, Inc. (United States)

13035-33 • 09:00 AM - 09:20 AM
**integration of synthetic data into real world computer vision pipelines**
*Author(s):* **Gregory P. Spell**, **Michael Tran**, **Peter Torrione,** CoVar, LLC (United States); **Kimberly Manser,** DEVCOM C5ISR (United States)

13035-34 • 09:20 AM - 09:40 AM
**Synthetic augmentation methods for object detection in infrared overhead imagery**
*Author(s):* **Timothy C. Havens**, **Nicholas Hamilton**, **Adam Webb,** Michigan Technological Univ. (United States); **Matt Wilder,** Michigan Tech Research Institute (United States); **Ben Hendrickson**, **Matthew Blanck**, **Erin Nelson, Wiley Roemer,** Signature Research, Inc. (United States)

13035-35 • 09:40 AM - 10:00 AM
**Mind the (domain) gap: metrics for the differences in synthetic and real data distributions**
*Author(s):* **Ashley Dale**, **William Reindl**, **Edwin Sanchez**, **Albert William, Lauren Christopher,** Indiana Univ.-Purdue Univ. Indianapolis (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 12: FIDELITY AND SENSITIVITY ANALYSIS II

25 April 2024 • 10:30 AM - 11:50 AM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)

13035-39 • 10:30 AM - 10:50 AM
**ODUSI: object detection using synthetic imagery**
*Author(s):* **Marilyn Esposito**, **Jing Lin**, **Renea Young, Keefa Nelson,** Air Force Research Lab. (United States)

13035-40 • 10:50 AM - 11:10 AM
**Improving object detector training on synthetic data by starting with a strong baseline methodology**
*Author(s):* **Frank A. Ruis**, **Alma Liezenga**, **Friso G. Heslinga**, **Luca Ballan**, **Thijs A. Eker**, **Richard J. M. den Hollander**, **Martin C. van Leeuwen**, **Judith Dijk, Wyke Huizinga,** TNO (Netherlands)

13035-41 • 11:10 AM - 11:30 AM
**Simulation fidelity analysis using deep neural networks**
*Author(s):* **Lalitha Dabbiru**, **Christopher T. Goodin**, **Daniel Carruth,** Mississippi State Univ. (United States); **Zachary Aspin**, **Justin Carrillo,** U.S. Army Engineer Research and Development Ctr. (United States); **John Kaniarz,** U.S. Army Combat Capabilities Development Command (United States)

13035-42 • 11:30 AM - 11:50 AM
**evaluating the influence of simulation fidelity in infrared sensor modeling on machine learning performance using explainable AI**
*Author(s):* **Justin T. Carrillo**, **Matthew Bray**, **Orie Cecil**, **Andrew Trautz**, **Matthew Farthing, John G. Monroe,** U.S. Army Engineer Research and Development Ctr. (United States)

**Lunch/Exhibition Break 11:50 AM - 01:20 PM**

### SESSION 13: FIDELITY AND SENSITIVITY ANALYSIS III

25 April 2024 • 01:20 PM - 02:40 PM | Potomac 6
*Session Chair(s):* **Kimberly E. Manser**, DEVCOM C5ISR (United States)

13035-43 • 01:20 PM - 01:40 PM
**Mixing synthetic and real data to build AI vision models**
*Author(s):* **Peter Rizzi**, **Michael Gormish**, **Jacob Kovarskiy**, **Aaron Reite, Matthew Zeiler,** Clarifai, Inc. (United States)

13035-37 • 01:40 PM - 02:00 PM
**Methods for fast rendering for radiometrically correct clouds**
*Author(s):* **Oliver Pierson,** Georgia Tech Research Institute (United States)

13035-38 • 02:00 PM - 02:20 PM
**Demonstration of the feasibility of using synthetically generated condensed water vapor plume imagery to train an AI model to automatically segment real imagery**
*Author(s):* **Anna X. Mason**, **Jacob A. Irizarry**, **Byron K. Eng**, **Michael G. Saunders**, **Adam A. Goodenough**, **Scott D. Brown, Carl Salvaggio,** Rochester Institute of Technology (United States)

13035-36 • 02:20 PM - 02:40 PM
**Automatic satellite characterization using simulated ISAR data**
*Author(s):* **Friso G. Heslinga**, **Miguel Caro Cuenca**, **Rob J. Knight, Faruk Uysal,** TNO (Netherlands)

# CONFERENCE 13036

# Big Data VI: Learning, Analytics, and Applications

**22 - 23 April 2024 | Potomac 2**

***Conference Chair(s):*** **Panos P. Markopoulos,** The Univ. of Texas at San Antonio (United States)

***Conference Co-Chair(s):*** **Bing Ouyang, George Sklivanitis,** Florida Atlantic Univ. (United States)

***Program Committee:*** **Fauzia Ahmad,** Temple Univ. (United States); **Gonzalo R. Arce,** Univ. of Delaware (United States); **Colleen P. Bailey,** Univ. of North Texas (United States); **Zois Boukouvalas,** American Univ. (United States); **Ali Cafer Gurbuz,** Mississippi State Univ. (United States); **Ying Liu,** Santa Clara Univ. (United States); **Dimitris A. Pados,** Florida Atlantic Univ. (United States); **Vagelis Papalexakis,** Univ. of California, Riverside (United States); **Ashley Prater-Bennette,** Air Force Research Lab. (United States); **Zhijun G. Qiao,** The Univ. of Texas Rio Grande Valley (United States); **Ervin Sejdic,** Univ. of Toronto (Canada); **Adrian Stern,** Ben-Gurion Univ. of the Negev (Israel)

## Monday 22 April 2024

### SESSION 1: MACHINE LEARNING FOR AUTOMATIC TARGET RECOGNITION I: JOINT SESSION WITH CONFERENCES 13036 AND 13039

22 April 2024 • 08:10 AM - 10:10 AM | National Harbor 5
*Session Chair(s):* **Timothy L. Overman**, Prime Solutions Group, Inc. (United States)

13039-1 • 08:10 AM - 08:50 AM
**Image data for training ML models: how would synthetic methods help** (Keynote Presentation)
*Author(s):* **Raghuveer M. Rao,** DEVCOM Army Research Lab. (United States)

13039-2 • 08:50 AM - 09:10 AM
**Multi-objective optimization with homotopy-based strategies for enhanced multimodal automatic target recognition models**
*Author(s):* **Sophia Abraham**, **Steve Cruz,** Univ. of Notre Dame (United States); **Suya You,** DEVCOM Army Research Lab. (United States); **Jonathan D. Hauenstein, Walter J. Scheirer,** Univ. of Notre Dame (United States)

13039-3 • 09:10 AM - 09:30 AM
**Depth-aware framework for small-scale camouflaged object detection via swin transformer and ghost convolution layer integration**
*Author(s):* **Rohan Putatunda, Kelvin U. Echenim,** Univ. of Maryland, Baltimore County (United States)

13039-4 • 09:30 AM - 09:50 AM
**Black box phase-based adversarial attacks on image classifiers**
*Author(s):* **Scott G. Hodes,** The Pennsylvania State Univ. (United States), Applied Research Lab. (United States); **Kory J Blose,** The Applied Research Lab at The Pennsylvania State University (United States), The Pennsylvania State University Department of Agricultural and Biological Engineering (United States); **Timothy J Kane,** The Pennsylvania State University School of Electrical Engineering and Computer Science (United States), The Applied Research Lab at The Pennsylvania State University (United States)

13039-5 • 09:50 AM - 10:10 AM
**Tracing the evolution: a review of dictionary-learning in ATR systems**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Mohammad AlShabi,** Univ. of Sharjah (United Arab Emirates)

**Coffee Break 10:10 AM - 10:30 AM**

### SESSION 2: METHODS AND APPLICATIONS I

22 April 2024 • 10:30 AM - 12:00 PM | Potomac 2
*Session Chair(s):* **Panagiotis Markopoulos**, The Univ. of Texas at San Antonio (United States)

13036-1 • 10:30 AM - 11:00 AM

**To be determined** *(Invited Paper)*
*Author(s):* **Andreas E. Savakis,** Rochester Institute of Technology (United States)

13036-2 • 11:00 AM - 11:20 AM
**A comparison of deep learning-based compressive imaging methods from a practitioner's perspective**
*Author(s):* **Adrian Stern**, **Shadi Kandalaft**, **Oren Bargan Lowte, Vladislav Kravtes,** Ben-Gurion Univ. of the Negev (Israel)

13036-3 • 11:20 AM - 11:40 AM
**Efficient end-to-end multispectral image compression**
*Author(s):* **Arthur C. Depoian**, **Colleen P. Bailey, Parthasarathy Guturu,** Univ. of North Texas (United States)

13036-4 • 11:40 AM - 12:00 PM
**L1-PCA with Quantum Annealing**
*Author(s):* **Ian Tomeo,** Rochester Institute of Technology (United States); **Panagiotis Markopoulos,** The Univ. of Texas at San Antonio (United States); **Andreas E. Savakis,** Rochester Institute of Technology (United States)

## Lunch Break 12:00 PM - 01:30 PM

## SESSION 3: METHODS AND APPLICATIONS II

22 April 2024 • 01:30 PM - 03:00 PM | Potomac 2
*Session Chair(s):* **Panagiotis Markopoulos**, The Univ. of Texas at San Antonio (United States)

13036-5 • 01:30 PM - 02:00 PM
**High altitude computational lidar emulation and machine learning reconstruction for Earth sciences** *(Invited Paper)*
*Author(s):* **Gonzalo R. Arce**, **Nestor Porras, Andres Ramirez,** Univ. of Delaware (United States)

13036-7 • 02:00 PM - 02:20 PM
**Describing Lifecycle Dynamics of Li-Ion Batteries (LIBs)**
*Author(s):* **Kristen Hallas**, **Md Shahriar Forhad**, **Benjamin Peters, Jianzhi Li,** The Univ. of Texas Rio Grande Valley (United States)

13036-8 • 02:20 PM - 02:40 PM
**Human-Based Gait Authentication Using Multi-modal Sensors From the Tactical Edge Device: Smartphone**
*Author(s):* **Shageenth Sandrakumar, Simon Khan,** Air Force Research Lab. (United States)

13036-28 • 02:40 PM - 03:00 PM
**Conditional constrained and unconstrained quantization for a uniform distribution on a hexagon**
*Author(s):* **Evans Nyanney,** The Univ. of Texas Rio Grande Valley (United States)

## Coffee Break 03:00 PM - 03:30 PM

## SESSION 4: METHODS AND APPLICATIONS III

22 April 2024 • 03:30 PM - 04:30 PM | Potomac 2
*Session Chair(s):* **Bing Ouyang**, Harbor Branch Oceanographic Institute (United States)

13036-9 • 03:30 PM - 03:50 PM
**Towards the acceleration of human learning capabilities through AI-assisted knowledge-tree building**
*Author(s):* **Kevin Hwang**, **Sai Challagundla,** Glenelg High School (United States), Univ. of Maryland, Baltimore County (United States); **Maryam Alomair,** Univ. of Maryland, Baltimore County (United States); **Doug Janssen,** St. Paul's School for Boys (United States); **Kendall Morton,** Glenelg High School (United States); **Lujie Chen, Fow-Sen Choa,** Univ. of Maryland, Baltimore County (United States)

13036-10 • 03:50 PM - 04:10 PM
**Quantifying sea lettuce density in an integrated multi-trophic aquaculture (IMTA) system: understanding the complex physical process through multi-modality data modeling**
*Author(s):* **Shagundeep Singh**, **William Fairman**, **Alisa Kunapinun**, **Paul S. Wills**, **Dennis Hanisak, Bing Ouyang,** Harbor Branch Oceanographic Institute (United States)

13036-11 • 04:10 PM - 04:30 PM
**Mapping the agricultural croplands of the world using Petabyte-scale big-data analytics from Landsat 30m satellite sensor data, multiple machine learning algorithms, and Google Earth Engine (GEE) cloud computing**
*Author(s):* **Prasad S. Thenkabail**, **Pardhasaradhi Teluguntla**, **Adam Oliphant**, **Itiya Aneece, Daniel Foley,** U.S. Geological Survey (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 5: METHODS AND APPLICATIONS IV

23 April 2024 • 10:30 AM - 12:00 PM | Potomac 2
*Session Chair(s):* **Panagiotis Markopoulos**, The Univ. of Texas at San Antonio (United States)

13036-13 • 10:30 AM - 11:00 AM
**To be determined** *(Invited Paper)*
*Author(s):* **Dimitris A. Pados,** Florida Atlantic Univ. (United States)

13036-14 • 11:00 AM - 11:20 AM
**Deploying transfer learning for unsupervised anomaly detection in video data**
*Author(s):* **Khandaker Mamun Ahmed**, **M. Hadi Amini, Naphtali Rishe,** Florida International Univ. (United States)

13036-15 • 11:20 AM - 11:40 AM
**Reuse of words in text supervision**
*Author(s):* **Aparnaa Senthilnathan,** Rochester Institute of Technology (United States); **Erin E. Tripp, Nathan Inkawhich,** Air Force Research Lab. (United States)

13036-16 • 11:40 AM - 12:00 PM
**Maximizing training efficiency through intelligent data exposure**
*Author(s):* **Ethan R. Adams**, **Arthur C. Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

## SESSION 6: METHODS AND APPLICATIONS V

23 April 2024 • 01:30 PM - 03:10 PM | Potomac 2
*Session Chair(s):* **George Sklivanitis**, Florida Atlantic Univ. (United States)

13036-17 • 01:30 PM - 01:50 PM
**Deep learning based sparse array design for emitter signal isolations**
*Author(s):* **Kyle Juretus,** Villanova Univ. (United States); **Syed Ali Hamza,** Widener Univ. (United States); **Moeness Amin,** Villanova Univ. (United States)

13036-18 • 01:50 PM - 02:10 PM
**Radar based continuous indoor activity recognition using deep learning**
*Author(s):* **Henry Breaker, Syed Ali Hamza,** Widener Univ. (United States)

13036-19 • 02:10 PM - 02:30 PM
**Robustness analysis of Wi-Fi-based human activity recognition**
*Author(s):* **Ajaya Dahal**, **Sabyasachi Biswas, Ali C. Gurbuz,** Mississippi State Univ. (United States)

13036-20 • 02:30 PM - 02:50 PM
**MIMO radar based vital sign monitoring using high resolution frequency estimation techniques**
*Author(s):* **Michael Jensen**, **Daniel Creighton**, **Mason Calderbank, Syed Ali Hamza,** Widener Univ. (United States)

13036-21 • 02:50 PM - 03:10 PM
**Human pose estimation and gait analysis with convolutional neural networks for Alzheimer's disease detection**
*Author(s):* **Mahmoud Seifallahi**, **Brennen Farrell,** Florida Atlantic Univ. (United States); **James E. Galvin,** Comprehensive Ctr. for Brain Health, Univ. of Miami (United States); **Behnaz Ghoraani,** Florida Atlantic Univ. (United States)

# CONFERENCE 13037

# Geospatial Informatics XIV

**25 April 2024 | Potomac 1**

***Conference Chair(s):*** **Kannappan Palaniappan,** Univ. of Missouri (United States); **Gunasekaran Seetharaman,** U.S. Naval Research Lab. (United States)

***Program Committee:*** **Ismail Akturk,** Ozyegin Univ. (Turkey); **Derek T. Anderson,** Univ. of Missouri (United States); **Alex Aved,** Air Force Research Lab. (United States); **John A. Berger,** Toyon Research Corp. (United States); **Erik Blasch,** Air Force Research Lab. (United States); **May V. Casterline,** NVIDIA Corp. (United States); **Charles L. Cathey,** Naval Information Warfare Ctr. Atlantic (United States); **Damon M. Conover,** CCDC Army Research Lab. (United States); **Peter J. Doucette,** U.S. Geological Survey (United States); **Marc-Antoine Drouin,** National Research Council Canada (Canada); **Hirsh Goldberg,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Joshua D. Harguess,** The MITRE Corp. (United States); **William Connor Horne,** U.S. Naval Research Lab. (United States); **John M. Irvine,** The MITRE Corp. (United States); **Amudha Joseph,** Amrita Vishwa Vidyapeetham Univ. (India); **Dan Lin,** Vanderbilt Univ. (United States); **Richard D. Massaro,** U.S. Army Corps of Engineers (United States); **Raju Namburu,** U.S. Army Engineer Research and Development Ctr. (United States); **Ram M. Narayanan,** The Pennsylvania State Univ. (United States); **Shibin Parameswaran,** Naval Information Warfare Ctr. Pacific (United States); **A. N. Rajagopalan,** Indian Institute of Technology Madras (India); **Raghuveer M. Rao,** DEVCOM Army Research Lab. (United States); **Vasit Sagan,** Saint Louis Univ. (United States); **Andreas Savakis,** Rochester Institute of Technology (United States); **Jason S. Schwendenmann,** National Geospatial-Intelligence Agency (United States); **Jie Shan,** Purdue Univ. (United States); **Omar Tahri,** Univ. de Bourgogne (France); **Clark N. Taylor,** Air Force Institute of Technology (United States); **Nishchal Verma,** Indian Institute of Technology Kanpur (India); **Chris M. Ward,** The MITRE Corp. (United States)

## Tuesday 23 April 2024

### POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13037-12 • 06:00 PM - 07:30 PM
**EpiX 2.0: an enhanced 3D measurement tool with integrated triangulation for cultural heritage and aerial photogrammetry applications**
*Author(s):* **Kaveh Safavigerdini**, **Jaired Collins,** Univ. of Missouri (United States); **Ryan Huynh,** Univ. of Missouri-Kansas City (United States); **Joshua Fraser, Kannappan Palaniappan,** Univ. of Missouri (United States)

13037-13 • 06:00 PM - 07:30 PM
**Autonomous drone behavior via MCDM of UFOMap layers**
*Author(s):* **Daniel Buffum**, **Andrew R Buck**, **Jack Akers,** Univ. of Missouri (United States); **Raub Camaioni**, **Matthew Deardorff,** U.S. Army DEVCOM C5ISR Center (United States); **Derek T Anderson,** Univ. of Missouri (United States); **Robert H Luke,** U.S. Army DEVCOM C5ISR Center (United States)

13037-16 • 06:00 PM - 07:30 PM
**Deep learning-based shadow detection in aerial images using synthetically generated scenes**
*Author(s):* **Taci Kucukpinar**, **Deniz Kavzak Ufuktepe**, **Joshua Fraser**, **Andrew Buck**, **Derek T. Anderson, Kannappan Palaniappan,** Univ. of Missouri (United States)

13037-20 • 06:00 PM - 07:30 PM
**Vision-based geolocalization of drones with a DSM**
*Author(s):* **Timothy Krock**, **Joshua B. Fraser**, **Jaired Collins,** Univ. of Missouri (United States); **Hadi Akbarpour,** Saint Louis Univ. (United States); **Kannappan Palaniappan,** Univ. of Missouri (United States)

## Thursday 25 April 2024

### SESSION 1: GEOSPATIAL INFORMATICS I

25 April 2024 • 08:30 AM - 10:10 AM | Potomac 1
*Session Chair(s):* **Gunasekaran Seetharaman**, U.S. Naval Research Lab. (United States)

13037-1 • 08:30 AM - 08:50 AM
**A bound on performance for object detection and classification for machine learning**
*Author(s):* **John M. Irvine**, **Nazario Irizarry, James H. Tanis,** The MITRE Corp. (United States)

13037-4 • 08:50 AM - 09:10 AM
**Aerial image feature mapping using deep neural networks**
*Author(s):* **Seyedeh Parisa Dajkhosh**, **Orges Furxhi, Eddie Jacobs,** The Univ. of Memphis (United States)

13037-2 • 09:10 AM - 09:30 AM
**Depth image fusion techniques for real-time reconstruction of 3D spaces from aerial imagery**
*Author(s):* **Jack Akers**, **Andrew Buck**, **Derek T. Anderson**, **Daniel Buffum**, **Jeffrey Kerley,** Univ. of Missouri (United States); **Raub Camaioni**, **Robert H. Luke**, **Matthew Deardorff,** DEVCOM C5ISR (United States); **James M. Keller,** Univ. of Missouri (United States)

13037-5 • 09:30 AM - 09:50 AM
**Fine-tuning SAM for aerial image segmentation**
*Author(s):* **Rajat Sahay, Andreas E. Savakis,** Rochester Institute of Technology (United States)

13037-3 • 09:50 AM - 10:10 AM
**Advancing coastal geospatial characterization using multidimensional remote sensing**
*Author(s):* **Trina Merrick**, **Andrei Abelev**, **Wesley Moses**, **Jeffrey Bowles**, **Gia Lamela**, **Robert Liang**, **Michael Vermillion, Rong-Rong Li,** U.S. Naval Research Lab. (United States)

**Coffee Break 10:10 AM - 10:40 AM**

### SESSION 2: GEOSPATIAL INFORMATICS II

25 April 2024 • 10:40 AM - 12:40 PM | Potomac 1
*Session Chair(s):* **John M. Irvine**, The MITRE Corp. (United States)

13037-6 • 10:40 AM - 11:00 AM
**Impact of land cover variations on the Morroa aquifer (Colombia) static and dynamic levels through remote sensing analysis**
*Author(s):* **Carlos Cohen-Manrique**, **Yady T. Solano Correa**, **Jose L. Villa-Ramírez,** Univ. Tecnológica de Bolívar (Colombia); **Alex Alvarez-Month,** CarSucre (Colombia)

13037-7 • 11:00 AM - 11:20 AM
**Time Series Water Body Analysis Through Planet Satellite Imagery: A Coastal Urban Case Study**
*Author(s):* **Camilo Naufal**, **Yady T. Solano Correa, Andres Marrugo,** Univ. Tecnológica de Bolívar (Colombia)

13037-9 • 11:20 AM - 11:40 AM
**Highway Slope Monitoring using 3D Laser Scanning at Different Seasons**
*Author(s):* **AQM Zohuruzzaman,** Jackson State Univ. (United States); **David P Wamai,** Univ. of South Carolina (United States); **Weicong Feng,** The City College of New York (United States); **Sadik Khan,** Jackson State Univ. (United States); **Austin R. J. Downey,** Univ. of South Carolina (United States); **Jie Wei,** The City College of New York (United States); **Erik Blasch, Paul T Schrader,** Air Force Research Lab. (United States)

13037-10 • 11:40 AM - 12:00 PM
**PatchNeRF: localized neural radiance field training from city-scale aerial images**
*Author(s):* **Landon Swartz**, **Taci Kucukpinar**, **Jaired Collins,** Univ. of Missouri (United States); **Richard Massaro,** U.S. Army Corps of Engineers (United States); **Kannappan Palaniappan,** Univ. of Missouri (United States)

13037-8 • 12:00 PM - 12:20 PM
**Quantifying image quality attributes for training and testing of machine learning methods**
*Author(s):* **Farzaan Naeem**, **Samuel Vilt**, **Paul Brown, John M. Irvine,** The MITRE Corp. (United States)

13037-11 • 12:20 PM - 12:40 PM
**Introducing TALOC (through-the-air link optical component): a free-space optical (FSO) communication system**
*Author(s):* **William Ziegler**, **Ron Smith**, **Stephen D. Roberson,** 4S - Silversword Software and Services, LLC (United States); **Kelli Boyer, James Sutherland,** 4S - Silversword Software and Services (United States)

**Lunch/Exhibit Break 12:40 PM - 02:30 PM**

## SESSION 3: GEOSPATIAL INFORMATICS III

25 April 2024 • 02:30 PM - 03:30 PM
*Session Chair(s):* **Gunasekaran Seetharaman**, U.S. Naval Research Lab. (United States)

13037-17 • 02:30 PM - 02:50 PM
**NIIRS, machine learning, and confidence: issues and opportunities for automating analysis NIIRS**
*Author(s):* **Michelle Brennan**, **Steven A. Israel**, **Kyle L. Jackson**, **B. Ann Martin,** National Geospatial-Intelligence Agency (United States); **James Tanis**, **Nazario Irizarry**, **Franck O. Ndjakou Njeunje, John M. Irvine,** The MITRE Corp. (United States)

13037-21 • 02:50 PM - 03:10 PM
**eByteFormer: object detection on event streams using ByteFormer**
*Author(s):* **Shahid Shabeer Malik**, **Maryam Moshrefizadeh**, **Ahmad Moori, Hadi AliAkbarpour,** Saint Louis Univ. (United States)

13037-22 • 03:10 PM - 03:30 PM
**ThumbTracks: a spatio-temporal assessment on SIFT variants in wide area motion imagery**
*Author(s):* **Jaired Collins**, **Joshua Fraser**, **Deniz Kavzak Ufuktepe**, **Timothy Krock, Kannappan Palaniappan,** Univ. of Missouri (United States)

## CONFERENCE 13038

# Dimensional Optical Metrology and Inspection for Practical Applications XIII

**24 - 25 April 2024 | Potomac 2**

***Conference Chair(s):*** **Kevin G. Harding,** Optical Metrology Solutions (United States); **Song Zhang,** Purdue Univ. (United States); **Jae-Sang Hyun,** Yonsei Univ. (Korea, Republic of)

***Conference Co-Chair(s):*** **Beiwen Li,** Iowa State Univ. of Science and Technology (United States); **Andrés G. Marrugo,** Univ. Tecnológica de Bolívar (Colombia)

***Program Committee:*** **Nikola Dudukovic,** Lawrence Livermore National Lab. (United States); **Greg A. Finney,** IERUS Technologies, Inc. (United States); **Jason C. Fox,** National Institute of Standards and Technology (United States); **Motoharu Fujigaki,** Univ. of Fukui (Japan); **Steven E. Grantham,** National Institute of Standards and Technology (United States); **Stefan Heist,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Aravinda Kar,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Damien P. Kelly,** Technische Univ. Ilmenau (Germany); **Chris Koontz,** Raytheon Co. (United States); **Peter Kühmstedt,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); **Martin Landmann,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Rongguang Liang,** College of Optical Sciences, The Univ. of Arizona (United States); **Georges T. Nehmetallah,** The Catholic Univ. of America (United States); **Gunther Notni,** Technische Univ. Ilmenau (Germany); **Kemao Qian,** Nanyang Technological Univ. (Singapore); **Prem Rachakonda**, **Brian Simonds,** National Institute of Standards and Technology (United States); **Lei Tian,** Boston Univ. (United States); **Yajun Wang,** Wuhan Univ. (China); **Zhaoyang Wang,** The Catholic Univ. of America (United States); **Jiangtao Xi,** Univ. of Wollongong (Australia); **Jing Xu,** Tsinghua Univ. (China); **Dongmin Yang,** Meta (United States); **Xiangchao Zhang,** Fudan Univ. (China); **Zonghua Zhang,** Hebei Univ. of Technology (China); **Aurora A. Zinck,** Lockheed Martin Corp. (United States); **Chao Zuo,** Nanjing Univ. of Science and Technology (China)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS

24 April 2024 • 10:30 AM - 10:40 AM | Potomac 2
*Session Chair(s):* **Beiwen Li**, Iowa State Univ. of Science and Technology (United States)

Opening remarks for Dimensional Optical Metrology and Inspection for Practical Applications XIII.

## SESSION 1: METROLOGY METHODS I

24 April 2024 • 10:40 AM - 11:50 AM | Potomac 2
*Session Chair(s):* **Beiwen Li**, Iowa State Univ. of Science and Technology (United States)

13038-1 • 10:40 AM - 11:10 AM
**Optimization of color-coded apertures for compressive multispectral and depth imaging with time-of-flight sensors** *(Invited Paper)*
*Author(s):* **Hoover Rueda-Chacón,** Univ. Industrial de Santander (Colombia); **Gonzalo R. Arce,** Univ. of Delaware (United States)

13038-2 • 11:10 AM - 11:30 AM
**Thermal single-shot 3D shape measurement of transparent objects by statistical point pattern projection**
*Author(s):* **Martin Landmann**, **Henri Speck,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Zengyang Gao,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Friedrich-Schiller-Univ. Jena (Germany); **Stefan Heist**, **Peter Kühmstedt,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Gunther Notni,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Technische Univ. Ilmenau (Germany)

13038-3 • 11:30 AM - 11:50 AM
**Multimodal 3D measurement setup for generating multimodale real-world data sets for transparent object recognition**
*Author(s):* **Christina Junger,** Technische Univ. Ilmenau (Germany); **Henri Speck**, **Martin Landmann**, **Kevin Srokos**, **Stefan Heist,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Gunther Notni,** Technische Univ. Ilmenau (Germany), Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

**Lunch/Exhibition Break 11:50 AM - 01:20 PM**

## SESSION 2: METROLOGY METHODS II

24 April 2024 • 01:20 PM - 02:20 PM | Potomac 2
*Session Chair(s):* **Beiwen Li**, Iowa State Univ. of Science and Technology (United States)

13038-4 • 01:20 PM - 01:40 PM
**Novel 3D geometry measurement method using cylindrical-shaped mechanical projector**
*Author(s):* **Min-Cheol Choi, Jae-Sang Hyun,** Yonsei Univ. (Korea, Republic of)

13038-5 • 01:40 PM - 02:00 PM
**Measuring shiny surfaces with optical gages**
*Author(s):* **Kevin G. Harding,** Optical Metrology Solutions LLC (United States)

13038-6 • 02:00 PM - 02:20 PM
**Online SERS for in-process detection of aflatoxin in agricultural commodities**
*Author(s):* **Nathan Stebbins,** tec5USA, Inc. (United States); **Sebastian Huelck, Jude Schneck,** tec5USA Inc (United States)

**Coffee Break 02:20 PM - 02:50 PM**

## SESSION 3: METROLOGY ANALYSIS

24 April 2024 • 02:50 PM - 04:40 PM | Potomac 2
*Session Chair(s):* **Andrés G. Marrugo**, Univ. Tecnológica de Bolívar (Colombia)

13038-7 • 02:50 PM - 03:20 PM
**Toward a target-free calibration of a multimodal structured light and thermal imaging system** *(Invited Paper)*
*Author(s):* **Eberto Benjumea**, **Raúl Vargas,** Univ. Tecnológica de Bolívar (Colombia); **Rigoberto Juarez-Salazar,** Consejo Nacional de Humanidades, Ciencias y Tecnologías (Mexico), Ctr. de Investigación y Desarrollo de Tecnología Digital, Instituto Politécnico Nacional (Mexico); **Andrés G. Marrugo,** Univ. Tecnológica de Bolívar (Colombia)

13038-8 • 03:20 PM - 03:40 PM
**Motion-induced error reduction using velocity profiles in phase-shifting profilometry systems**
*Author(s):* **Sanghoon Jeon, Jae-Sang Hyun,** Yonsei Univ. (Korea, Republic of)

13038-9 • 03:40 PM - 04:00 PM
**3D normal vector estimation using event camera**
*Author(s):* **Hyunwoo Kim, Jae-Sang Hyun,** Yonsei Univ. (Korea, Republic of)

13038-10 • 04:00 PM - 04:20 PM
**Advancing event camera-based 3D reconstructions: optimized projection for high-quality measurements**
*Author(s):* **Christoph Freitag,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Institut für Angewandte Physik, Friedrich-Schiller-Univ. Jena (Germany), Abbe Ctr. of Photonics, Friedrich-Schiller-Univ. Jena (Germany); **Stefan Heist,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Andreas Walter Stark,** Institut für Angewandte Optik und Biophysik, Friedrich-Schiller-Univ. Jena (Germany); **Peter Kühmstedt,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Gunther Notni,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Technische Univ. Ilmenau (Germany); **Christian Franke,** Institut für Angewandte Optik und Biophysik, Friedrich-Schiller-Univ. Jena (Germany)

13038-11 • 04:20 PM - 04:40 PM
**Exploring out-of-focus camera calibration for improved UAV survey accuracy**
*Author(s):* **Camilo Naufal**, **Fernando J Quintero Vasquez**, **Yady T. Solano Correa, Andres Marrugo,** Univ. Tecnológica de Bolívar (Colombia)

## Thursday 25 April 2024

### SESSION 4: APPLICATIONS

25 April 2024 • 08:30 AM - 10:20 AM | Potomac 2
*Session Chair(s):* **Stefan Heist**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

13038-13 • 08:30 AM - 09:00 AM
**Optically measuring the front and rear surface shape of transparent objects** *(Invited Paper)*
*Author(s):* **Martin Landmann**, **Henri Speck,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Saikat Chandra Das,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Friedrich-Schiller-Univ. Jena (Germany); **Stefan Heist**, **Peter Kühmstedt,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); **Gunther Notni,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany), Technische Univ. Ilmenau (Germany)

13038-14 • 09:00 AM - 09:20 AM
**Improving skin color accuracy in DLP-based 3D reconstruction**
*Author(s):* **Erik Barrios,** Univ. Tecnológica de Bolívar (Colombia), Univ. Nacional Abierta y a Distancia (Colombia); **Maria S. Millan,** Univ. Politècnica de Catalunya (Spain); **Lenny A. Romero, Andrés G. Marrugo,** Univ. Tecnológica de Bolívar (Colombia)

13038-15 • 09:20 AM - 09:40 AM
**MIR low coherence interferometer for precise thickness measurements of nano-composite optical ceramics**
*Author(s):* **Paul M. Thomas**, **Chris T. Cotton**, **Michael A. Marcus**, **Donald Gibson, David C. Compertore,** Lumetrics, Inc. (United States)

13038-16 • 09:40 AM - 10:00 AM
**Autonomous robotic 3D scanning for smart factory planning**
*Author(s):* **Adam Haroon**, **Anush Lakshman**, **Micah Mundy, Beiwen Li,** Iowa State Univ. of Science and Technology (United States)

13038-17 • 10:00 AM - 10:20 AM
**Production of 3D fingertip replicas using a 3D scanning-3D printing-casting strategy**
*Author(s):* **Micah Mundy, Beiwen Li,** Iowa State Univ. of Science and Technology (United States)

### DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13038-12
**Grey wolf optimizer for efficient feature selection in robotic systems**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi**, **Maamar Bettayeb, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13039

# Automatic Target Recognition XXXIV

**22 - 24 April 2024 | National Harbor 5**

CONFERENCE CO-SPONSORS


***Conference Chair(s):*** **Kenny Chen,** Lockheed Martin Missiles and Fire Control (United States); **Riad I. Hammoud,** PlusAI, Inc. (United States); **Timothy L. Overman,** Prime Solutions Group, Inc. (United States)

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## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:00 AM - 08:10 AM | National Harbor 5
*Session Chair(s):* **Timothy L. Overman**, Prime Solutions Group, Inc. (United States)
Opening remarks for Automatic Target Recognition XXXIV.

### SESSION 1: MACHINE LEARNING FOR AUTOMATIC TARGET RECOGNITION I: JOINT SESSION WITH CONFERENCES 13036 AND 13039

22 April 2024 • 08:10 AM - 10:10 AM | National Harbor 5
*Session Chair(s):* **Timothy L. Overman**, Prime Solutions Group, Inc. (United States)

13039-1 • 08:10 AM - 08:50 AM
**Image data for training ML models: how would synthetic methods help** (Keynote Presentation)
*Author(s):* **Raghuveer M. Rao,** DEVCOM Army Research Lab. (United States)

13039-2 • 08:50 AM - 09:10 AM
**Multi-objective optimization with homotopy-based strategies for enhanced multimodal automatic target recognition models**
*Author(s):* **Sophia Abraham**, **Steve Cruz,** Univ. of Notre Dame (United States); **Suya You,** DEVCOM Army Research Lab. (United States); **Jonathan D. Hauenstein, Walter J. Scheirer,** Univ. of Notre Dame (United States)

13039-3 • 09:10 AM - 09:30 AM
**Depth-aware framework for small-scale camouflaged object detection via swin transformer and ghost convolution layer integration**
*Author(s):* **Rohan Putatunda, Kelvin U. Echenim,** Univ. of Maryland, Baltimore County (United States)

13039-4 • 09:30 AM - 09:50 AM
**Black box phase-based adversarial attacks on image classifiers**
*Author(s):* **Scott G. Hodes,** The Pennsylvania State Univ. (United States), Applied Research Lab. (United States); **Kory J Blose,** The Applied Research Lab at The Pennsylvania State University (United States), The Pennsylvania State University Department of Agricultural and Biological

Engineering (United States); **Timothy J Kane,** The Pennsylvania State University School of Electrical Engineering and Computer Science (United States), The Applied Research Lab at The Pennsylvania State University (United States)

13039-5 • 09:50 AM - 10:10 AM
**Tracing the evolution: a review of dictionary-learning in ATR systems**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Mohammad AlShabi,** Univ. of Sharjah (United Arab Emirates)

**Coffee Break 10:10 AM - 10:40 AM**

## SESSION 2: ELECTRO-OPTICAL AND INFRARED DETECTION AND TRACKING I

22 April 2024 • 10:40 AM - 12:00 PM | National Harbor 5
*Session Chair(s):* **Kenny Chen**, Lockheed Martin Missiles and Fire Control (United States)

13039-6 • 10:40 AM - 11:00 AM
**Utilizing Representative Layers for IR Classification**
*Author(s):* **Bethany L. Allik,** DEVCOM Army Research Lab. (United States)

13039-7 • 11:00 AM - 11:20 AM
**Transitioning Algorithms from IR Imagery to Future Event Based Systems**
*Author(s):* **Peter A. Torrione**, **Joe Camilo,** Covar, LLC (United States); **Marie Marie Talbott,** U.S. Army (United States), DEVCOM C5ISR (United States)

13039-8 • 11:20 AM - 11:40 AM
**Real-time object detection and tracking using flash LiDAR imagery**
*Author(s):* **Daniel Carvalho,** DCS Corp. (United States); **Jarrod P. Brown**, **Darrell B. Card,** Air Force Research Lab. (United States); **Art Lompado,** Polaris Sensor Technologies, Inc. (United States); **Abhijit Bhattacharjee, Riccardo Consolo,** The MathWorks, Inc. (United States)

13039-9 • 11:40 AM - 12:00 PM
**Utilizing Grounded SAM for self-supervised frugal camouflaged human detection**
*Author(s):* **Matthias Pijarowski,** HENSOLDT Optronics GmbH (Germany), Hochschule Aalen - Technik und Wirtschaft (Germany); **Alexander Wolpert,** HENSOLDT Optronics GmbH (Germany); **Martin Heckmann,** Hochschule Aalen - Technik und Wirtschaft (Germany); **Michael Teutsch,** HENSOLDT Optronics GmbH (Germany)

**Lunch Break 12:00 PM - 01:30 PM**

## SESSION 3: RADAR FREQUENCY AND SYNTHETIC APERTURE RADAR AUTOMATIC TARGET RECOGNITION I

22 April 2024 • 01:30 PM - 02:30 PM | National Harbor 5
*Session Chair(s):* **Kristen Jaskie**, Prime Solutions Group, Inc. (United States)

13039-11 • 01:30 PM - 01:50 PM
**Stepped-frequency radar target recognition with random forests**
*Author(s):* **Ismail I. Jouny,** Lafayette College (United States)

13039-12 • 01:50 PM - 02:10 PM
**Characterizing open-set ATR methods to detect out of distribution data for a maritime object classifier in space-based electro optical imagery**
*Author(s):* **John G. Warner,** U.S. Naval Research Lab. (United States); **Vishal Patel,** Johns Hopkins University (United States)

13039-31 • 02:10 PM - 02:30 PM
**Disruptive imaging field trial (DRIFT) on computational and compressive imaging systems**
*Author(s):* **Todd W. Du Bosq,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Olivia Pavlic**, **Timothy Lang,** Naval Surface Warfare Ctr. Crane Div. (United States); **Kevin Nielson**, **Terence Haran,** Georgia Tech Research Institute (United States); **Pieter Piscaer**, **Nicolas Boehrer**, **Judith Dijk,** TNO (Netherlands); **Martin Laurenzis,** Institut Franco-Allemand de Recherches de Saint-Louis (France); **Jürgen Limbach**, **Peter Lutzmann**, **Gabriela Paunescu,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jonathan Piper**, **O. Ben Elphick**, **Jacob Franks,** Defence Science and Technology Lab. (United Kingdom); **Sebastian Strecker,** Wehrtechnische Dienststelle für Waffen und Munition (Germany)

**Coffee Break 02:30 PM - 03:05 PM**

## SESSION 4: ELECTRO-OPTICAL AND INFRARED DETECTION AND TRACKING II

22 April 2024 • 03:05 PM - 03:45 PM | National Harbor 5
*Session Chair(s):* **Timothy L. Overman**, Prime Solutions Group, Inc. (United States)

13039-17 • 03:05 PM - 03:25 PM
**Situational awareness and state estimation tools for search and localize missions with stationary targets in formation**
*Author(s):* **Patrick V. Haggerty**, **Sydney E. Matthys, Benjamin A. Strasser,** General Dynamics Mission Systems (United States)

13039-18 • 03:25 PM - 03:45 PM
**Segmentation-based low-resolution multiple hypothesis spatial tracker**
*Author(s):* **Geoffrey H. Goldman, Minas Benyamin,** DEVCOM Army Research Lab. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:20 AM**

## OPENING REMARKS

23 April 2024 • 10:20 AM - 10:30 AM | National Harbor 5
*Session Chair(s):* **Riad I. Hammoud**, PlusAI, Inc. (United States)
Opening remarks for Automatic Target Recognition XXXIV.

## SESSION 5: MACHINE LEARNING FOR AUTOMATIC TARGET RECOGNITION II

23 April 2024 • 10:30 AM - 12:10 PM | National Harbor 5
*Session Chair(s):* **Riad I. Hammoud**, PlusAI, Inc. (United States)

13039-19 • 10:30 AM - 11:10 AM
**End-to-end machine learning for co-optimized sensing and automated target recognition** (Keynote Presentation)
*Author(s):* **Scott McCloskey,** Kitware, Inc. (United States)

13039-32 • 11:10 AM - 11:50 AM
**Remote sensing and vision problems under adverse imaging conditions** *(Invited Paper)*
*Author(s):* **Zhu Li,** Univ. of Missouri-Kansas City (United States)

13039-21 • 11:50 AM - 12:10 PM
**Quantum classification for synthetic aperture radar**
*Author(s):* **Salil Naik,** Arizona State Univ. (United States); **Nolan Vaughn,** Prime Solutions Group, Inc. (United States); **Andreas S. Spanias,** Arizona State Univ. (United States); **Kristen Jaskie,** Prime Solutions Group, Inc. (United States), Arizona State Univ. (United States)

**Lunch/Exhibition Break 12:10 PM - 01:40 PM**

## SESSION 6: PANEL DISCUSSION: MACHINE LEARNING FOR AUTOMATIC TARGET RECOGNITION

23 April 2024 • 01:40 PM - 03:10 PM | National Harbor 5
*Session Chair(s):* **Peter A. Torrione**, Covar, LLC (United States)
Automatic Target Recognition (ATR), traditionally rooted in predefined algorithms and rule-based systems, has long been a cornerstone in defense operations. In its conventional form, ATR relied on handcrafted features and rigid frameworks, meeting the challenges of its time. However, the landscape of modern defense scenarios demands a paradigm shift.

In response to evolving complexities, ATR is seamlessly transitioning into the realm of artificial intelligence (AI), embracing a future marked by innovation and adaptability. The traditional rule-based approaches are giving way to dynamic, data-driven methodologies empowered by AI. This shift is not merely a technological upgrade; it represents a strategic move to tackle the intricate challenges of contemporary defense.

The integration of Transformer-based architectures in ATR reflects a fundamental departure from the limitations of predefined algorithms. This evolution is particularly notable in tasks requiring nuanced understanding, such as anomaly detection and trajectory prediction. Moreover, explainable AI (XAI) techniques are becoming integral, ensuring accuracy, transparency, and user trust in ATR systems.

Looking forward, the trajectory of ATR is shaped by the promise of Generative Adversarial Networks (GANs) addressing data scarcity and Quantum Machine Learning optimizing high-dimensional analyses. Academic pursuits like federated learning and meta-learning provide the intellectual backbone for a future-ready ATR landscape.

This narrative unfolds at the intersection of tradition and innovation, where the definition of ATR expands beyond its conventional boundaries, ushering in an era where AI becomes the linchpin in meeting the challenges of modern defense.

*Moderators:*
**Asif Mehmood**, Chief Digital and Artificial Intelligence Office (United States)

*Panelists:*
**Zhu Li** University of Missouri (United States)
**Shuvra Bhattacharyya** University of Maryland (United States)
**Edmund Zelnio** Air Force Research Lab. (United States)
**Peter A. Torrione** Covar, LLC (United States)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 7: RADAR FREQUENCY AND SYNTHETIC APERTURE RADAR AUTOMATIC TARGET RECOGNITION II

23 April 2024 • 03:40 PM - 05:00 PM | National Harbor 5
*Session Chair(s):* **Kristen Jaskie**, Prime Solutions Group, Inc. (United States)

13039-22 • 03:40 PM - 04:00 PM
**Uncertainty-informed SAR image classification with Bayesian neural networks**
*Author(s):* **Tian Ye,** The Univ. of Southern California (United States); **Rajgopal Kannan,** DEVCOM Army Research Lab. (United States); **Viktor Prasanna**, **Xu Wang,** The Univ. of Southern California (United States); **Carl Busart,** DEVCOM Army Research Lab. (United States)

13039-23 • 04:00 PM - 04:20 PM
**Unsupervised SAR representation learning improves classification performance**
*Author(s):* **Nolan Vaughn**, **Bo Sullivan, Kristen Jaskie,** Prime Solutions Group, Inc. (United States)

13039-24 • 04:20 PM - 04:40 PM
**SAR ATR transferability analysis**
*Author(s):* **Craig M. Vineyard**, **Johannes Bauer**, **William M. Severa, Efrain Gonzalez,** Sandia National Labs. (United States)

13039-25 • 04:40 PM - 05:00 PM
**SAR ATR explainability and interpretability analysis**
*Author(s):* **Craig M. Vineyard**, **William M. Severa**, **Johannes Bauer, Efrain Gonzalez,** Sandia National Labs. (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13039-26 • 06:00 PM - 07:30 PM
**A comparative analysis of optical sensor artifacts across neural network-based ATR algorithms**
*Author(s):* **Quinton Davidson,** U.S. Naval Research Lab. (United States)

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

## ARTIFICIAL INTELLIGENCE AND DEEP LEARNING: JOINT SESSION WITH CONFERENCES 13039 AND 13046

24 April 2024 • 01:20 PM - 03:20 PM | National Harbor 2
*Session Chair(s):* **Michael T. Eismann**, Air Force Research Lab. (United States); **Kenny Chen**, Lockheed Martin Missiles and Fire Control (United States)

13039-27 • 01:20 PM - 01:40 PM
**Object detection for infrared ground to ground applications on the edge**
*Author(s):* **Joseph A. Rivera,** Lockheed Martin Corp. (United States); **Abhijit Bhattacharjee**, **Birju Patel, Alexander Taylor,** The MathWorks, Inc. (United States)

13046-42 • 01:40 PM - 02:00 PM
**Zero-shot object detection for infrared images using pre-trained vision and language models**
*Author(s):* **Shotaro Miwa**, **Shun Otsubo**, **Jia Qu, Yasuaki Susumu,** Mitsubishi Electric Corp. (Japan)

13046-43 • 02:00 PM - 02:20 PM
**Deployment of advanced computational infrared imaging and automatic target recognition software on new high-power mobile processors that achieve new levels of SWAP optimized performance**
*Author(s):* **Art Stout,** Teledyne FLIR LLC (United States)

13039-28 • 02:20 PM - 02:40 PM
**Investigations into out-of-domain performance of a two-step ATR based on a fusion of thermal and environmental data**
*Author(s):* **Sophia P. Bragdon**, **Vuong H. Truong**, **Jay L. Clausen**, **Andrew C Trautz, Matthew D Bray,** U.S. Army Engineer Research and Development Ctr. (United States)

13039-29 • 02:40 PM - 03:00 PM
**Infrared collects of scale models for automatic target recognition assessment**
*Author(s):* **Jacob Ross**, **Rajith Weerasinghe**, **Ryan J. Shaver**, **Justin Lastrapes,** Etegent Technologies, Ltd. (United States); **Paul Sotirelis,** Air Force Research Lab. (United States)

13046-45 • 03:00 PM - 03:20 PM
**Geolocalization from multiband image matching to simulated scenery based on digital elevation data**
*Author(s):* **Jeremy W. Mares**, **Mark Martino**, **Alex R. Irwin, Christopher K. Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

# CONFERENCE 13040

# Pattern Recognition and Prediction XXXV

**24 - 25 April 2024 | Potomac 3**

***Conference Chair(s):*** **Mohammad S. Alam,** Minnesota State Univ., Mankato (United States); **Vijayan K. Asari,** Univ. of Dayton (United States)

***Program Committee:*** **Ayman Alfalou,** Institut Supérieur d'Electronique du Nord (France); **Khan M. Iftekharuddin,** Old Dominion Univ. (United States); **Mohammad Ataul Karim,** Univ. of Massachusetts Dartmouth (United States); **Jed Khoury,** Lartec, Inc. (United States); **Thomas T. Lu,** Jet Propulsion Lab. (United States); **Asif Mehmood,** CDAO - Chief Digital and Artificial Intelligence Office (United States); **Sidike Paheding,** Fairfield Univ. (United States); **Rupert C. D. Young,** Univ. of Sussex (United Kingdom)

## Tuesday 23 April 2024

### POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13040-24 • 06:00 PM - 07:30 PM
**High-capacity reversible information hiding based on multi-difference histogram and gray coding**
*Author(s):* **Wenhui Gong**, **Xiaowen Chen,** Chongqing Univ. (China); **Mohammad S. Alam,** Minnesota State Univ., Mankato (United States); **Jun Sang,** Chongqing Univ. (China)

13040-25 • 06:00 PM - 07:30 PM
**Attention-based fusion network for image forgery localization**
*Author(s):* **Wenhui Gong**, **Yan Chen,** Chongqing Univ. (China); **Mohammad S. Alam,** Minnesota State Univ., Mankato (United States); **Jun Sang,** Chongqing Univ (China)

13040-23 • 06:00 PM - 07:30 PM
**Deep learning architecture: an application for skin lesion segmentation-based polar image transformations on dermoscopy images**
*Author(s):* **Redha Ali,** Cincinnati Children's Hospital Medical Ctr. (United States); **Almabrok Essa,** John Carroll Univ. (United States); **Elmoatazbellah Ben Omar,** Wright State Univ. (United States); **Adel Alshamili,** Engineering and Information Technology Research Ctr. (Libya); **Fatmah Ali,** Engineering and Information Technology Research Center (Libya); **Russell C. Hardie,** Univ. of Dayton (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS

24 April 2024 • 10:30 AM - 10:40 AM | Potomac 3
*Session Chair(s):* **Mohammad S. Alam**, Minnesota State Univ., Mankato (United States); **Vijayan K. Asari**, Univ. of Dayton (United States)
Opening remarks for Pattern Recognition and Prediction XXXV.

### SESSION 1: INTELLIGENT PREDICTION

24 April 2024 • 10:40 AM - 11:40 AM | Potomac 3
*Session Chair(s):* **Mohammad S. Alam**, Minnesota State Univ., Mankato (United States); **Vijayan K. Asari**, Univ. of Dayton (United States)

13040-1 • 10:40 AM - 11:00 AM
**Improving pulmonary CT image generation with transformer-based generative adversarial networks**
*Author(s):* **Yueying Tian,** University of Sussex (United Kingdom); **Xudong Han**, **Elif Ucurum**, **Chris R. Chatwin,** Univ. of Sussex (United Kingdom); **Phil M. Birch,** Univ of Sussex (United Kingdom); **Rupert C. D. Young,** Univ. of Sussex (United Kingdom)

13040-2 • 11:00 AM - 11:20 AM
**Novel algorithm development for event-based sensing deployment**
*Author(s):* **Bjorn Kjellstrand**, **Lilian Casias**, **Kaylin Hagopian**, **Christian Pattyn**, **Christopher Saltonstall, Joshua Shank,** Sandia National Labs. (United States)

13040-4 • 11:20 AM - 11:40 AM
**Sub-pixel object tracking in RGB intensity and depth imagery**
*Author(s):* **Eric Smith**, **Yakov Diskin, Vijayan K. Asari,** Univ. of Dayton (United States)

**Lunch/Exhibition Break 11:40 AM - 01:30 PM**

### SESSION 2: HYPERSPECTRAL IMAGING BASED CLASSIFICATION

24 April 2024 • 01:30 PM - 02:30 PM | Potomac 3
*Session Chair(s):* **Vijayan K. Asari**, Univ. of Dayton (United States); **Mohammad S. Alam**, Minnesota State Univ., Mankato (United States)

13040-5 • 01:30 PM - 01:50 PM
**Hyperspectral image classification with retentive network**
*Author(s):* **Sidike Paheding**, **Nusrat Zahan,** Fairfield Univ. (United States); **Abel A. Reyes,** Michigan Technological University (United States); **Ernesto Martinez, Eung-Joo Lee,** The Univ. of Arizona (United States)

13040-6 • 01:50 PM - 02:10 PM
**Improving Computational Complexity of Multi-Target Multi-Agent Reinforcement for Hyperspectral Satellite Sensor Tasking**
*Author(s):* **Amir K. Saeed,** Johns Hopkins Univ. (United States); **Francisco Holguin**, **Alhassan S. Yasin,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Benjamin A. Johnson, Benjamin M. Rodriguez,** Johns Hopkins Univ. (United States)

13040-8 • 02:10 PM - 02:30 PM
**NABLA-N for meltpond detection**
*Author(s):* **Aqsa Sultana**, **Vijayan K. Asari**, **Theus H. Aspiras**, **Ruixu Liu,** Univ. of Dayton (United States); **Ivan Sudakow,** The Open Univ. (United Kingdom); **Lee W. Cooper,** Univ. of Maryland Ctr. for Environmental Science (United States)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 3: MACHINE LEARNING BASED DETECTION

24 April 2024 • 03:00 PM - 04:50 PM | Potomac 3
*Session Chair(s):* **Sidike Paheding**, Fairfield Univ. (United States); **Mohammad S. Alam**, Minnesota State Univ., Mankato (United States)

13040-9 • 03:00 PM - 03:30 PM
**Intelligent Knowledge Base Search Tool using Large Language Model and Graph Neural Network** *(Invited Paper)*
*Author(s):* **Edward T. Chow**, **Kevin Payumo,** Jet Propulsion Lab. (United States); **Inimai Subramanian,** Jet Propulsion Lab (United States)

13040-12 • 03:30 PM - 03:50 PM
**Generalized comparison assessment of unstructured data using foundation model features**
*Author(s):* **Charlie T. Veal**, **Derek T. Anderson**, **Marshall B. Lindsay**, **Andy G. Varner**, **Scott D. Kovaleski,** Univ. of Missouri (United States); **Stanton R. Price, Steven R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13040-13 • 03:50 PM - 04:10 PM
**Underwater Simultaneous Enhancement and Super-Resolution Impact Evaluation on Object Detection**
*Author(s):* **Ali Awad,** Michigan Technological Univ. (United States); **Nusrat Zahan,** Fairfield Univ. (United States); **Evan Lucas,** Michigan Technological Univ. (United States); **Sidike Paheding,** Fairfield Univ. (United States); **Ashraf Saleem,** Michigan Technological Univ. (United States)

13040-14 • 04:10 PM - 04:30 PM
**Evaluation of the required optical resolution for deep learning-based long-range UAV detection**
*Author(s):* **Denis Ojdanic**, **Niklas Paternoster**, **Christopher Naverschnigg**, **Andreas Sinn, Georg Schitter,** Technische Univ. Wien (Austria)

13040-26 • 04:30 PM - 04:50 PM
**Leveraging deep learning for data processing to improve discriminative modeling capabilities**
*Author(s):* **Amir K. Saeed, Benjamin M. Rodriguez,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

# Thursday 25 April 2024

## SESSION 4: NOVEL PATTERN RECOGNITION METHODS

25 April 2024 • 08:00 AM - 09:00 AM | Potomac 3
*Session Chair(s):* **Sidike Paheding**, Fairfield Univ. (United States)

13040-15 • 08:00 AM - 08:20 AM
**Mapping of vegetation and fire regimes in northern California from Landsat imagery using recurrent residual U-Net**
*Author(s):* **Vijayan K. Asari**, **Rayan Afsar**, **Aqsa Sultana, Theus H. Aspiras,** Univ. of Dayton (United States)

13040-18 • 08:20 AM - 08:40 AM
**An algorithm for deinterleaving of RADAR scans for their analysis by ELINT systems**
*Author(s):* **William G. Warren**, **Jared Allanigue**, **James V Outlaw**, **Alan Schroeder**, **Gil Chapman**, **Erin M Mansfield, Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States)

13040-19 • 08:40 AM - 09:00 AM
**3D brain image segmentation using 3D tiled convolution neural networks**
*Author(s):* **Md. Ashraful Alam**, **Md Mahibul Haque**, **Jobeda Khanam Ria**, **Fahad Al Mannan**, **Sadman Majumder, MD Reaz Uddin,** BRAC Univ. (Bangladesh)

**Coffee Break 09:00 AM - 09:15 AM**

## SESSION 5: BIOMETRICS

25 April 2024 • 09:15 AM - 09:55 AM | Potomac 3
*Session Chair(s):* **Vijayan K. Asari**, Univ. of Dayton (United States)

13040-20 • 09:15 AM - 09:35 AM
**YOLO-based GNN for multi-person pose estimation**
*Author(s):* **Vijayan K. Asari, Ming Gong,** Univ. of Dayton (United States); **Ming Gong, Ruixu Liu,** Univ. of Dayton (United States)

13040-22 • 09:35 AM - 09:55 AM
**Graph visualization of vaccine hesitancy among African American community in Tuskegee County during covid pandemic .**
*Author(s):* **Prakash Duraisamy,** Univ. of Wisconsin-Green Bay (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13040-3
**Bridging the gap: deep learning in the semantic segmentation of remote sensing data**
*Author(s):* **Amine Hadir**, **Olga Assainova**, **Mohamed Adjou,** ISEN Yncréa Ouest (France); **Gaetan Palka,** Univ. d'Orléans (France); **Marwa ElBouz, Ayman Alfalou,** ISEN Yncréa Ouest (France)

13040-7
**Adapting to climate change: the role of metaheuristic algorithms in optimal decision making**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

13040-10
**Optimizing network sensors using unsupervised machine learning approach to identify a pollutant source**
*Author(s):* **Sidi Mohammed Alaoui,** ISEN Yncréa Ouest (France); **Khalifa DJEMAL,** Univ. d'Evry Val d'Essonne (France); **Ehsan Sedgh Gooya,** ISEN Yncréa Ouest (France); **Amir Ali Feiz,** Univ. d'Evry Val d'Essonne (France); **Ayman Alfalou,** ISEN Yncréa Ouest (France); **Pierre NGAE,** Univ. d'Evry Val d'Essonne (France)

13040-16
**Small-scale simulator on common warehouse components for low-power object detection methods**
*Author(s):* **Matthieu Desmarescaux**, **Wissam Kaddah**, **Ayman Alfalou,** ISEN Yncréa Ouest (France); **Nicolas Picquerey,** Generix Group (France)

13040-17
**Automatic detection of translocation t(9;22) using Siamese architecture**
*Author(s):* **Mohammed El Amine Bechar**, **Nesma Settouti**, **Jean-Marie Guyader**, **Marwa ElBouz,** ISEN Yncréa Ouest (France); **Nathalie Douet-Guilbert,** Ctr. Hospitalier Regional Univ. Brest (France); **Ayman Alfalou,** ISEN Yncréa Ouest (France); **Marie-Bérengère Troadec,** Ctr. Hospitalier Regional Univ. Brest (France)

# CONFERENCE 13041

# Three-Dimensional Imaging, Visualization, and Display 2024

CONFERENCE CO-SPONSOR

NHK Foundation

**22 - 23 April 2024 | Potomac 3**

***Conference Chair(s):*** **Bahram Javidi,** Univ. of Connecticut (United States)

***Conference Co-Chair(s):*** **Xin Shen,** Univ. of Hartford (United States); **Arun Anand,** Sardar Patel Univ. (India)

***Program Committee:*** **Jun Arai,** NHK Japan Broadcasting Corp. (Japan); **Pietro Ferraro,** Institute of Applied Science & Intelligent Systems (Italy); **Hong Hua,** College of Optical Sciences, The Univ. of Arizona (United States); **Manuel Martínez-Corral,** Univ. de València (Spain); **Osamu Matoba,** Kobe Univ. (Japan); **Takanori Nomura,** Wakayama Univ. (Japan); **José Manuel Rodríguez Ramos,** Univ. de La Laguna (Spain); **Natan Tzvi Shaked,** Tel Aviv Univ. (Israel); **Adrian Stern,** Ben-Gurion Univ. of the Negev (Israel); **Hirotsugu Yamamoto,** Utsunomiya Univ. (Japan); **Zeev Zalevsky,** Bar-Ilan Univ. (Israel)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:20 AM - 08:30 AM | Potomac 3
*Session Chair(s):* **Bahram Javidi**, Univ. of Connecticut (United States)

### SESSION 1: DEVICES FOR 3D IMAGING, TV, VIDEO, AND VISUALIZATION SYSTEMS

22 April 2024 • 08:30 AM - 10:00 AM | Potomac 3
*Session Chair(s):* **Bahram Javidi**, Univ. of Connecticut (United States)

13041-1 • 08:30 AM - 09:00 AM
**Modern 3D imaging and display: a lens design point of view** (Keynote Presentation)
*Author(s):* **Simon Thibault,** Univ. Laval (Canada)

13041-2 • 09:00 AM - 09:30 AM
**Understanding the performance and visual effects of head-mounted light field displays** (Keynote Presentation)
*Author(s):* **Hong Hua,** Wyant College of Optical Sciences (United States)

13041-3 • 09:30 AM - 10:00 AM
**Increasing depth of field for slanted lenticular 3D displays** *(Invited Paper)*
*Author(s):* **Xiao Wei Sun**, **Changxiong Zheng, Philip Surman,** Southern Univ. of Science and Technology (China)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: DIGITAL HOLOGRAPHY AND RELATED TECHNOLOGIES I

22 April 2024 • 10:30 AM - 11:40 AM | Potomac 3
*Session Chair(s):* **Hong Hua**, Wyant College of Optical Sciences (United States)

13041-5 • 10:30 AM - 11:00 AM
**Deep learning in digital holography for biomedical applications** *(Invited Paper)*
*Author(s):* **Inkyu Moon,** Daegu Gyeongbuk Institute of Science & Technology (Korea, Republic of)

13041-7 • 11:00 AM - 11:20 AM
**Enhanced wide-field off-axis holography based on intensity correlation**
*Author(s):* **Amit Yadav,** Indian Institute of Technology (BHU), Varanasi (India); **Gyanendra Sheoran,** National Institute of Technology, Delhi (India); **Takamasa Suzuki,** Niigata Univ. (Japan); **Rakesh Kumar Singh,** Indian Institute of Technology (BHU), Varanasi (India)

13041-35 • 11:20 AM - 11:40 AM
**Overview of 3D object detection through fog and occlusion: passive integral imaging vs active (LiDAR) sensing**
*Author(s):* **Kashif Usmani**, **Bahram Javidi**, **Timothy O'Connor, Pranav Wani,** Univ. of Connecticut (United States)

**Lunch Break 11:40 AM - 01:10 PM**

## SESSION 3: 3D IMAGING AND RELATED TECHNOLOGIES I

22 April 2024 • 01:10 PM - 02:50 PM | Potomac 3
*Session Chair(s):* **Amit Ashok**, Wyant College of Optical Sciences (United States)

13041-9 • 01:10 PM - 01:40 PM
**Event-based stereo systems** (Keynote Presentation)
*Author(s):* **Adrian Stern, Raviv Ilani,** Ben-Gurion Univ. of the Negev (Israel)

13041-10 • 01:40 PM - 02:10 PM
**Event-driven lightfield imaging** *(Invited Paper)*
*Author(s):* **Lei Tian,** Boston Univ. (United States)

13041-11 • 02:10 PM - 02:30 PM
**Hollow point cloud generation by procedural inlier removal**
*Author(s):* **Tess Harris,** Mississippi State Univ. (United States); **Jan Rainer M. Jamora,** Air Force Research Lab. (United States)

13041-57 • 02:30 PM - 02:50 PM
**Active sensing of a hidden object using Gaussian and optical vortices speckles: a comparative study**
*Author(s):* **Kang-Min Lee**, **Cristian Hernando Acevedo, Aristide Dogariu,** Univ. of Central Florida (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 4: DIGITAL HOLOGRAPHY AND RELATED TECHNOLOGIES II

22 April 2024 • 03:20 PM - 04:50 PM | Potomac 3
*Session Chair(s):* **Xin Shen**, Univ. of Hartford (United States)

13041-12 • 03:20 PM - 03:50 PM
**Lensless photography using a random amplitude coded aperture and its refocusing strategy** *(Invited Paper)*
*Author(s):* **Takanori Nomura,** Wakayama Univ. (Japan)

13041-13 • 03:50 PM - 04:20 PM
**Smart and intelligent systems for quantitative phase imaging-techniques and algorithms** *(Invited Paper)*
*Author(s):* **Renu John,** Indian Institute of Technology Hyderabad (India)

13041-14 • 04:20 PM - 04:50 PM
**Exit-pupil expansion in holographic waveguide based Maxwellian near eye augmented reality displays** *(Invited Paper)*
*Author(s):* **Rajveer Kaur, Raj Kumar,** CSIR - Central Scientific Instruments Organisation (India)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 5: BIOMEDICAL APPLICATIONS OF 3D SENSING AND IMAGING

23 April 2024 • 10:30 AM - 12:00 PM | Potomac 3
*Session Chair(s):* **Adrian Stern**, Ben-Gurion Univ. of the Negev (Israel)

13041-15 • 10:30 AM - 11:00 AM
**Elucidating biophysical mechanisms of directed energy exposure using quantitative phase imaging** *(Invited Paper)*
*Author(s):* **Zachary A. Steelman,** Air Force Research Lab. (United States); **Sean P. O'Connor, Anna Sedelnikova,** SAIC (United States); **Matthew T. Conway,** The Univ. of Iowa (United States); **Stacey L. Martens, Joel Bixler,** Air Force Research Lab. (United States)

13041-16 • 11:00 AM - 11:30 AM
**Polarization digital holographic microscope for live cell imaging:** *(Invited Paper)*
*Author(s):* **Rakesh Kumar Singh**, **Shivam Kumar Chaubey,** Indian Institute of Technology (BHU), Varanasi (India); **Mohit Rathor,** Indian Institute of Technology (BHU) (India); **Rupen Tamang, Biplob Koch,** Banaras Hindu Univ. (India)

13041-17 • 11:30 AM - 12:00 PM
**Application of a table top off-axis digital holographic interference microscope to study bio-mechanical and bio-physical properties of biological cells** *(Invited Paper)*
*Author(s):* **Priyanka Vora,** Government Engineering College, Daman (India); **Chetna M. Patel,** V.P. & R.P.T.P. Science College (India); **Arun Anand,** Sardar Patel Univ. (India)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

### SESSION 6: 3D IMAGING AND RELATED TECHNOLOGIES II

23 April 2024 • 01:30 PM - 03:20 PM | Potomac 3
*Session Chair(s):* **Simon Thibault**, Univ. Laval (Canada)

13041-18 • 01:30 PM - 02:00 PM
**Quantum-inspired imaging: resolving beyond the Rayleigh limit** (Keynote Presentation)
*Author(s):* **Amit Ashok,** Wyant College of Optical Sciences (United States)

13041-19 • 02:00 PM - 02:30 PM
**SWIR multispectral lidar for mixed pixel discrimination** *(Invited Paper)*
*Author(s):* **Abbie T. Watnik,** U.S. Naval Research Lab. (United States)

13041-20 • 02:30 PM - 03:00 PM
**An overview of machine learning techniques for 2D and 3D data processing** *(Invited Paper)*
*Author(s):* **Abhijit Mahalanobis,** The Univ. of Arizona (United States)

13041-21 • 03:00 PM - 03:20 PM
**Overcoming the division by zero problem in the assessment of the degree of polarization in poorly illuminated scenes** *(Invited Paper)*
*Author(s):* **Xin Shen,** Univ. of Hartford (United States); **Marcos Aviñoá**, **Salvador Bosch,** Univ. de Barcelona (Spain); **Bahram Javidi,** Univ. of Connecticut (United States); **Artur Carnicer,** Univ. de Barcelona (Spain)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 7: DIGITAL HOLOGRAPHY AND RELATED TECHNOLOGIES III

23 April 2024 • 03:50 PM - 04:50 PM | Potomac 3
*Session Chair(s):* **Arun Anand**, Sardar Patel Univ. (India)

13041-22 • 03:50 PM - 04:20 PM
**Overview of computational advances in quantitative phase imaging using digital holographic microscopy** *(Invited Paper)*
*Author(s):* **Ana Doblas**, **Brian Bogue-Jimenez,** Univ. of Massachusetts Dartmouth (United States); **Sofía Obando Vásquez**, **Raúl Castañeda, Carlos A. Trujillo,** Univ. EAFIT (Colombia)

13041-23 • 04:20 PM - 04:50 PM
**Field-of-view enhancement in digital holographic imaging** *(Invited Paper)*
*Author(s):* **Raj Kumar,** CSIR - Central Scientific Instruments Organisation (India), Academy of Scientific and Innovative Research (AcSIR) (India); **Lavlesh Pensia,** CSIR - Central Scientific Instruments Organisation (India), Academy for Scientific and Innovative Research (AcSIR) (India)

13041-38 • 04:50 PM - 05:10 PM
**Lensless imaging systems: a technological and clinical review for automated disease identification**
*Author(s):* **Gregory Aschenbrenner**, **Saurabh Goswami**, **Timothy O'Connor**, **Peter M. Douglass**, **Kashif Usmani, Bahram Javidi,** Univ. of Connecticut (United States)

13041-39 • 05:10 PM - 05:30 PM
**Overview of 3D profilometry using integral imaging**
*Author(s):* **Alex Maric**, **Bahram Javidi,** Univ. of Connecticut (United States); **Xin Shen,** Univ. of Hartford (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13041-28 • 06:00 PM - 07:30 PM
**Three-dimensional optical sensing and computational reconstruction combining integral imaging and axially distributed sensing**
*Author(s):* **Xin Shen**, **Nathan Green, Lucas Slomski,** Univ. of Hartford (United States)

13041-29 • 06:00 PM - 07:30 PM
**Design and development of digital holographic microscope integrated with optical tweezers**
*Author(s):* **Arun Anand,** Sardar Patel Univ. (India); **Subhash Utadiya,** The Maharaja Sayajirao Univ. of Baroda (India); **Vismay Trivedi,** National Institute of Technology, Delhi (India); **Nimit R. Patel**, **Mugdha Joglekar,** The Maharaja Sayajirao Univ. of Baroda (India); **Vani K. Chhaniwal,** Sardar Patel Univ. (India); **Chetna M. Patel,** V.P. & R.P.T.P. Science College (India); **Bahram Javidi,** Univ. of Connecticut (United States)

13041-30 • 06:00 PM - 07:30 PM
**Large field of view 3D imaging based on iterative phase retrieval**
*Author(s):* **Arun Anand,** Sardar Patel Univ. (India); **Vismay Trivedi,** National Institute of Technology, Delhi (India); **Swapnil Mahajan,** The Maharaja Sayajirao Univ. of Baroda (India); **Bahram Javidi,** Univ. of Connecticut (United States)

13041-31 • 06:00 PM - 07:30 PM
**Low powered photo-detector based on SnSe2 crystals grown by DVT for photo sensing applications**
*Author(s):* **Preet Vyas**, **Devang R. Dhorada**, **Kevin K. Bhanderi**, **Shubham U. Gupta, K. D. Patel,** Sardar Patel Univ. (India)

13041-32 • 06:00 PM - 07:30 PM
**Camera array calibration for 3D integral imaging reconstruction and depth detection**
*Author(s):* **Brody Monarca, Xin Shen,** Univ. of Hartford (United States)

13041-33 • 06:00 PM - 07:30 PM
**Common path two-lens wavefront division digital holographic microscope for 3D imaging of living cells**
*Author(s):* **Arun Anand,** Sardar Patel Univ. (India); **Nimit R. Patel,** The Maharaja Sayajirao Univ. of Baroda (India); **Vismay Trivedi,** National Institute of Technology, Delhi (India); **Vani K. Chhaniwal,** Sardar Patel Univ. (India); **Bahram Javidi,** Univ. of Connecticut (United States); **Gyanendra Sheoran,** National Institute of Technology, Delhi (India)

13041-34 • 06:00 PM - 07:30 PM
**An overview of polarimetric integral imaging in turbid water: sensing and imaging**
*Author(s):* **Rakesh Joshi**, **Bahram Javidi, Gokul Krishnan,** Univ. of Connecticut (United States)

13041-36 • 06:00 PM - 07:30 PM
**An overview of 1D integral imaging convolutional neural networks applied in underwater optical signal detection under degraded environments**
*Author(s):* **Yinuo Huang**, **Bahram Javidi**, **Gokul Krishnan, Rakesh Joshi,** Univ. of Connecticut (United States)

13041-37 • 06:00 PM - 07:30 PM
**An overview of 3D Integral imaging-based human gesture recognition under degraded environments: comparison between 3D Integral imaging and RGB-D sensors**
*Author(s):* **Gokul Krishnan**, **Rakesh Joshi**, **Yinuo Huang, Bahram Javidi,** Univ. of Connecticut (United States)

13041-41 • 06:00 PM - 07:30 PM
**Robustness of single random phase encoding lensless imaging systems to reducing number of sensor pixels by orders of magnitude and increasing sensor pixel size**
*Author(s):* **Saurabh Goswami**, **Peter M. Douglass**, **Pranav Wani**, **Gaurav Gupta, Bahram Javidi,** Univ. of Connecticut (United States)

13041-42 • 06:00 PM - 07:30 PM
**Overview of digital holographic deep learning of red blood cells for field-portable rapid-disease screening**
*Author(s):* **Timothy O'Connor, Bahram Javidi,** Univ. of Connecticut (United States)

13041-44 • 06:00 PM - 07:30 PM
**1. 3D lidar mapping and AI for industrial navigation robot**
*Author(s):* **Jaesung Yang**, **Harry W. Bickford**, **Andrew Esteves, Kiwon Sohn,** Univ. of Hartford (United States)

13041-45 • 06:00 PM - 07:30 PM
**Complementation by binocular vision about aerial image missing by monocular vision in AIRR with a gap between retro-reflectors**
*Author(s):* **Takeru Nishiyama**, **Shiro Suyama, Hirotsugu Yamamoto,** Utsunomiya Univ. (Japan)

13041-46 • 06:00 PM - 07:30 PM
**3D stereoscopic imaging for spatial mapping and orientation**
*Author(s):* **Dillon Stan,** Univ. of Hartford (United States)

13041-47 • 06:00 PM - 07:30 PM
**3D multi-perspective depth detection using point clouds and machine learning**
*Author(s):* **Harry W. Bickford**, **Jaesung Yang**, **Andrew Esteves, Xin Shen,** Univ. of Hartford (United States)

13041-48 • 06:00 PM - 07:30 PM
**A study of integral imaging based depth detection using single planner computational volumetric reconstruction**
*Author(s):* **Vanden Haviland, Xin Shen,** Univ. of Hartford (United States)

13041-49 • 06:00 PM - 07:30 PM
**Design and development of a second-generation eye-hand coordination assisting device**
*Author(s):* **Daniella Pinho, Takafumi Asaki,** Univ. of Hartford (United States)

13041-50 • 06:00 PM - 07:30 PM
**End-to-end simulation process in lens design software for 3D light field displays evaluation**
*Author(s):* **Sédick Rabia**, **Guillaume Allain, Simon Thibault,** Univ. Laval (Canada)

13041-51 • 06:00 PM - 07:30 PM
**Towards the development of standards and performance metrics for 3D imaging systems**
*Author(s):* **Prem Rachakonda**, **Kamel S. Saidi**, **Marek Franaszek**, **Wesley Rhodes**, **Helen Qiao,** National Institute of Standards and Technology (United States); **Armin Khatoonabadi,** Apera AI (Canada); **John Sweetser,** Intel (United States); **David Dechow,** Machine Vision Source, LLC (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13041-43

**4Pi microscopy in biomedicine: a comprehensive bibliometric assessment of its evolution and impact**
*Author(s):* **Khaled Obaideen**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13042

# Advanced Optics for Imaging Applications: UV through LWIR IX

**22 - 23 April 2024 | Potomac 5**

***Conference Chair(s):*** **Jay N. Vizgaitis,** optX Imaging Systems (United States); **Peter L. Marasco,** Air Force Research Lab. (United States); **Jasbinder S. Sanghera,** U.S. Naval Research Lab. (United States)

***Program Committee:*** **Kyle R. Bryant,** U.S. Army Combat Capabilities Development Command (United States); **John P. Deegan,** Rochester Precision Optics, LLC (United States); **James B. Johnson,** MIT Lincoln Lab. (United States); **Spencer Novak,** LightPath Technologies, Inc. (United States); **S. Craig Olson,** L3Harris Technologies, Inc. (United States); **Clara Rivero-Baleine,** Lockheed Martin Missiles and Fire Control (United States); **Miguel P. Snyder,** DEVCOM C5ISR (United States); **Alan Symmons,** Vital Materials Co., Ltd. (United States); **Stan Szapiel,** Raytheon ELCAN Optical Technologies (Canada); **Nicholas A. Thompson,** Thales Optronics Ltd. (United Kingdom); **Jue Wang,** Corning Incorporated (United States)

## Monday 22 April 2024

### WELCOME AND OPENING REMARKS

22 April 2024 • 08:30 AM - 08:40 AM | Potomac 5

**Jay N. Vizgaitis**, optX Imaging Systems (United States); **Peter L. Marasco**, Air Force Research Lab. (United States); **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States)

### SESSION 1: METAMATERIALS

22 April 2024 • 08:40 AM - 10:10 AM | Potomac 5

*Session Chair(s):* **Jay N. Vizgaitis**, optX Imaging Systems (United States); **Peter L. Marasco**, Air Force Research Lab. (United States)

13042-1 • 08:40 AM - 09:10 AM

**Meta-optical systems: A new paradigm in imaging technologies** *(Invited Paper)*

*Author(s):* **Yakov Soskind,** Coherence Photonics, LLC (United States)

13042-2 • 09:10 AM - 09:30 AM

**$Sb_2S_3$ nanostructured dynamic optical metasurfaces**

*Author(s):* **Robert Bruce**, **Adrian A. Podpirka**, **Gabriella Hunt**, **Cam Gutgsell, David Shrekenhamer,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13042-3 • 09:30 AM - 09:50 AM

**Metasurface hybrid lens physical modeling**

*Author(s):* **Ko-Han Shih, C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13042-4 • 09:50 AM - 10:10 AM

**Transmission enhancement via metasurfaces with tunable waveband performance by dewetting and seeded masking**

*Author(s):* **Benjamin A. Vaca**, **William E. Genet**, **Tyler A. Benge**, **Jude K. Yoshino**, **Ishwar D. Aggarwal, Thomas C. Hutchens,** The Univ. of North Carolina at Charlotte (United States)

**Coffee Break 10:10 AM - 10:40 AM**

### SESSION 2: MACHINE LEARNING FOR OPTICS

22 April 2024 • 10:40 AM - 11:40 AM | Potomac 5

*Session Chair(s):* **Peter L. Marasco**, Air Force Research Lab. (United States); **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States)

13042-5 • 10:40 AM - 11:00 AM

**Addressing multi-scale challenges in metasurface design with differentiable far-field propagation**

*Author(s):* **Marshall B. Lindsay**, **Scott D. Kovaleski**, **Andy G. Varner**, **Charlie T. Veal**, **Derek T. Anderson,** Univ. of Missouri (United States); **Stanton R. Price, Steven R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13042-6 • 11:00 AM - 11:20 AM
**Time-series neural networks to predict electromagnetic wave propagation**
*Author(s):* **Andy G. Varner**, **Scott D. Kovaleski**, **Marshall B. Lindsay**, **Junyoung Shin**, **Charlie T. Veal**, **Derek T. Anderson,** Univ. of Missouri (United States); **Stanton R. Price, Steven R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13042-8 • 11:20 AM - 11:40 AM
**Cooperative optimization of neural-network-based diffraction simulations and benchtop spatial light modulators**
*Author(s):* **Marshall B. Lindsay**, **Scott D. Kovaleski**, **Andy G. Varner**, **Charlie T. Veal**, **Derek T. Anderson,** Univ. of Missouri (United States); **Staton R. Price, Steven R Price,** U.S. Army Engineer Research and Development Ctr. (United States)

**Lunch Break 11:40 AM - 01:10 PM**

## SESSION 3: OPTICS FOR SYSTEMS

22 April 2024 • 01:10 PM - 03:10 PM | Potomac 5
*Session Chair(s):* **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States); **Jay N. Vizgaitis**, optX Imaging Systems (United States)

13042-24 • 01:10 PM - 01:30 PM
**First-order calculation of optical cross-section (OCS) based on the Lagrange invariant**
*Author(s):* **Kevin J. McIntyre,** Leonardo DRS (United States)

13042-9 • 01:30 PM - 01:50 PM
**Folded path reflective telescope for SWAP limited imaging**
*Author(s):* **James B. Johnson**, **Robert Martinez**, **Christopher D. Roll**, **Benjamin A. Cohen**, **Gary J. Swanson, Michael P. Chrisp,** MIT Lincoln Lab. (United States)

13042-10 • 01:50 PM - 02:10 PM
**Design-based optimization of stray-light performance in a multispectral single aperture VIS/SWIR 2-chip camera**
*Author(s):* **SK Shaid-Ur Rahman**, **Bertram G. Achtner, Martin Hübner,** HENSOLDT Optronics GmbH (Germany)

13042-12 • 02:10 PM - 02:30 PM
**A high-performance multispectral 3-sensor zoom camera with fully achromatized common entrance optics for submarine optronics masts**
*Author(s):* **Christian Lehmann**, **Martin Gerken, Martin Huebner,** HENSOLDT Optronics GmbH (Germany)

13042-13 • 02:30 PM - 02:50 PM
**Development and testing of a ruggedized compact VNIR-SWIR hyperspectral imager for remote sensing**
*Author(s):* **James B. Johnson**, **Christopher D. Roll**, **Bayleigh Nugent**, **Jenna Montague**, **Jeromy Lyman**, **Samuel Berger**, **Melissa Brennan**, **Michael P. Chrisp**, **Ronald B. Lockwood, Corrie Smeaton,** MIT Lincoln Lab. (United States)

13042-25 • 02:50 PM - 03:10 PM
**Full-band infrared imaging with Risley prisms**
*Author(s):* **Jeremy Hodis, Jay N. Vizgaitis,** optX Imaging Systems (United States)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 4: FABRICATION AND COATINGS

22 April 2024 • 03:40 PM - 05:00 PM | Potomac 5
*Session Chair(s):* **Jay N. Vizgaitis**, optX Imaging Systems (United States); **Peter L. Marasco**, Air Force Research Lab. (United States)

13042-14 • 03:40 PM - 04:00 PM
**MRL improvement for large OAP mirror manufacturing for DE applications**
*Author(s):* **John J. Gilmore**, **Felix Radesi**, **Michael Hyman, Brandon B. Light,** Optimax Systems, Inc. (United States)

13042-15 • 04:00 PM - 04:20 PM
**Theoretical principles and design practices for edge filters and coatings**
*Author(s):* **Yongli Xu**, **Bob G. Benson**, **Jue Wang**, **Jingyu Lao**, **Rekha Doshi**, **Shane M. Stephens, Joseph M Kunick,** Corning Incorporated (United States)

13042-17 • 04:20 PM - 04:40 PM
**$CO_2$-laser additive manufacturing of antireflective transparent films based on homogeneous multiple-layer of $TiO_2$ and $SiO_2$ nanoparticles**
*Author(s):* **Yahya Bougdid**, **Gunjan Kulkarni,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Francois Chenard,** IRflex Corporation (United States); **Chandraika Sugrim,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Ranganathan Kumar,** Univ. of Central Florida (United States); **Aravinda Kar,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13042-26 • 04:40 PM - 05:00 PM
**Surface tension driven finishing of large sphere chalcogenide glass preforms for precision glass molding**
*Author(s):* **Peter F. Wachtel**, **A. Collin Beckens, John Deegan,** Rochester Precision Optics LLC (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## OPENING REMARKS: TUESDAY

23 April 2024 • 10:30 AM - 10:40 AM | Potomac 5
**Jay N. Vizgaitis**, optX Imaging Systems (United States); **Peter L. Marasco**, Air Force Research Lab. (United States); **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States)

## SESSION 5: ADVANCED OPTICAL MATERIALS

23 April 2024 • 10:40 AM - 12:00 PM | Potomac 5

*Session Chair(s):* **Peter L. Marasco**, Air Force Research Lab. (United States); **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States)

13042-18 • 10:40 AM - 11:00 AM

**Multiband optics for visible-MWIR imaging**

*Author(s):* **Daniel J. Gibson,** U.S. Naval Research Lab. (United States); **Robert R. Nicol,** Jacobs Engineering Group Inc. (United States); **Adam Floyd**, **Shyam S. Bayya**, **Vinh Q. Nguyen**, **Daniel L. Rhonehouse**, **Jasbinder S. Sanghera,** U.S. Naval Research Lab. (United States); **Jonathan Koerber, Gregory T. Forcherio,** Naval Surface Warfare Ctr. Crane Div. (United States)

13042-19 • 11:00 AM - 11:20 AM

**Sulfur-rich infrared transmitting polymer fibers**

*Author(s):* **Darryl A. Boyd**, **Vinh Q. Nguyen**, **Daniel L. Rhonehouse,** U.S. Naval Research Lab. (United States); **Geoffrey D. Chin**, **Frederic Kung,** Univ. Research Foundation (United States); **Kenneth J. Ewing**, **Daniel J. Gibson**, **Woohong R. Kim, Jasbinder S. Sanghera,** U.S. Naval Research Lab. (United States)

13042-20 • 11:20 AM - 11:40 AM

**GRIN materials for LWIR applications**

*Author(s):* **Claire Fourmentin,** Institut des Sciences Chimiques de Rennes (France), CNRS (France), Univ. de Rennes 1 (France); **Enora Lavanant,** Umicore Specialty Powders France (France); **Florence de la Barrière**, **Guillaume Druart,** ONERA (France); **Raphaël Proux**, **Mathieu Rozé**, **Yann M. Guimond,** Umicore IR Glass (France); **Xiang-Hua Zhang, Laurent Calvez,** Institut des Sciences Chimiques de Rennes (France), CNRS (France), Univ. de Rennes 1 (France)

13042-21 • 11:40 AM - 12:00 PM

**Application and testing of SupremEX® 640 and AyontEXTM 13 for mirrors and precision structures**

*Author(s):* **Mike N. Sweeney,** CMM Optic (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM

Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13042-22 • 06:00 PM - 07:30 PM

**Ultra-compact hyperspectral imaging system**

*Author(s):* **Erik Beckert**, **Felix Kraze**, **Martin Hubold, Robert Bruening,** Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13042-23

**The scientific footprint of SWIR detectors**

*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Talal Bonny**, **Mohammad AlShabi, Ahmed Alobaid,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13043

# Anomaly Detection and Imaging with X-Rays (ADIX) IX

**24 - 25 April 2024 | National Harbor 7**

***Conference Chair(s):*** **Amit Ashok,** Wyant College of Optical Sciences (United States); **Joel A. Greenberg, Michael E. Gehm,** Duke Univ. (United States)

***Program Committee:*** **Mark A. Anastasio,** Univ. of Illinois (United States); **Gonzalo R. Arce,** Univ. of Delaware (United States); **David Coccarelli,** Quadridox, Inc. (United States); **Jason W. Fleischer,** Princeton Univ. (United States); **Edward D. Franco,** Rapiscan Systems Labs. (United States); **Christopher W. Gregory,** Smiths Detection Inc. (United States); **Tim E. Harvey,** Salient Guard (United States); **Harry E. Martz,** Lawrence Livermore National Lab. (United States); **Sean Pang,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Laura Parker,** U.S. Dept. of Homeland Security (United States); **Lei Tian,** Boston Univ. (United States); **Sharene Young,** U.S. Dept. of Homeland Security (United States); **Yunhui Zhu,** Virginia Polytechnic Institute and State Univ. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 1: SYSTEMS DESIGN

24 April 2024 • 10:30 AM - 12:30 PM | National Harbor 7
*Session Chair(s):* **Joel A. Greenberg**, Duke Univ. (United States)

13043-1 • 10:30 AM - 11:10 AM
**Detection of concealed threats in homeland security environments** (Keynote Presentation)
*Author(s):* **Laura Parker,** U.S. Dept. of Homeland Security (United States)

13043-2 • 11:10 AM - 11:30 AM
**Spectrum optimization for X-ray dual-mode imager comprising radiography and coherent scatter**
*Author(s):* **David C. Kemdirim, Paul C. Johns,** Carleton Univ. (Canada)

13043-3 • 11:30 AM - 12:00 PM
**Spectral imaging advances: FDA's regulatory research on photon counting detector systems** *(Invited Paper)*
*Author(s):* **Bahaa Ghammraoui,** U.S. Food and Drug Administration (United States)

13043-4 • 12:00 PM - 12:30 PM
**Progress in silicon field emission X-ray sources for computed tomography** *(Invited Paper)*
*Author(s):* **Winston Chern,** X-Sight Ltd. (United States)

**Lunch/Exhibition Break 12:30 PM - 02:00 PM**

## SESSION 2: ALGORITHMS I

24 April 2024 • 02:00 PM - 03:20 PM | National Harbor 7
*Session Chair(s):* **Amit Ashok**, Wyant College of Optical Sciences (United States)

13043-5 • 02:00 PM - 02:20 PM
**Improved reconstruction and classification performance in a hybrid CT + XRD explosives detection system**
*Author(s):* **Turner Richmond**, **Daniel Pike**, **Ed Franco**, **Colt Dudley**, **Ryan Moody**, **Anya Lawe**, **Cullen Peters**, **David Coccarelli, Joel A. Greenberg,** Quadridox, Inc. (United States)

13043-6 • 02:20 PM - 02:40 PM
**Unsupervised Denoising for Spectral CT Images using a U-Net with Block-Based Training**
*Author(s):* **Raziye Kubra Kumrular, Thomas Blumensath,** Univ. of Southampton (United Kingdom)

13043-7 • 02:40 PM - 03:00 PM
**Machine-learning-enabled open vocabulary detection and localization in X-ray imagery**
*Author(s):* **Caitlin Carnahan**, **Joseph Seaward**, **Soren Nelson**, **Benjamin Brown**, **John A. Wright,** Physical Sciences Inc. (United States); **Kumar Babu,** U.S. Dept. of Homeland Security (United States)

13043-8 • 03:00 PM - 03:20 PM
**Material-discrimination based classifiers using augmented data for dual modality of X-ray transmission-based and diffraction-based systems**
*Author(s):* **Amit Ashok,** Wyant College of Optical Sciences (United States); **Ratchaneekorn Thamvichai,** The Univ. of Arizona (United States)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 3: SYNTHETIC DATA AND MATERIALS

24 April 2024 • 03:50 PM - 05:40 PM | National Harbor 7
*Session Chair(s):* **Michael E. Gehm**, Duke Univ. (United States)

13043-9 • 03:50 PM - 04:30 PM
**Leveraging synthetic data to enhance screening applications** (Keynote Presentation)
*Author(s):* **Domenic Bianchini,** Transportation Security Administration (United States)

13043-10 • 04:30 PM - 04:50 PM
**A pipeline for generating realistic virtual models for physics-based X-ray synthetic data generation**
*Author(s):* **David Coccarelli**, **Daniel Pike**, **Cullen Peters**, **Anya Lawe**, **Chris Larkee**, **Eric Espenhahn, Joel A. Greenberg,** Quadridox, Inc. (United States)

13043-11 • 04:50 PM - 05:20 PM
**Integrating synthetic data validation and quality benchmarks into a continuous integration/continuous delivery (CI/CD) data-generation pipeline** *(Invited Paper)*
*Author(s):* **Eric Fiterman**, **Kenneth Brown**, **Daniel Mallia, Justin Tornetta,** Cignal LLC (United States)

13043-13 • 05:20 PM - 05:40 PM
**Development of tunable semi-solid explosive simulants using a parametric model**
*Author(s):* **Douglas DeSario**, **Michael C. Brogden**, **Robert F. Schaffer,** Signature Science, LLC (United States); **Ronald A. Krauss,** U.S. Dept. of Homeland Security (United States)

# Thursday 25 April 2024

## SESSION 4: PHASE/SCATTER SYSTEMS

25 April 2024 • 08:30 AM - 10:30 AM | National Harbor 7
*Session Chair(s):* **Joel A. Greenberg**, Duke Univ. (United States)

13043-14 • 08:30 AM - 08:50 AM
**X-ray backscatter imaging: A new deployable form factor for defence and security applications**
*Author(s):* **Claire Schofield**, **Tom Farrell**, **Elaine Hood**, **Lyndsey Hopgood**, **Joe Spooner, Andrew Argyle,** Defence Science and Technology Lab. (United Kingdom)

13043-15 • 08:50 AM - 09:10 AM
**Progress toward spectrally responsive edge-illumination (SREI) X-ray phase contrast imaging (XPCI)**
*Author(s):* **Ava X. Hurlock**, **Sarah D. Ruiz**, **Timothy Koh, Michael E. Gehm,** Duke Univ. (United States)

13043-16 • 09:10 AM - 09:30 AM
**Development of a high-energy x-ray diffraction system for determining materials' signatures relevant to transportation security**
*Author(s):* **Alexander J. DeMasi**, **Joel B. Rovner**, **Patrick J. Cocola,** Signature Science, LLC (United States); **Harry Haas**, **Joshua Stroker,** Signature Science (United States); **Ronald A. Krauss, Duane Karns,** U.S. Dept. of Homeland Security (United States)

13043-17 • 09:30 AM - 09:50 AM
**Further development of asymmetric illumination X-ray differential phase contrast imaging**
*Author(s):* **Sarah D. Ruiz, Michael E. Gehm,** Duke Univ. (United States)

13043-18 • 09:50 AM - 10:10 AM
**High-resolution X-ray diffraction imaging in a tabletop system**
*Author(s):* **Joel A. Greenberg**, **Colt Dudley**, **Ryan Moody**, **Eric Espenhahn**, **Sakurako Kida**, **Anuj J. Kapadia, David Coccarelli,** Quadridox, Inc. (United States)

13043-19 • 10:10 AM - 10:30 AM
**Ghost imaging to see internal structure of a biological object with x-ray-based speckle illumination**
*Author(s):* **Sanjit Karmakar,** Stony Brook Univ. (United States); **Justin Goodrich**, **Andrei Fluerasu**, **Kwangmin Yu,** Brookhaven National Lab. (United States); **Cinzia Da Vi`a**, **Andrei Nomerotski,** Stony Brook Univ. (United States); **Elisha Siddiqui Matekole**, **Lonny E. Berman**, **Timothy Paape, Sean McSweeney,** Brookhaven National Lab. (United States)

**Coffee Break 10:30 AM - 11:00 AM**

## SESSION 5: ALGORITHMS II

25 April 2024 • 11:00 AM - 12:00 PM | National Harbor 7
*Session Chair(s):* **Amit Ashok**, Wyant College of Optical Sciences (United States)

13043-20 • 11:00 AM - 11:20 AM
**Generation of imagery-derived texture features for material discrimination**
*Author(s):* **Michael C. Brogden,** Signature Science, LLC (United States); **Ronald A. Krauss,** U.S. Dept. of Homeland Security (United States); **Patrick J. Cocola,** Signature Science, LLC (United States); **Robert F Schaffer, Harry M Haas,** Signature Science (United States)

13043-21 • 11:20 AM - 11:40 AM
**Towards efficient diagnostics: refining vision transformers for medical image multi-label classification**
*Author(s):* **Garrett I. Cayce**, **Arthur C Depoian, Colleen P. Bailey,** Univ. of North Texas (United States)

13043-22 • 11:40 AM - 12:00 PM
**3D effective atomic number estimation for X-ray security inspection systems**
*Author(s):* **Ozan Yalçın,** Hacettepe University (Turkey)

# CONFERENCE 13044

# Optical Waveguide and Laser Sensors III

**22 - 23 April 2024 | National Harbor 7**

***Conference Chair(s):*** **Robert A. Lieberman,** Lumoptix, LLC (United States); **Glen A. Sanders,** Honeywell Technology (United States); **Michael P. Buric,** National Energy Technology Lab. (United States)

***Program Committee:*** **Christopher S. Baldwin,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Gurbinder Kaur,** Thapar Univ. (India); **John L. Maida,** Halliburton (United States); **Alexis Mendez,** MCH Engineering LLC (United States); **Gary Pickrell,** Virginia Polytechnic Institute and State Univ. (United States); **Eric Udd,** Columbia Gorge Research LLC (United States); **Reinhardt Willsch,** Leibniz-Institut für Photonische Technologien e.V. (Germany); **Ruishu F. Wright, Jeffrey K. Wuenschell,** National Energy Technology Lab. (United States)

## Monday 22 April 2024

### SESSION 1: SENSOR SYSTEMS AND INTERROGATOR OPTIMIZATION

22 April 2024 • 08:30 AM - 10:20 AM | National Harbor 7
*Session Chair(s):* **Glen A. Sanders**, Honeywell Technology (United States)

13044-1 • 08:30 AM - 08:50 AM
**Ultra-long distance BOTDA sensor system employing hybrid amplification and advanced noise reduction techniques**
*Author(s):* **Hari Bhatta**, **Nageswara R. Lalam**, **Michael P. Buric, Ruishu F. Wright,** National Energy Technology Lab. (United States)

13044-2 • 08:50 AM - 09:10 AM
**Generalized noise framework for Brillouin fiber sensors**
*Author(s):* **Joseph B. Murray, Brandon Redding,** U.S. Naval Research Lab. (United States)

13044-3 • 09:10 AM - 09:30 AM
**Multicore Fiber Optic Gyro**
*Author(s):* **Ron Smith, William R. A. Ziegler,** 4S - Silversword Software and Services, LLC (United States)

13044-4 • 09:30 AM - 09:50 AM
**Recent advances in silicon-photonics-based sensors including latest capabilities and additions to ANELLO's ultra-low-loss silicon-nitride platform**
*Author(s):* **Avi Feshali, Nathan Abrams,** Anello Photonics, Inc. (United States)

13044-5 • 09:50 AM - 10:20 AM
**High-resolution spectrometer using Brillouin lasing for spectral compression** *(Invited Paper)*
*Author(s):* **Joseph B. Murray**, **Brandon Redding, Matthew J. Murray,** U.S. Naval Research Lab. (United States)

**Coffee Break 10:20 AM - 10:50 AM**

### SESSION 2: SENSORS FOR EXTREME ENVIRONMENTS

22 April 2024 • 10:50 AM - 02:30 PM | National Harbor 7
*Session Chair(s):* **Robert A. Lieberman**, Lumoptix, LLC (United States)

13044-6 • 10:50 AM - 11:20 AM
**Distributed sapphire fiber sensors for steel-making industrial applications** *(Invited Paper)*
*Author(s):* **Farhan Mumtaz**, **Hanok Tekle**, **Bohong Zhang**, **Jeffrey D. Smith**, **Ronald J. O'Malley**, **Rex E. Gerald, Jie Huang,** Missouri Univ. of Science and Technology (United States)

13044-7 • 11:20 AM - 11:40 AM
**Development of an immersion fiber-optic Raman sensor for real-time analysis of molten materials up to 1600°C**
*Author(s):* **Bohong Zhang**, **Hanok Tekle**, **Ronald J. O'Malley**, **Jeffrey D. Smith**, **Farhan Mumtaz**, **Rex E. Gerald, Jie Huang,** Missouri Univ.

of Science and Technology (United States)

13044-8 • 11:40 AM - 12:00 PM
**Enhancing aluminum casting efficiency through real-time optical fiber sensor monitoring at the metal-mold interface**
*Author(s):* **Bohong Zhang**, **Abhishek Prakash-Hungund**, **Ronald J. O'Malley**, **Farhan Mumtaz**, **Laura Bartlett**, **Rex E. Gerald, Jie Huang,** Missouri Univ. of Science and Technology (United States)

Lunch Break • 12:00 PM - 01:30 PM

13044-9 • 01:30 PM - 01:50 PM
**Distributed fiber-optic sensors for applications in electric arc furnaces**
*Author(s):* **Ogbole C. Inalegwu**, **Rony K. Saha**, **Yeshwanth R. Mekala**, **Farhan Mumtaz**, **Rex E. Gerald**, **Ronald J. O'Malley, Jie Huang,** Missouri Univ. of Science and Technology (United States)

13044-10 • 01:50 PM - 02:10 PM
**Overpressure sensing through acousto-optics: a comparison between a Self-Mixing Interferometer and an all-fiber Michelson interferometer**
*Author(s):* **Sébastien Maqueda,** CEA (France); **Julien Perchoux**, **Clément Tronche,** Université de Toulouse, LAAS-CNRS, CNRS, INPT (France); **Louis Thamié**, **Alan Dufourmentel**, **Marc Genetier**, **Maylis Lavayssiere, Yohan Barbarin,** CEA-DAM (France)

13044-11 • 02:10 PM - 02:30 PM
**Polymer single-mode chirped fiber Bragg grating for more sensitive shock velocity measurements**
*Author(s):* **Yohan Barbarin**, **Louis Thamié**, **Pascal Hereil**, **Sofiane Echaoui, Alexandre S. Lefrançois,** CEA-Gramat (France)

**Coffee Break 02:30 PM - 02:50 PM**

## SESSION 3: EXOTIC GUIDED WAVE SENSORS

22 April 2024 • 02:50 PM - 05:00 PM | National Harbor 7
*Session Chair(s):* **Jeffrey K. Wuenschell**, National Energy Technology Lab. (United States)

13044-12 • 02:50 PM - 03:20 PM
**Sensing enabled by frequency domain reflectometry in guided structures** *(Invited Paper)*
*Author(s):* **Kevin P. Chen**, **Yuqi Li**, **Emeka Ikpeazu, Qirui Wang,** Univ. of Pittsburgh (United States)

13044-13 • 03:20 PM - 03:40 PM
**Online monitoring of hydrogen processing using hollow-core waveguide-based Raman spectroscopy**
*Author(s):* **John Kelly, Robert Lascola,** Savannah River National Lab. (United States)

13044-14 • 03:40 PM - 04:00 PM
**Highly cascaded first-order fiber Bragg gratings in highly multimode optical fibers for distributed temperature sensing under harsh environment conditions**
*Author(s):* **Farhan Mumtaz**, **Hanok Tekle**, **Bohong Zhang**, **Jeffrey D. Smith**, **Ronald J. O'Malley**, **Rex E. Gerald, Jie Huang,** Missouri Univ. of Science and Technology (United States)

13044-15 • 04:00 PM - 04:20 PM
**Optical fiber specklegram sensor for water leak detection and localization**
*Author(s):* **Ogbole C. Inalegwu**, **Muhammad Roman**, **Farhan Mumtaz**, **Bohong Zhang**, **Anand Nambisan, Jie Huang,** Missouri Univ. of Science and Technology (United States)

13044-16 • 04:20 PM - 04:40 PM
**Dopant segregation in single-crystal optical fiber grown via the laser-heated pedestal growth technique**
*Author(s):* **Gary R. Lander**, **Jeffrey K. Wuenschell**, **Geunsik Lim,** National Energy Technology Lab. (United States); **Dolendra Karki**, **Paul R. Ohodnicki,** Univ. of Pittsburgh (United States); **Michael P. Buric,** National Energy Technology Lab. (United States)

13044-17 • 04:40 PM - 05:00 PM
**Feasibility of distributed temperature sensing using an enhanced scattering fiber**
*Author(s):* **Xiaoguang Sun,** OFS Fitel, LLC (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 4: SENSORS FOR INFRASTRUCTURE MONITORING I

23 April 2024 • 10:30 AM - 12:00 PM | National Harbor 7
*Session Chair(s):* **Ruishu Feng Wright**, National Energy Technology Lab. (United States)

13044-18 • 10:30 AM - 11:00 AM
**Numerical analysis of quasi-distributed acoustic sensing for guided wave-based pipeline damage detection** *(Invited Paper)*
*Author(s):* **Pengdi Zhang**, **Khurram Naeem**, **Enrico Sarcineli,** Univ. of Pittsburgh (United States); **Ruishu F. Wright**, **Sandeep R. Bukka**, **Nageswara R. Lalam,** National Energy Technology Lab. (United States); **Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

13044-19 • 11:00 AM - 11:20 AM
**Petroleum Product Pipeline Monitoring by Optical Frequency Domain Reflectometry**
*Author(s):* **Matthew M. Brister**, **Nageswara R. Lalam, Ruishu F. Wright,** National Energy Technology Lab. (United States)

13044-20 • 11:20 AM - 11:40 AM
**Calcined polyethyleneimine-coated optical fibers for distributed pH monitoring at high pressures and temperatures**
*Author(s):* **Alexander J. Shumski**, **Nathan Diemler, Ruishu F. Wright,** National Energy Technology Lab. (United States)

13044-21 • 11:40 AM - 12:00 PM
**Numerical modeling of cylindrical non-axisymmetric elastic waves detected by fiber-optic sensors for damage detection**
*Author(s):* **Enrico Sarcinelli**, **Pengdi Zhang**, **Khurram Naeem,** Univ. of Pittsburgh (United States); **Ruishu F. Wright**, **Nageswara R. Lalam,** National Energy Technology Lab. (United States); **Hessam Babaee, Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

## SESSION 5: SENSORS FOR INFRASTRUCTURE MONITORING II

23 April 2024 • 01:30 PM - 03:00 PM | National Harbor 7
*Session Chair(s):* **Ruishu Feng Wright**, National Energy Technology Lab. (United States)

13044-22 • 01:30 PM - 02:00 PM
**Distributed Optical Fiber Sensor System: Application to Natural Gas Pipeline Monitoring (Invited Paper)** *(Invited Paper)*
*Author(s):* **Nageswara R. Lalam**, **Hari Bhatta**, **Michael P. Buric,** National Energy Technology Lab. (United States); **Paul R. Ohodnicki,** Univ. of Pittsburgh (United States); **Ruishu F. Wright,** National Energy Technology Lab. (United States)

13044-23 • 02:00 PM - 02:20 PM
**Pipeline damage detection using multimode fiber-optic acoustic sensor and ultrasonic guided waves**
*Author(s):* **Khurram Naeem**, **Pengdi Zhang**, **Enrico Sarcinelli**, **Dolendra Karki**, **Tulika Khanikar**, **Yang-Duan Su,** Univ. of Pittsburgh (United States); **Nageswara R. Lalam**, **Ruishu F. Wright,** National Energy Technology Lab. (United States); **Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

13044-24 • 02:20 PM - 02:40 PM
**Multimode interference-based fiber-optic sensors using SNS configuration**
*Author(s):* **Tulika Khanikar**, **Dolendra Karki**, **Yang-Duan Su**, **Khurram Naeem, Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

13044-25 • 02:40 PM - 03:00 PM
**Multi-parameter optical fiber sensor for differentiation of cross-sensitivity between humidity, $CH_4$, $CO_2$, pressure, and corrosion**
*Author(s):* **Badri P. Mainali**, **Alexander J. Shumski**, **Sandeep Bukka**, **Nathan Diemler,** National Energy Technology Lab. (United States); **Ruishu Wright,** National Energy Technology Laby Lab. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 6: SENSORS FOR ENERGY APPLICATIONS

23 April 2024 • 03:30 PM - 05:40 PM | National Harbor 7
*Session Chair(s):* **Michael P. Buric**, National Energy Technology Lab. (United States)

13044-26 • 03:30 PM - 04:00 PM
**Functionalized fiber-optic current and magnetic-field sensors for electrical power-grid monitoring applications** *(Invited Paper)*
*Author(s):* **Dolendra Karki**, **Tulika Khanikar**, **Khurram Naeem, Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

13044-27 • 04:00 PM - 04:20 PM
**Performance benchmarking of low-cost plasmonic temperature sensor for Li-ion battery thermal monitoring**
*Author(s):* **Yang-Duan Su**, **Khurram Naeem**, **Atieh Shirzadeh**, **Heather Phillips, Paul R. Ohodnicki,** Univ. of Pittsburgh (United States)

13044-28 • 04:20 PM - 04:40 PM
**Single-crystal optical fiber and perovskite oxide sensing materials for gas monitoring above 500°C**
*Author(s):* **Jeffrey K. Wuenschell**, **Youngseok Jee**, **Gary R. Lander**, **Geunsik Lim,** National Energy Technology Lab. (United States), Leidos, Inc. (United States); **Michael P. Buric,** National Energy Technology Lab. (United States)

13044-29 • 04:40 PM - 05:00 PM
**Advancing $CO_2$ sensor based on open-ended hollow coaxial cable resonator for monitoring in challenging industrial environments**
*Author(s):* **Bohong Zhang,** Missouri Univ. of Science and Technology (United States); **Shixuan Zeng**, **Min Chen,** Bettergy Corp. (United States); **Jie Huang,** Missouri Univ. of Science and Technology (United States)

13044-30 • 05:00 PM - 05:20 PM
**Deep-learning-assisted automated detection of gas influx signature in wellbore using distributed acoustic sensor data**
*Author(s):* **Jyotsna Sharma, Hypatia Mills,** Louisiana State Univ. (United States)

13044-31 • 05:20 PM - 05:40 PM
**Optical fiber sensor capable of monitoring hydrogen in the subsurface hydrogen storage environment**
*Author(s):* **Daejin Kim**, **Alexander J. Shumski**, **Krista K. Bullard, Ruishu F. Wright,** National Energy Technology Lab. (United States)

# CONFERENCE 13045

# Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XXXV

**23 - 25 April 2024 | National Harbor 3**

CONFERENCE CO-SPONSORS

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TRUE COLORS INFRARED IMAGING INC.

***Conference Chair(s):*** **David P. Haefner,** DEVCOM C5ISR (United States); **Gerald C. Holst,** JCD Publishing (United States)

***Program Committee:*** **Gisele Bennett,** MEPSS LLC (United States); **Piet Bijl,** TNO (Netherlands); **Katrin Braesicke,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **James A. Dawson,** Blake Labs, LLC (United States); **John W. Devitt,** RTX Corp. (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences (United States); **Christopher N. Durell,** Labsphere, Inc. (United States); **Richard L. Espinola,** U.S. Naval Research Lab. (United States); **Orges Furxhi,** True Colors Infrared Imaging (United States); **Jonathan G. Hixson,** DEVCOM C5ISR (United States); **Eddie L. Jacobs,** The Univ. of Memphis (United States); **Daniel A. LeMaster,** U.S. Dept. of Transportation (United States); **Terrence S. Lomheim,** The Aerospace Corp. (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Joseph P. Reynolds,** DEVCOM C5ISR (United States); **Austin A. Richards,** Oculus Photonics LLP (United States); **Michael A. Soel,** Teledyne FLIR LLC (United States); **Sean Strickland,** Santa Barbara Infrared, Inc. (United States); **Curtis M. Webb,** L3Harris Technologies, Inc. (United States)

## INFORMATION

This conference grants three awards: 1) Best presentation is selected by the conference committee; 2) Santa Barbara Infrared (SBIR) is offering a $250.00 honorarium for an innovation award, granted for the most innovative test technique; and 3) True Colors Infrared Imaging (TCII) is awarding a $250.00 honorarium to the most innovative modeling and simulation-driven imager design or analysis paper presented by a student or young researcher. All awardees will receive recognition header on their published paper in the conference proceedings, provided that the manuscript is submitted before the end of the conference. See the Awards page for full details.

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### WELCOME AND OPENING REMARKS

23 April 2024 • 01:30 PM - 01:40 PM | National Harbor 3
**David P. Haefner**, DEVCOM C5ISR (United States); **Gerald C. Holst**, JCD Publishing (United States)

## SESSION 1: INFRARED IMAGING SYSTEMS I

23 April 2024 • 01:40 PM - 03:10 PM | National Harbor 3
*Session Chair(s):* **Daniel A. LeMaster**, U.S. Dept. of Transportation (United States); **Ronald G. Driggers**, Wyant College of Optical Sciences (United States)

13045-1 • 01:40 PM - 02:10 PM
**Adventures in low-light imaging** *(Invited Paper)*
*Author(s):* **Austin A. Richards,** Oculus Photonics LLP (United States)

13045-2 • 02:10 PM - 02:30 PM
**Per-pixel Radiometric Calibration to Silux**
*Author(s):* **David P. Haefner,** DEVCOM C5ISR (United States); **Aaron Hendrickson,** Naval Air Warfare Ctr. Aircraft Div. (United States); **Austin A. Richards,** Oculus Photonics LLP (United States); **Martin Hübner,** HENSOLDT Optronics GmbH (Germany); **Bradley L. Preece**, **Brian Teaney, Stephen D. Burks,** DEVCOM C5ISR (United States)

13045-3 • 02:30 PM - 02:50 PM
**Detector size selection for long-range targeting performance in the extended shortwave infrared band**
*Author(s):* **Lindsey Wiley**, **Adam Katheder**, **Joshua Follansbee,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **Jeff Voss**, **Richard E. Pimpinella,** Sivananthan Labs., Inc. (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States)

13045-4 • 02:50 PM - 03:10 PM
**Trade study of moving sensor optimization model**
*Author(s):* **Jennifer Hewitt**, **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 2: INFRARED IMAGING SYSTEMS II

23 April 2024 • 03:40 PM - 05:20 PM | National Harbor 3
*Session Chair(s):* **Ronald G. Driggers**, Wyant College of Optical Sciences (United States); **Daniel A. LeMaster**, U.S. Dept. of Transportation (United States)

13045-5 • 03:40 PM - 04:00 PM
**Comparison of scene contrast temperature in MWIR and LWIR**
*Author(s):* **Shane Jordan**, **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **Orges Furxhi,** True Colors Infrared Imaging (United States); **Patrick Leslie,** The Univ. of Arizona (United States); **Richard C. Cavanaugh,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Eddie L. Jacobs,** The Univ. of Memphis (United States)

13045-6 • 04:00 PM - 04:20 PM
**Developing new measurements through modeling and simulation: camera to display latency measurements**
*Author(s):* **David P. Haefner**, **Stephen D. Burks,** DEVCOM C5ISR (United States); **Aaron Hendrickson,** U.S. Navy (NAWCAD) (United States)

13045-7 • 04:20 PM - 04:40 PM
**Image-plane speckle contrast and Fλ/d in active imaging systems**
*Author(s):* **Joshua Follansbee**, **Eric Mitchell,** The Univ. of Arizona (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States)

13045-8 • 04:40 PM - 05:00 PM
**Multispectral characterization of tower visibility in VIS, NIR, SWIR, MWIR, and LWIR bands from a ground-vehicle**
*Author(s):* **Mark Martino**, **Li Zhang**, **Jeremy W. Mares**, **Alex Irwin**, **Oles Fylypiv**, **Eunmo Kang,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13045-9 • 05:00 PM - 05:20 PM
**Automated image-based range performance evaluation using TOD over natural backgrounds**
*Author(s):* **Robert E. Short,** Leonardo DRS (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13045-37 • 06:00 PM - 07:30 PM
**Topological dependence of diffuse reflectance for IR absorbing materials**
*Author(s):* **Jesse Duncan**, **Troy B. Mayo**, **Scott Ramsey, Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States)

13045-38 • 06:00 PM - 07:30 PM
**Experimental comparison of active imaging modes for long-range target imaging in near-IR verse SWIR bands**
*Author(s):* **Eunmo Kang**, **Oles Fylypiv**, **Jeremy W. Mares,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Joshua Follansbee**, **Ron G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13045-39 • 06:00 PM - 07:30 PM
**Multispectral LWIR plenoptics system free of FPN**
*Author(s):* **Sergio N. Torres**, **Felipe A. Borcoski, Joaquin A. Lermanda,** Univ. de Concepción (Chile)

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 3: INFRARED IMAGING SYSTEMS III

24 April 2024 • 10:30 AM - 12:40 PM | National Harbor 3
*Session Chair(s):* **John W. Devitt**, RTX Corp. (United States); **Richard L. Espinola**, U.S. Naval Research Lab. (United States)

13045-10 • 10:30 AM - 11:00 AM
**Range-performance models of infrared imaging systems: developmental background and view into the future** *(Invited Paper)*
*Author(s):* **Katrin Braesicke,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13045-11 • 11:00 AM - 11:20 AM
**A comparison of reflected and emitted radiometric signal levels in SWIR, eSWIR, MWIR, and superband (SWIR through MWIR) optical systems**
*Author(s):* **Luke D. Somerville**, **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States); **C. Kyle Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Patrick Leslie, Shane Jordan,** Wyant College of Optical Sciences (United States)

13045-12 • 11:20 AM - 11:40 AM
**Evaluation of video stabilization metrics for the assessment of camera vibrations**
*Author(s):* **Gregor Franz, Stefan Keßler,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13045-13 • 11:40 AM - 12:00 PM
**Interrogation as a targeting task**
*Author(s):* **Eddie L. Jacobs,** The Univ. of Memphis (United States); **C. Kyle Renshaw,** Univ. of Central Florida (United States); **Ronald G. Driggers,** The Univ. of Arizona (United States); **Orges Furxhi,** The Univ. of Memphis (United States)

13045-14 • 12:00 PM - 12:20 PM
**Comparing thermal imager performance using deep-learning-based models: triangle orientation discrimination (TOD) classifier versus you only look once (YOLO)**
*Author(s):* **Daniel Wegner, Stefan Keßler,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13045-15 • 12:20 PM - 12:40 PM
**A low-light camera SNR D* metric**
*Author(s):* **Bradley L. Preece,** DEVCOM C5ISR (United States)

## Lunch/Exhibition Break 12:40 PM - 02:00 PM

## ROUND-TABLE DISCUSSION: CURRENT MODELING LIMITATIONS

24 April 2024 • 02:00 PM - 03:00 PM | National Harbor 3

Moderator:
**Michael Soel**, Teledyne FLIR Systems, Inc. (United States)

Panelists:
**Ronald Driggers**, The Univ. of Arizona (United States)
**Orges Furxhi**, True Colors Infrared Imaging (United States)
**Brian P. Teaney** DEVCOM C5ISR (United States)
**Daniel Wegner**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

## Coffee Break 03:00 PM - 03:30 PM

## SESSION 4: INFRARED IMAGING SYSTEMS IV

24 April 2024 • 03:30 PM - 05:30 PM | National Harbor 3
*Session Chair(s):* **Richard L. Espinola**, U.S. Naval Research Lab. (United States); **John W. Devitt**, RTX Corp. (United States)

13045-16 • 03:30 PM - 03:50 PM
**Image classification algorithm performance based on Fλ/d**
*Author(s):* **Jonathan G. Hixson,** DEVCOM C5ISR (United States)

13045-17 • 03:50 PM - 04:10 PM
**Towards Cn2 parity between imaging-based simulation and measurement**
*Author(s):* **Thomas P. Watson, Apratim Dasgupta**, **Daniel Foti, Eddie L. Jacobs,** The Univ. of Memphis (United States)

13045-18 • 04:10 PM - 04:30 PM
**Parallax correction for helmet-mounted devices**
*Author(s):* **Eric A. Flug**, **Kiran Bagalkotkar**, **Bradley L. Preece,** DEVCOM C5ISR (United States); **Emily Lasko**, **Julie Demyanovich,** CACI Technologies Inc. (United States); **John Graybeal**, **Trevor Fitzsimmons,** DEVCOM C5ISR (United States); **Vinh Tran,** Simeon Technology LLC (United States)

13045-19 • 04:30 PM - 04:50 PM
**Sensitivity, resolution, and range-resolution comparison of continuous-wave time-of-flight (CWToF) and laser-range gated with range-resolve (LRGRR) to laser-range-gated (LRG) and continuous-wave (CW) active-imaging systems**
*Author(s):* **Joshua Teague**, **Orges Furxhi**, **Joshua Follansbee**, **Ronald G. Driggers,** The Univ. of Arizona (United States); **Mark F. Spencer,** Joint Directed Energy Transition Office (United States)

13045-20 • 04:50 PM - 05:10 PM
**integration of motion blur into the TTP metric for pilotage performance**
*Author(s):* **Jonathon Wade,** The Univ. of Arizona (United States); **Orges Furxi,** True Colors Infrared Imaging (United States); **Ronald G. Driggers,** The Univ. of Arizona (United States)

13045-21 • 05:10 PM - 05:30 PM
**Estimating OpenCV ArUco performance from linear camera and scene parameters**
*Author(s):* **Timothy Tuininga,** MAG Aerospace (United States); **Stephen D. Burks, David P. Haefner,**DEVCOM C5ISR (United States)

## Thursday 25 April 2024

### SESSION 5: INFRARED IMAGING SYSTEMS V

25 April 2024 • 08:10 AM - 10:00 AM | National Harbor 3
*Session Chair(s):* **Jonathan G. Hixson**, DEVCOM C5ISR (United States); **Eddie L. Jacobs**, The Univ. of Memphis (United States)

13045-22 • 08:10 AM - 08:40 AM
**History of FLIR testing revisited** *(Invited Paper)*
*Author(s):* **Curtis M. Webb,** L3Harris Technologies, Inc. (United States)

13045-23 • 08:40 AM - 09:00 AM
**Neuromorphic sensor characterization and performance modeling**
*Author(s):* **Stephen D. Burks**, **David P. Haefner,**DEVCOM C5ISR (United States); **Jonah P. Sengupta,** Army Research Lab (United States)

13045-24 • 09:00 AM - 09:20 AM
**Demystifying event-based camera latency: sensor speed dependence on pixel biasing, light, and spatial activity**
*Author(s):* **Jonah P. Sengupta,** U.S. Army Research Lab. (United States); **Stephen D. Burks,** DEVCOM C5ISR (United States)

13045-25 • 09:20 AM - 09:40 AM
**A take on latency measurement for vision systems**
*Author(s):* **Antoine Grégoire**, **Nathalie Roy**, **Simon Roy**, **Simon Potvin**, **Michel Dupuis**, **Anne Martel, Jean-Claude Bouchard,** Defence Research and Development Canada, Valcartier (Canada)

13045-26 • 09:40 AM - 10:00 AM
**Imaging sensor band comparison for situation awareness in wildfires**
*Author(s):* **Patrick Leslie,** The Univ. of Arizona (United States); **Thomas P. Watson,**The Univ. of Memphis (United States); **Shane Jordan,** The Univ. of Arizona (United States); **Eddie L. Jacobs,** The Univ. of Memphis (United States); **Ronald G. Driggers**, **Lindsey Wiley, Joshua Follansbee,** The Univ. of Arizona (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 6: INFRARED IMAGING SYSTEMS VI

25 April 2024 • 10:30 AM - 12:10 PM | National Harbor 3
*Session Chair(s):* **Eddie L. Jacobs**, The Univ. of Memphis (United States); **Jonathan G. Hixson**, DEVCOM C5ISR (United States)

13045-27 • 10:30 AM - 10:50 AM
**Automated SWIR, MWIR, and LWIR camera test results compared to models**
*Author(s):* **Arnold L. Adams,** IRCameras, LLC (United States)

13045-28 • 10:50 AM - 11:10 AM
**Measuring a camera system's F-number using retroreflections**
*Author(s):* **Derek J. Burrell**, **Allen J. Parker**, **David P. Haefner, Stephen D. Burks,**DEVCOM C5ISR (United States)

13045-29 • 11:10 AM - 11:30 AM
**Is LED technology suitable to replace a tungsten filament lamp for night vision devices and I2 tubes testing?**
*Author(s):* **Nathalie Roy**, **Simon Potvin**, **Anne Martel,** Defence Research and Development Canada, Valcartier (Canada); **Michel Dupuis**, **Jean-Claude Bouchard,** Defence Research and Development Canada (Canada); **Antoine Grégoire,** Defence Research and Development Canada, Valcartier (Canada)

13045-30 • 11:30 AM - 11:50 AM
**Calibrating a multispectral scene for objective measurements of multi-band camera systems**
*Author(s):* **Allen J. Parker**, **David P. Haefner, Stephen D. Burks,**DEVCOM C5ISR (United States)

13045-31 • 11:50 AM - 12:10 PM
**Development of an image-based electro-optical system performance prediction tool for design and optimization**
*Author(s):* **Ozgur M. Polat, Yücel C. Özer,** ASELSAN A.S. (Turkey)

**Lunch/Exhibition Break 12:10 PM - 01:30 PM**

## ROUND-TABLE DISCUSSION: FUTURE TESTING REQUIREMENTS

25 April 2024 • 01:30 PM - 02:30 PM | National Harbor 3

Moderator:
**Curtis M. Webb**, L3Harris Technologies, Inc. (United States)

Panelists:
**Stephen Burks**, DEVCOM C5ISR (United States)
**Chris Durell**, Remote Sensing Labsphere, Inc. (United States)
**Al Gibson**, Santa Barbara Infrared, Inc. (United States)
**Ilya Koshkin**, CI Systems (United States)
**Jeffrey T. Meier**, US Army Redstone Technical Test Ctr. (United States)
**Austin Richards**, Oculus Photonics (United States)
**Nathalie Roy**, Defence Research and Development Canada, Valcartier (Canada)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 7: INFRARED IMAGING SYSTEMS VII

25 April 2024 • 03:00 PM - 05:00 PM | National Harbor 3
*Session Chair(s):* **Curtis M. Webb**, L3Harris Technologies, Inc. (United States)

13045-32 • 03:00 PM - 03:20 PM
**Terahertz system characterization and performance modeling**
*Author(s):* **Stephen D. Burks,** DEVCOM C5ISR (United States); **Linda E. Marchese,** RaySecur Inc. (United States); **David P. Haefner,** DEVCOM C5ISR (United States)

13045-33 • 03:20 PM - 03:40 PM
**Impact analysis of longwave infrared focal plane array (LWIR FPA) temperature variations on its characterization process**
*Author(s):* **Augusto Cezar Gomes dos Santos**, **Adenir Silva Filho**, **Leonardo Bruno de Sá**, **Fábio L. Firmino,** Ctr. Tecnologico do Exercito (Brazil); **Cristian A. Delfino,** Instituto de Estudos Avançados (Brazil)

13045-34 • 03:40 PM - 04:00 PM
**Techniques for measuring comparable lab and field MTFs**
*Author(s):* **Jordan L. Rubis**, **Patrick Leslie,** The Univ. of Arizona (United States); **Jeffery T. Meier**, **Ellie Spitzer,** U.S. Army Redstone Test Ctr. (United States); **Eddie L. Jacobs,** The Univ. of Memphis (United States); **Ronald G. Driggers,** Wyant College of Optical Sciences, The Univ. of Arizona (United States)

13045-35 • 04:00 PM - 04:20 PM
**Measuring and modeling of wetted surfaces**
*Author(s):* **David A. Vaitekunas,** W. R. Davis Engineering, Ltd. (Canada); **Moses Kodur, Martin Szczesniak,** Surface Optics Corp. (United States)

13045-36 • 04:20 PM - 04:40 PM
**Rifle scope tester: optical system description and application**
*Author(s):* **Dario Cabib,** CI Systems (Israel) Ltd. (Israel)

13045-40 • 04:40 PM - 05:00 PM
**The effects of focal plane parameters on eSWIR imaging system performance**
*Author(s):* **Angus Hendrick,** The Univ. of Arizona (United States)

# CONFERENCE 13046

# Infrared Technology and Applications L

**21 - 25 April 2024 | National Harbor 2**

***Conference Chair(s):*** **Gabor F. Fulop,** Maxtech International, Inc. (United States); **Michael H. MacDougal,** Attollo Engineering, LLC (United States); **David Z. Ting,** Jet Propulsion Lab. (United States)

***Conference Co-Chair(s):*** **Masafumi Kimata,** Consultant (Japan)

***Program Committee:*** **Tayfun Akin,** Mikro-Tasarim Elektronik San. ve Tic. A.S. (Turkey); **Oguz Altun,** ASELSAN A.S. (Turkey); **Eric Belhaire,** Thales (France); **Richard J. Blackwell,** BAE Systems (United States); **Wolfgang A. Cabanski,** AIM INFRAROT-MODULE GmbH (Germany); **John T. Caulfield,** Cyan Systems, Inc. (United States); **Leonard P. Chen,** Raytheon Technologies Corp. (United States); **Eric Costard,** IRnova AB (Sweden); **Michael T. Eismann,** Air Force Research Lab. (United States); **Martin H. Ettenberg,** Princeton Infrared Technologies, Inc. (United States); **Adam Greenen,** Leonardo UK Ltd. (United Kingdom); **Michael Groenert,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Sarath D. Gunapala,** Jet Propulsion Lab. (United States); **Charles M. Hanson,** Consultant (United States); **Arjun Kar-Roy,** Tower Semiconductor USA Inc. (United States); **Michael W. Kelly,** Anduril Industries, Inc. (United States); **Young-Ho Kim,** i3system, Inc. (Korea, Republic of); **Philip C. Klipstein,** SCD SemiConductor Devices (Israel); **Kevin C. Liddiard,** Electro-optic Sensor Design (Australia); **John C. Liobe,** Sensors Unlimited, a Collins Aerospace Co. (United States); **Whitney Mason,** Defense Advanced Research Projects Agency (United States); **John Lester Miller,** Cascade Electro-Optics, LLC (United States); **Mario O. Münzberg,** HENSOLDT Optronics GmbH (Germany); **Minh Nguyen,** HRL Labs., LLC (United States); **Shinpei Ogawa,** Mitsubishi Electric Corp. (Japan); **Tony J. Ragucci,** Leonardo DRS (United States); **Manijeh Razeghi,** Northwestern Univ. (United States); **Donald A. Reago,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Charles J. Reyner,** Air Force Research Lab. (United States); **Antoni Rogalski,** Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland); **Laurent Rubaldo,** Lynred (France); **Thomas R. Schimert,** DRS Network & Imaging Systems, LLC (United States); **Stefan P. Svensson,** DEVCOM Army Research Lab. (United States); **Nansheng Tang,** L3Harris Technologies, Inc. (United States); **Christophe Vasse,** Thales LAS France SAS (France); **Alexander Veprik,** Cryo Tech Ltd. (Israel); **Mike D. Walters,** Teledyne FLIR LLC (United States)

## Sunday 21 April 2024

### WELCOME AND OPENING REMARKS

21 April 2024 • 01:30 PM - 01:40 PM | National Harbor 2

**Gabor F. Fulop**, Maxtech International, Inc. (United States) and Infrared Imaging News (United States)

### SESSION 1: SWIR I

21 April 2024 • 01:40 PM - 03:30 PM | National Harbor 2

*Session Chair(s):* **Michael H. MacDougal**, Attollo Engineering, LLC (United States); **John C. Liobe**, Sensors Unlimited, a Collins Aerospace Co. (United States)

13046-2 • 01:40 PM - 02:10 PM

**Advanced SWIR sensor development at SUI** *(Invited Paper)*

*Author(s):* **John C. Liobe**, **Krishna Linga, Wei Huang,** Sensors Unlimited, a Collins Aerospace Co. (United States)

13046-3 • 02:10 PM - 02:30 PM

**SWIFT: a low SWaP wide distribution SWIR product line**

*Author(s):* **Oren Ofer**, **Rahel Elishkov**, **Gal Reches**, **Avraham R. Fraenkel**, **Einat Louzon**, **Claudio G. Jakobson**, **Roman Dobromislin**, **Nimrod Ben Ari**, **Michael Labilov**, **Menashe Alcheck**, **Yair Lury**, **Haim Mary**, **Ehud Almog**, **Michal Nitzani**, **Yoram Karni**, **Tuvy Markovitz,** SCD SemiConductor Devices (Israel); **Benny Milgrom,** Israel Ministry of Defence (Israel)

13046-4 • 02:30 PM - 02:50 PM

**Study of new types of detectors in the SWIR (short-wave infrared): extension of the operating band beyond 1.7 μm**

*Author(s):* **Jordi Roubichou,** Lab. d'Astrophysique de Marseille (France); **Jean-Luc Reverchon**, **Axel Evirgen**, **Claire Theveneau,** III-V Lab. (France); **Vincent Gueriaux**, **Gerard Berginc,** Thales LAS France SAS (France); **Jean-Luc Gach,** Lab d'Astrophysique de Marseille (France); **Jean-Luc Beuzit,** Lab. d'Astrophysique de Marseille (France)

13046-5 • 02:50 PM - 03:10 PM
**InGaAs photodetector with 1 fA dark current at 15μm pixel pitch**
*Author(s):* **Muammer Kozan**, **Baran Utku Tekin**, **Alican Karakuş**, **Aylin Kangallı Akkoyunlu**, **Mehmet Emin Kısa**, **Arda Şahin**, **Ebru Sağıroğlu**, **Alper Şahin**, **Mert Eren Ağcabay**, **Elif Aytuna**, **Yiğit Özer**, **Başak Bakır**, **Gözde Demir**, **Hatice Demir Özdemir Bulut**, **Çağla Özgit Akgün**, **Ahmet M. Akbaş**, **Vedat Karakaş**, **Yunus Dağ**, **Ömer Lütfi Nuzumlalı, Seymen M. Aygün,** ASELSAN A.S. (Turkey)

13046-6 • 03:10 PM - 03:30 PM
**SWIR multi-mode tracking (MMT) developments at SUI**
*Author(s):* **John C. Liobe**, **Grant James**, **Jinguo Yu, Michael W. Delamere,** Sensors Unlimited, a Collins Aerospace Co. (United States)

**Coffee Break 03:30 PM - 03:50 PM**

## SESSION 2: SWIR II

21 April 2024 • 03:50 PM - 05:10 PM | National Harbor 2
*Session Chair(s):* **John C. Liobe**, Sensors Unlimited, a Collins Aerospace Co. (United States); **Martin H. Ettenberg**, Princeton Infrared Technologies, Inc. (United States)

13046-7 • 03:50 PM - 04:10 PM
**Low-SWaP SWIR ALPD product development at SUI**
*Author(s):* **John C. Liobe**, **Michael J. Evans, John Wieners,** Sensors Unlimited, a Collins Aerospace Co. (United States)

13046-8 • 04:10 PM - 04:30 PM
**Progress at Leonardo UK in APD array technology development for high-speed 2D linear mode photon-counting applications**
*Author(s):* **Peter Thorne, Charlie Turner,** Leonardo UK Ltd. (United Kingdom)

13046-9 • 04:30 PM - 04:50 PM
**SWIR's advantage over the visible in long-range imaging scenarios: comparative field trials in a variety of atmospheric conditions**
*Author(s):* **Gabriel Jobert**, **Nicolas Vannier**, **Sandra Pelletier**, **Romain Delubac**, **Xavier Brenière**, **Nicolas Péré-Laperne, Laurent Rubaldo,** Lynred (France)

13046-10 • 04:50 PM - 05:10 PM
**Small pixel SWIR imagers using InGaAs and CQDs**
*Author(s):* **Michael H. MacDougal**, **Tim Strand**, **Jon C. Geske**, **Andrew D. Hood, Chris Mak,** Attollo Engineering, LLC (United States)

## SESSION 3: SWIR III: CQD

21 April 2024 • 05:10 PM - 06:20 PM | National Harbor 2
*Session Chair(s):* **Martin H. Ettenberg**, Princeton Infrared Technologies, Inc. (United States); **John C. Liobe**, Sensors Unlimited, a Collins Aerospace Co. (United States)

13046-11 • 05:10 PM - 05:40 PM
**Mid-infrared optoelectronics with mercury chalcogenide colloidal quantum dots** *(Invited Paper)*
*Author(s):* **Philippe Guyot-Sionnest,** The Univ. of Chicago (United States)

13046-12 • 05:40 PM - 06:00 PM
**High-resolution SWIR sensors and cameras**
*Author(s):* **Robert J. Stewart**, **Ethan J. D. Klem, Allan H. Hilton,** SWIR Vision Systems (United States)

13046-13 • 06:00 PM - 06:20 PM
**Image sensors and cameras based on colloidal quantum dots (CQD) for visible-to-SWIR detection**
*Author(s):* **Mark Allen,** Emberion Oy (Finland); **Surama Malik**, **Chris Bower**, **Yinglin Liu,** Emberion (United Kingdom); **Sami Kallioinen**, **Markus Nenonen,** Emberion Oy (Finland); **David T. So**, **Alan Colli,** Emberion (United Kingdom); **Janne Tamminen**, **Jarkko Routama,** Emberion Oy (Finland); **Samiul Haque,** Emberion (United Kingdom); **Frank Coenen**, **Jyri Hämäläinen,** Emberion Oy (Finland); **Piers Andrew,** Emberion (United Kingdom); **Tapani Ryhänen,** Emberion Oy (Finland)

# Monday 22 April 2024

## SESSION 4: INFRARED IN EUROPE I

22 April 2024 • 08:20 AM - 10:10 AM | National Harbor 2
*Session Chair(s):* **Linda Höglund**, IRnova AB (Sweden)

13046-801 • 08:20 AM - 08:30 AM
**Session Introduction on Infrared in Europe**
*Author(s):* **Linda Höglund,** IRnova AB (Sweden)

13046-14 • 08:30 AM - 09:00 AM
**HOT all the way from SWIR to VLWIR at AIM: Present status of MCT-based small pitch infrared detector arrays for higher operating temperatures and the shape of things to come** *(Invited Paper)*
*Author(s):* **Stefan Hanna**, **Holger Bitterlich**, **Rainer Breiter**, **Detlef Eich**, **Alexander Epping**, **Heinrich Figgemeier**, **Holger Lutz**, **Karl-Martin Mahlein**, **Manuel Ullrich, Alexander Sieck,** AIM INFRAROT-MODULE GmbH (Germany)

13046-15 • 09:00 AM - 09:20 AM
**Enhancement of quantum efficiency via tuning electric-field distribution for long-wavelength infrared InAs/GaSb type-II superlattice detectors**
*Author(s):* **Quankui K. Yang**, **Raphael Müller**, **Mark Wobrock**, **Wolfgang Luppold**, **Volker Daumer, Robert Rehm,** Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany)

13046-16 • 09:20 AM - 09:50 AM
**Compositional analysis of MBE-grown InAs/InAsSb T2SL for IR detector: towards a refined understanding of transport and optical properties** *(Invited Paper)*
*Author(s):* **Jean-Philippe Perez**, **Matthias Tornay**, **Richard Arinero**, **Philippe Christol,** Institut d'Électronique et des Systèmes (France); **Gilles Patrairche**, **Konstantinos Pantzas,** Ctr. de Nanosciences et de Nanotechnologies, CNRS (France), Univ. Paris-Saclay (France); **Nicolas Péré-Laperne,** Lynred (France)

13046-17 • 09:50 AM - 10:10 AM
**Latest development on Sub-10μm technologies at LYNRED**
*Author(s):* **Laurent Rubaldo**, **Nicolas Morisset**, **Alexandre Brunner**, **Cécile Grezes**, **Nicolas Péré-Laperne**, **Gulnar Dagher**, **Alexandra Blay**, **Alexandre Kerlain,** Lynred (France); **Clement Lobre**, **Olivier Gravrand,** CEA-LETI (France); **Pierre Jenouvrier, David Billon-Lanfrey,** Lynred (France)

**Coffee Break 10:10 AM - 10:40 AM**

## SESSION 5: INFRARED IN EUROPE II

22 April 2024 • 10:40 AM - 12:00 PM | National Harbor 2
*Session Chair(s):* **Linda Höglund**, IRnova AB (Sweden)

13046-18 • 10:40 AM - 11:10 AM
**Type-II superlattice HD detectors at IRnova for eSWIR and MWIR applications** *(Invited Paper)*
*Author(s):* **Linda Höglund**, **Marie Delmas**, **David Ramos**, **Ruslan Ivanov**, **Thierry Kohl**, **Laura Zurauskaite**, **Dean Evans**, **David Rihtnesberg**, **Linnea Bendrot**, **Sergiy Smuk**, **Anton Smuk**, **Smilja Becanovic**, **Susanne Almqvist**, **Pia Tinghag, Eric M. Costard,** IRnova AB (Sweden)

13046-19 • 11:10 AM - 11:40 AM
**Low photon detection using low-noise InAs and AlGaAsSb avalanche photodiodes** *(Invited Paper)*
*Author(s):* **Chee Hing Tan**, **Tarick Blain**, **Ye Cao**, **Jonathan Taylor-Mew**, **Jo Shien Ng**, **John David,** The Univ. of Sheffield (United Kingdom); **Benjamin White, Xiao Collins,** Phlux Technology Ltd (United Kingdom)

13046-20 • 11:40 AM - 12:00 PM
**Developments in MCT and T2SL technology for HOT applications at Leonardo UK**
*Author(s):* **Dominic Kwan,** Leonardo UK Ltd. (United Kingdom)

**Lunch Break 12:00 PM - 01:20 PM**

## SESSION 6: T2SL I

22 April 2024 • 01:20 PM - 02:50 PM | National Harbor 2
*Session Chair(s):* **Nansheng Tang**, L3Harris Technologies, Inc. (United States); **Binh-Minh Nguyen**, HRL Labs., LLC (United States)

13046-802 • 01:20 PM - 01:30 PM
**Session Introduction on T2SL**
*Author(s):* **Nansheng Tang,** L3Harris Technologies, Inc. (United States)

13046-21 • 01:30 PM - 02:00 PM
**Yield and performance limitations in cooled infrared detector materials** *(Invited Paper)*
*Author(s):* **Neil F. Baril**, **Tony Almeida**, **Dave Benson**, **Sumith V. Bandara**, **Randy N. Jacobs**, **Alex E. Brown**, **Andy Stoltz**, **Peter Smith, Ken Brogden,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States)

13046-22 • 02:00 PM - 02:30 PM
**Near bandgap absorption and carrier transport in InAs/InAsSb superlattice devices** *(Invited Paper)*
*Author(s):* **David R. Rhiger,** Raytheon Vision Systems (United States)

13046-23 • 02:30 PM - 02:50 PM
**Transport properties of minority carriers in mid- and long-wavelength InAs/InAsSb superlattice infrared detectors**
*Author(s):* **Alexander Soibel**, **David Z. Ting**, **Anita M. Fisher**, **Arezou Khoshakhlagh**, **Brian J. Pepper, Sarath D. Gunapala,** Jet Propulsion Lab. (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 7: T2SL II

22 April 2024 • 03:20 PM - 04:50 PM | National Harbor 2
*Session Chair(s):* **Binh-Minh Nguyen**, HRL Labs., LLC (United States); **Nansheng Tang**, L3Harris Technologies, Inc. (United States)

13046-24 • 03:20 PM - 03:50 PM
**Antimonide-based infrared detector research at HRL Laboratories** *(Invited Paper)*
*Author(s):* **Binh-Minh Nguyen,** HRL Labs., LLC (United States)

13046-25 • 03:50 PM - 04:10 PM
**Type II strained layer superlattice planar diode fabrication via thermal diffusion of zinc: an alternative architecture to unipolar barrier detectors**
*Author(s):* **Brent Webster**, **Joshua M. Duran, Gamini Ariyawansa,** Air Force Research Lab. (United States)

13046-26 • 04:10 PM - 04:30 PM
**HOT Type-II superlattice detectors at ASELSAN**
*Author(s):* **Neslihan Demirer, Göktug Agca,** ASELSAN A.S. (Turkey)

13046-27 • 04:30 PM - 04:50 PM
**Graphene diode-based type-II superlattice infrared photodetectors**
*Author(s):* **Shoichiro Fukushima**, **Masaaki Shimatani**, **Manabu Iwakawa, Shinpei Ogawa,** Mitsubishi Electric Corp. (Japan)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 8: KEYNOTE SESSION

23 April 2024 • 10:30 AM - 11:10 AM | National Harbor 2
*Session Chair(s):* **Gabor F. Fulop**, Maxtech International, Inc. (United States)

13046-1 • 10:30 AM - 11:10 AM
**The future of infrared efforts at DARPA** (Keynote Presentation)
*Author(s):* **Whitney Mason,** Defense Advanced Research Projects Agency (United States)

### SESSION 9: MCT

23 April 2024 • 11:10 AM - 11:50 AM | National Harbor 2
*Session Chair(s):* **Laurent Rubaldo**, Lynred (France)

13046-28 • 11:10 AM - 11:30 AM
**Latest developments of high-performance LW and VLWIR p/n MCT FPAs at DEFIR**
*Author(s):* **Olivier Gravrand**, **Clément Lobre,** CEA-LETI (France); **Cecile Grezes,** Lynred (France); **Titouan LeGoff,** CEA-LETI (France); **Diane Sam-Giao,** Lynred (France); **Florent Rochette**, **Nicolas Baier,** CEA-LETI (France); **Laurent Rubaldo,** Lynred (France)

13046-29 • 11:30 AM - 11:50 AM
**Low flux LW FPAs developments at LETI for science applications**
*Author(s):* **Titouan LeGoff,** CEA-LETI (France); **Christian C. K. Ketchazo,** CEA-IRFU (France); **Clément Lobre**, **Amaury Mavel,** CEA-LETI (France); **Thibault Pichon**, **Olivier Boulade**, **Benoit Horeau,** CEA-IRFU (France); **Olivier Gravrand,** CEA-LETI (France)

**Lunch/Exhibition Break 11:50 AM - 01:30 PM**

## PANEL DISCUSSION: INFRARED IN AUTOMOTIVE APPLICATIONS

23 April 2024 • 01:30 PM - 02:30 PM | National Harbor 2

Thermal imaging technology is poised to become widespread in advanced driver assistance systems (ADAS) for pedestrian detection and as part of the sensor stack, along with visible cameras, lidar, radar and other sensors, for future autonomous vehicles.

Moderator:
**Andrew Hood**, Attollo Engineering, LLC (United States)

Panelists:
**David Cheskis**, TriEye Ltd. (Israel)
**John Hong**, Obsidian Sensors, Inc. (United States)
**Stuart Klapper**, Magna International Inc.
**Ethan Klem**, SWIR Vision Systems (United States)
**Fushuai Liu**, IRay/Raytron Technology Co., Ltd. (China)
**Jeffrey Shay**, VALEO North America Inc. (United States)
**Sebastien Tinnes**, Lynred (France)
**Mike Walters**, Teledyne FLIR LLC (United States)

### Coffee Break 02:30 PM - 02:50 PM

## SESSION 10: UNCOOLED

23 April 2024 • 02:50 PM - 04:10 PM | National Harbor 2
*Session Chair(s):* **Tony J. Ragucci**, Leonardo DRS (United States)

13046-31 • 02:50 PM - 03:10 PM
**Fabrication and characterization of bolometer type uncooled IRFPAs using semi-conducting SWCNT networks in VGA formats**
*Author(s):* **Ryota Yuge**, **Tomo Tanaka**, **Masahiko Sano**, **Masataka Noguchi**, **Takashi Miyazaki,** NEC Corp. (Japan); **Megumi Kanaori,** National Institute of Advanced Industrial Science and Technology (Japan); **Toshie Miyamoto, Naoki Oda,** NEC Corp. (Japan)

13046-32 • 03:10 PM - 03:30 PM
**Automatic Emergency Braking: How can affordable thermal camera improve reliability and extend use cases to nighttime conditions**

*Author(s):* **Sebastien Tinnes**, **Quentin Noir**, **Guillaume Delubac, Jessy Matias,** Lynred (France)

13046-74 • 03:30 PM - 03:50 PM
**FDSOI transistor-based uncooled microbolometer: demonstration of a 12μm pixel sensitive to IR flux**
*Author(s):* **Antoine Albouy,** CEA-LETI, Univ. Grenoble Alpes (France); **Geoffroy Dumont**, **Mélanie Le Cocq**, **Claire Vialle**, **Romain M.R. Kubica**, **Laurent Carle**, **Valérie Goudon**, **Thomas Perrillat-Bottonet**, **Jean-Jacques Yon, Patrick Leduc,** CEA-LETI (France)

13046-33 • 03:50 PM - 04:10 PM
**Latest Developments of uncooled IRFPA technology at Raytron**
*Author(s):* **Fushuai Liu,** Raytron Technology Co., Ltd. (China); **Shan Dong,** Yantai Raytron Technology Co., Ltd. (China); **Wenli Chen,** Raytron Technology Co. Ltd. (China)

### Break 04:10 PM - 04:20 PM

## SESSION 11: SMALL PIXEL PITCH

23 April 2024 • 04:20 PM - 06:10 PM | National Harbor 2
*Session Chair(s):* **Eric M. Costard**, IRnova AB (Sweden); **Andrew D. Hood**, Attollo Engineering, LLC (United States)

13046-34 • 04:20 PM - 04:50 PM
**Advances in small-pitch ultra-high-definition cameras** *(Invited Paper)*
*Author(s):* **John T. Caulfield**, **Jon Paul Curzan**, **Bob Piatek**, **Dave Schmitz,** Cyan Systems, Inc. (United States); **Sevag Terterian, Hasan Sharifi,** HRL Labs., LLC (United States)

13046-35 • 04:50 PM - 05:10 PM
**Low SWaP high definition MWIR detector with 5μm pitch**
*Author(s):* **Avi Magid**, **Lior Shkedy**, **Nimrod Ben Ari**, **Niv Shiloah**, **Claudio G. Jakobson**, **Willie Freiman**, **Eran Armon**, **Ehud Almog**, **Sivan Srur Nawi**, **Boris Berenshtein**, **Nati Ashush**, **Gal Tzvieli**, **Menashe Alcheck,** SCD SemiConductor Devices (Israel); **Josh Lazarus,** SCD Semi Conductor Devices (Israel); **Ori Magril,** SCD SemiConductor Devices (Israel); **Or Dicker**, **Benny Milgrom,** Israel Ministry of Defense (Israel); **Tuvy Markovitz,** SCD SemiConductor Devices (Israel)

13046-36 • 05:10 PM - 05:30 PM
**Condor HD: Towards an optimised 12µm pixel MWIR-LWIR dual waveband structure using MOVPE grown CMT**
*Author(s):* **Adam Greenen**, **Sudesh K. Bains**, **Les G. Hipwood**, **Andrew Reed**, **Chris D. Maxey, Marcus Lee,** Leonardo UK Ltd. (United Kingdom)

13046-37 • 05:30 PM - 05:50 PM
**III-V technology developments addressing a high operating temperature at LYNRED**
*Author(s):* **Nicolas Péré-Laperne**, **Alexandre Brunner**, **Gulnar Dagher**, **Jérôme Coussement,** Lynred (France); **Axel Evirgen**, **Jean-Luc Reverchon**, **Bouzid Simozrag**, **Michel Garcia**, **Bruno P. Gérard,** III-V Lab. (France); **Cyril Cervera**, **Olivier Gravrand,** CEA-LETI (France); **Anaïs Saintoyant, Nicolas Morisset,** Lynred (France)

13046-38 • 05:50 PM - 06:10 PM
**Advancing QWIP toward HD thermal and polarimetric imaging in LWIR**
*Author(s):* **Ruslan Ivanov**, **Dennis Visser**, **Linda Höglund**, **Sergiy Smuk**, **Sara Högnadottir**, **Linnea Bendrot**, **Thierry Kohl**, **Laura Zurauskaite**, **Dean Evans**, **David Rihtnesberg**, **Dilara Buldu**, **Anton Smuk**, **Susanne Sehlin**, **Susanne Almqvist**, **Maria Englund**, **Pia Tinghag, Eric M. Costard,** IRnova AB (Sweden)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13046-65 • 06:00 PM - 07:30 PM
**Hybrid black phosphorus-plasmonic nanograting for high-performance infrared sensing**
*Author(s):* **Shinpei Ogawa**, **Masaaki Shimatani**, **Shoichiro Fukushima, Manabu Iwakawa,** Mitsubishi Electric Corp. (Japan)

13046-66 • 06:00 PM - 07:30 PM
**Enhancing responsivity in silicon-based photodetectors for mid-infrared sensing**
*Author(s):* **Ching-Fuh Lin**, **Du-Ting Cheng, Po-Hsien Chiang,** National Taiwan Univ. (Taiwan)

13046-67 • 06:00 PM - 07:30 PM
**Metalens for 80 × 60 SOI diode uncooled IRFPA**
*Author(s):* **Misaki Hanaoka**, **Shinpei Ogawa**, **Manabu Iwakawa**, **Shoichiro Fukushima, Shimatani Masaaki,** Mitsubishi Electric Corp. (Japan)

13046-68 • 06:00 PM - 07:30 PM
**Advances in liquid crystal beam steering and modulation in the infrared**
*Author(s):* **Christopher L. Hoy,** Meadowlark Optics (United States)

13046-69 • 06:00 PM - 07:30 PM
**InGaAs/GaAsSb type-II quantum well photodetectors with a barrier layer for reducing dark current**
*Author(s):* **Tomo Tanaka,** NEC Corp. (Japan), National Institute of Advanced Industrial Science and Technology (Japan); **Shin-ichiro Gozu,** National Institute of Advanced Industrial Science and Technology (Japan); **Masahiko Sano,** NEC Corp. (Japan); **Megumi Kanaori,** National Institute of Advanced Industrial Science and Technology (Japan); **Taizo Shibuya**, **Yuichi Igarashi,** NEC Corp. (Japan), National Institute of Advanced Industrial Science and Technology (Japan); **Naoki Oda,** NEC Corp. (Japan); **Ryota Yuge,** NEC Corp. (Japan), National Institute of Advanced Industrial Science and Technology (Japan)

13046-70 • 06:00 PM - 07:30 PM
**Interfacial layer engineering for graphene/InSb heterojunction-based high-performance mid-infrared photodiodes using photogating**
*Author(s):* **Masaaki Shimatani**, **Shoichiro Fukushima**, **Manabu Iwakawa, Shinpei Ogawa,** Mitsubishi Electric Corp. (Japan)

13046-71 • 06:00 PM - 07:30 PM
**Detection technology for photon energy below the Schottky barrier**
*Author(s):* **Yao-Hang Dong**, **Zih-Chun Su**, **Po-Hsien Chiang, Ching-Fuh Lin,** National Taiwan Univ. (Taiwan)

13046-73 • 06:00 PM - 07:30 PM
**Radiation test result of T2SL device for space application**
*Author(s):* **Young-Ho Kim,** i3system, Inc. (Korea, Republic of); **Young Tak Roh,** i3system (Korea, Republic of); **Sang Soon Yong,** Korea Aerospace Research Institute (Korea, Republic of); **Han Jung,** i3system, Inc. (Korea, Republic of)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 12: BJØRN ANDRESEN MEMORIAL SESSION

24 April 2024 • 10:30 AM - 11:30 AM | National Harbor 2
*Session Chair(s):* **Gabor F. Fulop**, Maxtech International, Inc. (United States); **Dario Cabib**, CI Systems (Israel) Ltd. (Israel)

13046-803 • 10:30 AM - 10:50 AM
**Session Introduction on Bjorn Andresen Memorial Session**
*Author(s):* **Gabor F. Fulop,** Maxtech International, Inc. (United States)

13046-39 • 10:50 AM - 11:10 AM
**Modular system for testing the spectral response and spectral MTF of sensors in the VIS/NIR and MID/FAR IR**
*Author(s):* **Dario Cabib, Moshe Elkabets,** CI Systems (Israel) Ltd. (Israel)

13046-41 • 11:10 AM - 11:30 AM
**Polarimetric thermal technology in defense and public safety applications: a transformative shift from the conventional thermal market**
*Author(s):* **Arik Nir,** Frenel Imaging, Ltd. (Israel)

**Lunch/Exhibition Break 11:30 AM - 01:20 PM**

### SESSION 13: ARTIFICIAL INTELLIGENCE AND DEEP LEARNING: JOINT SESSION WITH CONFERENCES 13039 AND 13046

24 April 2024 • 01:20 PM - 03:20 PM | National Harbor 2
*Session Chair(s):* **Michael T. Eismann**, Air Force Research Lab. (United States); **Kenny Chen**, Lockheed Martin Missiles and Fire Control (United States)

13039-27 • 01:20 PM - 01:40 PM
**Object detection for infrared ground to ground applications on the edge**
*Author(s):* **Joseph A. Rivera,** Lockheed Martin Corp. (United States); **Abhijit Bhattacharjee**, **Birju Patel, Alexander Taylor,** The MathWorks, Inc. (United States)

13046-42 • 01:40 PM - 02:00 PM
**Zero-shot object detection for infrared images using pre-trained vision and language models**
*Author(s):* **Shotaro Miwa**, **Shun Otsubo**, **Jia Qu, Yasuaki Susumu,** Mitsubishi Electric Corp. (Japan)

13046-43 • 02:00 PM - 02:20 PM
**Deployment of advanced computational infrared imaging and automatic target recognition software on new high-power mobile processors that achieve new levels of SWAP optimized performance**
*Author(s):* **Art Stout,** Teledyne FLIR LLC (United States)

13039-28 • 02:20 PM - 02:40 PM
**Investigations into out-of-domain performance of a two-step ATR based on a fusion of thermal and environmental data**
*Author(s):* **Sophia P. Bragdon**, **Vuong H. Truong**, **Jay L. Clausen**, **Andrew C Trautz, Matthew D Bray,** U.S. Army Engineer Research and Development Ctr. (United States)

13039-29 • 02:40 PM - 03:00 PM
**Infrared collects of scale models for automatic target recognition assessment**
*Author(s):* **Jacob Ross**, **Rajith Weerasinghe**, **Ryan J. Shaver**, **Justin Lastrapes,** Etegent Technologies, Ltd. (United States); **Paul Sotirelis,** Air Force Research Lab. (United States)

13046-45 • 03:00 PM - 03:20 PM
**Geolocalization from multiband image matching to simulated scenery based on digital elevation data**
*Author(s):* **Jeremy W. Mares**, **Mark Martino**, **Alex R. Irwin, Christopher K. Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 14: SENSORS TECHNOLOGIES

24 April 2024 • 03:50 PM - 04:50 PM | National Harbor 2
*Session Chair(s):* **Masafumi Kimata**

13046-46 • 03:50 PM - 04:10 PM
**High-performance VLWIR MBE HgCdTe photoconductive detectors**
*Author(s):* **Henry Yuan**, **Kelly Bartholomew**, **Devon Myers**, **Carl Meyer**, **Angela Russell**, **Joyce Laquindanum**, **Ravi K. Guntupalli,** Teledyne Judson Technologies (United States); **Christopher Chen**, **Bill Conroy**, **Borzoyeh Shojaei, Aristo Yulius,** Teledyne Imaging Sensors (United States)

13046-47 • 04:10 PM - 04:30 PM
**MESA etch and surface passivation for InAs photodetectors: optical, electrical performance, and stability improvement**
*Author(s):* **Vicky Zhang**, **Jongwoo Kim**, **Henry Yuan**, **John Clark**, **Mike R. Meixell**, **Carl Meyer**, **Witold Czelen**, **Eli Sullivan**, **Gary Apgar, Joyce Laquindanum,** Teledyne Judson Technologies (United States)

13046-75 • 04:30 PM - 04:50 PM
**Infrared Focal Plane Arrays Based on Two-Dimensional Materials: Possibilities and Challenges**
*Author(s):* **Arash Dehzangi,** Northwestern Univ. (United States), Defense Advanced Research Projects Agency (United States), ECS Federal, LLC (United States); **Hooman Mohseni,** Northwestern Univ. (United States)

# Thursday 25 April 2024

## SESSION 15: ROIC

25 April 2024 • 08:50 AM - 09:50 AM | National Harbor 2
*Session Chair(s):* **Arjun Kar-Roy**, Tower Semiconductor USA Inc. (United States)

13046-51 • 08:50 AM - 09:10 AM
**65nm ROIC platform for next-generation infrared commercial and defense applications**
*Author(s):* **David Howard**, **Arjun KarRoy, Michael Scott,** Tower Semiconductor Ltd. (United States)

13046-52 • 09:10 AM - 09:30 AM
**Low-noise high-sensitivity digital readout integrated circuit for SWIR imaging**
*Author(s):* **Thomas Poonnen**, **Kendall Esparza**, **Sean McCotter**, **Brian Ratledge**, **William Z. Korth**, **Nishant Dhawan, Kenton T. Veeder,** Senseeker Engineering Inc. (United States)

13046-53 • 09:30 AM - 09:50 AM
**Swarm intelligent readout integrated circuit pixel array for advanced infrared search and track**
*Author(s):* **Thomas Poonnen, William Z. Korth,** Senseeker Engineering Inc. (United States)

**Coffee Break 09:50 AM - 10:20 AM**

## PANEL DISCUSSION: CRYOGENIC TECHNOLOGIES

25 April 2024 • 10:20 AM - 11:30 AM | National Harbor 2

View Full Details: spie.org/dcs/cryogenic-panel

Join this panel comprising top-level users and customers of cryogenic technology. The objective is to provide users with a platform to express their wish-lists, forecasts, and future needs.

Moderator:
**Eric Costard**, CTO, IRnova AB (Sweden)

Panelists:
**Rob Wilson**, Head of Research and Development, Leonardo Electronics (United Kingdom)
**Chris Alicandro**, Senior Director of Sales, Teledyne FLIR-Components (United States)
**Ed Huang**, Sr. Director Cooled Products and Programs, Attollo Engineering, LLC (United States)
**David Billon-Lanfrey**, Strategy Director, Lynred (France)
**Holger Lutz**, Head of System Design, AIM Infrarot Module (Germany)
**An-Jong Kang**, Director of Cooled Detector Division, i3system, Inc. (Korea, Republic of)
**Oğuz Altun**, Director, ASELSAN A.S. (Turkey)
**Carl S. Kirkconnell**, President, West Coast Solutions (United States)

**Lunch/Exhibition Break 11:30 AM - 01:00 PM**

## SESSION 16: CRYOCOOLERS I

25 April 2024 • 01:00 PM - 03:00 PM | National Harbor 2
*Session Chair(s):* **Alexander Veprik**, Cryo Tech Ltd. (Israel); **Christophe Vasse**, Thales LAS France SAS (France)

13046-54 • 01:00 PM - 01:20 PM
**Reduction of vibrations in miniature Stirling cryocoolers**
*Author(s):* **Aljaz Osterman, Klemen Dovrtel,** Le-Tehnika d.o.o. (Slovenia)

13046-55 • 01:20 PM - 01:40 PM
**Joule Thomson coolers for HOT IR detectors**
*Author(s):* **Franc Megušar, Marko Cuderman,** Le-Tehnika d.o.o. (Slovenia)

13046-56 • 01:40 PM - 02:00 PM
**HALT process for Thales rotary cooler reliability release**
*Author(s):* **Christophe Vasse**, **Simon-Didier Venzal**, **Sylvain Lassalle, Emilien Durupt,** Thales LAS France SAS (France)

13046-57 • 02:00 PM - 02:20 PM
**Effective end of lifetime prediction of rotary Stirling coolers based on ultrasonic structure born sound analysis**
*Author(s):* **Martin Hübner**, **Oliver Tscherwitschke**, **Roland Hanslick,** HENSOLDT Optronics GmbH (Germany); **Ori Sela**, **Avishai Filis, Lavenda Sigal,** RICOR Cryogenic & Vacuum Systems (Israel)

13046-58 • 02:20 PM - 02:40 PM
**Low SWAP cryocoolers for HOT MWIR and attritable applications**
*Author(s):* **Andreas Fiedler**, **Vince Loung**, **Michael Costolo**, **Edward Huang, Michael H. MacDougal,** Attollo Engineering, LLC (United States)

13046-63 • 02:40 PM - 03:00 PM
**Thermal vacuum testing of the compact cryocooler control electronics (C3E) with the Lockheed Martin microcryocooler**
*Author(s):* **Carl S. Kirkconnell**, **Robert C. Hon**, **Cassie K. Smith**, **Leon Huynh**, **Jason M. Baxter,** West Coast Solutions (United States); **Richard W. Kaszeta,** Creare, LLC (United States); **Jeffrey R. Olson,** Lockheed Martin Space Systems Co. (United States); **James Gregoire,** Creare (United States); **Eric Roth,** Lockheed Martin Space Systems Co. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 17: CRYOCOOLERS II

25 April 2024 • 03:30 PM - 05:20 PM | National Harbor 2
*Session Chair(s):* **Andreas Fiedler**, Attollo Engineering, LLC (United States); **Alexander Veprik**, Cryo Tech Ltd. (Israel)

13046-59 • 03:30 PM - 04:00 PM
**Low-vibration cryocooler for low SWAP infrared imaging** *(Invited Paper)*
*Author(s):* **Alexander Veprik,** Cryo Tech Ltd. (Israel); **Vladimir I. Babitsky,** Loughborough Univ. (United Kingdom); **Samuel Kurucz**, **Rami Refaeli, Leonid Bunin,** Cryo Tech Ltd. (Israel)

13046-64 • 04:00 PM - 04:20 PM
**Development of miniature spaceflight cryocooler electronics with advanced performance and reliability**
*Author(s):* **Carl S. Kirkconnell**, **Robert C. Hon**, **Cassie K. Smith**, **Jason M. Baxter,** West Coast Solutions (United States); **Matthew C. Okabue**, **Michael B. Petach,** Northrop Grumman Corp. (United States); **Wyatt J Jackson**, **Nico G Italia,** West Coast Solutions (United States); **Richard W Kaszeta,** Creare LLC (United States), Creare LLC (United States); **James F Gregoire,** Creare LLC (United States)

13046-60 • 04:20 PM - 04:40 PM
**Pulse-tube cryocooler for integrated detector dewar cooler assembly**
*Author(s):* **Roel Arts**, **Daniel Willems**, **Jeroen C. Mullié**, **Stephan Olmanst**, **Garmt de Jonge, Jimmy Wade,** Thales Cryogenics B.V. (Netherlands)

13046-61 • 04:40 PM - 05:00 PM
**Cryocooler MTTF prediction for high operating temperature (HOT) T2SL detector**
*Author(s):* **James Zhan,** KT Photonics Inc. (Canada)

13046-62 • 05:00 PM - 05:20 PM
**SX035 linear cooler: application for harsh environments**
*Author(s):* **Ingo N. Rühlich**, **Carsten Rosenhagen**, **Markus Mai**, **Marcel Nussberger**, **Andreas Withopf, Johannes Rapp,** AIM INFRAROT-MODULE GmbH (Germany)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13046-72
**Exploring the horizons of graphene-infrared research: a bibliometric exploration**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13047

CONFERENCE CO-SPONSOR

TORNGATS

# Thermosense: Thermal Infrared Applications XLVI

**22 - 25 April 2024 | Chesapeake 6**

***Conference Chair(s):*** **Fernando López,** TORNGATS (Canada)

***Conference Co-Chair(s):*** **Nicolas P. Avdelidis,** Cranfield Univ. (United Kingdom); **Giovanni Ferrarini,** Istituto per le Tecnologie della Costruzione (Italy)

***Program Committee:*** **Paolo Bison,** Consiglio Nazionale delle Ricerche (Italy); **Michael C. Borish,** Oak Ridge National Lab. (United States); **Douglas Burleigh,** La Jolla Cove Consulting (United States); **L. Terry Clausing,** Drysdale and Associates, Inc. (United States); **Fred P. Colbert,** Colbert Infrared Services, Inc. (United States); **Jaap de Vries,** FM Global (United States); **Sheng-Jen Hsieh,** Texas A&M Univ. (United States); **Timo T. Kauppinen,** Arctic Construction Cluster Finland (Finland); **Dennis H. LeMieux,** Siemens Power Generation, Inc. (United States); **Monica Lopez Saenz,** IRCAM GmbH (Germany); **Xavier P. V. Maldague,** Univ. Laval (Canada); **Arantza Mendioroz,** Univ. of the Basque Country (Spain); **Junko Morikawa,** Tokyo Institute of Technology (Japan); **Gary L. Orlove,** Thermal Imaging Consultant (United States); **Beate Oswald-Tranta,** Montan Univ. Leoben (Austria); **G. Raymond Peacock,** Consultant (United States); **Ralph A. Rotolante,** Vicon Infrared (United States); **Andrés Esteban Rozlosnik,** SI Termografía Infrarroja (Argentina); **Morteza Safai,** The Boeing Co. (United States); **Takahide Sakagami,** Kobe Univ. (Japan); **Steven M. Shepard,** Thermal Wave Imaging, Inc. (United States); **Sami Siikanen,** VTT Technical Research Ctr. of Finland Ltd. (Finland); **Peter Spaeth,** NASA Langley Research Ctr. (United States); **Gregory R. Stockton,** Stockton Infrared Thermographic Services, Inc. (United States); **Gary E. Strahan,** Infrared Cameras, Inc. (United States); **Vladimir P. Vavilov,** National Research Tomsk Polytechnic Univ. (Russian Federation); **Catherine R. Ward,** General Atomics Aeronautical Systems, Inc. (United States); **Joseph N. Zalameda,** NASA Langley Research Ctr. (United States)

## INFORMATION

The chairs and committee will recognize one outstanding young researcher with a best student paper award for this conference. The award is open to any first author student presenting an oral presentation at SPIE Thermosense. A certificate and $500 monetary award will be granted to the student winner. See the Awards page for full details.

## Monday 22 April 2024

### THERMOSENSE VENDOR SESSION XX

22 April 2024 • 01:00 PM - 04:30 PM | Chesapeake 6

View Full Details: spie.org/dcs/thermosense-vendor-session

The Thermosense Vendor Session provides an early opportunity for exhibitors to highlight their latest technologies and newest products to the infrared industry and the SPIE Defense + Commercial Sensing technical audience prior to the opening of the exhibition.

13047-701 • 01:00 PM - 01:15 PM
**Infrared innovations: cutting-edge developments in scientific thermal imaging from Telops**
*Author(s):* **Vince Morton,** Telops Inc. (United States)

13047-702 • 01:15 PM - 01:30 PM
**Zooming into the future - G&H | Stingray's stellar spectacles: FireAnt SWIR Zoom and Apollo VNIR Space lenses**
*Author(s):* **Evan McCutcheon,** G&H | Stingray (United States)

13047-703 • 01:30 PM - 01:45 PM
**SWIR Vision Systems: Acuros(R) 6-6MP SWIR camera**
*Author(s):* **Samuel J. Wyman,** SWIR Vision Systems (United States)

13047-704 • 01:45 PM - 02:00 PM
**Advancements in space optics: Novel approaches to spectrally complex optics**
*Author(s):* **Timothy Olsen,** Spectral Systems, LLC (United States)

13047-705 • 02:00 PM - 02:15 PM
**The OPAL test bench family: from ultra-compact to versatile visible to thermal collimators**
*Author(s):* **Arnaud Louboutin,** HGH Systèmes Infrarouges (France)

13047-706 • 02:15 PM - 02:30 PM
**New T2SL(SLS) infrared detectors from IRnova**
*Author(s):* **Eric M. Costard,** IRnova AB (Sweden)

Coffee Break • 02:30 PM - 03:15 PM

13047-707 • 03:15 PM - 03:30 PM
**Thales Cryogenics updates for 2024**
*Author(s):* **Kevin Giesen,** Thales Cryogenics B.V. (Netherlands)

13047-708 • 03:30 PM - 03:45 PM
**Optical filters and coatings for IR applications**
*Author(s):* **Chris Karp,** Chroma Technology Corp. (United States)

13047-709 • 03:45 PM - 04:00 PM
**Advances in infrared sensor capabilities**
*Author(s):* **Mark Fydenkevez,** Quantum Imaging, Inc. (United States)

13047-710 • 04:00 PM - 04:15 PM
**Recent developments in the field of cryogenic coolers for IR detectors**
*Author(s):* **Victor Segal,** RICOR Cryogenic & Vacuum Systems (Israel)

13047-711 • 04:15 PM - 04:30 PM
**Drone tracking with SWIR and MWIR cameras**
*Author(s):* **Devin Standard,** RP Optical USA (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:50 AM**

### WELCOME AND OPENING REMARKS

23 April 2024 • 10:50 AM - 11:00 AM | Chesapeake 6
**Fernando López**, TORNGATS (Canada)

### SESSION 1: ARTIFICIAL INTELLIGENCE AND NDE4.0 IN IRT I

23 April 2024 • 11:00 AM - 12:00 PM | Chesapeake 6
*Session Chair(s):* **Fernando López**, TORNGATS (Canada); **Arantza Mendioroz**, Univ. del País Vasco (Spain)

13047-38 • 11:00 AM - 11:20 AM
**Effect of lock-in thermography test parameters on classifying defects in CFRP by means of a convolutive neural network**
*Author(s):* **Tiziana Matarrese,** Politecnico di Bari (Italy); **Roberto Marani,** Consiglio Nazionale delle Ricerche (Italy); **Davide Palumbo,** Politecnico di Bari (Italy); **Tiziana D'Orazio,** Consiglio Nazionale delle Ricerche (Italy); **Umberto Galietti,** Politecnico di Bari (Italy)

13047-3 • 11:20 AM - 11:40 AM
**Synthetic visible-IR images pairs generation for multi-spectral NDT using flying spot thermography and deep learning**
*Author(s):* **Kevin Helvig**, **Pauline Trouvé-Peloux**, **Ludovic Gaverina**, **Jean-Michel Roche, Baptiste Abeloos,** ONERA (France)

13047-4 • 11:40 AM - 12:00 PM
**A few-shot learning approach for the segmentation of subsurface defects in thermography images of concrete structures**
*Author(s):* **Sandra Pozzer**, **Gabriel Ramos,** Univ. Laval (Canada); **Ehsan Rezazadeh Azar,** Toronto Metropolitan Univ. (Canada); **Ahmad Osman,** Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren IZFP (Germany); **Ahmed El Refai,** Univ. Laval (Canada); **Fernando López,** TORNGATS (Canada); **Clemente Ibarra-Castanedo, Xavier P. V. Maldague,** Univ. Laval (Canada)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

### SESSION 2: ARTIFICIAL INTELLIGENCE AND NDE4.0 IN IRT II

23 April 2024 • 01:30 PM - 02:30 PM | Chesapeake 6
*Session Chair(s):* **Arantza Mendioroz**, Univ. del País Vasco (Spain); **Fernando López**, TORNGATS (Canada)

13047-6 • 01:30 PM - 01:50 PM
**Surface moisture detection using thermal imaging and computer vision**
*Author(s):* **Raveen Appuhamy**, **Yuandi Wu**, **Faraz Alderson, Stephen A. Gadsden,** McMaster Univ. (Canada)

13047-7 • 01:50 PM - 02:10 PM
**Bond line thickness estimation in composite structures using multiple inspection techniques**
*Author(s):* **Peter W. Spaeth**, **William C. Schneck**, **Matthew R. Webster, Joseph N. Zalameda,** NASA Langley Research Ctr. (United States)

13047-39 • 02:10 PM - 02:30 PM
**A comparison of different modulation strategies for inspecting of masonry wall via active thermography**
*Author(s):* **Rocco Zito**, **Stefano Laureti,** Univ. della Calabria (Italy); **Giovanni Ferrarini,** Istituto per le Tecnologie della Costruzione (Italy); **Paolo Bison,** Consiglio Nazionale delle Ricerche (Italy); **Marco Ricci,** Univ. della Calabria (Italy)

## SESSION 3: DRONE AND AIRBORNE THERMOGRAPHY: ROBOTICS

23 April 2024 • 02:30 PM - 03:10 PM | Chesapeake 6
*Session Chair(s):* **Nicolas P. Avdelidis**, Cranfield Univ. (United Kingdom); **Michael C. Borish**, Oak Ridge National Lab. (United States)

13047-8 • 02:30 PM - 02:50 PM
**Advances in airborne thermal and hyperspectral imaging of built environment**
*Author(s):* **Timo T. Kauppinen,** Arctic Construction Cluster Finland (Finland); **Sami Siikanen**, **Marko Savolainen,** VTT Technical Research Ctr. of Finland Ltd. (Finland); **Petri Nygren,** SNAPS Oy (Finland); **Marko Paavola,** VTT Technical Research Ctr. of Finland Ltd. (Finland)

13047-9 • 02:50 PM - 03:10 PM
**Heat-source selection for drone-based active-infrared thermography**
*Author(s):* **Marc Genest**, **Shashank Pant**, **Dmitrii Klishch,** National Research Council Canada (Canada); **Clemente Ibarra-Castanedo**, **Xavier P. V. Maldague,** Univ. Laval (Canada); **Argyrios Zolotas, Nicolas P. Avdelidis,** Cranfield Univ. (United Kingdom)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 4: HYPERSPECTRAL AND MULTISPECTRAL IMAGERY

23 April 2024 • 03:40 PM - 04:40 PM | Chesapeake 6
*Session Chair(s):* **Beate Oswald-Tranta**, Montan Univ. Leoben (Austria); **Xavier P.V. Maldague**, Univ. Laval (Canada)

13047-10 • 03:40 PM - 04:00 PM
**Plastic identification using hyperspectral thermal imager and principal component analysis**
*Author(s):* **Mads N. Larsen,** Univ. of Southern Denmark (Denmark), Newtec Engineering A/S (Denmark); **Anders L. Jørgensen,** Newtec Engineering A/S (Denmark); **Martin L. Henriksen,** Aarhus Univ. (Denmark); **Victor Petrunin,** Newtec Engineering A/S (Denmark); **Jakob Kjelstrup-Hansen,** Univ. of Southern Denmark (Denmark); **Bjarke Jørgensen,** Newtec Engineering A/S (Denmark); **Mogens Hinge,** Aarhus Univ. (Denmark)

13047-11 • 04:00 PM - 04:20 PM
**Multispectral and hyperspectral infrared imaging for plastic waste sorting and recycling**
*Author(s):* **Jonathan Zheng**, **Vinod Kumar**, **Andrew Ngo,** A*STAR Institute of Materials Research and Engineering (Singapore); **Ngai-Man Cheung,** Singapore Univ. of Technology and Design (Singapore); **Carlos Manzano,** A*STAR Institute of Materials Research and Engineering (Singapore); **Somayya Ebrahimkhani**, **Vo Van Tuan**, **Le Hoang Anh,** Singapore Univ. of Technology and Design (Singapore); **Sreedhar Unnikrishnakurup,** A*STAR Institute of Materials Research and Engineering (Singapore)

13047-12 • 04:20 PM - 04:40 PM
**High-speed infrared thermography of Li-ion battery explosion dynamics**
*Author(s):* **Joseph Carrock**, **Antoine Dumont**, **Mark Norman, Alex Côté,** Telops Inc. (Canada)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13047-33 • 06:00 PM - 07:30 PM
**Active thermography non-destructive inspection of a damaged artwork with a complex shape**
*Author(s):* **Masashi Ishikawa,** Tokushima Univ. (Japan); **Stefano Sfarra,** Univ. degli Studi dell'Aquila (Italy); **Panagiotis Theodorakeas,** National Technical Univ. of Athens (Greece)

13047-35 • 06:00 PM - 07:30 PM
**Non-destructive evaluation of 3D-printed fibre-reinforced composite materials mechanical behaviour**
*Author(s):* **Rosanna Forster**, **Antonio Feteira**, **Dimitra Soulioti,** Sheffield Hallam Univ. (United Kingdom); **Sotirios A. Grammatikos,** Norwegian Univ. of Science and Technology (Norway); **Yvonne Walsh, Evangelos Kordatos,** Sheffield Hallam Univ. (United Kingdom)

13047-36 • 06:00 PM - 07:30 PM
**Semantic segmentation of defects in infrastructures through multi-modal images**
*Author(s):* **Sara Shahsavarani,** Univ. Laval (Canada); **Fernando López,** TORNGATS (Canada); **Clemente Ibarra-Castanedo, Xavier P. V. Maldague,** Univ. Laval (Canada)

13047-37 • 06:00 PM - 07:30 PM
**Attention mechanism for computational thermography**
*Author(s):* **Bardia Yousefi,** Univ. of Maryland, College Park (United States); **Xavier P. V. Maldague,** Univ. Laval (Canada)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### OPENING REMARKS: WEDNESDAY

24 April 2024 • 10:30 AM - 10:40 AM | Chesapeake 6
**Nicolas P. Avdelidis**, Cranfield Univ. (United Kingdom)

### SESSION 5: IR NDT APPLICATIONS I

24 April 2024 • 10:40 AM - 12:40 PM | Chesapeake 6
*Session Chair(s):* **Nicolas P. Avdelidis**, Cranfield Univ. (United Kingdom); **Giovanni Ferrarini**, Istituto per le Tecnologie della Costruzione (Italy)

13047-14 • 10:40 AM - 11:00 AM
**Enhancing fault characterization in composites using infrared thermography: a bee-colony optimization approach with self-organizing maps**
*Author(s):* **Bruno P. Barella**, **Renan Garcia,** Univ. Federal de Uberlândia (Brazil); **Nicolas P. Avdelidis,** Cranfield Univ. (United Kingdom); **Henrique C. Fernandes,** Univ. Federal de Uberlândia (Brazil), Cranfield Univ. (United Kingdom)

13047-15 • 11:00 AM - 11:20 AM
**Inspection of short surface cracks by inductive thermography and by computer tomography**
*Author(s):* **Beate Oswald-Tranta**, **Alexander Hackl,** Montan Univ. Leoben (Austria); **Eider Gorostegui-Colinas**, **Ander Muniategui,** Lortek S.Coop. (Spain); **Philipp Westphal,** GKN Aerospace (Sweden)

13047-16 • 11:20 AM - 11:40 AM
**Crack characterisation in manganese steel using a μ-bolometer camera and an air-cooled inductor**
*Author(s):* **Christoph Tuschl**, **Beate Oswald-Tranta,** Montan Univ. Leoben (Austria); **Peter Dornig,** ÖBB-Infrastruktur AG (Austria); **David Künstner,** voestalpine Rail Technology GmbH (Austria); **Melanie Pötz,** voestalpine Railway Systems GmbH (Austria); **Sven Eck,** Materials Ctr. Leoben Forschung GmbH (Austria)

13047-17 • 11:40 AM - 12:00 PM
**Preliminary procedure for the assessment of probeless friction spot stir welds (P-FSSW) in dissimilar aluminum alloys by long pulsed laser thermography**
*Author(s):* **Giuseppe Dell'Avvocato,** Univ. degli Studi dell'Aquila (Italy); **Anna Castellano**, **Mariia Rashkovets**, **Davide Palumbo**, **Nicola Contuzzi**, **Giuseppe Casalino, Umberto Galietti,** Politecnico di Bari (Italy)

13047-18 • 12:00 PM - 12:20 PM
**Non-destructive crack evaluation with line-scan laser thermography: a finite element preliminary study**
*Author(s):* **Giuseppe Masciopinto,** Politecnico di Bari (Italy); **Giuseppe Dell'Avvocato,** Univ. degli Studi dell'Aquila (Italy); **Ester D'Accardi**, **Davide Palumbo, Umberto Galietti,** Politecnico di Bari (Italy)

13047-25 • 12:20 PM - 12:40 PM
**Estimating thermal properties of coatings by using multi-frequency lock-in thermography**
*Author(s):* **Rocco Zito,** Univ. della Calabria (Italy); **Giovanni Ferrarini**, **Paolo Bison,** Istituto per le Tecnologie della Costruzione (Italy), Consiglio Nazionale delle Ricerche (Italy); **Stefano Laureti, Marco Ricci,** Univ. della Calabria (Italy)

## Lunch/Exhibition Break 12:40 PM - 02:10 PM

## SESSION 6: KEYNOTE SESSION

24 April 2024 • 02:10 PM - 02:50 PM | Chesapeake 6
*Session Chair(s):* **Fernando López**, TORNGATS (Canada)

13047-1 • 02:10 PM - 02:50 PM
**Three-dimensional thermophotonic super-resolution imaging with biomedical and NDI applications by spatiotemporal diffusion-reversal methods** (Keynote Presentation)
*Author(s):* **Andreas Mandelis,** Univ. of Toronto (Canada)

## Coffee Break 02:50 PM - 03:20 PM

## SESSION 7: ADDITIVE MANUFACTURING

24 April 2024 • 03:20 PM - 04:40 PM | Chesapeake 6
*Session Chair(s):* **Michael C. Borish**, Oak Ridge National Lab. (United States); **Peter W. Spaeth**, NASA Langley Research Ctr. (United States)

13047-19 • 03:20 PM - 03:40 PM
**In-line monitoring of the fused filament fabrication additive manufacturing process for fibre-reinforced composites**
*Author(s):* **Rosanna Forster**, **Antonio Feteira**, **Dimitra Soulioti,** Sheffield Hallam Univ. (United Kingdom); **Sotirios A. Grammatikos,** Norwegian Univ. of Science and Technology (Norway); **Evangelos Kordatos,** Sheffield Hallam Univ. (United Kingdom)

13047-20 • 03:40 PM - 04:00 PM
**Advanced NDT inspection approach for aircraft composite panels**
*Author(s):* **Angelos Plastropoulos**, **Muhammet E. Torbali,** Cranfield Univ. (United Kingdom); **Nicolas P. Avdelidis,** Cranfield Univ. (United Kingdom), Univ. Laval (Canada); **Clemente I. Castanedo**, **Xavier P. V. Maldague,** Univ. Laval (Canada); **Matthieu Klein,** Visiooimage inc. (Canada)

13047-21 • 04:00 PM - 04:20 PM
**Near-infrared in-situ measurements for the detection of keyhole porosity in autogenous Ti-6AL-4V welds**
*Author(s):* **Joseph N. Zalameda**, **Samuel J. Hocker**, **Peter W. Spaeth,** NASA Langley Research Ctr. (United States); **Brandon Widener,** Analytical Mechanics Associates, Inc. (United States)

13047-22 • 04:20 PM - 04:40 PM
**Updated CFD interface in ShipIR (v4.3)**
*Author(s):* **David A. Vaitekunas**, **Jim Thompson, James Crawford,** W. R. Davis Engineering, Ltd. (Canada)

## SELECTION OF BEST STUDENT PAPER AWARD

24 April 2024 • 04:40 PM - 05:00 PM | Chesapeake 6
Join us for the selection of the Thermosense Best Student Paper Award.

## THERMOSENSE COMMITTEE ANNUAL MEETING

24 April 2024 • 05:00 PM - 05:40 PM | Chesapeake 6
Join the Thermosense Committee for its Annual Meeting at SPIE DCS 2024.

## Thursday 25 April 2024

### OPENING REMARKS: THURSDAY

25 April 2024 • 08:30 AM - 08:40 AM | Chesapeake 6
**Giovanni Ferrarini**, Istituto per le Tecnologie della Costruzione (Italy)

### SESSION 8: IR NDT APPLICATIONS II

25 April 2024 • 08:40 AM - 10:20 AM | Chesapeake 6
*Session Chair(s):* **Giovanni Ferrarini**, Istituto per le Tecnologie della Costruzione (Italy); **Arantza Mendioroz**, Univ. del País Vasco (Spain)

13047-23 • 08:40 AM - 09:00 AM
**Scanning inductive and line laser thermography for surface crack detection and characterization in railway rails**
*Author(s):* **Ester D'Accardi**, **Giuseppe Dell'Avvocato**, **Giuseppe Masciopinto**, **Davide Palumbo, Umberto Galietti,** Politecnico di Bari (Italy)

13047-24 • 09:00 AM - 09:20 AM
**Periodic projection of a random spatial pattern for the assessment of the in-plane thermal diffusivity**
*Author(s):* **Paolo Bison**, **Giovanni Ferrarini,** Consiglio Nazionale delle Ricerche (Italy); **Christ Glorieux,** KU Leuven (Belgium); **Junko Morikawa**, **Shuji Kamegaki,** Tokyo Institute of Technology (Japan); **Stefano Rossi,** Consiglio Nazionale delle Ricerche (Italy); **Meguya Ryu,** National Institute of Advanced Industrial Science and Technology (Japan), National Metrology Institute of Japan (Japan)

13047-26 • 09:20 AM - 09:40 AM
**Advancements in composite material NDE: Towards data fusion of infrared thermography and digital shearography using modulated-thermal excitation**
*Author(s):* **Fernando López,** TORNGATS (Canada); **Armando Albertazzi, Analucia Vieira Fantin,** Univ. Federal de Santa Catarina (Brazil)

13047-27 • 09:40 AM - 10:00 AM
**Flash energy and duration issues in active thermography**
*Author(s):* **Steven M. Shepard,** Thermal Wave Imaging, Inc. (United States); **James Lhota,** Thermal Wave Imaging (United States); **Tasdiq Ahmed,** Thermal Wave Imaging, Inc. (United States); **Eric Miller, Duy Tran,** Thermal Wave Imaging (United States)

13047-28 • 10:00 AM - 10:20 AM
**Advances in eddy-current infrared thermography for the detection of corrosion in carbon-steel components**
*Author(s):* **Fernando López,** TORNGATS (Canada); **Clemente Ibarra-Castanedo,** Univ. Laval (Canada); **Matthieu Klein,** Visiooimage inc. (Canada)

**Coffee Break 10:20 AM - 10:50 AM**

### SESSION 9: AEROSPACE APPLICATIONS

25 April 2024 • 10:50 AM - 11:50 AM | Chesapeake 6
*Session Chair(s):* **Arantza Mendioroz**, Univ. del País Vasco (Spain); **Giovanni Ferrarini**, Istituto per le Tecnologie della Costruzione (Italy)

13047-30 • 10:50 AM - 11:10 AM
**Considerations of 2D effects for the estimation of delamination properties with lock-in infrared thermography**
*Author(s):* **Arantza Mendioroz**, **David Sagarduy-Marcos**, **Jon Pérez-Arbulu**, **Javier Rodríguez-Aseguinolaza,** Univ. del País Vasco (Spain); **Ricardo Celorrio**, **José Carlos Ciria,** Univ. de Zaragoza (Spain); **Jean-Christophe Batsale,** Univ. de Bordeaux (France); **Agustín Salazar,** Univ. del País Vasco (Spain)

13047-31 • 11:10 AM - 11:30 AM
**Evaluation of aircraft wheel and brake temperature based on infrared thermographic imaging**
*Author(s):* **Lusitha Shyamal Ramachandra**, **Fakhre Ali**, **Angelos Plastropoulos**, **Nicolas P. Avdelidis**, **Martin Skote, Ian Jennions,** Cranfield Univ. (United Kingdom)

13047-32 • 11:30 AM - 11:50 AM
**Thermal Inspection of low emissivity surfaces using a pulsed light-emitting diode (PLED) heat source**
*Author(s):* **Joseph N. Zalameda**, **Peter W. Spaeth, Samuel J. Hocker,** NASA Langley Research Ctr. (United States)

## BEST STUDENT PAPER AWARD CEREMONY

25 April 2024 • 11:50 AM - 12:00 PM | Chesapeake 6

Join us to congratulate the recipient of the Thermosense Best Student Paper Award.

Award Sponsored By:
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# CONFERENCE 13048

# Radar Sensor Technology XXVIII

**22 - 24 April 2024 | Chesapeake 8**

***Conference Chair(s):*** **Abigail S. Hedden,** U.S. Army Combat Capabilities Development Command (United States); **Gregory J. Mazzaro,** The Citadel-The Military College of South Carolina (United States)

***Program Committee:*** **Jeffrey Barber,** U.S. Dept. of Homeland Security (United States); **Matthew J. Brandsema,** Applied Research Lab., The Pennsylvania State Univ. (United States); **Armin W. Doerry,** Sandia National Labs. (United States); **Ryan A. Elwell,** DEVCOM C5ISR (United States); **Mark Govoni,** DEVCOM Army Research Lab. (United States); **Sevgi Zubeyde Gurbuz,** The Univ. of Alabama (United States); **Seong-Hwoon Kim,** Spartan Radar (United States); **Bingcheng C. Li,** Lockheed Martin Corp. (United States); **Changzhi Li,** Texas Tech Univ. (United States);**Neeraj Magotra,** Western New England Univ. (United States); **Anthony F. Martone,** DEVCOM Army Research Lab. (United States); **Claire Migliaccio,** Univ. Côte d'Azur (France); **Thomas Mitchell,** ICEYE Oy (United States); **Ram M. Narayanan,** The Pennsylvania State Univ. (United States); **Marius Necsoiu,** U.S. Army Research Lab. (United States); **Lam H. Nguyen,** DEVCOM Army Research Lab. (United States); **Chandra S. Pappu,** Union College (United States); **Markus Peichl,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Zhengyu Peng,** Aptiv (United States); **Brian R. Phelan,** DEVCOM Army Research Lab. (United States); **Thomas J. Pizzillo,** U.S. Naval Research Lab. (United States); **Zhijun Qiao,** The Univ. of Texas Rio Grande Valley (United States);**Kenneth I. Ranney,** DEVCOM Army Research Lab. (United States); **Ann Marie Raynal,** Sandia National Labs. (United States); **Duncan A. Robertson,** Univ. of St. Andrews (United Kingdom); **David M. Sheen,** Pacific Northwest National Lab. (United States); **David Tahmoush,** Parsons Corp. (United States); **Aleksi A. Tamminen,** Aalto Univ. (Finland); **Julio V. Urbina,** The Pennsylvania State Univ. (United States); **Russell Vela,** U.S. Army Space and Missile Defense Command (United States); **David A. Wikner,** DEVCOM Army Research Lab. (United States); **Okan Yurduseven,** Queen's Univ. Belfast (United Kingdom); **Yan Rockee Zhang,** The Univ. of Oklahoma (United States)

## INFORMATION

A Radar Sensor Technology Early Career Research Award will be given to the first author/presenter of the top three best early-career research paper and presentation combination in this conference. See the Awards page for full details.

## Monday 22 April 2024

### WELCOME AND 2023 AWARDS CEREMONY

22 April 2024 • 09:00 AM - 09:15 AM | Chesapeake 8

*Session Chair(s):* **Abigail S. Hedden**, U.S. Army Combat Capabilities Development Command (United States); **Gregory J. Mazzaro**, The Citadel-The Military College of South Carolina (United States)

Join the chairs for the 2024 opening welcome and recognition of the 2023 early career research award recipients.

### SESSION 1: APPLICATIONS AND EXPLOITATION TECHNIQUES I

22 April 2024 • 09:15 AM - 10:15 AM | Chesapeake 8

*Session Chair(s):* **Abigail S. Hedden**, U.S. Army Combat Capabilities Development Command (United States); **Gregory J. Mazzaro**, The Citadel-The Military College of South Carolina (United States)

13048-3 • 09:15 AM - 09:35 AM

**Dual-frequency GPR imaging for mapping the permafrost table**

*Author(s):* **Fauzia Ahmad**, **Albert Bulik, Atsuhiro Muto,** Temple Univ. (United States)

13048-4 • 09:35 AM - 09:55 AM

**Application of first-order non-autonomous chaos synchronization for bistatic radar system**

*Author(s):* **Chandra S. Pappu**, **Vasileios Megas,** Union College (United States); **Aubrey N. Beal, Tamseel M. Syed,** The Univ. of Alabama in Huntsville (United States)

13048-47 • 09:55 AM - 10:15 AM

**Single-layer resonant metasurfaces as versatile IR sensors, polarizers, filters, and reflectors**
*Author(s):* **Robert Magnusson,** The Univ. of Texas at Arlington (United States)

**Coffee Break 10:15 AM - 10:45 AM**

## SESSION 2: ALGORITHMS AND PROCESSING TECHNIQUES I

22 April 2024 • 10:45 AM - 12:05 PM | Chesapeake 8
*Session Chair(s):* **Ryan A. Elwell**, DEVCOM C5ISR (United States); **Rita Jakelyn Abad Lima**, Texas Tech Univ. (United States)

13048-5 • 10:45 AM - 11:05 AM
**Doppler processing with near-field arrays**
*Author(s):* **Traian V. Dogaru, Kenneth Ranney,** DEVCOM Army Research Lab. (United States)

13048-6 • 11:05 AM - 11:25 AM
**Coarray-domain fast iterative beamforming for DOA estimation of coherent and uncorrelated targets**
*Author(s):* **Fauzia Ahmad,** Temple Univ. (United States); **Moeness G. Amin,** Villanova Univ. (United States)

13048-7 • 11:25 AM - 11:45 AM
**Fast signal recovery for high-accuracy heart monitoring with FMCW radar**
*Author(s):* **Rémi Grisot,** Lab. d'Electronique, Antennes et Télécommunications, Univ. Côte d'Azur (France), XtreamWave (France); **Camille Chiquet,** XtreamWave (France); **Claire Migliaccio**, **Jean-Yves Dauvignac,** Lab. d'Electronique, Antennes et Télécommunications, Univ. Côte d'Azur (France); **Melanie Brulc, Jean-Paul Caruana,** XtreamWave (France)

13048-8 • 11:45 AM - 12:05 PM
**Signal processing applications of the Sensor Open Systems ArchitectureTM for missile seekers**
*Author(s):* **Jonathan Cain**, **Al Stuessy**, **Joyce Tokar, Stephen Simi,** Raytheon (United States)

**Lunch Break 12:05 PM - 02:00 PM**

## SESSION 3: PHENOMENOLOGY I

22 April 2024 • 02:00 PM - 03:00 PM | Chesapeake 8
*Session Chair(s):* **Jonathan Cain**, Raytheon (United States); **Chandra S. Pappu**, Union College (United States)

13048-9 • 02:00 PM - 02:20 PM
**Non-plane wave incidence on a body of revolution for remote sensing applications**
*Author(s):* **Edward C. Michaelchuck,** U.S. Naval Research Lab. (United States); **Roger H. Lang**, **William O. Coburn,** The George Washington Univ. (United States); **Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States)

13048-10 • 02:20 PM - 02:40 PM
**Combining random apertures and the recursive sidelobe minimization algorithm to reduce artifacts in sparse imaging**
*Author(s):* **Brian R. Phelan,** DEVCOM Army Research Lab. (United States); **Colin D. Kelly,** The Pennsylvania State Univ. (United States); **Traian V. Dogaru,** DEVCOM Army Research Lab. (United States); **Ram M. Narayanan,** The Pennsylvania State Univ. (United States)

13048-11 • 02:40 PM - 03:00 PM
**Change detection algorithms for ad hoc distributed radar**
*Author(s):* **Edwin A. Marengo, James Vedral,** Northeastern Univ. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 4: PHENOMENOLOGY II

22 April 2024 • 03:30 PM - 04:30 PM | Chesapeake 8
*Session Chair(s):* **Fauzia Ahmad**, Temple Univ. (United States); **Colin D. Kelly**, The Pennsylvania State Univ. (United States)

13048-12 • 03:30 PM - 03:50 PM
**Improved investigation of electromagnetic compatibility between radar sensors and 5G-NR radios**
*Author(s):* **Anas Amaireh**, **Yan Rockee Zhang,** The Univ. of Oklahoma (United States); **Dexiang Xu, David Bate,** Naval Information Warfare Ctr. Atlantic (United States)

13048-13 • 03:50 PM - 04:10 PM
**Frequency center randomization in the recursive sidelobe minimization algorithm**
*Author(s):* **Colin D. Kelly,** The Pennsylvania State Univ. (United States); **Brian R. Phelan**, **Traian V. Dogaru,** DEVCOM Army Research Lab. (United States); **Ram M. Narayanan,** The Pennsylvania State Univ. (United States)

13048-14 • 04:10 PM - 04:30 PM
**A quantitative study of the benefits of the Third-order over the Second-order Harmonic Radar**
*Author(s):* **Rita Jakelyn Abad Lima, Changzhi Li,** Texas Tech Univ. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 5: APPLICATIONS AND EXPLOITATION TECHNIQUES II

23 April 2024 • 10:30 AM - 11:30 AM | Chesapeake 8
*Session Chair(s):* **Sevgi Zubeyde Gurbuz**, The Univ. of Alabama (United States)

13048-15 • 10:30 AM - 10:50 AM
**Investigation of OFDM signals for microwave ranging**
*Author(s):* **Mehmet Yazgan,** Univ. of South Florida (United States); **Huseyin Arslan,** Medipol Univ. (Turkey); **Stavros Vakalis,** Univ. of South Florida (United States)

13048-16 • 10:50 AM - 11:10 AM
**RF-hardening of small UAS for mitigation of HIRF impacts**
*Author(s):* **Morgan Lau**, **Yan Rockee Zhang**, **Hernan Suarez**, **Kegan Reynolds,** The Univ. of Oklahoma (United States); **Steve Boyle,** Essential Aero Inc. (United States)

13048-17 • 11:10 AM - 11:30 AM
**Vibration monitoring of tunnel faces applying 78GHz DBF-based high-speed imaging radar**
*Author(s):* **Hideaki Iwaki**, **Takuro Nishi, Hiroyuki Tada,** Shimizu Corp. (Japan)

**Lunch/Exhibition Break 11:30 AM - 01:00 PM**

## SESSION 6: ALGORITHMS AND PROCESSING TECHNIQUES II

23 April 2024 • 01:00 PM - 02:00 PM | Chesapeake 8
*Session Chair(s):* **Stavros Vakalis**, Univ. of South Florida (United States); **Georg Schnattinger**, Rohde & Schwarz GmbH & Co. KG (Germany)

13048-18 • 01:00 PM - 01:20 PM
**Combined Kalman and Kalman-Levy filter for maneuvering target tracking**
*Author(s):* **Veena Sreekantamurthy**, **Ram M. Narayanan,** The Pennsylvania State Univ. (United States); **Anthony F. Martone,** DEVCOM Army Research Lab. (United States)

13048-19 • 01:20 PM - 01:40 PM
**Extending language based cost functions with deep learning**
*Author(s):* **Jackson S. Zaunegger**, **Paul G. Singerman**, **Ram M. Narayanan,** The Pennsylvania State Univ. (United States); **Muralidhar Rangaswamy,** Air Force Research Lab. (United States)

13048-21 • 01:40 PM - 02:00 PM
**Accuracy evaluation of asymptotic methods for the electromagnetic simulation of personnel security screening**
*Author(s):* **Georg Schnattinger,** Rohde & Schwarz GmbH & Co. KG (Germany); **Christian Schüßler**, **Konstantin Root, Martin Vossiek,** Institute of Microwaves and Photonics (LHFT), Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

**Coffee Break 02:00 PM - 03:00 PM**

## SESSION 7: QUANTUM REMOTE SENSING

23 April 2024 • 03:00 PM - 04:20 PM | Chesapeake 8
*Session Chair(s):* **Matthew J. Brandsema**, Applied Research Lab. (United States)

13048-25 • 03:00 PM - 03:20 PM
**Experimental progress using quantum binary waveforms and immediate idler detection techniques for remote sensing**
*Author(s):* **Matthew J. Brandsema,** Applied Research Lab. (United States)

13048-26 • 03:20 PM - 03:40 PM
**Quantum interferometric radar for biomedical applications**
*Author(s):* **David Luong**, **Ian W. K. Lam**, **Bhashyam Balaji, Sreeraman Rajan,** Carleton Univ. (Canada)

13048-27 • 03:40 PM - 04:00 PM
**Quantum illumination networks**
*Author(s):* **Xiaobin Zhao, Quntao Zhuang,** The Univ. of Southern California (United States)

13048-28 • 04:00 PM - 04:20 PM
**Ultralow-phase noise microwave generation using photonics for enhanced radar applications**
*Author(s):* **Andrew Attar**, **Henry Timmers**, **Bennett Sodergren**, **Cole Smith**, **Evan Barnes**, **Nate Phillips**, **Kurt Vogel, Kevin Knabe,** Vescent Photonics Inc. (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13048-42 • 06:00 PM - 07:30 PM
**A newly developed method for georegistration of synthetic aperture radar imagery**
*Author(s):* **Aimee Shore**, **R. Derek West**, **Joshua Tellez,** Sandia National Labs. (United States); **Frederick W. Koehler, Wade Schwartzkopf,** National Geospatial-Intelligence Agency (United States)

13048-43 • 06:00 PM - 07:30 PM
**Geolocation using synthetic aperture radar multilateration**
*Author(s):* **Armin W. Doerry, Douglas Bickel,** Sandia National Labs. (United States)

13048-44 • 06:00 PM - 07:30 PM
**Ray-tracing modeling for submillimeters**
*Author(s):* **Vasyl Molebny,** Academy of Technological Sciences of Ukraine (Ukraine); **Vyacheslav Sokurenko,** National Technical Univ. of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (Ukraine); **Tetiana Giannakopoulou,** Institute of Nanoscience and Nanotechnology (Greece); **Genadiy Churyumov, Jinghui Qui,** Harbin Institute of Technology (China)

13048-45 • 06:00 PM - 07:30 PM
**Empirical study of Cramer-Rao lower bound variants in target localization tasks**
*Author(s):* **Michael Potter**, **Shuo Tang**, **Tales Imbiriba**, **Pau Closas,** Northeastern Univ. (United States); **Deniz Erdogmus,** Northeastern Univ. (United States), George J. Kostas Research Institute for Homeland Security (United States); **Murat Akcakaya**, **Ben Wright,** George J. Kostas Research Institute for Homeland Security (United States); **Milica Stojanovic,** Northeastern Univ. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 8: RADAR MICRO-DOPPLER

24 April 2024 • 10:30 AM - 11:50 AM | Chesapeake 8
*Session Chair(s):* **Thomas J. Pizzillo**, U.S. Naval Research Lab. (United States)

13048-29 • 10:30 AM - 10:50 AM
**Gait pattern analysis of older adults via radar micro-Doppler signatures and wrist-worn accelerometer data**
*Author(s):* **Fauzia Ahmad, Shivayogi V. Hiremath,** Temple Univ. (United States)

13048-30 • 10:50 AM - 11:10 AM
**RF sensing of personalized mobility: accounting for temporal variability in ethogram-based classification**
*Author(s):* **Emre Kurtoglu**, **Sevgi Zubeyde Gurbuz**, **Sultanus Salehin,** The Univ. of Alabama (United States); **Moeness G. Amin,** Villanova Univ. (United States)

13048-31 • 11:10 AM - 11:30 AM
**Micro-Doppler radar characterization of vehicle vibrations**
*Author(s):* **Benjamin D. Simone**, **Ram M. Narayanan**, **Daniel K. Watson**, **Karl M. Reichard,** The Pennsylvania State Univ. (United States); **Kyle A. Gallagher,** US Army Research Laboratory (United States)

13048-32 • 11:30 AM - 11:50 AM
**Electromagnetic modeling and analysis of micro-Doppler characteristics of simulated human limping gaits**
*Author(s):* **Cunhao Zeng**, **Ram M. Narayanan,** The Pennsylvania State Univ. (United States); **Cayce A. Onks,** PennState Health Milton S. Hershey Medical Ctr. (United States)

**Lunch/Exhibition Break 11:50 AM - 01:30 PM**

## SESSION 9: MILLIMETER-WAVE SENSING AND IMAGING I

24 April 2024 • 01:30 PM - 02:30 PM | Chesapeake 8

*Session Chair(s):* **David A. Wikner**, DEVCOM Army Research Lab. (United States); **Duncan A. Robertson**, Univ. of St. Andrews (United Kingdom)

13048-33 • 01:30 PM - 01:50 PM

**A standardized test for measuring the spatial resolution of active millimeter wave imaging systems**

*Author(s):* **Jack L. Glover,** National Institute of Standards and Technology (United States)

13048-35 • 01:50 PM - 02:10 PM

**Measuring the refractive index of foam materials with very low reflection coefficients at millimeter wavelengths**

*Author(s):* **Peter R. Smith,** MAG Aerospace (United States); **James C. Weatherall, Jeffrey Barber,** U.S. Dept. of Homeland Security (United States)

13048-36 • 02:10 PM - 02:30 PM

**Sparse array millimeter-wave imaging using a single-board MIMO radar sensor**

*Author(s):* **Tasin Nusrat**, **Shivani Sharma, Stavros Vakalis,** Univ. of South Florida (United States)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 10: MILLIMETER-WAVE SENSING AND IMAGING II

24 April 2024 • 03:00 PM - 04:20 PM | Chesapeake 8

*Session Chair(s):* **Jeffrey Barber**, U.S. Dept. of Homeland Security (United States); **David M. Sheen**, Pacific Northwest National Lab. (United States)

13048-37 • 03:00 PM - 03:20 PM

**Rotational millimeter-wave shoe scanner using the discrete Fourier transform for backprojection-based image reconstruction**

*Author(s):* **Richard T. Clark**, **Stephanie McDaid, David M. Sheen,** Pacific Northwest National Lab. (United States)

13048-38 • 03:20 PM - 03:40 PM

**Multistatic cylindrical fast backprojection 3D image reconstruction**

*Author(s):* **David M. Sheen, Richard T. Clark,** Pacific Northwest National Lab. (United States)

13048-39 • 03:40 PM - 04:00 PM

**Experimental study on near-field DoA estimation using cooperative sensing system of MIMO radar modules with a commercial millimeter radar IC**

*Author(s):* **Hiroki Mori,** Toshiba Corp. (Japan)

13048-40 • 04:00 PM - 04:20 PM

**Shape-morphing origami platforms for RF computational imaging**

*Author(s):* **Suresh Venkatesh,** North Carolina State Univ. (United States)

# CONFERENCE 13049

# Laser Radar Technology and Applications XXIX

**24 - 25 April 2024 | National Harbor 4**

***Conference Chair(s):*** **Gary W. Kamerman,** FastMetrix Industries, LLC (United States); **Lori A. Magruder,** Applied Research Labs., The Univ. of Texas at Austin (United States); **Monte D. Turner,** National Geospatial-Intelligence Agency (United States)

***Program Committee:*** **Philip Gatt,** Lockheed Martin Coherent Technologies (United States); **Hans D. Hallen,** North Carolina State Univ. (United States); **Thomas J. Karr,** The MITRE Corp. (United States); **Martin Laurenzis,** Institut Franco-Allemand de Recherches de Saint-Louis (France); **Vasyl Molebny,** Academy of Technological Sciences of Ukraine (Ukraine); **Upendra N. Singh,** NASA Langley Research Ctr. (United States); **Andreas Ullrich,** RIEGL Laser Measurement Systems GmbH (Austria); **Christopher R. Valenta,** Georgia Institute of Technology (United States); **Andre J. van Rynbach,** Air Force Research Lab. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### WELCOME AND OPENING REMARKS

24 April 2024 • 10:30 AM - 10:40 AM | National Harbor 4
**Gary W. Kamerman**, FastMetrix Industries, LLC (United States)

### SESSION 1: LIDAR SYSTEMS I

24 April 2024 • 10:40 AM - 02:20 PM | National Harbor 4
*Session Chair(s):* **Gary W. Kamerman**

13049-1 • 10:40 AM - 11:10 AM
**Axicon-based optical system for laser microradar** *(Invited Paper)*
*Author(s):* **Vasyl Molebny,** Tracey Technologies (United States), Academy of Technological Sciences of Ukraine (Ukraine);**Joe Wakil, Chris Pope,** Tracey Technologies (United States)

13049-2 • 11:10 AM - 11:40 AM
**Multifunction digital holographic laser remote sensing** *(Invited Paper)*
*Author(s):* **Daniel Woodbury**, **Philip Gatt**, **Brian W. Krause**, **Samuel T. Thurman,** Lockheed Martin Coherent Technologies (United States);

**Carrie Noren,** Air Force Research Lab. (United States); **Mark F. Spencer,** Joint Directed Energy Transition Office (United States)

13049-3 • 11:40 AM - 12:00 PM
**3D coherent lidar imaging without coherence length limitation**
*Author(s):* **Ataberk Atalar**, **Christian J. Margison**, **Mert Bayer**, **Ozan B. Boyraz, Ozdal Boyraz,** Univ. of California, Irvine (United States)

Lunch Break • 12:00 PM - 01:30 PM

13049-4 • 01:30 PM - 02:00 PM
**A small all-range LIDAR for topographic mapping from orbit and navigation guidance during descent and touchdown** *(Invited Paper)*
*Author(s):* **Xiaoli Sun**, **Daniel R. Cremons**, **Erwan Mazarico,** NASA Goddard Space Flight Ctr. (United States); **David E. Smith,** Massachusetts Institute of Technology (United States); **Mark Storm**, **Richard Utano**, **Jacob Hwang**, **Xung Dang,** Fibertek, Inc. (United States); **James B. Abshire,** Univ. of Maryland, College Park (United States); **Jeff Beck,** Leonardo DRS (United States)

13049-5 • 02:00 PM - 02:20 PM
**A Geiger-mode lidar system for real-time detection and tracking of individual birds in large dense flocks**
*Author(s):* **Andrew Eldredge**, **Brandon Call**, **Dale G. Fried**, **Brandon Robinson**, **Trevor Mangum**, **David Kelley**, **Kimberly Reichel-Vischi,** 3DEO, Inc. (United States); **Carter Sturm,** U.S. Army Corps of Engineers (United States)

## SESSION 2: CALIBRATION AND ACCURACY

24 April 2024 • 02:20 PM - 03:40 PM | National Harbor 4
*Session Chair(s):* **Lori A. Magruder**, Applied Research Labs., The Univ. of Texas at Austin (United States)

13049-6 • 02:20 PM - 02:40 PM
**Time and phase RF synchronization using free space optical technology**
*Author(s):* **Ron Smith**, **William Ziegler, Stephen D. Roberson,** 4S - Silversword Software and Services, LLC (United States)

13049-7 • 02:40 PM - 03:00 PM
**Correcting spaceborne SAR-derived DEMs with ICESat-2 using deep learning**
*Author(s):* **Eric Guenther**, **Amy Neuenschwander**, **Lori Magruder, Donald Maze-England,** The Univ. of Texas at Austin (United States)

13049-8 • 03:00 PM - 03:20 PM
**Accuracy assessment of UAS bathymetric LiDAR in shallow water conditions**
*Author(s):* **James T. Dietrich, Eric Guenther,** The Univ. of Texas at Austin (United States)

13049-9 • 03:20 PM - 03:40 PM
**A deep residual network implementation for satellite-derived altimetry identification and classification**
*Author(s):* **Jeff Perry**, **Amy Neuenschwander**, **Matthew Holwill, Lori Magruder,** The Univ. of Texas at Austin (United States)

**Coffee Break 03:40 PM - 04:10 PM**

## SESSION 3: 3D PROCESSING AND PRODUCTS I

24 April 2024 • 04:10 PM - 05:30 PM | National Harbor 4
*Session Chair(s):* **Andre J. Van Rynbach**, Air Force Research Lab. (United States)

13049-10 • 04:10 PM - 04:30 PM
**Real-time lidar feature detection using convolution neural networks**
*Author(s):* **Matthew J. McGill,** The Univ. of Iowa (United States); **Stephen D. Roberson**, **William Ziegler**, **Ron Smith,** 4S - Silversword Software and Services, LLC (United States); **John E. Yorks,** Goddard Space Flight Center, Code 612 (United States)

13049-11 • 04:30 PM - 04:50 PM
**LiDAR scene reconstruction using imagery and frame overlap from a Texel camera**
*Author(s):* **Blake Chamberlain, Scott Budge,** Utah State Univ. (United States)

13049-12 • 04:50 PM - 05:10 PM
**Multi-polarization laser image fusion for improved underwater object recognition**
*Author(s):* **Oladipupo Adeoluwa**, **Sevgi Zubeyde Gurbuz**, **Carson Moseley**, **Karsten Schnier**, **Anirban Swakshar**, **Cooper Coldwell**, **Seongsin M. Kim, Patrick Kung,** The Univ. of Alabama (United States)

13049-14 • 05:10 PM - 05:30 PM
**Coincidence processing Geiger-mode lidar using dynamic lattices**
*Author(s):* **Carter A. Sturm,** Army Geospatial Ctr. (United States)

## Thursday 25 April 2024

### OPENING REMARKS: THURSDAY

25 April 2024 • 08:00 AM - 08:10 AM | National Harbor 4
**Monte D. Turner**, National Geospatial-Intelligence Agency (United States)

### SESSION 4: 3D PROCESSING AND PRODUCTS II

25 April 2024 • 08:10 AM - 09:30 AM | National Harbor 4
*Session Chair(s):* **Vasyl Molebny**, Academy of Technological Sciences of Ukraine (Ukraine)

13049-15 • 08:10 AM - 08:30 AM
**Motion compensation for lidar tomography and remote sensing**
*Author(s):* **Andre J. Van Rynbach**, **Sarah Krug**, **Brandon Hilton,** Air Force Research Lab. (United States); **Brett Spivey,** JASR Systems (United States)

13049-16 • 08:30 AM - 08:50 AM
**Reconstruction of primary electron generation rate in Geiger-mode APDs**
*Author(s):* **Weston T. Baines,** U.S. Army Engineer Research and Development Ctr. (United States)

13049-17 • 08:50 AM - 09:10 AM
**Wide-area lidar locator (WALL)**
*Author(s):* **Paul B. Lundquist, Andrew C. Teta,** Arete Associates (United States)

13049-18 • 09:10 AM - 09:30 AM
**Assessment of foliage poke-through capabilities of an airborne Geiger-mode lidar**
*Author(s):* **Dale G. Fried**, **David Kelley**, **Kimberly Reichel-Vischi**, **Brandon Call, Christopher Reichert,** 3DEO, Inc. (United States)

**Coffee Break 09:30 AM - 10:00 AM**

### SESSION 5: LIDAR COMPONENTS

25 April 2024 • 10:00 AM - 11:50 AM | National Harbor 4
*Session Chair(s):* **Lori A. Magruder**, Applied Research Labs., The Univ. of Texas at Austin (United States)

13049-19 • 10:00 AM - 10:30 AM
**A comparative analysis of DIN SAE Spec 91471 recommendations for automotive LiDAR characterization** *(Invited Paper)*
*Author(s):* **Daniel A. LeMaster**, **Huafeng Yu,** U.S. Dept. of Transportation (United States); **Jeremy P. Bos,** Michigan Technological Univ. (United States); **Christopher R. Valenta,** Georgia Tech Research Institute (United States); **Paul F. McManamon,** Exciting Technology, LLC (United States)

13049-20 • 10:30 AM - 10:50 AM
**In-situ gamma radiation testing of 2.4 micron wavelength extended InGaAs photodiodes at dry ice temperatures**
*Author(s):* **Abhay M. Joshi**, **Shubhashish Datta**, **Nilesh Soni,** Discovery Semiconductors, Inc. (United States); **Michael Sivertz,** NASA Space Radiation Lab. (United States), Brookhaven National Lab. (United States); **James Jardine,** Brookhaven National Lab. (United States)

13049-21 • 10:50 AM - 11:10 AM
**DMD as a pseudo-pixel array for long-range high-speed LIDAR**
*Author(s):* **Paul Hawthorne**, **Mark McDonald,** Heriot-Watt Univ. (United Kingdom); **Ian Park,** MBDA UK Ltd. (United Kingdom); **Duncan P. Hand,** Heriot-Watt Univ. (United Kingdom)

13049-22 • 11:10 AM - 11:30 AM
**Characterization of discrete amplification photon detector (DAPD) for long-range LiDAR applications**
*Author(s):* **Ming Wei**, **Cullen Bradley**, **Anna Gnacek**, **Andrew Sarangan, Paul F. McManamon,** Univ. of Dayton (United States)

13049-24 • 11:30 AM - 11:50 AM
**Development of a beam steering device for LiDAR-based spacecraft hazard avoidance and landing missions**
*Author(s):* **Anna Hecht Gnacek**, **Paul F. McManamon**, **Eddie Ruff**, **Alexander Cain,** Exciting Technology, LLC (United States); **Farzin Amzajerdian,** NASA Langley Research Ctr. (United States)

### CLOSING REMARKS

25 April 2024 • 11:50 AM - 12:00 PM | National Harbor 4
**Lori A. Magruder**, Applied Research Labs., The Univ. of Texas at Austin (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13049-13

**High-precision indoor localization using the extended Kalman filter approach**

*Author(s):* **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates); **S. Andrew Gadsden,** McMaster University (Canada); **Khaled Obaideen, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13050

# Polarization: Measurement, Analysis, and Remote Sensing XVI

**22 April 2024 | Chesapeake 1**

***Conference Chair(s):*** **David B. Chenault,** Polaris Sensor Technologies, Inc. (United States); **Meredith K. Kupinski,** Wyant College of Optical Sciences (United States); **Bradley M. Ratliff,** Univ. of Dayton (United States)

***Program Committee:*** **Michael G. Gartley,** Rochester Institute of Technology (United States); **Viktor Gruev,** Univ. of Illinois (United States); **Michael W. Kudenov,** North Carolina State Univ. (United States); **Charles F. LaCasse,** Riverside Research (United States); **Joseph Larry Pezzaniti,** Polaris Sensor Technologies, Inc. (United States); **Bradley M. Ratliff,** Univ. of Dayton (United States); **Joseph A. Shaw,** Montana State Univ. (United States); **J. Scott Tyo,** Monash Univ. (Australia)

## Monday 22 April 2024

### WELCOME AND OPENING REMARKS

22 April 2024 • 08:10 AM - 08:20 AM | Chesapeake 1

**David B. Chenault**, Polaris Sensor Technologies, Inc. (United States); **Meredith K. Kupinski**, Wyant College of Optical Sciences (United States); **Bradley M. Ratliff**, Univ. of Dayton (United States)

### SESSION 1: UNDERSTANDING POLARIMETRIC INSTRUMENTS

22 April 2024 • 08:20 AM - 10:00 AM | Chesapeake 1

*Session Chair(s):* **David B. Chenault**, Polaris Sensor Technologies, Inc. (United States)

13050-1 • 08:20 AM - 08:40 AM

**Angle of polarization confidence metric for polarization imaging**

*Author(s):* **Bradley M. Ratliff,** Univ. of Dayton (United States); **J. Scott Tyo**, **Oscar G. Rodriguez-Herrera,** Monash Univ. (Australia); **Andrey S. Alenin,** UNSW Canberra (Australia)

13050-2 • 08:40 AM - 09:00 AM

**Experimental comparison of 2×2 and 2×4 patterned microgrid polarimetric imaging cameras**

*Author(s):* **Keigo Hirakawa,** Univ. of Dayton (United States); **Daniel A. LeMaster,** U.S. Dept. of Transportation (United States); **Joseph Raffoul,** Univ. of Dayton (United States); **David B Chenault**, **David G Crandall, Larry Pezzaniti,** Polaris Sensor Technologies (United States)

13050-3 • 09:00 AM - 09:20 AM

**Micro-polarizer array demosaicking and denoising**

*Author(s):* **Joseph Raffoul,** Univ. of Dayton (United States); **Daniel LeMaster,** U.S. Dept. of Transportation (United States); **Keigo Hirakawa,** Univ. of Dayton (United States)

13050-4 • 09:20 AM - 09:40 AM

**Calibration of a suite of pixelated polarized sensors to sub-percent uncertainty levels**

*Author(s):* **Thijs Stockmans,** Leiden Univ. (Netherlands); **Erwoud van der Linden**, **Irina Malysheva,** SRON Netherlands Institute for Space Research (Netherlands); **Naor Scheinowitz**, **Kira N. Strelow,** Leiden Univ. (Netherlands); **Martijn Smit,** SRON Netherlands Institute for Space Research (Netherlands); **Frans Snik,** Leiden Univ. (Netherlands)

13050-5 • 09:40 AM - 10:00 AM

**Design of compact thermal IR polarization calibration target using polarized emission from thin wires**

*Author(s):* **Jeremy C. Parkinson, Meredith Kupinski,** Wyant College of Optical Sciences (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: POLARIMETRIC REMOTE SENSING

22 April 2024 • 10:30 AM - 12:10 PM | Chesapeake 1

*Session Chair(s):* **Bradley M. Ratliff**, Univ. of Dayton (United States)

13050-6 • 10:30 AM - 10:50 AM
**SkyPole: a geolocation algorithm based on polarized vision without using astronomical ephemerides**
*Author(s):* **Thomas Kronland-Martinet**, **Léo Poughon**, **Marcel Pasquinelli**, **David Duché**, **Julien R. Serres, Stéphane Viollet,** Aix-Marseille Univ. (France)

13050-7 • 10:50 AM - 11:10 AM
**Polarization-based underwater geolocalization with machine-learning algorithms**
*Author(s):* **Viktor Gruev,** Univ. of Illinois (United States)

13050-8 • 11:10 AM - 11:30 AM
**Optimal estimation of aerosol properties using all-sky spectro-polarimetry**
*Author(s):* **Robert Foster**, **Marcos J. Montes, Ahmed El-Habashi,** U.S. Naval Research Lab. (United States)

13050-9 • 11:30 AM - 11:50 AM
**IR polarimetry for environmental monitoring**
*Author(s):* **David B. Chenault**, **Larry Pezzaniti, Adam Hagewood,** Polaris Sensor Technologies, Inc. (United States)

13050-10 • 11:50 AM - 12:10 PM
**Multispectral polarimetric separability of urban materials**
*Author(s):* **John S. Furey**, **Sarah J. Becker**, **Heather S. Sussman, Kyle Klaus,** U.S. Army Engineer Research and Development Ctr. (United States)

**Lunch Break 12:10 PM - 01:30 PM**

## SESSION 3: POLARIMETRIC MEASUREMENTS

22 April 2024 • 01:30 PM - 02:50 PM | Chesapeake 1
*Session Chair(s):* **Meredith K. Kupinski**, Wyant College of Optical Sciences (United States)

13050-11 • 01:30 PM - 01:50 PM
**Comparison of spectral polarimetric instruments in varied environments**
*Author(s):* **John S. Furey**, **Thomas E. Berry, Elizabeth Lord,** U.S. Army Engineer Research and Development Ctr. (United States)

13050-12 • 01:50 PM - 02:10 PM
**Polarimetric inspection of flax composite material reinforcements**
*Author(s):* **Laurent Bigué**, **Karine Gautier, Marie-Ange Bueno,** Univ. de Haute Alsace (France)

13050-13 • 02:10 PM - 02:30 PM
**Full Mueller matrix imaging of human corneal birefringence**
*Author(s):* **Quinn Jarecki**, **Adeline Tai,** Wyant College of Optical Sciences (United States); **Khalid Omer,** Meta (United States); **Meredith K. Kupinski,** Wyant College of Optical Sciences (United States)

13050-14 • 02:30 PM - 02:50 PM
**Dispersion of the birefringence of quartz, magnesium fluoride, and sapphire in the ultraviolet through near infrared**
*Author(s):* **Michael Gartman,** The Univ. of Arizona (United States), Thorlabs, Inc. (United States); **Meredith K. Kupinski,** The Univ. of Arizona (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 4: OPTICAL SYSTEM CONCEPTS

22 April 2024 • 03:20 PM - 04:00 PM | Chesapeake 1
*Session Chair(s):* **Quinn Jarecki**, Wyant College of Optical Sciences (United States)

13050-16 • 03:20 PM - 03:40 PM
**Liquid crystal polarization rotators for the Miniaturized Absolute Magnetometer (MAM) of the NanoMagSat space mission**
*Author(s):* **Pilar García Parejo,** INTA Instituto Nacional de Técnica Aeroespacial (Spain), Eye4Sky (Spain); **Angel Jimenez-Girela**, **Daniel Merino-Pérez**, **Antonio Campos-Jara,** INTA Instituto Nacional de Técnica Aeroespacial (Spain); **Thomas Jager**, **William Fourcault**, **Francois Bertrand**, **Jean Michael Leger,** Univ. Grenoble Alpes (France), CEA-LETI (France); **Alberto Álvarez-Herrero,** INTA Instituto Nacional de Técnica Aeroespacial (Spain), Eye4Sky (Spain)

13050-17 • 03:40 PM - 04:00 PM
**Liquid crystal devices for compact optical space instruments**
*Author(s):* **Alberto Álvarez-Herrero**, **Pilar García Parejo,** INTA Instituto Nacional de Técnica Aeroespacial (Spain), Eye4Sky Technologies S.L. (Spain); **Antonio Campos-Jara**, **Leire Ayuso Angulo**, **Daniel Garranzo-García**, **Manuel Silva-López**, **Angel Jimenez-Girela**, **Daniel Merino-Pérez,** INTA Instituto Nacional de Técnica Aeroespacial (Spain); **Jesús Fernández Borrell,** Eye4Sky Technologies S.L. (Spain)

## SESSION 5: EXPLOITING POLARIZATION

22 April 2024 • 04:00 PM - 05:00 PM | Chesapeake 1
*Session Chair(s):* **Viktor Gruev**, Univ. of Illinois (United States)

13050-18 • 04:00 PM - 04:20 PM
**Unveiling minimum resolvable polarization ellipse difference (MRPED) method for polarimetric thermal-imaging-enhanced detection quantification**
*Author(s):* **Sagi Zur Arie,** Accutures (Israel)

13050-19 • 04:20 PM - 04:40 PM
**Disambiguation of surface normals using single-view Mueller shape-from-polarization**
*Author(s):* **Quinn Jarecki**, **Meredith K. Kupinski, Lily McKenna,** Wyant College of Optical Sciences (United States)

13050-20 • 04:40 PM - 05:00 PM
**Illuminating depth: polarimetric time-of-flight sensing with single-photon counting imager**
*Author(s):* **Karsten Schnier**, **Anirban Swakshar,** The Univ. of Alabama (United States); **Cooper Coldwell,** Univ. of Alabama (United States); **Sevgi Gurbuz**, **Seongsin M. Kim, Patrick Kung,** The Univ. of Alabama (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13050-21 • 06:00 PM - 07:30 PM
**High-speed polarization fiber sensors optimized for security purposes**
*Author(s):* **Martin Kyselák**, **Zdeněk Vyležich,** Univ. of Defence (Czech Republic); **Karel Slavicek,** Masaryk Univ. (Czech Republic); **David Grenar,** Brno Univ. of Technology (Czech Republic); **Jiri Vavra,** Univ. of Defence (Czech Republic)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13050-22

**The rise of the polarimetric Kalman filter: a bibliometric study on its growing significance**

*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates); **S. Andrew Gadsden,** McMaster University (Canada); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13051

CONFERENCE CO-SPONSOR

BAE SYSTEMS

# Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications VI

**22 - 25 April 2024 | Potomac 4**

***Conference Chair(s):*** **Peter J. Schwartz,** The MITRE Corp. (United States); **Benjamin Jensen,** Marine Corps Univ. (United States)

***Conference Co-Chair(s):*** **Myron E. Hohil,** DEVCOM - Armaments Ctr. (United States)

***Program Committee:*** **Tarek Abdelzaher,** Univ. of Illinois (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States); **Brayden Hollis**, **Jeffrey Hudack,** Air Force Research Lab. (United States); **Oscar Munoz,** DEVCOM Army Research Lab. (United States); **Tien Pham,** The MITRE Corp. (United States); **Alun D. Preece,** Cardiff Univ. (United Kingdom); **Katie Rainey,** Naval Information Warfare Ctr. Pacific (United States); **Christopher R. Ratto,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Ravi Ravichandran,** BAE Systems (United States); **Danda B. Rawat,** Howard Univ. (United States); **Kelly K. D. Risko,** U.S. Army DEVCOM Aviation and Missile Center (France); **Latasha Solomon,** DEVCOM Army Research Lab. (United States); **Bruce Swett,** Northrop Grumman Corp. (United States); **Michael Wolmetz,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

## Monday 22 April 2024

### SESSION 1: MISSION PLANNING I

22 April 2024 • 08:40 AM - 10:00 AM | Potomac 4

*Session Chair(s):* **Peter J. Schwartz**, The MITRE Corp. (United States); **Brayden Hollis**, Air Force Research Lab. (United States)

Opening Remarks 8:40 AM to 8:50 AM

13051-201 • 08:50 AM - 09:20 AM

**DoD challenges and opportunities in the era of foundation models** *(Invited Paper)*

*Author(s):* **Alvaro Velasquez,** Defense Advanced Research Projects Agency (United States)

13051-3 • 09:20 AM - 09:40 AM

**Battlefield information and tactics engine (BITE): a multimodal, large language model approach for battlespace management**

*Author(s):* **Brian J. Connolly,** Southwest Research Institute (United States)

13051-4 • 09:40 AM - 10:00 AM

**From pixels to strategy: harnessing Chat-GPT (Vision) for Atari games and military operations**

*Author(s):* **Nicholas R. Waytowich, Vinicius G. Goecks,** DEVCOM Army Research Lab. (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: COMPUTER VISION I

22 April 2024 • 10:30 AM - 11:30 AM | Potomac 4

*Session Chair(s):* **Christopher R. Ratto**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Tien Pham**, The MITRE Corp. (United States)

13051-6 • 10:30 AM - 10:50 AM

**DeepTie: deep learning-based image geo-registration**

*Author(s):* **Bingcai Zhang,** BAE Systems (United States)

13051-7 • 10:50 AM - 11:10 AM

**Comparing visual co-registration methods for UAV and satellite RGB imagery with semantic filtering of key points**

*Author(s):* **Trevor M. Bajkowski**, **J. Alex Hurt**, **Christopher W. Scully**, **James Keller,** Univ. of Missouri (United States); **Samantha Carley,** U.S. Army Engineer Research and Development Ctr. (United States); **Grant J. Scott,** Univ. of Missouri (United States); **Stanton R. Price,** U.S. Army

Engineer Research and Development Ctr. (United States)

13051-8 • 11:10 AM - 11:30 AM
**Collaborative object labeling in IoBT: a distributed approach for enhanced battlefield perception**
*Author(s):* **Rifat Sadik, Lena Mashayekhy,** Univ. of Delaware (United States)

**Lunch Break 11:30 AM - 01:20 PM**

## SESSION 3: MULTI-AGENT SYSTEMS

22 April 2024 • 01:20 PM - 02:50 PM | Potomac 4
*Session Chair(s):* **Jeffrey Hudack**, Air Force Research Lab. (United States); **Danda B. Rawat**, Howard Univ. (United States)

13051-202 • 01:20 PM - 01:50 PM
**How to Accelerate AI Adoption** *(Invited Paper)*
*Author(s):* **Isaac J. Faber,** U.S. Army (United States)

13051-9 • 01:50 PM - 02:10 PM
**Learning-based metareasoning for decision-making in multi-agent pursuit-evasion games**
*Author(s):* **Prannoy Namala,** Univ. of Maryland, College Park (United States); **Jeffrey W. Herrmann,** The Catholic Univ. of America (United States)

13051-11 • 02:10 PM - 02:30 PM
**Simulation experimentation of swarms: methodologies and analyses**
*Author(s):* **Elizabeth Mezzacappa**, **Melissa Jablonski**, **Michael McBride,** U.S. Army DEVCOM Armaments Ctr. (United States); **Shawn Mather**, **Aden Clymer**, **Kayla M. Jones**, **Tess Huchun-Walker**, **Curtis Meares,** U.S. Military Academy (United States); **Ross Arnold,** U.S. Army DEVCOM Armaments Ctr. (United States)

13051-12 • 02:30 PM - 02:50 PM
**Route planning optimization for symbiotic swarm robotics**
*Author(s):* **Benjamin Hand**, **Kevin Pham, Colleen P. Bailey,** Univ. of North Texas (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 4: VIRTUAL, AUGMENTED, AND MIXED REALITY

22 April 2024 • 03:20 PM - 04:40 PM | Potomac 4
*Session Chair(s):* **Bruce Swett**, Northrop Grumman Corp. (United States); **Ravi Ravichandran**, BAE Systems (United States)

13051-15 • 03:20 PM - 03:40 PM
**Evaluating the efficacy of a haptic feedback, 360° treadmill-integrated Virtual Reality framework and longitudinal training on decision-making performance in a complex search-and-shoot simulation**
*Author(s):* **Prakash Duraisamy,** Univ. of Wisconsin-Green Bay (United States)

13051-13 • 03:40 PM - 04:00 PM
**Towards virtual reality-based telemanipulation systems for military applications**
*Author(s):* **Iverson Monde, Dongbin Kim,** U.S. Military Academy (United States)

13051-14 • 04:00 PM - 04:20 PM
**Digital augmentation of direct view optics using a holographic waveguide**
*Author(s):* **Waylin J. Wing,** EOTECH, LLC. (United States); **Amelia Covert,** EOTECH (United States); **Abram Summerfield**, **Anthony Heath**, **Brian Bellah**, **Joseph Brincat**, **Sophia M. Kouza, Ava F. Kouza,** EOTECH, LLC. (United States)

13051-16 • 04:20 PM - 04:40 PM
**Understanding the impact of trust on performance in a training system using augmented reality**
*Author(s):* **Michael P. Browne,** Vision Products LLC (United States); **Gregory Welch**, **Gerd Bruder, Ryan Schubert,** Univ. of Central Florida (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 5: CAUSALITY

23 April 2024 • 10:30 AM - 12:10 PM | Potomac 4
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Bruce Swett**, Northrop Grumman Corp. (United States)
Opening remarks 10:30 AM to 10:40 AM

13051-203 • 10:40 AM - 11:10 AM
**Using AI to Support Critical Homeland Security Missions** *(Invited Paper)*
*Author(s):* **Brian J. Henz,** DEVCOM Army Research Lab. (United States)

13051-17 • 11:10 AM - 11:30 AM
**A comparison of causal discovery and explainable AI (XAI) for image datasets**
*Author(s):* **Atul Rawal,** Towson Univ. (United States); **Adrienne J. Raglin,** DEVCOM Army Research Lab. (United States); **Qianlong Wang, Ziying Tang,** Towson Univ. (United States)

13051-18 • 11:30 AM - 11:50 AM
**Improved face transformer model for facial emotion recognition in human-machine collaboration**
*Author(s):* **Sanjeev Roka, Danda B. Rawat,** Howard Univ. (United States)

13051-19 • 11:50 AM - 12:10 PM
**Causal discovery for image datasets via feature extraction**
*Author(s):* **Atul Rawal,** Towson Univ. (United States); **Adrienne J. Raglin,** DEVCOM Army Research Lab. (United States); **Qianlong Wang, Ziying Tang,** Towson Univ. (United States)

**Lunch/Exhibition Break 12:10 PM - 02:20 PM**

## SESSION 6: DECISION SUPPORT

23 April 2024 • 02:20 PM - 03:00 PM | Potomac 4
*Session Chair(s):* **Brayden Hollis**, Air Force Research Lab. (United States); **Michael Wolmetz**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13051-21 • 02:20 PM - 02:40 PM
**A methodology for representing and assessing artificial intelligence decision aids within modeling and simulation**
*Author(s):* **Joshua Wong**, **Emily A. Nack,** U.S. Military Academy (United States); **Zachary Steelman**, **Seth Erway,** U.S. Army DEVCOM Analysis Ctr. (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States)

13051-22 • 02:40 PM - 03:00 PM
**Multi-criteria decision engine for multiple operational environment (M-DEMOE)**
*Author(s):* **Kofi Nyarko**, **Peter Taiwo**, **Kelechi Nwachukwu,** Morgan State Univ. (United States); **Justine C. Rawal**, **Adrienne J. Raglin, John T. Richardson,** DEVCOM Army Research Lab. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 7: AI ASSURANCE FOR MDO APPLICATIONS: JOINT SESSION WITH CONFERENCES 13051 AND 13054

23 April 2024 • 03:30 PM - 05:20 PM | Potomac 4
*Session Chair(s):* **Joshua D. Harguess**, **Benjamin Jensen**, Marine Corps Univ. (United States)

13051-204 • 03:30 PM - 04:00 PM
**Overview of the responsible AI (RAI) toolkit** *(Invited Paper)*
*Author(s):* **Rachel Rajaseelan,** CDAO - Chief Digital and Artificial Intelligence Office (United States)

13051-24 • 04:00 PM - 04:20 PM
**Learning behavior of Offline Reinforcement Learning Agents**
*Author(s):* **Indu Shukla**, **Haley R. Dozier, Althea C. Henslee,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-25 • 04:20 PM - 04:40 PM
**When the occasion comes, the proverb comes: value alignment via proverbial bank and synthetic rules**
*Author(s):* **Cesa Salaam, Danda B. Rawat,** Howard Univ. (United States)

13054-25 • 04:40 PM - 05:00 PM
**Optimized and secured AI for the tactical edge**
*Author(s):* **Sek Chai,** Latent AI, Inc. (United States); **Scott Ostrowski,** Latent AI (United States)

13054-27 • 05:00 PM - 05:20 PM
**Assured AI Reference Architecture**
*Author(s):* **Marcus Tyler, James McCeney,** The MITRE Corp. (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13051-54 • 06:00 PM - 07:30 PM
**Physics-informed neural networks for modeling hysteretic behavior in magnetorheological dampers**
*Author(s):* **Yuandi Wu**, **Brett Sicard**, **Patrick Kosierb**, **Raveen Appuhamy**, **Alexandre M Leroux, Stephen A. Gadsden,** McMaster Univ. (Canada)

13051-55 • 06:00 PM - 07:30 PM
**Evading deep learning-based DGA detectors: current problems and solutions.**
*Author(s):* **Puck de Haan**, **Irina Chiscop**, **Bram Poppink, Yori Kamphuis,** TNO (Netherlands)

13051-56 • 06:00 PM - 07:30 PM
**Machine learning attacks and defenses for vehicular cyber physical systems**
*Author(s):* **Alondra Rodriguez**, **Lance Richard**, **Dawn Johnson, Atul Rawal,** Towson Univ. (United States)

13051-57 • 06:00 PM - 07:30 PM
**Physics-informed neural networks for scientific modeling: uses, implementations, and directions**
*Author(s):* **Alexander New**, **Andrew S. Gearhart**, **Ryan A. Darragh, Marisel Villafañe-Delgado,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13051-58 • 06:00 PM - 07:30 PM
**Interactive evolutionary computation for efficient COA development in military applications: challenges and approaches**
*Author(s):* **Nicholas R. Waytowich,** DEVCOM Army Research Lab. (United States)

13051-62 • 06:00 PM - 07:30 PM
**Optimizing neural network using clustering for resource constrained environment**
*Author(s):* **Chong Tian, Danda B. Rawat,** Howard Univ. (United States)

13051-63 • 06:00 PM - 07:30 PM
**Examining multi-input pipelines for the service degradation point**
*Author(s):* **Sergey Motorny,** UIC Government Services, LLC (United States); **S. Ross Glandon, Jing-Ru C. Cheng,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-26 • 06:00 PM - 07:30 PM
**Investigating the mission impact of non-kinetic variables in the operational environment**
*Author(s):* **Mark R. Mittrick**, **John Richardson**, **Vinicius G. Goecks**, **James Hare, Nicholas R. Waytowich,** DEVCOM Army Research Lab. (United States)

13051-10 • 06:00 PM - 07:30 PM
**Coordinated maneuver in ground robotics for multi-agent systems**
*Author(s):* **Rolando Fernandez,** DEVCOM Army Research Lab. (United States); **Jacob Adamson,** Texas A&M Univ. (United States); **Matthew Luo,** Univ. of California, Berkeley (United States); **Erin G. Zaroukian, Derrik E. Asher,** DEVCOM Army Research Lab. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 8: MISSION PLANNING II

24 April 2024 • 10:30 AM - 12:10 PM | Potomac 4
*Session Chair(s):* **Benjamin Jensen**, Marine Corps Univ. (United States); **Jeffrey Hudack**, Air Force Research Lab. (United States)
Opening remarks 10:30 AM to 10:40 AM

13051-205 • 10:40 AM - 11:10 AM
**Modeling and reasoning AI course of action generation hub** *(Invited Paper)*
*Author(s):* **Brayden Hollis,** Air Force Research Lab. (United States)

13051-27 • 11:10 AM - 11:30 AM
**AI agent community of practice pilot competition**
*Author(s):*

13051-28 • 11:30 AM - 11:50 AM
**A multi-model approach to modeling intelligent combat behaviors for wargaming**
*Author(s):* **Scotty Black,** Naval Postgraduate School (United States)

13051-29 • 11:50 AM - 12:10 PM
**Streamlined AI architecture for wargaming**
*Author(s):* **Shaun Ryer, Melanie Rose,** Air Force Research Lab. (United States)

**Lunch/Exhibition Break 12:10 PM - 02:00 PM**

## SESSION 9: AI/ML AND UNMANNED SYSTEMS: JOINT SESSION WITH CONFERENCES 13051 AND 13055

24 April 2024 • 02:00 PM - 03:20 PM | National Harbor 10
*Session Chair(s):* **Raja Suresh**, Arizona State Univ. (United States); **Myron E. Hohil**, DEVCOM - Armaments Ctr. (United States)

13055-11 • 02:00 PM - 02:20 PM
**The cultivation of autonomous strategic coordination systems**
*Author(s):* **Christopher W. Scully**, **George Bahr**, **Trevor Bajkowski**, **James Keller**, **Grant J. Scott,** Univ. of Missouri (United States); **Samantha S. Carley, Stanton Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-31 • 02:20 PM - 02:40 PM
**Generation of 3D LWIR thermal maps based on deep learning SLAM: feasibility and evaluation**
*Author(s):* **Donyung Kim, Sungho Kim,** Yeungnam Univ. (Korea, Republic of)

13055-12 • 02:40 PM - 03:00 PM
**Transfer learning for adaptable autonomy**
*Author(s):* **Michael Ganger**, **Anthony Bloch,** General Dynamics Mission Systems (United States); **Patrick V. Haggerty,** General Dynamics Missions Systems (United States)

13051-32 • 03:00 PM - 03:20 PM
**Leveraging foundation models for scene understanding in human-robot teaming**
*Author(s):* **David A. Handelman**, **Corban G. Rivera**, **William A. Paul**, **Andrew R. Badger**, **Emma A. Holmes**, **Martha I. Cervantes**, **Bethany G. Kemp, Erin C. Butler,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 10: EDGE COMPUTING

24 April 2024 • 03:50 PM - 05:30 PM | Potomac 4
*Session Chair(s):* **Nathaniel D. Bastian**, U.S. Military Academy (United States); **Oscar Munoz**, DEVCOM Army Research Lab. (United States)

13051-33 • 03:50 PM - 04:10 PM
**MLOps at the edge in DDIL environments**
*Author(s):* **Dinesh C. Verma, Peter Santhanam,** IBM Thomas J. Watson Research Ctr. (United States)

13051-34 • 04:10 PM - 04:30 PM
**Dynamic orchestration of data distributed inferencing with predictive modeling**
*Author(s):* **Cleon Anderson**, **Matthew Dwyer**, **David Harman, Scott Brown,** DEVCOM Army Research Lab. (United States)

13051-35 • 04:30 PM - 04:50 PM
**Stochastic optimization of inference execution on tactical edge networks**
*Author(s):* **Mikal Willeke,** U.S. Military Academy (United States); **Sean Harding**, **Kevin Chan,** DEVCOM Army Research Lab. (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States)

13051-36 • 04:50 PM - 05:10 PM
**Task-agnostic feature extractors for online learning at the edge**
*Author(s):* **Lisa Loomis**, **David Wise**, **Nathan Inkawhich**, **Clare Thiem, Nathan McDonald,** Air Force Research Lab. (United States)

13051-37 • 05:10 PM - 05:30 PM
**Accurate and computational efficient estimation with non-linear statistical models**
*Author(s):* **Maximillian Chen**, **Ryan Allen**, **Liane Ramac-Thomas, Melissa Strait,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

## Thursday 25 April 2024

### SESSION 11: COMPUTER VISION II

25 April 2024 • 08:20 AM - 10:00 AM | Potomac 4
*Session Chair(s):* **Christopher R. Ratto**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Latasha Solomon**, DEVCOM Army Research Lab. (United States)
Opening Remarks 8:20-8:30 AM

13051-206 • 08:30 AM - 09:00 AM
**RACER program progress** *(Invited Paper)*
*Author(s):* **Stuart H. Young,** Defense Advanced Research Projects Agency (United States)

13051-38 • 09:00 AM - 09:20 AM
**Efficient fine-grained automatic target recognition through active learning for defense applications**
*Author(s):* **Lesrene Browne,** Northeastern Univ. (United States); **Nathan Inkawhich**, **Claire Thorp**, **Sean Sisti, Walter Bennette,** Air Force Research Lab. (United States)

13051-40 • 09:20 AM - 09:40 AM
**On comparing multiple approaches for classifying vessels in imagery**
*Author(s):* **John G. Warner,** U.S. Naval Research Lab. (United States); **Vishal Patel,** Johns Hopkins University (United States)

13051-41 • 09:40 AM - 10:00 AM
**Recent advances on generative models for semantic segmentation: a survey**
*Author(s):* **Manish Bhurtel**, **Danda B. Rawat,** Howard Univ. (United States); **Daniel O Rice,** FAST Lab, BAE Systems (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 12: MISSION PLANNING III

25 April 2024 • 10:30 AM - 11:30 AM | Potomac 4
*Session Chair(s):* **Benjamin Jensen**, Marine Corps Univ. (United States); **Oscar Munoz**, DEVCOM Army Research Lab. (United States)

13051-42 • 10:30 AM - 10:50 AM
**Constrained deep reinforcement learning for maritime platform defense**
*Author(s):* **Jared Markowitz,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13051-43 • 10:50 AM - 11:10 AM
**Improving flight planning efficiency through machine learning**
*Author(s):* **Kalyan Vaidyanathan**, **Ty Danet**, **Trivi Tran, Yen Luu,** BAE Systems (United States)

13051-45 • 11:10 AM - 11:30 AM
**Modeling adversary behavior using Q-Learning**
*Author(s):* **Alana Li,** Univ. of California, Berkeley (United States); **Jessica Dorismond, Marco Gamarra,** Air Force Research Lab. - Rome (United States)

**Lunch/Exhibition Break 11:30 AM - 01:00 PM**

### SESSION 13: DATA INTEGRATION

25 April 2024 • 01:00 PM - 02:30 PM | Potomac 4
*Session Chair(s):* **Tarek Abdelzaher**, Univ. of Illinois (United States); **Michael Wolmetz**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13051-207 • 01:00 PM - 01:30 PM
**MITRE ATLAS: Understanding and Protecting against Adversarial Threats to AI** *(Invited Paper)*
*Author(s):* **Anna Raney,** The MITRE Corp. (United States)

13051-46 • 01:30 PM - 01:50 PM
**Vector symbolic open source information discovery**
*Author(s):* **Cai Davies,** Cardiff Univ. (United Kingdom); **Sam Meek**, **Philip Hawkins,** Helyx Secure Information Systems Ltd. (United Kingdom); **Benomy Tutcher,** Frazer-Nash Consultancy Ltd. (United Kingdom); **Graham Bent,** Neurosynapse Ltd. (United Kingdom); **Alun D. Preece,** Cardiff Univ. (United Kingdom)

13051-47 • 01:50 PM - 02:10 PM
**Enabling cross-platform sensor co-registration for distributed situational awareness**
*Author(s):* **Christopher W. Scully**, **Trevor Bajkowski**, **James Hurt**, **James Keller**, **Grant Scott,** Univ. of Missouri (United States); **Samantha Carley, Stanton Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-48 • 02:10 PM - 02:30 PM
**Synchronized analysis of video, imagery, and audio**
*Author(s):* **Kelechi Nwachukwu,** Morgan State Univ. (United States)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 14: CYBER

25 April 2024 • 03:00 PM - 04:40 PM | Potomac 4
*Session Chair(s):* **Nathaniel D. Bastian**, U.S. Military Academy (United States); **Danda B. Rawat**, Howard Univ. (United States)

13051-49 • 03:00 PM - 03:20 PM
**Lessons learned in designing a cyber reinforcement learning competition**
*Author(s):* **Tyler Cody**, **Emma Meno**, **David Jones**, **Tugba Erpek, Peter A Beling,** Virginia Polytechnic Institute and State Univ. (United States)

13051-50 • 03:20 PM - 03:40 PM
**Using large language models to protect information search in multi-domain operations**
*Author(s):* **Dinesh C. Verma,** IBM Thomas J. Watson Research Ctr. (United States); **David Beymer**, **Pawan Chowdhary, Sanand R Kadhe,** IBM Research - Almaden (United States)

13051-51 • 03:40 PM - 04:00 PM
**Dynamic reinforcement learning for network defense: botnet detection and eradication**
*Author(s):* **Robert Schabinger**, **Caleb Carlin**, **Jonathan Mullin,** DCI Solutions (United States); **David A. Bierbrauer**, **Emily A. Nack**, **John A. Pavlik**, **Alexander V. Wei**, **Nathaniel D. Bastian,** U.S. Military Academy (United States); **Metin B. Ahiskali,** DEVCOM C5ISR (United States)

13051-52 • 04:00 PM - 04:20 PM
**Semi-supervised learning with data augmentation for raw network traffic detection**
*Author(s):* **Robin Bhoo,** Carnegie Mellon Univ. (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States)

13051-53 • 04:20 PM - 04:40 PM
**Zero-shot learning for raw network traffic detection**
*Author(s):* **Pooja Rani, Nathaniel D. Bastian,** U.S. Military Academy (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13051-59
**The confluence of PSO and MDO: a bibliometric perspective**
*Author(s):* **Khaled Obaideen**, **Mohammad AlShabi**, **Maamar Bettayeb,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

13051-60
**A comparative study: fuzzy logic and ANN in addressing inverse depletion**
*Author(s):* **Bassam Khuwaileh**, **Mohammad A. AlShabi, Polina Matesha,** Univ. of Sharjah (United Arab Emirates)

13051-61
**Predicting the dynamics of a capsule-shaped equilibrium curve chaotic system using recurrent neural networks**
*Author(s):* **Wafaa Al Nassan**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13051-64
**Image inpainting based on adaptive generative models**
*Author(s):* **Nikolay Gapon,** Moscow State Univ. of Technology "STANKIN" (Russian Federation); **Aleksei Puzerenko,** Don State Technical University (Russian Federation); **Viacheslav Voronin**, **Marina Zhdanova, Evgeny A. Semenishchev,** Moscow State Univ. of Technology "STANKIN" (Russian Federation)

13051-66
**SLAM in XR: a bibliometric analysis of its application in virtual, augmented, and mixed reality**
*Author(s):* **Khaled Obaideen, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

## CONFERENCE 13052

# Autonomous Systems: Sensors, Processing, and Security for Ground, Air, Sea, and Space Vehicles and Infrastructure 2024

**22 - 23 April 2024 | National Harbor 12**

***Conference Chair(s):*** **Michael C. Dudzik,** IQM Research Institute (United States); **Stephen M. Jameson,** BAE Systems (United States); **Theresa J. Axenson,** National Reconnaissance Office (United States)

***Program Committee:*** **John E. Ball,** Mississippi State Univ. (United States); **Rita Barrios,** BlackBerry Ltd. (United States); **Jeremy P. Bos,** Michigan Technological Univ. (United States); **Andrew Dallas,** National Advanced Mobility Consortium (United States); **Jason M. Eichenholz,** Luminar Technologies, Inc. (United States); **Paul F. McManamon,** Exciting Technology, LLC (United States); **Brad McNett,** U.S. Army Combat Capabilities Development Command (United States); **Jeremy A. Salinger,** General Motors Co. (United States)

## Monday 22 April 2024

### SESSION 1: NOVEL ALGORITHMIC TECHNIQUES FOR CONTROL OF AUTONOMOUS SYSTEMS

22 April 2024 • 09:00 AM - 10:40 AM | National Harbor 12
*Session Chair(s):* **Theresa J. Axenson**, National Reconnaissance Office (United States)
Opening remarks 9:00 AM to 9:10 AM

13052-25 • 09:10 AM - 09:40 AM
**Remote sensing of planetary bodies** *(Invited Paper)*
*Author(s):* **Mitch Schulte,** NASA Ames Research Ctr. (United States)

13052-13 • 09:40 AM - 10:00 AM
**Evaluate the performance of attention DDPG-based adaptive cruise control system in all weather conditions**
*Author(s):* **Fahmida Islam**, **Iffat Ara Ebu**, **Mahfuzur Rahman**, **John E. Ball, Chris Goodin,** Mississippi State Univ. (United States)

13052-17 • 10:00 AM - 10:20 AM
**Multi-robot navigation using improved RRT*-smart with digital twin technology**
*Author(s):* **Elijah Riser**, **Timothy Sellers**, **Tingjun Lei**, **Chintam Pradeep, Chaomin Luo,** Mississippi State Univ. (United States)

13052-20 • 10:20 AM - 10:40 AM
**Adaptive image compression for vehicular ad hoc networks: A Discrete Wavelet Transform Low-Low subband (DWT-LL), Singular Value Decomposition (SVD), and Linear Programming (LP) approach for vehicle density sensing-based compression**
*Author(s):* **Mfon M. Okpok, Billy Kihei,** Kennesaw State Univ. (United States)

**Coffee Break 10:40 AM - 11:10 AM**

### SESSION 2: NOVEL SENSING APPLICATIONS FOR AUTONOMOUS SYSTEMS

22 April 2024 • 11:10 AM - 12:30 PM | National Harbor 12
*Session Chair(s):* **Stephen M. Jameson**, BAE Systems (United States)

13052-16 • 11:10 AM - 11:30 AM
**Vehicle detection using drone-mounted optically pumped magnetometers**
*Author(s):* **Jeremy W. Mares,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Patrick Leslie,** The Univ. of Arizona (United States); **Thomas Watson,** The Univ. of Memphis (United States); **Eunmo Kang,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Eddie Jacobs,** The Univ. of Memphis (United States); **Christopher K. Renshaw,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

13052-2 • 11:30 AM - 11:50 AM
**Enhancing cyber-physical systems (CPS) robustness through sensor-pair health indicator**
*Author(s):* **Ruben Eduardo Montano Claure**, **Julie B. Heynssens,** Northern Arizona Univ. (United States); **Ian Burke,** Northern Arizona University (United States); **Mahafujul Alam, Bertrand Cambou,** Northern Arizona Univ. (United States)

13052-6 • 11:50 AM - 12:10 PM
**Accelerated Hough transform-based tree diameter extraction from LiDAR point cloud data**
*Author(s):* **Bruce Hicks**, **Andrew Bonner**, **Leah Vaughn,** Mississippi State Univ. (United States); **David Saucier,** Human Factors and Athlete Engineering, Center for Advanced Vehicular Systems (United States); **Lalitha Dabbiru**, **John Ball, Ali C Gurbuz,** Mississippi State Univ. (United States), Sensor Lab, Center for Advanced Vehicular Systems (United States)

13052-15 • 12:10 PM - 12:30 PM
**Enhancing autonomous navigation: acoustic tomography through synthetic data modeling**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Mohammad AlShabi,** Univ. of Sharjah (United Arab Emirates)

## Lunch Break 12:30 PM - 01:30 PM

## SESSION 3: ROBUST CONTROL APPROACHES FOR AUTONOMOUS SYSTEMS

22 April 2024 • 01:30 PM - 03:20 PM | National Harbor 12
*Session Chair(s):* **Michael C. Dudzik**, IQM Research Institute (United States)

13052-28 • 01:30 PM - 02:00 PM
**Advances in space trusted autonomy** *(Invited Paper)*
*Author(s):* **Byron F. Knight,** National Reconnaissance Office (United States)

13052-12 • 02:00 PM - 02:20 PM
**A novel bioinspired tracking control method for mobile robots with the adaptive Sliding Innovation Filter**
*Author(s):* **Zhe Xu**, **Waleed Hilal**, **Stephen A. Gadsden,** McMaster Univ. (Canada); **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13052-19 • 02:20 PM - 02:40 PM
**Developing robust autonomous vehicles with ROS**
*Author(s):* **Dylan J. Kangas**, **Mohamed Salem**, **Kevin Li**, **Tyler Ryynanen**, **Steven Senczyszyn**, **Anthony J. Pinar,** Michigan Technological Univ. (United States); **Steven R Price**, **Stanton Price,** US Army Engineer Research and Development Center (United States); **Stephen Taylor**, **Timothy Murphy,** Naval Surface Warfare Ctr. Crane Div. (United States); **Timothy C. Havens,** Michigan Technological Univ. (United States)

13052-5 • 02:40 PM - 03:00 PM
**Digital unmanned aerial vehicles: applications of digital twins to UAVs**
*Author(s):* **Brett S. Sicard**, **Alex McCafferty-Leroux**, **Raveen Appuhamy**, **Andrew Newton**, **Patrick Kosierb, Stephen A. Gadsden,** McMaster Univ. (Canada)

13052-1 • 03:00 PM - 03:20 PM
**Current sensor fingerprint for real-time failure detection and transceiver identification in autonomous systems controlled by artificial intelligence (AI)**
*Author(s):* **Julie B. Heynssens**, **Jack Garrard**, **Ian Burke, Bertrand Cambou,** Northern Arizona Univ. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 5: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES I: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 10:30 AM - 12:00 PM | National Harbor 10
*Session Chair(s):* **Hoa G. Nguyen**, Office of Naval Research Global (Japan); **Michael C. Dudzik**, IQM Research Institute (United States)
Opening Remarks 10:30-10:40 AM

13055-1 • 10:40 AM - 11:00 AM
**Robot operating system 2 navigation stack in action: automating a Caterpillar 621G for pavement testing**
*Author(s):* **Collin Hays**, **Desmond Benton**, **Brian M. Robinson**, **Kevin Hall**, **Scott Craft**, **Rodney A. Wade**, **John Jetton**, **Caleb Spencer**, **Woody W. English,** Torch Technologies, Inc. (United States);**Robert Diltz,** Air Force Civil Engineer Ctr. (United States)

13052-8 • 11:00 AM - 11:20 AM
**Comparing performance of robot operating system (ROS) mapping algorithms in the presence of degraded or obscured depth sensors**
*Author(s):* **Steven Senczyszyn**, **Anthony J. Pinar**, **Mohamed Salem**, **Elizabeth Donoghue**, **Shelby Wills**, **Moira Broestl**, **Adam J. Webb**, **Timothy C. Havens,** Michigan Technological Univ. (United States); **Stanton R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13052-200 • 11:20 AM - 12:00 PM
**Trusted AI and autonomy for today's warfighter** (Keynote Presentation)
*Author(s):* **David A. Honey,** Deputy Under Secretary of Defense for Research and Engineering (United States)

**Lunch/Exhibition Break 12:00 PM - 01:50 PM**

## SESSION 6: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES II: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 01:50 PM - 02:50 PM | National Harbor 10
*Session Chair(s):* **Theresa J. Axenson**, National Reconnaissance Office (United States); **Brian M. Robinson**, Torch Technologies, Inc. (United States)

13055-2 • 01:50 PM - 02:10 PM
**The NATURE autonomy stack: an open-source stack for off-road navigation**
*Author(s):* **Christopher T. Goodin**, **Marc N. Moore**, **Daniel W. Carruth**, **Christopher R. Hudson**, **Lucas D. Cagle,** Mississippi State Univ. (United States); **Stefan Wapnick,** McGill Univ. (Canada); **Paramsothy Jayakumar,** US Army DEVCOM Ground Vehicle System Center (United States)

13055-3 • 02:10 PM - 02:30 PM
**Autonomous tractor for delivery of biocementation agent**
*Author(s):* **Collin Hays,** Torch Technologies, Inc. (United States);**Patrick Neal,** Univ. of Florida (United States); **Scott Craft**, **Desmond Benton,** Torch Technologies, Inc. (United States);**Carl Crane,** Univ. of Florida (United States); **Brian M. Robinson,** Torch Technologies, Inc. (United States); **James Denault,** Inventive Research Solutions (United States); **Kevin Hall**, **Woody W. English,** Torch Technologies, Inc. (United States); **Rhett Martineau,** Air Force Research Laboratory (United States); **Steven Bailey, Robert Diltz,** Air Force Civil Engineer Ctr. (United States)

13055-4 • 02:30 PM - 02:50 PM
**Flexible mission planning for autonomous ground and air robots**
*Author(s):* **Brad Pankow**, **Jordan Lampi**, **Lilia Moshkina, Nick Paul,** Soar Technology, Inc. (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 7: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES III: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 03:20 PM - 04:20 PM | National Harbor 10
*Session Chair(s):* **Paul L. Muench**, U.S. Army Combat Capabilities Development Command (United States); **Hoa G. Nguyen**, Office of Naval Research Global (Japan)

13052-10 • 03:20 PM - 03:40 PM
**CNN-based end-to-end learning for lane centering**
*Author(s):* **Iffat Ara Ebu**, **Fahmida Islam**, **John E. Ball, Chris Goodin,** Mississippi State Univ. (United States)

13052-9 • 03:40 PM - 04:00 PM
**Traffic light recognition and V2I communications of an autonomous vehicle with the traffic light for effective intersection navigation using YOLOv8 and MAVS simulation**
*Author(s):* **Mahfuzur Rahman**, **Fahmida Islam**, **John E. Ball, Chris Goodin,** Mississippi State Univ. (United States)

13052-3 • 04:00 PM - 04:20 PM
**Object Classification Techniques For Autonomous Radar Sensors**
*Author(s):* **Rasim Akin Sevimli,** Baskent Üniv. (Turkey)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13052-24 • 06:00 PM - 07:30 PM
**Investigation into deep learning methods for in-the-wild applications**
*Author(s):* **Haley B. Land**, **Stanton R Price,** U.S. Army Engineer Research and Development Ctr. (United States); **John E. Ball,** Mississippi State Univ. (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13052-18
**Path planning for a UGV using Salp Swarm Algorithm**
*Author(s):* **Mohammad A. AlShabi**, **Khlaled Ballous**, **Ali Bou Nassif**, **Maamar Bettayeb**, **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Stephen A. Gadsden,** McMaster Univ. (Canada)

# CONFERENCE 13053

CONFERENCE CO-SPONSOR

MISSISSIPPI STATE UNIVERSITY
AGRICULTURAL AUTONOMY INSTITUTE

# Autonomous Air and Ground Sensing Systems for Agricultural Optimization and Phenotyping IX

**22 - 23 April 2024 | National Harbor 14**

***Conference Chair(s):*** **J. Alex Thomasson,** Mississippi State Univ. (United States); **Christoph Bauer,** KWS SAAT SE & Co. KGaA (Germany)

***Program Committee:*** **Subodh Bhandari,** California State Polytechnic Univ., Pomona (United States); **Yufeng Ge,** Univ. of Nebraska-Lincoln (United States); **Xiongzhe Han,** Kangwon National Univ. (Korea, Republic of); **Seth C. Murray,** Texas A&M AgriLife Research (United States); **Haly L. Neely,** Washington State Univ. (United States); **Carl Salvaggio,** Rochester Institute of Technology (United States); **Michael Sama,** Univ. of Kentucky (United States); **Sindhuja Sankaran,** Washington State Univ. (United States); **Ajay Sharda,** Kansas State Univ. (United States); **Yeyin Shi,** Univ. of Nebraska-Lincoln (United States); **Alfonso F. Torres-Rua,** Utah State Univ. (United States)

## Monday 22 April 2024

### WELCOME AND OPENING REMARKS

22 April 2024 • 08:10 AM - 08:20 AM | National Harbor 14
**J. Alex Thomasson**, Mississippi State Univ. (United States)

### SESSION 1: UAV-BASED SENSING SYSTEMS FOR PHENOTYPING AND PRECISION AGRICULTURE

22 April 2024 • 08:20 AM - 09:30 AM | National Harbor 14
*Session Chair(s):* **J. Alex Thomasson**, Mississippi State Univ. (United States)

13053-1 • 08:20 AM - 08:50 AM
**Determining the best irrigation strategy of pistachio trees in saline soil** *(Invited Paper)*
*Author(s):* **Hamid Jafarbiglu**, **Alireza Pourreza**, **Mohammadreza Narimani,** Univ. of California, Davis (United States); **Blake M. Sanden,** Univ. of California Agriculture and Natural Resources (United States); **Giulia Marino**, **Mae Culumber**, **Mukesh Mehata,** Univ. of California (United States); **Louise Ferguson,** Univ. of California, Davis (United States)

13053-2 • 08:50 AM - 09:10 AM
**Automated pipeline for multi-polygon shapefile generation for phenotype and precision agriculture applications**
*Author(s):* **Aashvi Dua**, **Ajay Sharda**, **William Schapaugh, Rene Hessel,** Kansas State Univ. (United States)

13053-4 • 09:10 AM - 09:30 AM
**Data to science: an open-source online platform for managing, visualizing, and publishing UAS data**
*Author(s):* **Jinha Jung**, **Songlin Fei**, **Mitch Tuinstra**, **Yang Yang Diane Wang**, **Carol Song,** Purdue Univ. (United States); **Jeffrey Gillan,** The Univ. of Arizona (United States); **Mahendra Bhandari**, **Amir Ibrahim,** Texas A&M Univ. (United States); **Lan Zhao,** Purdue Univ. (United States); **Tyson Swetnam,** The Univ. of Arizona (United States); **Bryan Barker,** Oracle (United States); **Minyoung Jung, Ben Hancock,** Purdue Univ. (United States)

**Coffee Break 09:30 AM - 10:00 AM**

### SESSION 2: ADVANCED UAV AND UGV SENSORS FOR SPECIALTY CROP APPLICATIONS

22 April 2024 • 10:00 AM - 12:00 PM | National Harbor 14
*Session Chair(s):* **Christoph Bauer**, KWS SAAT SE & Co. KGaA (Germany)

13053-5 • 10:00 AM - 10:20 AM
**Advanced remote sensing for early detection of Broomrape in tomato crops: integrating spectral analysis and 3D radiative transfer**
*Author(s):* **Mohammadreza Narimani**, **Alireza Pourreza**, **Mohsen B Mesgaran, Parastoo Farajpoor,** Univ. of California, Davis (United States)

13053-6 • 10:20 AM - 10:40 AM
**Investigating the potential of UAV-based hyperspectral sensor in detecting powdery mildew in grapes**
*Author(s):* **Subodh Bhandari**, **Michael Acosta,** California State Polytechnic Univ., Pomona (United States); **Amar Raheja,** California State Polytechnic Univ Pomona (United States); **Cristobal Gonzalez,** California State Polytechnic Univ., Pomona (United States)

13053-7 • 10:40 AM - 11:00 AM
**Evaluation of RFID power and UAV flight level in plant inventory application**
*Author(s):* **Van B. Patiluna**, **Joe Mari J. Maja,** Clemson Univ. (United States); **James Robbins,** Retired (United States)

13053-8 • 11:00 AM - 11:20 AM
**Investigating the performance of monocular and stereo vision for the detection of weeds in a strawberry field using UAVs and machine learning techniques**
*Author(s):* **Subodh Bhandari**, **Amar Raheja, Derek Triska,** California State Polytechnic Univ., Pomona (United States)

13053-30 • 11:20 AM - 11:40 AM
**Multi-trait modeling for grape nutrient retrieval by proximal spectral sensing**
*Author(s):* **Parastoo Farajpoor**, **Alireza Pourreza, Matthew W. Fidelibus,** Univ. of California, Davis (United States)

13053-106 • 11:40 AM - 12:00 PM
**Estimating Almond Canopy Nitrogen through 3D Radiative Transfer Models**
*Author(s):* **Momtanu Chakraborty, Alireza Pourreza,** Univ. of California, Davis (United States)

**Lunch Break 12:00 PM - 01:30 PM**

## PANEL DISCUSSION ON AGRICULTURE: STATUS QUO, CHALLENGES, AND FUTURE COMMERCIAL SENSORS FOR UAVS AND UGVS

22 April 2024 • 01:30 PM - 03:00 PM | National Harbor 14
Moderator: **Alex Thomasson**, Mississippi State Univ. (United States) *Panelists:* **Trond Loke**, HySpex, Norsk Elektro Optikk AS (Norway) **Eric Johnson**, Planet (United States) **Liu Rohan**, PepsiCo (United States) **Christoph Bauer**, KWS SAAT SE & Co. KGaA (Germany)

In the panel discussion experts in their domains shared their perspectives on the current state and future trends of digital phenotyping and agricultural optimization. Insights from different industry perspectives are given.

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 3: UGVS FOR AGRICULTURAL PHENOTYPING AND MONITORING

22 April 2024 • 03:30 PM - 04:40 PM | National Harbor 14
*Session Chair(s):* **J. Alex Thomasson**, Mississippi State Univ. (United States)

13053-9 • 03:30 PM - 04:00 PM
**Development of Convolutional Neural Networks for Early Detection of Kimchi Cabbage Downy Mildew Based on Aerial Hyperspectral Images** *(Invited Paper)*
*Author(s):* **Xiongzhe Han,** Kangwon National Univ. (Korea, Republic of)

13053-10 • 04:00 PM - 04:20 PM
**A low cost, semi-autonomous phenotyping cart for late growth stages of tall crops**
*Author(s):* **Joseph Perry**, **Shoaf Robinson**, **Thomas P. Watson**, **Rafi Rahman**, **Angelin R. Favorito**, **Stephanie M. Ward, Eddie Jacobs,** The Univ. of Memphis (United States)

13053-11 • 04:20 PM - 04:40 PM
**A deep learning approach for precision phenotyping of corn stomata**
*Author(s):* **Sainath Reddy Gummi**, **Chulwoo Pack**, **Pappu K. Yadav**, **Young Chang**, **Mazhar Sher**, **James Kemeshi, Mohammad Ashik Alahe,** South Dakota State Univ. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## OPENING REMARKS

23 April 2024 • 10:30 AM - 10:40 AM | National Harbor 14
**J. Alex Thomasson**, Mississippi State Univ. (United States)

## SESSION 4: ACCURACY OF UAV-BASED SENSOR MEASUREMENTS

23 April 2024 • 10:40 AM - 12:10 PM | National Harbor 14
*Session Chair(s):* **J. Alex Thomasson**, Mississippi State Univ. (United States)

13053-12 • 10:40 AM - 11:10 AM
**Automating ground control point detection in UAS imagery using matrix barcodes** *(Invited Paper)*
*Author(s):* **Karla S. Ladino, Michael P. Sama,** Univ. of Kentucky (United States)

13053-13 • 11:10 AM - 11:30 AM
**State of spatial accuracy in UAS-derived remote sensing data**
*Author(s):* **Madison Dixon,** Mississippi State Univ. (United States)

13053-14 • 11:30 AM - 11:50 AM
**Performance assessment of crop line detection in corn field from unmanned aerial vehicle video**
*Author(s):* **Mohammad Abdus Shahid Rafi**, **Volkan Senyurek, Ali Gurbuz,** Mississippi State Univ. (United States)

13053-15 • 11:50 AM - 12:10 PM
**Phenotype calibration effectiveness of autonomous mobile ground control point**
*Author(s):* **Collin McLeod, John A. Thomasson,** Mississippi State Univ. (United States)

**Lunch/Exhibition Break 12:10 PM - 01:40 PM**

## SESSION 5: ADVANCED AGRICULTURAL SENSING FROM UGVS

23 April 2024 • 01:40 PM - 03:00 PM | National Harbor 14
*Session Chair(s):* **Christoph Bauer**, KWS SAAT SE & Co. KGaA (Germany)

13053-17 • 01:40 PM - 02:00 PM
**Enhancing cotton crop management by thermal sensing and chemical topping: a complete analysis and ground truthing**
*Author(s):* **Muhammad Abu Bakar Hayat,** Univ. of Agriculture, Faisalabad (Pakistan)

13053-18 • 02:00 PM - 02:20 PM
**Classifying adaxial and abaxial sides of diseased citrus leaves with selected hyperspectral bands and YOLOv8**
*Author(s):* **Quentin Frederick**, **Thomas Burks,** Univ. of Florida (United States); **Pappu K. Yadav,** South Dakota State Univ. (United States); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Megan M. Dewdney,** Univ. of Florida (United States)

13053-19 • 02:20 PM - 02:40 PM
**Development of an independent control system for improving spray distribution uniformity in unmanned aerial spraying system under varying operational and environmental conditions**
*Author(s):* **Seulgi Choi, Xiongzhe Han,** Kangwon National Univ. (Korea, Republic of)

13053-20 • 02:40 PM - 03:00 PM
**The Kalman filter's role in optimizing fluorescence analysis**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Mohammad AlShabi,** Univ. of Sharjah (United Arab Emirates)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13053-3
**A green smart station design for a UAV fleet management in precision agriculture**
*Author(s):* **Luis Miguel Samaniego Campoverde, Angel Freddy Ganapaza,** Univ. della Calabria (Italy)

# CONFERENCE 13054

# Assurance and Security for AI-enabled Systems

**22 - 23 April 2024 | National Harbor 8**

***Conference Chair(s):*** **Joshua D. Harguess,** The MITRE Corp. (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States); **Teresa L. Pace,** L3Harris Technologies, Inc. (United States)

***Program Committee:*** **Myron E. Hohil,** DEVCOM - Armaments Ctr. (United States); **Tien Pham,** The MITRE Corp. (United States); **Sandro Bjelogrlic,** NATO Communications and Information Agency (Netherlands); **Anna Knack,** The Alan Turing Institute (United Kingdom); **Ranjeev Mittu,** U.S. Naval Research Lab. (United States); **Jane Pinelis,** Johns Hopkins Univ. (United States); **Gautam K. Vallabha,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Jonathan B. Elliot,** US Dept. of Defense CDAO (United States); **Salman Asif,** Univ. of California, Riverside (United States); **Brian Jalaian,** University of West Florida, Florida Institute for Human and Machine Cognition (United States); **Michael Street,** NATO Communications and Information Agency (Netherlands); **Ken Fleischmann**, **Raul Longoria,** The Univ. of Texas at Austin (United States); **Brian Woolley,** MITRE Corp. (United States); **Dinesh C. Verma,** IBM Thomas J. Watson Research Ctr. (United States)

## Monday 22 April 2024

### OPENING REMARKS

22 April 2024 • 08:20 AM - 08:30 AM | National Harbor 8

### SESSION 1: KEYNOTE SESSION

22 April 2024 • 08:30 AM - 09:20 AM | National Harbor 8
*Session Chair(s):* **Joshua D. Harguess,** Cranium AI, Inc. (United States)

13054-200 • 08:30 AM - 09:20 AM
**Overview of the IARPA program on bias effects and notable generative AI limitations (BENGAL)** (Keynote Presentation)
*Author(s):* **Timothy McKinnon,**

### SESSION 2: ETHICS, FAIRNESS, RISK

22 April 2024 • 09:20 AM - 10:00 AM | National Harbor 8
*Session Chair(s):* **Nathaniel D. Bastian**, U.S. Military Academy (United States); **Brian Jalaian**, DEVCOM Army Research Lab. (United States)

13054-1 • 09:20 AM - 09:40 AM
**On the role of loss-driven systems analysis in assessing AI ethics**
*Author(s):* **Tyler Cody**, **Laura Freeman, Peter A Beling,** Virginia Polytechnic Institute and State Univ. (United States)

13054-2 • 09:40 AM - 10:00 AM
**Efforts to reduce risk in the release of artificial intelligence enabled systems**
*Author(s):* **Benjamin Schumeg, Benjamin Werner,** U.S. Army DEVCOM Armaments Ctr. (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 3: EXPLAINABILITY

22 April 2024 • 10:30 AM - 11:30 AM | National Harbor 8
*Session Chair(s):* **Brian Jalaian**, DEVCOM Army Research Lab. (United States); **Nathaniel D. Bastian**, U.S. Military Academy (United States)

13054-8 • 10:30 AM - 10:50 AM
**Extracting explanations, justification, and uncertainty from black-box deep neural networks**
*Author(s):* **Paul Ardis, Arjuna Flenner,** GE Aerospace (United States)

13054-9 • 10:50 AM - 11:10 AM

**Bias, explainability, and transparency for AI-enabled military systems**
*Author(s):* **Teresa L. Pace, Bryan Ranes,** L3Harris Technologies, Inc. (United States)

13054-11 • 11:10 AM - 11:30 AM
**Towards neuro-symbolic reinforcement learning for trustworthy human-autonomy teaming**
*Author(s):* **Priti Gurung**, **Jiang Li, Danda B. Rawat,** Howard Univ. (United States)

**Lunch Break 11:30 AM - 01:20 PM**

## SESSION 4: ATTACKS AND DEFENSES

22 April 2024 • 01:20 PM - 02:40 PM | National Harbor 8
*Session Chair(s):* **Joshua D. Harguess**, **Brian Woolley**, Air Force Institute of Technology (United States)

13054-126 • 01:20 PM - 01:40 PM
**The AI security Pyramid of Pain**
*Author(s):* **Chris M. Ward**, **Josh D. Harguess**, **Julia Tao,** Cranium AI, Inc. (United States); **Daniel Christman**, **Mike Tan, Paul Spicer,** Cranium AI (United States)

13054-4 • 01:40 PM - 02:00 PM
**Bayesian graph representation learning for adversarial patch detection**
*Author(s):* **Alexander Berenbeim**, **Alexander Wei,** U.S. Military Academy (United States); **Adam Cobb**, **Anirban Roy**, **Susmit Jha,** SRI International (United States); **Nathaniel D. Bastian,** U.S. Military Academy (United States)

13054-6 • 02:00 PM - 02:20 PM
**Toward understanding training data attacks in artificial intelligence and machine learning models**
*Author(s):* **Joshua S. White, Adam W. Pilbeam,** Federal Data Systems (United States)

13054-7 • 02:20 PM - 02:40 PM
**An AI Red Team Playbook**
*Author(s):* **Anna Raney**, **Shiri Bendelac**, **Keith Manville**, **Mike Tan,** The MITRE Corp. (United States); **Kureha Yamaguchi,** Alan Turing Institute (United Kingdom)

**Coffee Break 02:40 PM - 03:00 PM**

## SESSION 5: EVALUATION AND METRICS

22 April 2024 • 03:00 PM - 04:40 PM | National Harbor 8
*Session Chair(s):* **Brian Woolley**, Air Force Institute of Technology (United States); **Joshua D. Harguess**

13054-12 • 03:00 PM - 03:20 PM
**NRTK: an open source natural robustness toolkit for the evaluation of computer vision models**
*Author(s):* **Brian Hu**, **Brandon RichardWebster**, **Paul Tunison**, **Emily Veenhuis**, **Bharadwaj Ravichandran**, **Alexander Lynch**, **Stephen Crowell**, **Alessandro Genova**, **Vicente Bolea**, **Sebastien Jourdain,** Kitware, Inc. (United States); **Austin Whitesell,** The MITRE Corp. (United States)

13054-13 • 03:20 PM - 03:40 PM
**Practical guidance for human-machine teaming assurance of AI-enabled systems**
*Author(s):* **Glenn Lematta**, **Cindy Dominguez, Patricia L. McDermott,** The MITRE Corp. (United States)

13054-15 • 03:40 PM - 04:00 PM
**Dynamic monitoring, evolution, and deployment of multi-domain AI models**
*Author(s):* **Mark Gerken**, **Jen Sierchio, Michael Planer,** BAE Systems (United States)

13054-124 • 04:00 PM - 04:20 PM
**A security analysis of compressed communication in distributed deep neural networks**
*Author(s):* **Tejas Kannan,** The Univ. of Chicago (United States); **Sabrina Dimassimo, Rachel Haga,** Institute for Defense Analyses (United States)

13054-10 • 04:20 PM - 04:40 PM
**Exploiting explainability for reinforcement learning model assurance**
*Author(s):* **Alexander Tapley, Joseph Weissman,** The MITRE Corp. (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### Coffee Break 10:00 AM - 10:30 AM

## SESSION 6: APPLICATIONS TO RF, LLMS

23 April 2024 • 10:30 AM - 12:10 PM | National Harbor 8
*Session Chair(s):* **Teresa L. Pace**, L3Harris Technologies, Inc. (United States); **Gautam K. Vallabha**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States)
10:30 AM to 10:40 AM Opening Remarks

13054-201 • 10:40 AM - 11:10 AM
**Systematic AI Red Teaming** *(Invited Paper)*
*Author(s):* **Joe Lucas,** NVIDIA Corp. (United States)

13054-17 • 11:10 AM - 11:30 AM
**A federated learning deep forest approach for improving the open federated 5G security**
*Author(s):* **Hisham A. Kholidy,** SUNY Polytechnic Institute (United States); **Andrew Karam,** Air Force Research Lab. (United States); **Berrouachedi Abdelkader,** Lab. Paragraphe (France)

13054-18 • 11:30 AM - 11:50 AM
**Demonstrating confidence in radio frequency machine learning systems**
*Author(s):* **Matthew Judah, Scott Kuzdeba,** BAE Systems (United States)

13054-19 • 11:50 AM - 12:10 PM
**Differential privacy to mathematically secure fine-tuned large language models for linguistic steganography**
*Author(s):* **Sean Coffey**, **Joseph Catudal, Nathaniel D. Bastian,** U.S. Military Academy (United States)

**Lunch/Exhibition Break 12:10 PM - 01:30 PM**

## SESSION 7: CYBER

23 April 2024 • 01:30 PM - 03:00 PM | National Harbor 8
*Session Chair(s):* **Joshua D. Harguess**, The MITRE Corp. (United States)

13054-202 • 01:30 PM - 02:00 PM
**Overview of the CDAO JATIC program** *(Invited Paper)*
*Author(s):* **Jonathan B. Elliot, Asif Mehmood,** CDAO - Chief Digital and Artificial Intelligence Office (United States)

13054-20 • 02:00 PM - 02:20 PM
**The relevance, effectiveness, and future prospects of cyber deception implementation within organizations**
*Author(s):* **Kaila Eng**, **Carmen Schillaci, Atul Rawal,** Towson Univ. (United States)

13054-21 • 02:20 PM - 02:40 PM
**Comparison of cognitively-inspired salience and feature importance techniques in intrusion detection datasets**
*Author(s):* **Robert Thomson,** U.S. Military Academy (United States); **Edward Cranford,** Carnegie Mellon Univ. (United States); **Gabe Tucker,** The Ohio State Univ. (United States); **Christian Lebiere,** Carnegie Mellon Univ. (United States)

13054-23 • 02:40 PM - 03:00 PM
**Security games with malicious adversaries in the clouds: status update**
*Author(s):* **Artis Carter,** Augusta Univ. (United States); **Richard Hernandez,** Florida International Univ. (United States); **Soamar Homsi, Makenzie Cosgrove,** Air Force Research Lab. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 8: AI ASSURANCE FOR MDO APPLICATIONS: JOINT SESSION WITH CONFERENCES 13051 AND 13054

23 April 2024 • 03:30 PM - 05:20 PM | Potomac 4
*Session Chair(s):* **Joshua D. Harguess**, **Benjamin Jensen**, Marine Corps Univ. (United States)

13051-204 • 03:30 PM - 04:00 PM
**Overview of the responsible AI (RAI) toolkit** *(Invited Paper)*
*Author(s):* **Rachel Rajaseelan,** CDAO - Chief Digital and Artificial Intelligence Office (United States)

13051-24 • 04:00 PM - 04:20 PM
**Learning behavior of Offline Reinforcement Learning Agents**
*Author(s):* **Indu Shukla**, **Haley R. Dozier, Althea C. Henslee,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-25 • 04:20 PM - 04:40 PM
**When the occasion comes, the proverb comes: value alignment via proverbial bank and synthetic rules**
*Author(s):* **Cesa Salaam, Danda B. Rawat,** Howard Univ. (United States)

13054-25 • 04:40 PM - 05:00 PM
**Optimized and secured AI for the tactical edge**
*Author(s):* **Sek Chai,** Latent AI, Inc. (United States); **Scott Ostrowski,** Latent AI (United States)

13054-27 • 05:00 PM - 05:20 PM
**Assured AI Reference Architecture**
*Author(s):* **Marcus Tyler, James McCeney,** The MITRE Corp. (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13054-26 • 06:00 PM - 07:30 PM
**An AI blue team playbook**
*Author(s):* **Mike Tan,** The MITRE Corp. (United States); **Kureha Yamaguchi,** The Alan Turing Institute (United Kingdom); **Anna Raney,** The MITRE Corp. (United States); **Victoria Nockles**, **Margaux Leblanc,** The Alan Turing Institute (United Kingdom); **Shiri Bendelac,** The MITRE Corp. (United States)

13054-125 • 06:00 PM - 07:30 PM
**Practical considerations for adversarial training**
*Author(s):* **Roger C. Sengphanith**, **Diego Marez, Shibin Parameswaran,** Naval Information Warfare Ctr. Pacific (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13054-16
**Byzantine-robust federated learning performance evaluation via distance-statistical aggregations**
*Author(s):* **Francesco Colosimo, Giovanni Rocca,** Univ. della Calabria (Italy)

# CONFERENCE 13055

# Unmanned Systems Technology XXVI

**23 - 25 April 2024 | National Harbor 10**

***Conference Chair(s):*** **Hoa G. Nguyen,** Office of Naval Research Global (Japan); **Paul L. Muench,** U.S. Army Combat Capabilities Development Command (United States); **Robert Diltz,** Air Force Civil Engineer Ctr. (United States)

***Program Committee:*** **Jared Giesbrecht,** Defence Research and Development Canada, Suffield (Canada); **Anthony Jones,** Naval Information Warfare Ctr. Pacific (United States); **Sridhar Lakshmanan,** Univ. of Michigan-Dearborn (United States); **Larry H. Matthies,** Jet Propulsion Lab. (United States); **Camille S. Monnier,** Charles River Analytics, Inc. (United States); **Cynthia Nguyen,** Naval Information Warfare Ctr. Pacific (United States); **Dilip G. Patel,** General Dynamics Robotic Systems (United States); **Raja Suresh,** Iyengar LLC (United States)

## Monday 22 April 2024

### SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 1: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES I: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 10:30 AM - 12:00 PM | National Harbor 10
*Session Chair(s):* **Hoa G. Nguyen**, Office of Naval Research Global (Japan); **Michael C. Dudzik**, IQM Research Institute (United States)
Opening Remarks 10:30-10:40 AM

13055-1 • 10:40 AM - 11:00 AM
**Robot operating system 2 navigation stack in action: automating a Caterpillar 621G for pavement testing**
*Author(s):* **Collin Hays**, **Desmond Benton**, **Brian M. Robinson**, **Kevin Hall**, **Scott Craft**, **Rodney A. Wade**, **John Jetton**, **Caleb Spencer**, **Woody W. English,** Torch Technologies, Inc. (United States);**Robert Diltz,** Air Force Civil Engineer Ctr. (United States)

13052-8 • 11:00 AM - 11:20 AM
**Comparing performance of robot operating system (ROS) mapping algorithms in the presence of degraded or obscured depth sensors**
*Author(s):* **Steven Senczyszyn**, **Anthony J. Pinar**, **Mohamed Salem**, **Elizabeth Donoghue**, **Shelby Wills**, **Moira Broestl**, **Adam J. Webb**, **Timothy C. Havens,** Michigan Technological Univ. (United States); **Stanton R. Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13052-200 • 11:20 AM - 12:00 PM
**Trusted AI and autonomy for today's warfighter** (Keynote Presentation)
*Author(s):* **David A. Honey,** Deputy Under Secretary of Defense for Research and Engineering (United States)

**Lunch/Exhibition Break 12:00 PM - 01:50 PM**

### SESSION 2: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES II: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 01:50 PM - 02:50 PM | National Harbor 10
*Session Chair(s):* **Theresa J. Axenson**, National Reconnaissance Office (United States); **Brian M. Robinson**, Torch Technologies, Inc. (United States)

13055-2 • 01:50 PM - 02:10 PM
**The NATURE autonomy stack: an open-source stack for off-road navigation**
*Author(s):* **Christopher T. Goodin**, **Marc N. Moore**, **Daniel W. Carruth**, **Christopher R. Hudson**, **Lucas D. Cagle,** Mississippi State Univ. (United States); **Stefan Wapnick,** McGill Univ. (Canada); **Paramsothy Jayakumar,** US Army DEVCOM Ground Vehicle System Center (United States)

13055-3 • 02:10 PM - 02:30 PM
**Autonomous tractor for delivery of biocementation agent**
*Author(s):* **Collin Hays,** Torch Technologies, Inc. (United States); **Patrick Neal,** Univ. of Florida (United States); **Scott Craft**, **Desmond Benton,** Torch Technologies, Inc. (United States); **Carl Crane,** Univ. of Florida (United States); **Brian M. Robinson,** Torch Technologies, Inc. (United States); **James Denault,** Inventive Research Solutions (United States); **Kevin Hall**, **Woody W. English,** Torch Technologies, Inc. (United States); **Rhett Martineau,** Air Force Research Laboratory (United States); **Steven Bailey, Robert Diltz,** Air Force Civil Engineer Ctr. (United States)

13055-4 • 02:30 PM - 02:50 PM
**Flexible mission planning for autonomous ground and air robots**
*Author(s):* **Brad Pankow**, **Jordan Lampi**, **Lilia Moshkina, Nick Paul,** Soar Technology, Inc. (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 3: SENSING, PROCESSING, AND SAFETY FOR UNMANNED GROUND VEHICLES III: JOINT SESSION WITH CONFERENCES 13052 AND 13055

23 April 2024 • 03:20 PM - 04:20 PM | National Harbor 10
*Session Chair(s):* **Paul L. Muench**, U.S. Army Combat Capabilities Development Command (United States); **Hoa G. Nguyen**, Office of Naval Research Global (Japan)

13052-10 • 03:20 PM - 03:40 PM
**CNN-based end-to-end learning for lane centering**
*Author(s):* **Iffat Ara Ebu**, **Fahmida Islam**, **John E. Ball, Chris Goodin,** Mississippi State Univ. (United States)

13052-9 • 03:40 PM - 04:00 PM
**Traffic light recognition and V2I communications of an autonomous vehicle with the traffic light for effective intersection navigation using YOLOv8 and MAVS simulation**
*Author(s):* **Mahfuzur Rahman**, **Fahmida Islam**, **John E. Ball, Chris Goodin,** Mississippi State Univ. (United States)

13052-3 • 04:00 PM - 04:20 PM
**Object Classification Techniques For Autonomous Radar Sensors**
*Author(s):* **Rasim Akin Sevimli,** Baskent Üniv. (Turkey)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13055-27 • 06:00 PM - 07:30 PM
**Earthling reasoning for intelligent system**
*Author(s):* **Xinjia Chen,** Northwestern State Univ. (United States)

13055-28 • 06:00 PM - 07:30 PM
**Swarm UAVs for area mapping in GPS-denied locations**
*Author(s):* **Daniel Golan**, **Patrick Kennedy**, **Bryan M. Gonzalez**, **Ryan Taylor**, **Joseph Perry**, **Ethan Thomas**, **Ryan Ebrahimi**, **Kyle Fox, Sergey V. Drakunov,** Embry-Riddle Aeronautical Univ. (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 4: BIO-INSPIRED SYSTEMS

24 April 2024 • 10:30 AM - 12:10 PM | National Harbor 10
*Session Chair(s):* **Hoa G. Nguyen**, Office of Naval Research Global (Japan); **Cynthia Nguyen**, Naval Information Warfare Ctr. Pacific (United States)
Opening remarks 10:30 to 10:40 AM

13055-7 • 10:40 AM - 11:10 AM
**Gait control for undulatory swimmers: inspiration from biological systems to robots** *(Invited Paper)*
*Author(s):* **Sridhar Ravi,** The Univ. of New South Wales at the Australian Defence Force Academy (Australia); **Karthick Dhileep,** The Univ. of New South Wales (Australia); **Don Sofge,** U.S. Naval Research Lab. (United States); **Qiuxiang Huang**, **Fangbao Tian**, **John Young, Joseph Lai,** The Univ. of New South Wales (Australia)

13055-9 • 11:10 AM - 11:30 AM
**Centroid-based cell decomposition robot path planning algorithm integrated with a bio-inspired approach**
*Author(s):* **James Huston H. Rogers**, **Timothy Sellers**, **Tingjun Lei**, **Christopher R. Hudson, Chaomin Luo,** Mississippi State Univ. (United States)

13055-10 • 11:30 AM - 11:50 AM
**Synergizing graph-based methods with biologically inspired algorithms for enhanced robot path planning efficiency**
*Author(s):* **Timothy Sellers**, **Tingjun Lei**, **Daniel W. Carruth, Chaomin Luo,** Mississippi State Univ. (United States)

13055-8 • 11:50 AM - 12:10 PM
**Autonomous unmanned systems: traversing the bibliometric terrain of genetic algorithm-based path planning**
*Author(s):* **Khaled Obaideen**, **Mohammad AlShabi**, **Maamar Bettayeb,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

**Lunch/Exhibition Break 12:10 PM - 02:00 PM**

### SESSION 5: AI/ML AND UNMANNED SYSTEMS: JOINT SESSION WITH CONFERENCES 13051 AND 13055

24 April 2024 • 02:00 PM - 03:20 PM | National Harbor 10
*Session Chair(s):* **Raja Suresh**, Arizona State Univ. (United States); **Myron E. Hohil**, DEVCOM - Armaments Ctr. (United States)

13055-11 • 02:00 PM - 02:20 PM
**The cultivation of autonomous strategic coordination systems**
*Author(s):* **Christopher W. Scully**, **George Bahr**, **Trevor Bajkowski**, **James Keller**, **Grant J. Scott,** Univ. of Missouri (United States); **Samantha S. Carley, Stanton Price,** U.S. Army Engineer Research and Development Ctr. (United States)

13051-31 • 02:20 PM - 02:40 PM
**Generation of 3D LWIR thermal maps based on deep learning SLAM: feasibility and evaluation**
*Author(s):* **Donyung Kim, Sungho Kim,** Yeungnam Univ. (Korea, Republic of)

13055-12 • 02:40 PM - 03:00 PM
**Transfer learning for adaptable autonomy**
*Author(s):* **Michael Ganger**, **Anthony Bloch,** General Dynamics Mission Systems (United States); **Patrick V. Haggerty,** General Dynamics Missions Systems (United States)

13051-32 • 03:00 PM - 03:20 PM
**Leveraging foundation models for scene understanding in human-robot teaming**
*Author(s):* **David A. Handelman**, **Corban G. Rivera**, **William A. Paul**, **Andrew R. Badger**, **Emma A. Holmes**, **Martha I. Cervantes**, **Bethany G. Kemp, Erin C. Butler,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 6: MULTI-AGENT SYSTEMS

24 April 2024 • 03:50 PM - 05:10 PM | National Harbor 10
*Session Chair(s):* **Hoa G. Nguyen**, Office of Naval Research Global (Japan); **Raja Suresh**, Arizona State Univ. (United States)

13055-13 • 03:50 PM - 04:10 PM
**Dynamic, decentralized task allocation for UAS swarms**
*Author(s):* **Jordan Beason**, **Gregory Hurlock**, **Dongbin Kim, Pratheek Manjunath,** U.S. Military Academy (United States)

13055-14 • 04:10 PM - 04:30 PM
**Multi-robot path planning using potential field-based simulated annealing approach**
*Author(s):* **Saleh Alarabi,** Univ. of Detroit Mercy (United States); **Tingjun Lei,** Mississippi State Univ. (United States); **Michael Santora,** Univ. of Detroit Mercy (United States); **Chaomin Luo, Timothy Sellers,** Mississippi State Univ. (United States)

13055-15 • 04:30 PM - 04:50 PM
**Gravitational-inspired teaming behaviors in a UAV swarm using reinforcement learning**
*Author(s):* **Samantha S. Carley**, **Stanton Price, Samantha Butler,** U.S. Army Engineer Research and Development Ctr. (United States)

13055-16 • 04:50 PM - 05:10 PM
**Drone-hosted autonomous radio mesh activity: biological inspired swarming at scale (DHARMA-BLISS)**
*Author(s):* **Andy Duque, Benjamin A. Strasser,** General Dynamics Mission Systems (United States)

# Thursday 25 April 2024

## SESSION 7: SENSING AND CONTROL

25 April 2024 • 08:30 AM - 09:30 AM | National Harbor 10
*Session Chair(s):* **Paul L. Muench**, U.S. Army Combat Capabilities Development Command (United States); **Brian M. Robinson**, Torch Technologies, Inc. (United States)

13055-17 • 08:30 AM - 08:50 AM
**Earthling logic for intelligent control**
*Author(s):* **Xinjia Chen,** Northwestern State Univ. (United States)

13055-18 • 08:50 AM - 09:10 AM
**Asymptotic distribution theory for stochastic control**
*Author(s):*

13055-19 • 09:10 AM - 09:30 AM
**Automatic segmentation using knowledge distillation with ensemble models (ASKDEM)**
*Author(s):* **Anthony Buschiazzo,** Huntington Ingalls Industries, Inc. (United States); **Mason Russell**, **Phillip Osteen, James Uplinger,** DEVCOM Army Research Lab. (United States)

**Coffee Break 09:30 AM - 10:00 AM**

## SESSION 8: COMMUNICATIONS AND COMPUTING TECHNOLOGY

25 April 2024 • 10:00 AM - 11:20 AM | National Harbor 10
*Session Chair(s):* **Hoa G. Nguyen**, Office of Naval Research Global (Japan); **Cynthia Nguyen**, Naval Information Warfare Ctr. Pacific (United States)

13055-22 • 10:00 AM - 10:20 AM
**Enabling multi-radio and cognitive radio technologies with named-data networking for better ad-hoc networking**
*Author(s):* **Peter M. Le**, **Lan Wang**, **Eddie Jacobs, Thomas P. Watson,** The Univ. of Memphis (United States)

13055-24 • 10:20 AM - 10:40 AM
**Operationalize DNA technology for U.S. defense**
*Author(s):* **Lubjana Beshaj,** U.S. Military Academy (United States); **Samuel Crislip,** U.S. Dept. of Defense (United States)

13055-25 • 10:40 AM - 11:00 AM
**Edge processing for frequency identification on drone-deployed structural health monitoring sensor nodes**
*Author(s):* **Ryan Yount**, **Joud N. Satme**, **David Wamai, Austin R. J. Downey,** Univ. of South Carolina (United States)

13055-26 • 11:00 AM - 11:20 AM
**Evaluating robot operating system's capabilities across distributed containerized systems**
*Author(s):* **Christopher W. Scully**, **Connor Johnson**, **Jonas Ferguson**, **Trevor Bajkowski**, **James M. Keller**, **Grant J. Scott,** Univ. of Missouri (United States); **Samantha S. Carley, Stanton Price,** U.S. Army Engineer Research and Development Ctr. (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13055-20
**The application of sliding innovation filter as estimation strategy applied to a UAV**
*Author(s):* **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates); **Andrew A. Gadsden,** McMaster Univ. (Canada); **Bassam Khuwaileh, Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates)

13055-21
**Parameter estimation of an unmanned aerial vehicle using dandelion algorithm**
*Author(s):* **Mohammad A. AlShabi**, **Omar Saleh**, **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Andrew A. Gadsden,** McMaster Univ. (Canada); **Maamar Bettayeb,** Univ. of Sharjah (United Arab Emirates)

13055-23
**Mobility prediction for re-routing strategy in drone networks**
*Author(s):* **Angel Freddy Ganapaza, Francesco Colosimo,** Univ. della Calabria (Italy)

# CONFERENCE 13056

# Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XXV

**22 - 25 April 2024 | Chesapeake 5**

***Conference Chair(s):*** **Jason A. Guicheteau,** DEVCOM Chemical Biological Ctr. (United States); **Christopher R. Howle,** Defence Science and Technology Lab. (United Kingdom); **Tanya L. Myers,** Pacific Northwest National Lab. (United States)

***Program Committee:*** **Christopher C. Carter,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Augustus W. Fountain,** Univ. of South Carolina (United States); **Timothy J. Johnson,** Pacific Northwest National Lab. (United States); **Lars Landström,** FOI-Swedish Defence Research Agency (Sweden); **Aaron LaPointe,** U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Tyler Miller,** Defense Threat Reduction Agency (United States); **Paul M. Pellegrino,** DEVCOM Army Research Lab. (United States); **Sherrie S. Pilkington,** Intelligence Advanced Research Projects Activity (United States); **Nathaniel R. Gomer,** The Pennsylvania State Univ. (United States)

## Monday 22 April 2024

### SESSION 1: CBRNE TRACE ANALYSIS

22 April 2024 • 08:00 AM - 10:00 AM | Chesapeake 5
*Session Chair(s):* **Jason A. Guicheteau**, DEVCOM Chemical Biological Ctr. (United States)

13056-800 • 08:00 AM - 08:10 AM
**Welcome Statements**

13056-1 • 08:10 AM - 08:40 AM
**Detection of CBE with deep UV Raman and fluorescence mapping spectroscopy** *(Invited Paper)*
*Author(s):* **Rohit Bhartia**, **William F. Hug**, **Ray Reid**, **Quoc Nguyen**, **Ken Nguyen, Simon Bruelisauer,** Photon Systems, Inc. (United States)

13056-2 • 08:40 AM - 09:00 AM
**Trace explosive detection and identification signature characterisation studies using Deep UV florescence and Raman spectroscopy**
*Author(s):* **Jayne Newton**, **Ellie Makinson**, **Beth Bowden**, **Sonali Dabba**, **Natasha Stevens**, **Chris Howle,** Defence Science and Technology Lab. (United Kingdom); **Rohit Bhartia**, **William F. Hug, Ray Reid,** Photon Systems, Inc. (United States)

13056-3 • 09:00 AM - 09:20 AM
**Laser-based infrared sensor for fast and non-contact detection and identification of forensic traces in crime scene investigations**
*Author(s):* **Marko Haertelt**, **Yuri V. Flores,** Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany); **Christian Ulrich**, **Frank Schnürer,** Fraunhofer-Institut für Chemische Technologie ICT (Germany); **Gino Groeneveld,** Netherlands Forensic Institute (Netherlands)

13056-4 • 09:20 AM - 09:40 AM
**Multimodal approach for chemical and biological substance screening**
*Author(s):* **Marek Michalowski**, **Adam T. Polak**, **Emma Le Francois, David J. M. Stothard,** Fraunhofer Ctr. for Applied Photonics (United Kingdom)

13056-5 • 09:40 AM - 10:00 AM
**Predicting the persistence of trace quantities of explosives materials**
*Author(s):* **Michael R. Papantonakis**, **Viet K. Nguyen**, **Robert Furstenberg, R. Andrew McGill,** U.S. Naval Research Lab. (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 2: INTEGRATED PHOTONIC SENSING

22 April 2024 • 10:30 AM - 11:50 AM | Chesapeake 5
*Session Chair(s):* **Conor Sharp**

13056-6 • 10:30 AM - 10:50 AM
**Waveguide-enhanced raman spectroscopy of trace vapors with fiber-attached photonic integrated circuits**
*Author(s):* **Todd H. Stievater**, **Nathan F. Tyndall,** U.S. Naval Research Lab. (United States); **Erik D. Emmons**, **Kevin C. Hung**, **Erik S. Roese,** DEVCOM Chemical Biological Ctr. (United States); **Jordan N. Butt,** Univ. of Rochester (United States); **Kyle J. Walsh**, **Marcel W. Pruessner,** U.S. Naval Research Lab. (United States); **Phillip G. Wilcox**, **Jason A. Guicheteau,** DEVCOM Chemical Biological Ctr. (United States); **Benjamin L. Miller,** Univ. of Rochester (United States); **R. Andrew McGill,** U.S. Naval Research Lab. (United States)

13056-7 • 10:50 AM - 11:10 AM
**Part-per-trillion, selective, and robust nitric oxide sensing using FLOWER**
*Author(s):* **Tsu-Te Judith Su**, **Yinchao Xu,** Wyant College of Optical Sciences (United States); **Allison M. Stanko**, **Chloe S. Cerione**, **Trevor Lohrey,** Caltech (United States); **Euan McLeod,** Wyant College of Optical Sciences (United States); **Brian M. Stoltz,** Caltech (United States)

13056-8 • 11:10 AM - 11:30 AM
**1-D and 2-D biomaterial photonic crystals and graphene films for optical detection of molecules**
*Author(s):* **Richard M. Osgood**, **Jin Ho Kim**, **Michael Leuenberger,** U.S. Army Combat Capabilities Development Command Soldier Ctr. (United States); **Steven Kooi,** Massachusetts Institute of Technology (United States); **Joseph Plumitallo**, **Jimmy Xu,** Brown Univ. (United States); **Leila Deravi,** Northeastern Univ. (United States)

13056-9 • 11:30 AM - 11:50 AM
**Toward portable nanostructured whispering gallery mode chemical sensors accessed via free-space coupling**
*Author(s):* **Euan McLeod**, **Kunal Sharma**, **Sartanee Suebka,** Wyant College of Optical Sciences (United States); **Judith Su,** Wyant College of Optical Sciences (United States), The Univ. of Arizona (United States)

**Lunch Break 11:50 AM - 01:20 PM**

## SESSION 3: CHEMICAL HAZARD SENSING I

22 April 2024 • 01:20 PM - 02:40 PM | Chesapeake 5
*Session Chair(s):* **Christopher C. Carter**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13056-10 • 01:20 PM - 01:40 PM
**Fast broadband QCL-based chemical detection: an optical alternative for road surface reconnaissance**
*Author(s):* **Frank Wilsenack**, **Fabian Meyer,** Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS) (Germany); **Yuri V. Flores**, **Marko Haertelt,** Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany); **Mario Adelhardt,** Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS) (Germany)

13056-11 • 01:40 PM - 02:00 PM
**One-handed UV Raman sensor for standoff trace detection now a reality**
*Author(s):* **Rob Waterbury**, **Thuyan Conghuyentonnu**, **Hunter Hardy**, **Alex Jacobson**, **Tim Molner**, **Ryan Robins**, **Marshall Scott,** Alakai Defense Systems, Inc. (United States); **Viktor Smolski,** Alakai Defense Systems (United States)

13056-12 • 02:00 PM - 02:20 PM
**Proximal detection using handheld UV-Raman spectroscopy**
*Author(s):* **Bradley R. Arnold,** Univ. of Maryland, Baltimore County (United States)

13056-13 • 02:20 PM - 02:40 PM
**Hand-portable trace chemical detector**
*Author(s):* **Erik Lenferink**, **Anish Goyal**, **Dimitry Maltsev**, **Wynn Bowers**, **Paul Kafig**, **Thomas Gray**, **Derek Wood**, **Charles Meeske, Steve Korbly,** Block Engineering, LLC (United States)

**Coffee Break 02:40 PM - 03:10 PM**

## SESSION 4: BIOLOGICAL HAZARD SENSING

22 April 2024 • 03:10 PM - 04:50 PM | Chesapeake 5
*Session Chair(s):* **Lars Landstrom**, FOI-Swedish Defence Research Agency (Sweden)

13056-14 • 03:10 PM - 03:30 PM
**Biothreat detection and identification using a carbon nanotube capture and containment array and surface enhanced Raman spectroscopy**
*Author(s):* **Nathaniel R. Gomer**, **Amanda Clase, Mauricio Terrones,** The Pennsylvania State Univ. (United States)

13056-15 • 03:30 PM - 03:50 PM
**Biolayer interferometry as a biological detection platform**
*Author(s):* **Courtney Love,** U.S. Army DEVCOM Chemical Biological Ctr. (United States); **Erin Antoshak**, **Kristy Wisser**, **Edward R. Hofmann,** U.S. Army DEVCOM Chemical Biological Ctr. (United States), EXCET, Inc. (United States); **Kelly Basi,** U.S. Army DEVCOM Chemical Biological Ctr. (United States); **Charles Davidson,** U.S. Army DEVCOM Chemical Biological Ctr. (United States), Science & Technology Corp. (United States); **Gary Kilper,** U.S. Army DEVCOM Chemical Biological Ctr. (United States), EXCET, Inc. (United States)

13056-16 • 03:50 PM - 04:10 PM
**Condensation-based growth of nanoparticles for real-time inertial-based capture and biothreat sensing**
*Author(s):* **Md Sadiqul Islam**, **Nicholas J. Schnoebelen**, **Kawkab Ahasan**, **Pranav Shrotriya, Todd A. Kingston,** Iowa State Univ. of Science and Technology (United States)

13056-17 • 04:10 PM - 04:30 PM
**Rapid detection of bioaerosol by measuring single particle differential circular polarization scattering (CIDS)**
*Author(s):* **Yongle Pan**, **Aimable Kalume,** DEVCOM Army Research Lab. (United States); **Joshua Santarpia,** Univ. of Nebraska Medical Ctr. (United States), National Strategic Research Institute (United States)

13056-18 • 04:30 PM - 04:50 PM
**Detection of microorganisms in drinking water using fluorescence spectroscopy**
*Author(s):* **Jörgen Gladh**, **Julia Hedborg**, **Per Jonsson**, **Fredrik Kullander**, **Per Ola Andersson**, **Alexandra C. Johansson, Lars Landstrom,** FOI-Swedish Defence Research Agency (Sweden)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

## SESSION 5: AEROSOL CHARACTERIZATION I

23 April 2024 • 10:40 AM - 12:00 PM | Chesapeake 5
*Session Chair(s):* **Sherrie S. Pilkington**, Intelligence Advanced Research Projects Activity (United States)

13056-19 • 10:40 AM - 11:00 AM
**Optical constants measurements of liquids for modeling aerosolized threats**
*Author(s):* **Tanya L. Myers**, **Schuyler Lockwood**, **Tracy Baker**, **Oliva M. Primera-Pedrozo**, **Bruce E. Bernacki, Timothy J. Johnson,** Pacific Northwest National Lab. (United States)

13056-20 • 11:00 AM - 11:20 AM
**aerosol release tracking via optical barcodes: aerosol sensor testing ground truth**
*Author(s):* **Jay D. Eversole,** Nova Scientific (United States); **Joszef Czege**, **Michael Stewart**, **Matthew B. Hart**, **Vasanthi Sivaprakasam,** U.S. Naval Research Lab. (United States); **Alan Huston,** U.S. Naval Research Lab.-retired (United States)

13056-21 • 11:20 AM - 11:40 AM
**Aerosol mass spectrometer for aerosol characterization at the ambient aerosol test facility**
*Author(s):* **Matthew B. Hart,** U.S. Naval Research Lab. (United States); **Ken S. Grabowski,** Nova Research, Inc. (United States); **Oyedoyin T. Aduroja**, **Cathy S. Scotto,** U.S. Naval Research Lab. (United States); **Jay D. Eversole,** Nova Research, Inc. (United States); **Vasanthi Sivaprakasam,** U.S. Naval Research Lab. (United States)

13056-22 • 11:40 AM - 12:00 PM
**Constructing arbitrary-shape scatterer models for analysis of optical spectral data**
*Author(s):* **Andrew R. Shabaev**, **Robert Furstenberg**, **Tyler J. Huffman**, **Christopher A. Kendziora, R. Andrew McGill,** U.S. Naval Research Lab. (United States)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

## SESSION 6: RADIOLOGICAL SENSING

23 April 2024 • 01:30 PM - 03:00 PM | Chesapeake 5
*Session Chair(s):* **Tanya L. Myers**, Pacific Northwest National Lab. (United States)

13056-23 • 01:30 PM - 02:00 PM
**Development of spectroscopic tools for nuclear forensics signatures development** *(Invited Paper)*
*Author(s):* **Eliel Villa-Aleman**, **Jason Darvin**, **Don Dick**, **Bryan Foley**, **Thomas Shehee**, **Ashlee Swindle,** Savannah River National Lab. (United States); **Emily H Kwapis, Kyle C Hartig,** University of Florida (United States)

13056-24 • 02:00 PM - 02:20 PM
**A dedicated autonomous ground contamination detection system for dispersed radioactive materials**
*Author(s):* **Sanjoy Mukhopadhyay,** Nevada National Security Site (United States); **Richard J. Maurer,** National Security Technologies, LLC (United States); **Johnny Grimes,** Nevada National Security Site (United States)

13056-25 • 02:20 PM - 02:40 PM
**Monitoring the reaction dynamics of UF6 by cryogenic layering and FTIR spectroscopy**
*Author(s):* **Louis E. McNamara**, **Abigail M. Waldron**, **Samuel Uba**, **Eliel Villa-Aleman, Kimberly A. S. Fessler,** Savannah River National Lab. (United States)

13056-26 • 02:40 PM - 03:00 PM
**Single-photon quantum Raman spectroscopy for stand-off, hand-held detection of gas-phase molecules**
*Author(s):* **Anthony Ojo**, **Roman Spesyvtsev**, **Stuart Bennett**, **John Leck, David J. M. Stothard,** Fraunhofer Ctr. for Applied Photonics (United Kingdom)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 7: NEXT-GENERATION AND CBRNE SENSING: JOINT SESSION WITH CONFERENCES 13026 AND 13056

23 April 2024 • 03:30 PM - 05:10 PM | National Harbor 4
*Session Chair(s):* **Augustus W. Fountain**, Univ. of South Carolina (United States); **Richard A. Crocombe**, Crocombe Spectroscopic Consulting, LLC (United States)

13056-27 • 03:30 PM - 03:50 PM
**The Hyper-Cam Nano next generation LWIR hyperspectral imaging system**
*Author(s):* **Joseph Carrock,** Telops Inc. (United States); **Antoine Dumont,** Telops Inc. (Canada); **Benjamin Saute,** Telops, Inc. (Canada); **Mark Norman**, **Martin Lariviere-Bastien, Martin Chamberland,** Telops Inc. (Canada)

13056-28 • 03:50 PM - 04:10 PM
**Evaluation of emerging chemical sensors for food protection and chemical sensing**
*Author(s):* **Jerry B. Cabalo, Rabih E. Jabbour,** DHS Chemical Security and Analysis Ctr. (United States)

13056-29 • 04:10 PM - 04:30 PM
**Resonant cavity enhanced infrared photodiode array for bio-chemical sensing and identification: Solid state spectrometer**
*Author(s):* **Adam Craig,** Amethyst Research Ltd. (United Kingdom), Lancaster Univ. (United Kingdom); **Mark Carmichael,** Amethyst Research Ltd. (United Kingdom); **Terry Golding,** Amethyst Research Inc. (United Kingdom); **Andrew Marshall,** Lancaster Univ. (United Kingdom)

13026-23 • 04:30 PM - 04:50 PM
**Integrated Raman sensor smart robot for swift and remote on-site forensic analysis**
*Author(s):* **Eddie Tan**, **Sam Heng Lum**, **Yan Ling Lau**, **Shi Yi Liang**, **Hansel Tay**, **Kiat Nern Yeo**, **M. K. Michael Tay**, **Justin Tan**, **Chiew Yung Yang**, **Gee Wah Ng, Chin Chin Lim,** Home Team Science and Technology Agency (Singapore)

13026-24 • 04:50 PM - 05:10 PM
**Real-time particle analysis of aerosols and hazardous substances using single-particle mass spectrometry and deep learning**
*Author(s):* **Heinrich Ruser**, **Guanzhong Wang**, **Thomas Adam,** Univ. der Bundeswehr München (Germany); **Johannes Passig,** Helmholtz Zentrum München GmbH (Germany), Univ Rostock (Germany); **Sven Ehlert, Andreas Walte,** PHOTONION GmbH (Germany)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13056-51 • 06:00 PM - 07:30 PM
**The TLX-VIS component library for the AIM photonics silicon nitride passive PIC process**
*Author(s):* **Nathan F. Tyndall**, **Marcel W. Pruessner,** U.S. Naval Research Lab. (United States); **Jordan N. Butt,** Univ. of Rochester (United States); **Kyle J. Walsh,** U.S. Naval Research Lab. (United States); **M. J. Hossain**, **Amit Dikshit**, **Jin Wallner**, **Nicholas M. Fahrenkopf,** Research Foundation for The State Univ. of New York (United States); **Scott A Holmstrom,** University of Tulsa (United States); **Todd H. Stievater,** U.S. Naval Research Lab. (United States)

13056-52 • 06:00 PM - 07:30 PM
**IR absorption spectra for common polyfluorides in food and pharmaceutical production using density functional theory**
*Author(s):* **Sonjae Wallace,** Lehman College (United States); **Samuel G. Lambrakos,** U.S. Naval Research Lab. (United States); **Louis Massa,** Hunter College (United States)

13056-53 • 06:00 PM - 07:30 PM
**3D-printed flexible sensor devices for security applications**
*Author(s):* **Dimitrios A. Exarchos**, **Panagiota Dalla**, **Spyridoula Farmaki**, **Anastasios Vasileiadis, Theodore E. Matikas,** Univ. of Ioannina (Greece)

13056-54 • 06:00 PM - 07:30 PM
**Compact biosensing platform for integration with airborne particle capture device**
*Author(s):* **Samuel De Penning**, **Nicholas J. Schnoebelen, Todd A. Kingston,** Iowa State Univ. of Science and Technology (United States); **Todd A. Kingston, Pranav Shrotriya,** Iowa State Univ. of Science and Technology (United States)

13056-55 • 06:00 PM - 07:30 PM
**Discerning molecular transitions using adaptive Savitzy-Golay filtering and ML-based classification in mid-infrared sensing**
*Author(s):* **Al Alexis**, **Ryan Bischoff**, **Darius L. Boyce, Mohammad A. Khan,** Delaware State Univ. (United States)

13056-56 • 06:00 PM - 07:30 PM
**Improving Raman stand-off distance for the detection of chemical warfare agents**
*Author(s):* **Samantha Davies**, **Kelly Curtis, Ken Mcewan,** Defence Science and Technology Lab. (United Kingdom)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

### Coffee Break 10:00 AM - 10:30 AM

### SESSION 8: CHEMICAL HAZARD SENSING II

24 April 2024 • 10:30 AM - 12:20 PM | Chesapeake 5
*Session Chair(s):* **Christopher R. Howle**, Defence Science and Technology Lab. (United Kingdom)

13056-30 • 10:30 AM - 11:00 AM
**Optical sensing in context: a twenty-five year retrospective** *(Invited Paper)*
*Author(s):* **Chris D. Dyer,** Defence Science and Technology Lab. (United Kingdom)

13056-31 • 11:00 AM - 11:20 AM
**Single image spectroscopy using a grating spectrometer and a broadband IR laser source**
*Author(s):* **Christopher A. Kendziora**, **Tyler J. Huffman, Robert Furstenberg,** U.S. Naval Research Lab. (United States)

13056-32 • 11:20 AM - 11:40 AM
**High-speed single-pixel long-wave-infrared trace chemical detection system**
*Author(s):* **Thomas Gray**, **Derek Wood**, **Dimitry Maltsev**, **Wynn Bowers**, **Anish K. Goyal**, **Erik Lenferink**, **Charles Meeske, Steve Korbly,** Block Engineering, LLC (United States)

13056-33 • 11:40 AM - 12:00 PM
**Combining standoff tomography with point detection: a game changer for the identification of airborne toxic chemicals**
*Author(s):* **Frank Wilsenack,** Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS) (Germany); **Maria Allers**, **Fabian Meyer**, **Thomas Wolf,** Bundesamt für Ausrüstung, Informationstechnik und Nutzung der Bundeswehr (Germany); **Torbjörn Tjärnhage**, **Lars Landström,** FOI-Swedish Defence Research Agency (Sweden); **Arne Ficks,** Bundeswehr Research Institute for Protective Technologies and CBRN Protection (WIS) (Germany)

13056-34 • 12:00 PM - 12:20 PM
**Low-SWaP-C colorimetric detection of vapor-phase chemical threats**
*Author(s):* **Richard P. Kingsborough**, **Enya Mulroy**, **Jude Kelley**, **William Barney**, **Richard Fletcher**, **Eliana Roberts, Roderick Kunz,** MIT Lincoln Lab. (United States)

### Lunch/Exhibition Break 12:20 PM - 01:30 PM

### SESSION 9: EXPLOSIVE SENSING

24 April 2024 • 01:30 PM - 03:10 PM | Chesapeake 5
*Session Chair(s):* **Aaron LaPointe**, U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States)

13056-48 • 01:30 PM - 01:50 PM
**Blue is the new white: Collection and correlation of spectroscopic data of explosive tetra ammine copper complexes to their physical characteristics**
*Author(s):* **Victor Waller, Lars Landström,** FOI-Swedish Defence Research Agency (Sweden)

13056-35 • 01:50 PM - 02:10 PM
**Emerging explosive threat analysis for using threat anomaly detection (ThreAD)**
*Author(s):* **Eric R. Languirand,** U.S. Army Combat Capabilities Development Command (United States); **Amee Polk**, **Michael Kauzlarich,** U.S. Army Combat Capabilities Development Command Chemical Biological Center (United States); **Jacob Buchman,** Army Educational Outreach Program Graduate Fellowship (United States); **Matthew D. Collins,** U.S. Army Combat Capabilities Development Command (United States)

13056-36 • 02:10 PM - 02:30 PM
**Stand-off explosive sensing and imaging with scanning dual-comb IR spectrometer: limits of detection and operation in scanning mode**
*Author(s):* **Vasili G. Savitski**, **James Feehan**, **Roman Spesyvtsev,** Fraunhofer UK Research Ltd. (United Kingdom); **Kerry Alton**, **Peter Glover**, **Lauren Holley**, **Jayne Newton**, **Chris Howle,** Defence Science and Technology Lab. (United Kingdom); **Michael Papantonakis**, **R. Andrew McGill, Viet K. Nguyen,** U.S. Naval Research Lab. (United States)

13056-37 • 02:30 PM - 02:50 PM
**Molecular dynamics models for sublimation of explosive materials**
*Author(s):* **Andrew R. Shabaev**, **Robert Furstenberg**, **Michael R. Papantonakis**, **Chris Kendziora**, **R. Andrew McGill, Youngchan Kim,** U.S. Naval Research Lab. (United States)

13056-38 • 02:50 PM - 03:10 PM
**Solutions for detection of improvised explosives using nuclear quadrupole resonance**
*Author(s):* **Georgy V. Mozzhukhin**, **Ayşe Maraşli**, **Eren Doğan**, **Pavel A. Kupriyanov**, **Bektaş Çoiak**, **Maksut Maksutoğlu**, **Sinan Kazan**, **Hacer Ipek,** Gebze Technical Univ. (Turkey); **Çengiz Okay,** Marmara Üniv. (Turkey); **Rustem Khusnutdinov,** Kazan State Power Engineering Univ. (Russian Federation); **Bulat Rameev,** Gebze Technical Univ. (Turkey)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 10: ADVANCES IN CBRNE SIGNATURES AND SENSOR ALGORITHMS

24 April 2024 • 03:40 PM - 05:40 PM | Chesapeake 5
*Session Chair(s):* **Paul M. Pellegrino**, DEVCOM Army Research Lab. (United States)

13056-39 • 03:40 PM - 04:00 PM
**ML-based Classification of interfering spectral molecular transitions in mid-infrared spectroscopy**
*Author(s):* **Zayna Juracka,** Northrop Gruman Corp. (United States); **Alan Pilero, Mohammad A. Khan,** Delaware State Univ. (United States)

13056-40 • 04:00 PM - 04:20 PM
**Deep learning for hazard quantification from imagery**
*Author(s):* **Christian Svinth**, **Eleanor B. Byler, Kirsten Chojnicki,** Pacific Northwest National Lab. (United States)

13056-41 • 04:20 PM - 04:40 PM
**Infrared signatures from chemical warfare agent simulants on kaolinite**
*Author(s):* **Natalie Gese, Hergen Eilers,** Washington State Univ. (United States)

13056-42 • 04:40 PM - 05:00 PM
**Revisiting the liquid mull technique to derive the infrared optical constants of organic powders from transmission IR spectroscopy**
*Author(s):* **Audrey Picard-Lafond, Emmanuela Diaz,** Defence Research and Development Canada (Canada)

13056-43 • 05:00 PM - 05:20 PM
**Optimal spectral resolution for solids and liquids using FTIR and other infrared spectrometers: How much resolution do you really need?**
*Author(s):* **Brenda M. Forland**, **Kendall D. Hughey**, **Michael J. Wilhelm**, **Olivia N. Williams**, **Benjamin F. Cappello**, **Connor L. Gaspar**, **Tanya L. Myers**, **Steven W. Sharpe, Timothy J. Johnson,** Pacific Northwest National Lab. (United States)

13056-44 • 05:20 PM - 05:40 PM
**Infrared signatures of thermal degradation products from chemical warfare agent simulants**
*Author(s):* **Natalie Gese,** Washington State Univ. (United States); **Hergen Eilers,** Washington State Univ (United States)

# Thursday 25 April 2024

## SESSION 11: AEROSOL CHARACTERIZATION II

25 April 2024 • 09:10 AM - 10:20 AM | Chesapeake 5
*Session Chair(s):* **Timothy J. Johnson**, Pacific Northwest National Lab. (United States)

13056-45 • 09:10 AM - 09:40 AM
**Static aerosol test panels as standoff detection performance targets** *(Invited Paper)*
*Author(s):* **R. Andrew McGill**, **Viet K. Nguyen**, **Robert Furstenberg**, **Christopher A. Kendziora**, **Daniel Corbin**, **Christopher Breshike, Michael R. Papantonakis,** U.S. Naval Research Lab. (United States)

13056-46 • 09:40 AM - 10:00 AM
**Analysis of chemical aerosol generation and characterization using various liquid aerosol generators**
*Author(s):* **Oyedoyin T. Aduroja**, **Vasanthi Sivaprakasam, Cathy S. Scotto,** U.S. Naval Research Lab. (United States)

13056-47 • 10:00 AM - 10:20 AM
**Modeling of infrared scattering signatures of liquid and solid aerosol clouds**
*Author(s):* **Robert Furstenberg**, **Andrew Shabaev**, **Christopher A. Kendziora**, **Tyler J. Huffman, R. Andrew McGill,** U.S. Naval Research Lab. (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13056-57
**Hydrogen peroxide sensors in the literature**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13057

# Signal Processing, Sensor/Information Fusion, and Target Recognition XXXIII

**22 - 24 April 2024 | Chesapeake 9**

***Conference Chair(s):*** **Ivan Kadar,** Interlink Systems Sciences, Inc. (United States); **Erik P. Blasch,** Air Force Research Lab. (United States); **Lynne L. Grewe,** California State Univ., East Bay (United States)

***Conference Co-Chair(s):*** **Bhashyam Balaji,** Defence Research and Development Canada (Canada); **Thia Kirubarajan,** TrackGen Solutions Inc. (Canada)

***Program Committee:*** **Dave Braines,** IBM United Kingdom Ltd. (United Kingdom); **Alex L. Chan,** DEVCOM Army Research Lab. (United States); **Kuochu C. Chang,** George Mason Univ. (United States); **Mark J. Carlotto,** General Dynamics Mission Systems (United States); **Chee-Yee Chong,** Independent Consultant (United States); **Frederick E. Daum,** Raytheon Missiles & Defense (United States); **Jean Dezert,** ONERA (France); **Laurie H. Fenstermacher,** Air Force Research Lab. (United States); **Brian Jalaian,** DEVCOM Army Research Lab. (United States); **Georgiy M. Levchuk,** Aptima, Inc. (United States); **James Llinas,** Univ. at Buffalo (United States); **Uttam Majumder,** National Geospatial-Intelligence Agency (United States); **Harley R. Myler,** Lamar Univ. (United States); **Ruixin Niu,** Virginia Commonwealth Univ. (United States); **Sean M. O'Rourke**, **Todd Rovito,** Air Force Research Lab. (United States); **Andreas E. Savakis,** Rochester Institute of Technology (United States); **Robert W. Schutz,** Consultant (United States); **Stelios C.A. Thomopoulos,** National Ctr. for Scientific Research "Demokritos" (Greece); **Andre J. Van Rynbach,** Air Force Research Lab. (United States); **Edward L. Waltz,** Virginia Polytechnic Institute and State Univ. (United States); **Peter K. Willett,** Univ. of Connecticut (United States); **Kaipei Yang,** Plato Systems (United States); **Shanchieh Jay Yang,** Rochester Institute of Technology (United States); **Yufeng Zheng,** The Univ. of Mississippi Medical Ctr. (United States)

## Monday 22 April 2024

### SESSION 1: MULTISENSOR FUSION, MULTITARGET TRACKING, AND RESOURCE MANAGEMENT I

22 April 2024 • 08:00 AM - 10:00 AM | Chesapeake 9

*Session Chair(s):* **Lynne L. Grewe**, California State Univ., East Bay (United States)

13057-1 • 08:00 AM - 08:20 AM

**Adaptive PHD-track oriented tracker: applications in infrared detection contexts**

*Author(s):* **Dominique Maltese,** Safran Electronics & Defense (France)

13057-2 • 08:20 AM - 08:40 AM

**Using estimation theory to optimize electric pump flow rates**

*Author(s):* **Raveen Appuhamy**, **Alex McCafferty-Leroux**, **Brett Sicard, Stephen A. Gadsden,** McMaster Univ. (Canada)

13057-3 • 08:40 AM - 09:00 AM

**Nonlinear Filtering Using the Double Exponential Transformation**

*Author(s):* **Quade Butler**, **Brett Sicard**, **Waleed Hilal**, **S. Andrew Gadsden,** McMaster Univ. (Canada); **Youssef Ziada,** Ford Motor Co. (United States)

13057-4 • 09:00 AM - 09:20 AM

**Integrating IMU and optical flow sensors for enhanced drone velocity control**

*Author(s):* **John Cain**, **Djedjiga Belfadel,** Fairfield Univ. (United States); **David Haessig**, **Cherif Chibane,** AuresTech Inc. (United States); **Shida Ye,** Univ. of Connecticut (United States)

13057-5 • 09:20 AM - 09:40 AM

**Asynchronous sensor fusion for multiple object tag-less activity tracking in manufacturing**

*Author(s):* **Kaipei Yang,** Univ. of Connecticut (United States); **Aria Pezeshk**, **Charles Lehman, Amin Arbabian,** Plato Systems, Inc. (United States)

13057-6 • 09:40 AM - 10:00 AM

**Sliding mode and variable structure filters for signal processing: a comprehensive review**

*Author(s):* **Waleed Hilal**, **Stephen A. Gadsden, Mohammad A. AlShabi,** McMaster Univ. (Canada)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 2: MULTISENSOR FUSION, MULTITARGET TRACKING, AND RESOURCE MANAGEMENT II

22 April 2024 • 10:30 AM - 11:50 AM | Chesapeake 9
*Session Chair(s):* **Erik P. Blasch**, Air Force Research Lab. (United States)

13057-7 • 10:30 AM - 10:50 AM
**Open source tools for Bayesian search**
*Author(s):* **Michael Harris**, **Nikki Perree**, **James Wright, Jordi Barr,** Defence Science and Technology Lab. (United Kingdom)

13057-8 • 10:50 AM - 11:10 AM
**Bullet proofing Bayesian particle flow against stiffness**
*Author(s):* **Frederick E. Daum**, **Liyi Dai**, **Jim Huang, Arjang Noushin,** Raytheon (United States)

13057-9 • 11:10 AM - 11:30 AM
**Numerical experiments for bullet-proofed Bayesian particle flow filters**
*Author(s):* **Frederick E. Daum,** Raytheon (United States)

13057-10 • 11:30 AM - 11:50 AM
**Statistically efficient estimation of noise variances for a Wiener process observed with measurement noise**
*Author(s):* **Shida Ye**, **Yaakov Bar-Shalom**, **Peter Willett,** Univ. of Connecticut (United States); **Ahmed Zaki,** Naval Undersea Warfare Ctr. (United States)

**Lunch Break 11:50 AM - 01:20 PM**

## PANEL DISCUSSION: EDGE-BASED COMPUTING CHALLENGES AND OPPORTUNITIES FOR SENSOR FUSION

22 April 2024 • 01:20 PM - 04:45 PM | Chesapeake 9
Panel Moderators:
**Lynne Grewe**, California State Univ. (United States)
**Ivan Kadar**, Interlink Systems Sciences, Inc. (United States)

Panelists:
**Andreas Savakis**, Rochester Institute of Technology (United States)
**Yu Chen**, Binghamton University (SUNY) (United States)
**Genshe Chen**, Intelligent Fusion, Inc (United States)
**Yufeng Zheng**, University of Mississippi Medical Center (United States)

Traditionally, sensor fusion methods included close-in multimodal measurements associated with ground robotics but evolved to incorporate many types of data from different sources. As the explosion of computational processing was available, the terms sensor, data, and information fusion enabled “big data” methods such as large-area imaging from electro-optical sensors and hundreds of sensors monitoring a wide geographical area. To process such large quantities of data, powerful computers and systems resulted in cloud computing approaches as centralized sensor fusion. However, there was still a need to develop methods for decentralized and distributed sensor fusion from sensors at the edge. To balance these approaches of centralized-cloud and decentralized-edge techniques, notions of fog-enabled distributed sensor fusion methods were developed to orchestrate the data flow, processing, and analysis. The panel focuses on the trends that seek to utilize edge-computing platforms amongst a large corpus of sensor, contextual, and social sources. For example, the advent of recent concepts of consideration includes digital twin technology, large language models, deep learning, and neuromorphic/neurosymbolic, among others. The panel will highlight not just the small-scale edge computing of the past, but how edge-computing sensor fusion is coordinated in terms of information and source fusion domains available from cloud and fog computing.

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 3: INFORMATION FUSION METHODOLOGIES AND APPLICATIONS I

23 April 2024 • 10:30 AM - 11:50 AM | Chesapeake 9
*Session Chair(s):* **Erik P. Blasch**, Air Force Research Lab. (United States)

13057-11 • 10:30 AM - 10:50 AM
**Interfacing topological data analysis (TDA) with AI/ML for multimodal data fusion and automatic target recognition (ATR)**
*Author(s):* **Paul Schrader,** Air Force Research Lab. (United States)

13057-12 • 10:50 AM - 11:10 AM
**Sensor fusion with multi-modal ground sensor network for endangered animal protection in large areas**
*Author(s):* **Sam B. Siewert,** California State Univ., Chico (United States); **Luis Felipe Zapata-Rivera**, **Catlina Aranzazu-Suescun**, **George Waldron,** Embry-Riddle Aeronautical Univ. (United States); **Ravindra Mangar,** Dartmouth College (United States); **Devang Raval**, **Prasanna Vaddkkepurakkal, Feras Alshehri,** California State Univ., Chico (United States)

13057-14 • 11:10 AM - 11:30 AM
**Enhancing drone abnormal behavior detection using data fusion techniques and dynamic Bayesian network methods**
*Author(s):* **Pierre Pathe,** CS Group (France), Ctr. de Recherche de l'Ecole de l'Air (France); **Benjamin Pannetier,** CS Group (France); **Olivier Bartheye,** Ctr. de Recherche de l'Ecole de l'Air (France)

13057-25 • 11:30 AM - 11:50 AM
**Analytics and models in the era of strategic competition** *(Invited Paper)*
*Author(s):* **Laurie H. Fenstermacher,** Air Force Research Lab. (United States)

**Lunch/Exhibition Break 11:50 AM - 01:40 PM**

## SESSION 4: INFORMATION FUSION METHODOLOGIES AND APPLICATIONS II

23 April 2024 • 01:40 PM - 02:20 PM | Chesapeake 9
*Session Chair(s):* **Erik P. Blasch**, Air Force Research Lab. (United States)

13057-17 • 01:40 PM - 02:00 PM
**Digital twin meets information fusion: panel results**
*Author(s):* **Erik P. Blasch,** Air Force Research Lab. (United States); **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States); **Yu Chen,** Binghamton Univ. (United States); **Yufeng Zheng,** The Univ. of Mississippi Medical Ctr. (United States); **Lynne L. Grewe,** California State Univ., East Bay (United States)

13057-18 • 02:00 PM - 02:20 PM
**Value-based sensor and information fusion**
*Author(s):* **Erik P. Blasch,** Air Force Research Lab. (United States)

**Coffee Break 02:20 PM - 02:50 PM**

## SESSION 5: SIGNAL AND IMAGE PROCESSING, AND INFORMATION FUSION APPLICATIONS I

23 April 2024 • 02:50 PM - 04:40 PM | Chesapeake 9
*Session Chair(s):* **Lynne L. Grewe**, California State Univ., East Bay (United States)

13057-20 • 02:50 PM - 03:20 PM
**Radar target recognition based on complex compressive sensing of stepped-frequency returns** *(Invited Paper)*
*Author(s):* **Ismail I. Jouny,** Lafayette College (United States)

13057-22 • 03:20 PM - 03:40 PM
**Objects recognition in high-scattering conditions at radio/microwave frequency**
*Author(s):* **Pavlo A. Molchanov,** IPD Scientific, LLC (United States)

13057-23 • 03:40 PM - 04:00 PM
**Comparative study of different micro-Doppler signatures for V-band radar-based drone detection**
*Author(s):* **Ankita Dey**, **Sreeraman Rajan,** Carleton Univ. (Canada); **Bhashyam Balaji,** Defence Research and Development Canada (Canada); **Shashank Pant,** National Research Council Canada (Canada); **Anthony Damini,** Defence Research and Development Canada (Canada)

13057-24 • 04:00 PM - 04:20 PM
**EO and radar fusion for fine-grained target classification with a strong few-shot learning baseline**
*Author(s):* **Luca Ballan**, **Jorge G. O. Melo**, **Sebastiaan P. van den Broek**, **Jan Baan**, **Friso G. Heslinga**, **Wyke Huizinga**, **Judith Dijk, Arta Dilo,** TNO (Netherlands)

13057-13 • 04:20 PM - 04:40 PM
**Grounding ontologies with pre-trained large language models for activity based intelligence**
*Author(s):* **Anee Azim**, **Leon S. Clark**, **Caleb K. Y. Lau,** Lockheed Martin Australia (Australia); **Miles Cobb,** Lockheed Martin Space Systems Co. (United States); **Kendall L. Jenner,** Lockheed Martin Australia (Australia)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C

Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13057-40 • 06:00 PM - 07:30 PM
**Target clustering based multi-Bernoulli filter for superpositional sensors**
*Author(s):* **Sen Wang,** National Univ. of Defense Technology (China)

13057-41 • 06:00 PM - 07:30 PM
**Distributed learning for automatic modulation recognition in bandwidth-limited networks**
*Author(s):* **Narges Rashvand,** The Univ. of North Carolina at Charlotte (United States); **Kenneth Witham,** Kostas Research Institute at Northeastern University (United States); **Gabriel Maldonado**, **Vinit Katariya,** The Univ. of North Carolina at Charlotte (United States); **Aly Sultan**, **Gunar Schirner,** Northeastern Univ. (United States); **Hamed Tabkhi,** The Univ. of North Carolina at Charlotte (United States)

13057-42 • 06:00 PM - 07:30 PM
**Investigating the waveform foundation of the Havana Syndrome**
*Author(s):* **Logan Boehm**, **Ruksana Kabealo**, **Isabela Perdomo**, **Nate Hagen, Anthony O. Smith,** Florida Institute of Technology (United States)

13057-45 • 06:00 PM - 07:30 PM
**Marine formation targets intent recognition based on BiConvLSTM-Attention**
*Author(s):* **FeiHong Qiao**, **YunQiao Xi**, **Jian Liu, JunPing Zhang,** Harbin Institute of Technology (China)

13057-46 • 06:00 PM - 07:30 PM
**Intent recognition of maritime group targets based on BiConvLSTM-Attention**
*Author(s):* **FeiHong Qiao**, **YunQiao Xi**, **Jian Liu, JunPing Zhang,** Harbin Institute of Technology (China)

13057-58 • 06:00 PM - 07:30 PM
**Working MOG optimization via opportunistic delays**
*Author(s):* **Gennady Staskevich,** Clarkson Univ. (United States)

13057-21 • 06:00 PM - 07:30 PM
**Case studies for application of an algorithm for deinterleaving of RADAR scans**
*Author(s):* **Jared Allanigue**, **William G. Warren**, **James V Outlaw**, **Alan Schroeder**, **Gil Chapman**, **Erin M Mansfield, Samuel Lambrakos,** U.S. Naval Research Lab. (United States)

# Wednesday 24 April 2024

## SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 6: SIGNAL AND IMAGE PROCESSING, AND INFORMATION FUSION APPLICATIONS II

24 April 2024 • 10:30 AM - 12:30 PM | Chesapeake 9
*Session Chair(s):* **Lynne L. Grewe**, California State Univ., East Bay (United States)

13057-26 • 10:30 AM - 10:40 AM
**StrokeChange: computer vision ML based detection of stroke related facial patterns towards an in-situ patient recovery/status monitoring system.**
*Author(s):* **Lynne L. Grewe, Soujanya Ravindra Nayak,** California State Univ., East Bay (United States)

13057-27 • 10:40 AM - 11:10 AM
**Real-time face recognition system at the edge** *(Invited Paper)*
*Author(s):* **Emre Ozen**, **Fikret Alim**, **Sefa B. Okcu**, **Enes Kavakli, Cevahir Cigla,** ASELSAN A.S. (Turkey)

13057-28 • 11:10 AM - 11:30 AM
**RedVox: evolution and applications of a smartphone infrasound recorder**
*Author(s):* **Patrick Liu,** Air Force Research Lab. (United States); **Milton Garces,** Univ. of Hawai'i (United States), RedVox, Inc. (United States); **Anthony Christe,** RedVox, Inc. (United States); **Eric Lam,** Air Force Research Lab. (United States)

13057-29 • 11:30 AM - 11:50 AM
**Contextually-aware autonomous navigation framework for human guidance**
*Author(s):* **Nicolas Norena Acosta,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States), Johns Hopkins Univ. (United States); **Chigozie Ewulum,** Johns Hopkins Univ. Applied Physics Lab. (United States); **Michael Pekala,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States); **Marin Kobilarov,** Johns Hopkins Univ. (United States); **Seth Billings,** Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

13057-30 • 11:50 AM - 12:10 PM
**Vision transformer quantization with multi-step knowledge distillation**
*Author(s):* **Navin Ranjan, Andreas E. Savakis,** Rochester Institute of Technology (United States)

13057-31 • 12:10 PM - 12:30 PM
**Image sequence analysis using dynamic topic model**
*Author(s):* **Amit Bhatia, Neil Bomberger,** BAE Systems (United States)

**Lunch/Exhibition Break 12:30 PM - 02:00 PM**

## SESSION 7: SIGNAL AND IMAGE PROCESSING, AND INFORMATION FUSION APPLICATIONS III

24 April 2024 • 02:00 PM - 03:20 PM | Chesapeake 9
*Session Chair(s):* **Lynne L. Grewe**, California State Univ., East Bay (United States)

13057-33 • 02:00 PM - 02:20 PM
**Influence of multimodal training data for pipe segmentation in RGB and thermal infrared images in critical infrastructure**
*Author(s):* **Yannick Edward Tarant, Oscar H. Ramírez-Agudelo, Lena Schreiber,** Deutsches Zentrum für Luft- und Raumfahrt e. V. (Germany)

13057-34 • 02:20 PM - 02:40 PM
**Recognizing surface and subsurface objects based on dynamic responses in infrared imagery**
*Author(s):* **D. Keith Wilson**, **Sora C. Haley**, **Max E. Krackow**, **Sophia P. Bragdon**, **Vuong H. Truong**, **Jay L. Clausen, Megan I. Bishop,** U.S. Army Engineer Research and Development Ctr. (United States)

13057-35 • 02:40 PM - 03:00 PM
**Automated data processing in real time for fiber optic sensors using deep neural networks: AptiFOS**
*Author(s):* **Sandeep Reddy Bukka**, **Nageswara Lalam**, **Hari Datta Bhatta, Ruishu Wright,** National Energy Technology Lab. (United States)

13057-39 • 03:00 PM - 03:20 PM
**Satellite attitude activity identification using change-point and wavelet analysis**
*Author(s):* **Sydney Kwitowski,** Univ. at Buffalo (United States); **Jeremy R. Chapman**, **Andrew D. Dianetti,** Air Force Research Lab. (United States); **Christopher K. Nebelecky, John L. Crassidis,** Univ. at Buffalo (United States)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13057-36
**Self-generated model of acoustics encryption by means of true random number generator**
*Author(s):* **Olga Safaryan**, **Larisa Cherckesova**, **Nikolay Gapon**, **Irina Alferova**, **Boris Akishin,** Don State Technical Univ. (Russian Federation); **Evgeny A. Semenishchev,** Moscow State Univ. of Technology "STANKIN" (Russian Federation)

13057-43
**Data-driven techniques for signal recovery and decryption**
*Author(s):* **Wafaa Al Nassan**, **Talal Bonny, Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13057-117
**Unscented Kalman filter in chaotic digital communication: a robust spread**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates); **S. Andrew Gadsden,** McMaster University (Canada); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13058

# Disruptive Technologies in Information Sciences VIII

**22 - 24 April 2024 | National Harbor 6**

***Conference Chair(s):*** **Misty Blowers,** Datalytica (United States); **Bryant T. Wysocki,** Air Force Research Lab. (United States); **Bryant T. Wysocki,** Air Force Research Lab. (United States); **Ramesh Bharadwaj,** U.S. Naval Research Lab. (United States)

***Conference Co-Chair(s):*** **Gaby Rossi,** Datalytica (United States)

***Program Committee:*** **Yu Chen,** Binghamton Univ. (United States); **Brian Crooks,** (); **Michael L. Fanto,** Air Force Research Lab. (United States); **Russell D. Hall,** Zel Technologies, LLC (United States); **Chin-tser Huang,** Univ. of South Carolina (United States); **Nelson Jaimes,** The George Washington Univ. (United States); **Raju Namburu,** DEVCOM Army Research Lab. (United States); **Jon R. Williams,** Datalytica (United States); **Andrew Young,** (United States)

## Monday 22 April 2024

### SESSION 1: AI METHODOLOGIES AND APPLICATIONS I

22 April 2024 • 08:30 AM - 10:10 AM | National Harbor 6
*Session Chair(s):* **Nelson Jaimes**, The George Washington Univ. (United States)

13058-1 • 08:30 AM - 08:50 AM
**Bridging the AI/ML gap with explainable symbolic causal models using information theory**
*Author(s):* **Stuart W. Card,** Critical Technologies Inc. (United States)

13058-2 • 08:50 AM - 09:10 AM
**Application specificity of data for pre-training in computer vision**
*Author(s):* **Gabriel Peters,** Rochester Institute of Technology (United States), L3Harris Technologies, Inc. (United States);**Scott Couwenhoven**, **Derek Walvoord,** L3Harris Technologies, Inc. (United States); **Carl Salvaggio,** Rochester Institute of Technology (United States)

13058-3 • 09:10 AM - 09:30 AM
**Modular, hierarchical machine learning for sequential goal completion**
*Author(s):* **Nathan R. McDonald,** Air Force Research Lab. (United States)

13058-4 • 09:30 AM - 09:50 AM
**Deep reinforcement learning to assess lower extremity movement intention and assist a rehabilitation exoskeleton**
*Author(s):* **Robert P. Dizor**, **Anil Raj,** Univ. of West Florida (United States), Florida Institute for Human & Machine Cognition (United States); **Bryan M. Gonzalez,** Embry-Riddle Aeronautical Univ. (United States); **Garhett Smith**, **zachary carter**, **domingues rodrigues,** Univ. of West Florida (United States); **jacob newton,** Virginia Commonwealth University (United States)

13058-5 • 09:50 AM - 10:10 AM
**Eye tracking in extreme environments: from invention to new frontiers of human-machine teaming**
*Author(s):* **Connor Tate,** Univ. of West Florida (United States), Florida Institute for Human & Machine Cognition (United States); **Jeffrey Phillips,** Florida Institute for Human & Machine Cognition (United States); **Dawn Kernagis,** Univ. of North Carolina at Chapel Hill School of Medicine (United States)

**Coffee Break 10:10 AM - 10:40 AM**

### SESSION 2: AI METHODOLOGIES AND APPLICATIONS II

22 April 2024 • 10:40 AM - 12:00 PM | National Harbor 6
*Session Chair(s):* **Nelson Jaimes**, The George Washington Univ. (United States)

13058-6 • 10:40 AM - 11:00 AM
**Quantization to accelerate inference in multi-modal 3D object detection**
*Author(s):* **Billy Geerhart**, **Venkateswara Dasari**, **Brian Rapp**, **Peng Wang,** DEVCOM Army Research Lab. (United States); **Ju Wang, Christopher X Payne,** Virginia State Univ. (United States)

13058-8 • 11:00 AM - 11:20 AM
**A systems theoretic perspective on open architectures for learning systems**
*Author(s):* **Tyler Cody, Peter A Beling,** Virginia Polytechnic Institute and State Univ. (United States)

13058-18 • 11:20 AM - 11:40 AM
**Generative AI agile assistant**
*Author(s):* **Darrell L. Young**, **James Moreland**, **Perry Boyette, Jason Teske,** RTX Corp. (United States)

13058-50 • 11:40 AM - 12:00 PM
**SpaceX 2.0: A revisit (the persistent monitoring of emerging technology)**
*Author(s):* **Richard M. Buchter,** DEVCOM Army Research Lab. (United States)

**Lunch Break 12:00 PM - 01:00 PM**

## SESSION 3: AI FOR DETECTION AND RECOGNITION

22 April 2024 • 01:00 PM - 02:00 PM | National Harbor 6
*Session Chair(s):* **Nathan R. McDonald**, Air Force Research Lab. (United States)

13058-9 • 01:00 PM - 01:20 PM
**HALO: an ontology for representing and categorizing hallucinations in large language models**
*Author(s):* **Navapat Nananukul, Mayank Kejriwal,** The Univ. of Southern California (United States)

13058-10 • 01:20 PM - 01:40 PM
**Adaptive object detection algorithms for resource constrained autonomous robotic systems**
*Author(s):* **Joseph Pappas,** Purdue Univ. (United States); **Venkateswara Dasari**, **Billy Geerhart**, **David Alexander**, **Peng Wang,** DEVCOM Army Research Lab. (United States); **Somali Chaterji,** Purdue Univ. (United States)

13058-11 • 01:40 PM - 02:00 PM
**Methodology of soft partition for image classification**
*Author(s):* **Vinod K. Mishra,** DEVCOM Army Research Lab. (United States); **C.-C. Jay Kuo,** University of Southern California (United States)

## SESSION 4: AI SYSTEMS AND DECISION MAKING I

22 April 2024 • 02:00 PM - 03:20 PM | National Harbor 6
*Session Chair(s):* **Gennady Staskevich**, Clarkson Univ. (United States)

13058-12 • 02:00 PM - 02:20 PM
**Circumventing broken neural networks, both real and Imaginary, through SPSF-based neural decoding and interconnected associative memory matrices**
*Author(s):* **James P. LaRue,** Jadco Signals (United States)

13058-13 • 02:20 PM - 02:40 PM
**Combining AI control systems and human decision support via robustness and criticality**
*Author(s):* **Walt Woods,** Independent Scholar (United States); **Alexander Grushin,** Galois, Inc. (United States); **Simon Khan,** Air Force Research Lab. (United States); **Alvaro Velasquez,** Univ. of Colorado Boulder (United States)

13058-14 • 02:40 PM - 03:00 PM
**Latency-aware service placement for generative AI at the edge**
*Author(s):* **Bipul Thapa, Lena Mashayekhy,** Univ. of Delaware (United States)

13058-15 • 03:00 PM - 03:20 PM
**Risk mitigations for the DoD's fielding of generative artificial intelligence and large language models**
*Author(s):* **Misty Blowers**, **Brian Crooks, Andy Young,** Datalytica (United States)

**Coffee Break 03:20 PM - 03:40 PM**

## SESSION 5: AI SYSTEMS AND DECISION MAKING II

22 April 2024 • 03:40 PM - 04:20 PM | National Harbor 6
*Session Chair(s):* **Gennady Staskevich**, Clarkson Univ. (United States)

13058-16 • 03:40 PM - 04:00 PM
**Quantifying decision complexity in IADS operations**
*Author(s):* **George Cybenko,** Thayer School of Engineering at Dartmouth (United States); **Lucas Sheldon,** Systems & Technology Research (United States)

13058-17 • 04:00 PM - 04:20 PM
**Large language models and new paths to digital transformation of the engineering enterprise**
*Author(s):* **Tyler Cody, Peter Beling,** Virginia Polytechnic Institute and State Univ. (United States)

## SESSION 6: METAVERSE, DIGITAL, AND SYNTHETIC TECHNOLOGIES

22 April 2024 • 04:20 PM - 04:40 PM
*Session Chair(s):* **Misty Blowers**, Datalytica LLC (United States)

13058-7 • 04:20 PM - 04:40 PM
**Serious games for climate change education and resilience: virtual forests in the metaverse**
*Author(s):* **Aidan Ackerman,** SUNY College of Environmental Science and Forestry (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 9: DATA ANALYTICS AND FEDERATED SYSTEMS

23 April 2024 • 10:30 AM - 12:10 PM | National Harbor 6
*Session Chair(s):* **Jeff Anderson**, Integration Innovation, Inc. (United States)

13058-27 • 10:30 AM - 10:50 AM
**Situational awareness on a graph: towards graph neural networks for spectrum analysis and battlefield management**
*Author(s):* **Jeff Anderson,** Integration Innovation, Inc. (United States)

13058-28 • 10:50 AM - 11:10 AM
**Opening architecture development in software factories**
*Author(s):* **Rowland Darbin**, **Mike Tyler**, **Troy Lay,** General Dynamics Mission Systems (United States); **Ronald M. Gordon, Paul E. Parker,** U.S. Army PEO STRI (United States)

13058-30 • 11:10 AM - 11:30 AM
**Aberdeen architecture: information flow monitoring and tracking**
*Author(s):* **Patrick W. Jungwirth,** U.S. Army Research Lab. (United States); **W. Michael Crowe,** Aviation and Missile Center (United States); **Tom Barnett,** DEVCOM Aviation and Missile Ctr. (United States)

13058-31 • 11:30 AM - 11:50 AM
**Working MOG Optimization via Opportunistic Delays**
*Author(s):* **Gennady Staskevich, Joseph Skufca,** Clarkson Univ. (United States)

13058-48 • 11:50 AM - 12:10 PM
**Deep HoriXons: 3D Virtual Generative AI Assisted Campus for Deep Learning AI and Cybersecurity**
*Author(s):* **Robert Williams,** Discovery Lab. - Global (DLG) (United States)

**Lunch/Exhibition Break 12:10 PM - 02:00 PM**

## SESSION 8: CYBERSECURITY AND ENCRYPTION I

23 April 2024 • 02:00 PM - 03:00 PM | National Harbor 6
*Session Chair(s):* **Gabriela Rossi**, Datalytica LLC (United States)

13058-24 • 02:00 PM - 02:20 PM
**A look inside of homomorphic encryption for federated learning**
*Author(s):* **Lubjana Beshaj,** U.S. Military Academy (United States)

13058-25 • 02:20 PM - 02:40 PM
**Integration of blockchain in smart systems: problems and opportunities for real-time sensor data storage**
*Author(s):* **Naseem Alsadi**, **Syed Zaidi**, **Mankaran Rooprai**, **Waleed Hilal,** McMaster Univ. (Canada); **John Yawney,** Adastra Corp. (Canada); **Andrew Gadsden,** McMaster Univ. (Canada)

13058-22 • 02:40 PM - 03:00 PM
**Neural network cryptography: vulnerabilities and attack strategies**
*Author(s):* **Lubjana Beshaj,** U.S. Military Academy (United States); **Gaurav Tyagi,** Kevadiya Inc. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 6: KEYNOTE SESSION

23 April 2024 • 03:30 PM - 04:00 PM | National Harbor 6
*Session Chair(s):* **Misty Blowers**, Datalytica LLC (United States)

13058-200 • 03:30 PM - 04:00 PM
**Keynote Presentation** (Keynote Presentation)
*Author(s):* **Steve Parode,** U.S. Naval Intelligence (United States)

## SESSION 7: CYBERSECURITY AND ENCRYPTION II

23 April 2024 • 04:00 PM - 04:40 PM | National Harbor 6
*Session Chair(s):* **Gabriela Rossi**, Datalytica LLC (United States)

13058-21 • 04:00 PM - 04:20 PM
**Integrated spacecraft autonomous attitude control testbed**
*Author(s):* **Jacob Romeo**, **Dylan Ballback**, **Kyle Fox, Sergey V Drakunov,** Embry-Riddle Aeronautical Univ. (United States)

13058-26 • 04:20 PM - 04:40 PM
**Zero trust decision analysis for next generation networks**
*Author(s):* **Joseph B. Kroculick,** Winifred Connects LLC (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 10: SIGNAL PROCESSING AND SOFTWARE EXECUTION FLOW

24 April 2024 • 10:30 AM - 11:30 AM | National Harbor 6
*Session Chair(s):* **Misty Blowers**, Datalytica LLC (United States)

13058-34 • 10:30 AM - 10:50 AM
**The game-changing memristive technology for next-gen AI/ML hardware**
*Author(s):* **Kang Jun Bai**, **Jack P. Lombardi**, **Clare D. Thiem, Nathan R. McDonald,** Air Force Research Lab. (United States)

13058-35 • 10:50 AM - 11:10 AM
**OpenMutt: a low-cost quadruped for student education in research**
*Author(s):* **Bryan M. Gonzalez**, **Jeremy Niemiec**, **Dylan Ballback**, **Aleiya T. Deets**, **Zachary R. Nadeau**, **Avery Cuenin**, **Gabriel M. Alkire**, **Christopher Hockley, Monica Garcia,** Embry-Riddle Aeronautical Univ. (United States)

13058-19 • 11:10 AM - 11:30 AM
**CubeSat Reaction Wheel Attitude Control Platform**
*Author(s):* **Justin Hartland**, **Dylan Ballback**, **Ryan Taylor**, **Ella Cheatham**, **Isaac Stitt**, **Jacob Salazar**, **Anuhya Suhas, Vishwam Rathod,** Embry-Riddle Aeronautical Univ. (United States)

**Lunch/Exhibition Break 11:30 AM - 12:50 PM**

### DECEIVER SESSION KICKOFF

24 April 2024 • 12:50 PM - 01:05 PM | National Harbor 6
*Session Chair(s):* **Yu Chen**, Binghamton Univ. (United States)
Under the umbrella of Disruptive Technologies in Information Sciences VIII, we organize this session for detecting and deterring misinformation and deception focusing on disseminating education on counteracting erroneous information, verifying evidence, and reporting (DECEIVER). The DECEIVER session aims at bringing researchers and experts together to present and discuss the latest developments and technical solutions concerning various aspects of rebuilding a trust foundation in the era of rumor, misinformation, and disinformation.

### SESSION 11: DECEIVER I

24 April 2024 • 01:05 PM - 03:05 PM | National Harbor 6
*Session Chair(s):* **Yu Chen**, Binghamton Univ. (United States)

13058-36 • 01:05 PM - 01:35 PM
**The impact of misinformation on the health of underrepresented youth during public health crises: a preliminary study** *(Invited Paper)*
*Author(s):* **Lulu Al Arfaj,** Binghamton Univ. (United States); **Joon Suk Lee**, **Joseph A. Shelton,** Virginia State Univ. (United States); **Zeynep Ertem**, **Thi Tran, Yu Chen,** Binghamton Univ. (United States)

13058-37 • 01:35 PM - 02:05 PM
**Uncovering deep-rooted cultural differences (UNCOVER)** *(Invited Paper)*
*Author(s):* **Aleksey Panasyuk,** Air Force Research Lab. (United States); **Bryan Li, Chris Callison-Burch,** University of Pennsylvania (United States)

13058-38 • 02:05 PM - 02:35 PM
**Debunking warfare narratives: the role of commercial satellites in the russian-ukrainian conflict** *(Invited Paper)*
*Author(s):* **Seden Akcinaroglu**, **Ekrem Karakoc, Ozlem Tonguc,** Binghamton Univ. (United States)

13058-39 • 02:35 PM - 03:05 PM
**A lightweight deep learning model for rapid detection of fabricated ENF signals from audio sources** *(Invited Paper)*
*Author(s):* **Adilet Pazylkarim,** Binghamton Univ. (United States); **Deeraj Nagothu,** Intelligent Fusion Technology, Inc. (United States); **Yu Chen,** Binghamton Univ. (United States)

**Coffee Break 03:05 PM - 03:25 PM**

## SESSION 12: DECEIVER II

24 April 2024 • 03:25 PM - 05:35 PM | National Harbor 6
*Session Chair(s):* **Yu Chen**, Binghamton Univ. (United States)

13058-40 • 03:25 PM - 03:55 PM
**Generative adversarial networks-based AI-generated imagery authentication using frequency domain analysis** *(Invited Paper)*
*Author(s):* **Nihal Poredi,** Binghamton Univ. (United States); **Monica Sudarsan**, **Enoch Solomon,** Virginia State Univ. (United States); **Deeraj Nagothu,** Intelligent Fusion Technology, Inc. (United States); **Yu Chen,** Binghamton Univ. (United States)

13058-41 • 03:55 PM - 04:25 PM
**Video modification in drone and satellite imagery** *(Invited Paper)*
*Author(s):* **Michael J. Reale**, **Daniel P. Murphy,** SUNY Polytechnic Institute (United States); **Maria Cornacchia, Jamie Vazquez Madera,** Air Force Research Lab. (United States)

13058-42 • 04:25 PM - 04:55 PM
**Integrating information warfare strategies with emerging AI technologies for enhanced national security** *(Invited Paper)*
*Author(s):* **Terry Traylor,** North Dakota State Univ. (United States)

13058-32 • 04:55 PM - 05:15 PM
**Continuous time systems disruptive signal processing and accurate real time signal reconstruction**
*Author(s):* **W. M. Crowe,** U.S. Army Aviation and Missile Command (United States); **Patrick W. Jungwirth,** U.S. Army Research Lab. (United States)

13058-148 • 05:15 PM - 05:35 PM
**Black-box Reverse Engineering AI Enabled Systems with AI**
*Author(s):* **Misty Blowers**, **Santos S. Salinas, Seth A. Bailey,** Datalytica LLC (United States)

## PANEL DISCUSSION: DECEIVER

24 April 2024 • 05:45 PM - 06:15 PM | National Harbor 6
Human society is facing an unprecedented era of information bombardment. Every day we are swamped by such a huge number of texts, videos, audio, emails, and posts that are far beyond what one can digest. The Internet and the social media are key game-changers in exploiting rights and freedoms. They give the opportunity for spreading limitless fake photos, reports, and opinions. Recent deepfake video attacks on some public scenarios have raised more concerns. Misinformation may actually cause disturbance in our society and ruin the foundation of trust. Government agencies like the U.S. Defense Advanced Research Projects Agency (DARPA) and National Security Agency (NSA) are concerned about losing the war against misinformation that uses popular ML techniques to automatically incorporate artificial components into existing video streams. Join this panel discussion on DECEIVER: Disseminating, Education on Counteracting, Erroneous, Information, Verifying, Evidence, and Reporting, to learn about detecting and deterring misinformation and deception, and hear researchers and experts discuss the latest developments and technical solutions concerning various aspects of rebuilding a trust foundation in the era of rumor, misinformation, and disinformation.

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13058-43
**The convergence of control and cognition: a bibliometric overview of UKF in AI-infused robotics**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi**, **Maamar Bettayeb,** Univ. of Sharjah (United Arab Emirates); **S. Andrew Gadsden,** McMAster University (Canada); **Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

13058-44
**Load balancing algorithms in SDN networks with multiple servers**
*Author(s):* **Alex Ramiro Masaquiza Caiza**, **Denis Andres Maigualema Quimbita**, **Mauro Tropea, Francesco Colosimo,** Univ. della Calabria (Italy)

13058-45
**Multi-interface mobile gateways for LPWAN-based air pollution monitoring**
*Author(s):* **Luis Miguel Samaniego Campoverde**, **Arijit Dutta**, **Mauro Tropea, Floriano De Rango,** Univ. della Calabria (Italy)

# CONFERENCE 13059

# Smart Biomedical and Physiological Sensor Technology XXI

**22 April 2024 | National Harbor 11**

***Conference Chair(s):*** **Brian M. Cullum,** Univ. of Maryland, Baltimore County (United States); **Douglas Kiehl,** Eli Lilly and Company (United States); **Eric S. McLamore,** Clemson Univ. (United States)

***Program Committee:*** **Alper Bozkurt,** North Carolina State Univ. (United States); **Jonathan C. Claussen,** Iowa State Univ. of Science and Technology (United States); **Matthew B. Coppock,** DEVCOM Army Research Lab. (United States); **Sudhir Dahal,** Thermo Fisher Scientific Inc. (United States); **Andrew M. Fales,** U.S. Food and Drug Administration (United States); **Mikella E. Farrell,** DEVCOM Army Research Lab. (United States); **Ellen L. Holthoff,** Assistant Secretary of the Army for Acquisition, Logistics, and Technology (United States); **Ilko K. Ilev,** U.S. Food and Drug Administration (United States); **Yong Lin Kong,** The Univ. of Utah (United States); **Kamdeo D. Mandal,** Indian Institute of Technology (BHU), Varanasi (India); **T. Joshua Pfefer,** U.S. Food and Drug Administration (United States); **Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States); **Pietro Strobbia,** Univ. of Cincinnati (United States); **Michael Weinrich,** Eunice Kennedy Shriver National Institute of Child Health and Human Development (United States); **Sheng Xu,** Univ. of California, San Diego (United States)

## Monday 22 April 2024

### SESSION 1: NOVEL MATERIALS SENSING

22 April 2024 • 08:00 AM - 10:00 AM | National Harbor 11

*Session Chair(s):* **Eric S. McLamore**, Clemson Univ. (United States); **Kamdeo D. Mandal**, Indian Institute of Technology (BHU), Varanasi (India)

13059-1 • 08:00 AM - 08:20 AM

**Multiwavelength spectral photon detection system with 10.9nm resolution capable of perform data stream at 420Gs/s.**

*Author(s):* **Masanobu Yamamoto**, **John Jaiber Gonzalez Murillo**, **Keegan Hernandez,** Miftek Inc. (United States); **Valery Patsekin,** Purdue Univ. (United States); **J. Paul Robinson,** Miftek Inc. (United States), Purdue Univ. (United States)

13059-2 • 08:20 AM - 08:40 AM

**Phase transition in hydroxyapatites: bone and laser host materials**

*Author(s):* **Himagowri Prasad,** Boston Univ. (United States); **Aria Tauraso**, **Krishna S. Machuga**, **Tagide deCarvahlo**, **Fow-Sen Choa**, **Bradley Arnold**, **Brian Cullum,** Univ. of Maryland, Baltimore County (United States); **Kamdeo D. Mandal,** Indian Institute of Technology (BHU), Varanasi (India); **Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States)

13059-3 • 08:40 AM - 09:00 AM

**Thermal characteristics of multifunctional high Z and high density 2D and 3D crystals**

*Author(s):* **Abhishek Singh**, **Krishna S. Machuga**, **Eric Bowman**, **Leslie Scheurer**, **Ratu Wilhma Jessica Joos,** Univ. of Maryland, Baltimore County (United States); **Narasimha Prasad,** NASA Langley Research Ctr. (United States); **Josh Valencia**, **Cindy Tope**, **Brian Cullum, Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States)

13059-4 • 09:00 AM - 09:20 AM

**Dielectric energy storage materials for space sensors**

*Author(s):* **Gabrielle Amalthea Trobare**, **Aria Tauraso,** Univ. of Maryland, Baltimore County (United States); **Narasimha Prasad,** NASA Langley Research Ctr. (United States); **Ching-Hua Su,** NASA Marshall Space Flight Ctr. (United States); **Bradley Arnold**, **Fow-Sen Choa**, **Brian Cullum,** Univ. of Maryland, Baltimore County (United States); **Kamdeo D. Mandal,** Indian Institute of Technology (BHU), Varanasi (India); **Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States)

13059-5 • 09:20 AM - 09:40 AM

**Studies of multifunctional $Bi_{12}GeO_{20}$ compound synthesized by chemical route**

*Author(s):* **Anup Kumar,** Indian Institute of Technology (BHU), Varanasi (India); **Manish K. Verma**, **Biswajeet Jena**, **Dhanesh Tiwary,** Indian Institute of Technology (BHU) (India); **Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States); **Kamdeo D. Mandal,** Indian Institute of Technology (BHU), Varanasi (India)

13059-6 • 09:40 AM - 10:00 AM
**Flux growth of optical sensor zinc selenide crystals**
*Author(s):* **Meghan Brandt**, **Nicholas Schmidt**, **Aria Tauraso**, **Rachit B. Sood,** Univ. of Maryland, Baltimore County (United States); **Ching-Hua Su,** NASA Marshall Space Flight Ctr. (United States); **Bradley Arnold**, **Fow-Sen Choa**, **Brian Cullum, Narsingh Bahadur Singh,** Univ. of Maryland, Baltimore County (United States)

**Coffee Break 10:00 AM - 10:20 AM**

## SESSION 2: FUTURE OF INDIVIDUAL CARE AND MONITORING

22 April 2024 • 10:20 AM - 12:00 PM | National Harbor 11
*Session Chair(s):* **Matthew B. Coppock**, DEVCOM Army Research Lab. (United States); **Eric S. McLamore**, Clemson Univ. (United States)

13059-11 • 10:20 AM - 10:40 AM
**Quantifying knowledge: medical applications of radar aging through the lens of bibliometrics**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Talal Bonny**, **Mohammad AlShabi, Ahmad Alobaid,** Univ. of Sharjah (United Arab Emirates)

13059-7 • 10:40 AM - 11:00 AM
**Inkjet-printed 2-D conductors for electromyography (EMG) electrodes in biosensing applications**
*Author(s):* **Allyson R. Tesky**, **Sujan Aryal**, **Julia Molitor, Anupama Kaul,** Univ. of North Texas (United States)

13059-8 • 11:00 AM - 11:20 AM
**Extracting functional connectivity signatures in substance use disorder using energy landscape analysis**
*Author(s):* **Sravani Varanasi,** Univ. of Maryland, Baltimore County (United States); **Tianye Zhai**, **Hong Gu**, **Yihong Yang,** National Institute on Drug Abuse, National Institutes of Health (United States); **Fow-Sen Choa,** Univ. of Maryland, Baltimore County (United States)

13059-9 • 11:20 AM - 11:40 AM
**Functional connectivity differences between cocaine users and healthy controls: an fMRI study**
*Author(s):* **Sravani Varanasi,** Univ. of Maryland, Baltimore County (United States); **Tianye Zhai**, **Hong Gu**, **Yihong Yang,** National Institute on Drug Abuse, National Institutes of Health (United States); **Fow-Sen Choa,** Univ. of Maryland, Baltimore County (United States)

13059-10 • 11:40 AM - 12:00 PM
**Exploring connections between auditory hallucinations and language model structures and functions**
*Author(s):* **Janerra D. Allen**, **Luke Xia,** Univ. of Maryland, Baltimore County (United States); **L. Elliot Hong,** Univ. of North Texas Health Science Ctr. of Houston (United States); **Fow-Sen Choa,** Univ. of Maryland, Baltimore County (United States)

**Lunch Break 12:00 PM - 02:00 PM**

## SESSION 3: ADVANCES IN FUNCTIONAL NUCLEIC ACID BIOSENSING

22 April 2024 • 02:00 PM - 02:40 PM | National Harbor 11
*Session Chair(s):* **Pietro Strobbia**, Univ. of Cincinnati (United States); **Matthew B. Coppock**, DEVCOM Army Research Lab. (United States)

13059-13 • 02:00 PM - 02:20 PM
**Sensing hydrogels based on surface-enhanced Raman scattering for the direct detection of plant viruses in infected plants** *(Invited Paper)*
*Author(s):* **Lyndsay Kissell,** Univ. of Cincinnati (United States); **Huazhen Liu,** Univ. of Kentucky (United States); **Manisha Sheokand**, **Der Vang,** Univ. of Cincinnati (United States); **Pradeep Kachroo,** Univ. of Kentucky (United States); **Pietro Strobbia,** Univ. of Cincinnati (United States)

13059-15 • 02:20 PM - 02:40 PM
**Advancing SERS biosensing via rational design and automation** *(Invited Paper)*
*Author(s):*

**Coffee Break 02:40 PM - 03:00 PM**

## SESSION 4: SERS BIOSENSING FOR DEFENSE AND HEALTH

22 April 2024 • 03:00 PM - 04:40 PM | National Harbor 11
*Session Chair(s):* **Pietro Strobbia**, Univ. of Cincinnati (United States)

13059-16 • 03:00 PM - 03:30 PM
**Fabrication of aerosol jet printed SERS sensors for the detection of chemical warfare agents and environmental pollutants** *(Invited Paper)*
*Author(s):* **Andrea N. Giordano,** Air Force Research Lab. (United States); **Lyndsay Kissell**, **Pietro Strobbia,** Univ. of Cincinnati (United States); **Rahul Rao,** Air Force Research Lab. (United States)

13059-17 • 03:30 PM - 04:00 PM
**Exploring MOF-based micromotors as SERS sensors** *(Invited Paper)*
*Author(s):* **Eric R. Languirand,** U.S. Army (United States); **Errie Parrilla**, **Nathaniel Smith,** The Pennsylvania State Univ. (United States); **Matthew Collins,** U.S. Army (United States); **Angus Unruh,** The Pennsylvania State Univ. (United States); **Lars Lefkowitz,** Science and Mathematics Academy at Aberdeen High School (Harford County Public Schools) (United States); **Cecilia Phung,** Army Combat Capabilities Development Command Chemical Biological Center (United States); **Ayusman Sen,** The Pennsylvania State Univ. (United States)

13059-18 • 04:00 PM - 04:20 PM
**Advanced point-of-care lateral flow immunoassay devices to detect the salivary lipopolysaccharide of porphyromonas gingivalis bacteria for oral health** *(Invited Paper)*
*Author(s):* **Daewoo Han,** Univ. of Cincinnati (United States); **Sancai Xie,** Procter & Gamble Co. (United States); **Lyndsay Kissell**, **Pietro Strobbia, Andrew J. Steckl,** Univ. of Cincinnati (United States)

13059-19 • 04:20 PM - 04:40 PM
**Label-free surface-enhanced Raman scattering (SERS) and machine learning for biological analysis**
*Author(s):* **Der Vang**, **Maria S. Kelly**, **Ruxandra I. Dima,** Univ. of Cincinnati (United States); **Jonathan Pahren**, **Tom Cambron,** Procter & Gamble Co. (United States); **Pietro Strobbia,** Univ. of Cincinnati (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13059-20 • 06:00 PM - 07:30 PM
**Harnessing data and satellites for early malaria warning: a global health imperative**
*Author(s):* **Zahidur Rahman,** LaGuardia Community College (United States); **Roytman Leonid,** City College Of the City University of New York (United States); **Abdelhamid Kadik,** LaGuardia Community College (United States); **Dilara Rosy,** Marks Home Care (United States); **Pradipta Nandi,** All India Institute of Medical Sciences, New Delhi (India)

13059-21 • 06:00 PM - 07:30 PM
**Advancements in pathogen detection: the integration of SERS and LSPR technologies in handheld clinical diagnostics**
*Author(s):* **Sebastian Huelck,** tec5USA, Inc. (United States)

# CONFERENCE 13060

# Sensing for Agriculture and Food Quality and Safety XVI

**22 - 23 April 2024 | National Harbor 15**

***Conference Chair(s):*** **Moon S. Kim,** Agricultural Research Service (United States); **Byoung-Kwan Cho,** Chungnam National Univ. (Korea, Republic of)

***Conference Co-Chair(s):*** **Fartash Vasefi,** SafetySpect Inc. (United States)

***Program Committee:*** **Kuanglin Chao,** Agricultural Research Service (United States); **Ana Garrido-Varo,** Univ. de Córdoba (Spain); **Renfu Lu,** Agricultural Research Service (United States); **Yankun Peng,** China Agricultural Univ. (China); **Dolores Pérez-Marín,** Univ. de Córdoba (Spain); **Jianwei Qin,** Agricultural Research Service (United States); **J. Paul Robinson,** Purdue Univ. (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States); **Paul J. Williams,** Department of Food Science, Stellenbosch Univ. (South Africa); **Haibo Yao,** Mississippi State Univ. (United States); **Yibin Ying,** Zhejiang Univ. (China); **Seung-Chul Yoon,** Agricultural Research Service (United States)

## Monday 22 April 2024

### SESSION 1: NIR SPECTROSCOPY AND IMAGING

22 April 2024 • 01:30 PM - 03:10 PM | National Harbor 15
*Session Chair(s):* **Byoung-Kwan Cho**, Chungnam National Univ. (Korea, Republic of)

13060-1 • 01:30 PM - 01:50 PM
**Online analysis of compound feeds using near infrared spectroscopy**
*Author(s):* **Dolores C. Pérez-Marín**, **Irina Torres-Rodríguez**, **José A. Entrenas, Ana Garrido-Varo,** Univ. de Córdoba (Spain)

13060-2 • 01:50 PM - 02:10 PM
**Enhancing food safety: Real-time detection of foreign materials using high-speed NIR hyperspectral imaging**
*Author(s):* **Seung-Chul Yoon,** Agricultural Research Service (United States); **Zirak Khan,** The Univ. of Georgia (United States)

13060-3 • 02:10 PM - 02:30 PM
**Determination of the quality of sliced Iberian ham using hyperspectral imaging technology**
*Author(s):* **Irina Torres-Rodríguez**, **José A. Entrenas, Dolores C. Pérez-Marín,** Univ. de Córdoba (Spain)

13060-4 • 02:30 PM - 02:50 PM
**Detection of woody breast condition in broiler breast fillets using multispectral scattering imaging**
*Author(s):* **Jiaxu Cai, Yuzhen Lu,** Michigan State Univ. (United States)

13060-5 • 02:50 PM - 03:10 PM
**Evaluation of a portable NIR spectrometer to increase the number of olive oil samples inspected to enhance its quality and integrity image**
*Author(s):* **María del Mar Garrido-Cuevas**, **Dolores C. Pérez-Marín**, **María-Teresa Sánchez, Ana Garrido-Varo,** Univ. de Córdoba (Spain)

**Coffee Break 03:10 PM - 03:40 PM**

### SESSION 2: SPECTRAL IMAGING: AI/ML APPLICATION

22 April 2024 • 03:40 PM - 05:00 PM | National Harbor 15
*Session Chair(s):* **Fartash Vasefi**, SafetySpect Inc. (United States)

13060-6 • 03:40 PM - 04:00 PM
**Enhancing food safety in senior care facilities: real-time risk assessment with optical scanner-AI integration**
*Author(s):* **Kaylee Husarik,** SafetySpect Inc. (United States); **Hamed Taheri Gorji,** SafetySpect Inc. (United States), Univ. of North Dakota (United States); **Jianwei Qin**, **Diane E. Chan**, **Insuck Baek**, **Moon S. Kim,** Agricultural Research Service (United States); **Nicholas MacKinnon**, **Stanislav Sokolov,** SafetySpect Inc. (United States); **Michael Johnson,** Aspire Clinical Intelligence (United States); **Melanie Metz,** Edgewood Healthcare (United States); **Zachary Downs,** Aspire Clinical Intelligence (United States), Senior Healthcare Innovation Consortium (United

States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States); **Fartash Vasefi,** SafetySpect Inc. (United States)

13060-7 • 04:00 PM - 04:20 PM
**Detection of citrus black spot fungus using fluorescence imaging and deep learning on leaf surface**
*Author(s):* **Pappu K. Yadav,** South Dakota State Univ. (United States); **Thomas Burks,** Univ. of Florida (United States); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Megan M. Dewdney**, **Mark A Ritenour,** Univ. of Florida (United States); **Fartash Vasefi,** SafetySpect Inc. (United States)

13060-9 • 04:20 PM - 04:40 PM
**Bee mite detection based on deep learning using hyperspectral imaging**
*Author(s):* **Hong Gu Lee**, **Jeong Yong Shin,** Kangwon National Univ. (Korea, Republic of); **Su-Bae Kim,** National Institute of Agricultural Sciences (Korea, Republic of); **Changyeun Mo,** Kangwon National Univ. (Korea, Republic of)

13060-8 • 04:40 PM - 05:00 PM
**Plant disease detection from leaf images**
*Author(s):* **Prakash Duraisamy,** Univ. of Wisconsin-Green Bay (United States)

## SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

# Tuesday 23 April 2024

## SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

**Coffee Break 10:00 AM - 10:30 AM**

## SESSION 3: PLANT HEALTH AND QUALITY MONITORING

23 April 2024 • 10:30 AM - 12:00 PM | National Harbor 15
*Session Chair(s):* **Jianwei Qin**, Agricultural Research Service (United States)
10:30 AM to 10:40 AM Opening Remarks

13060-10 • 10:40 AM - 11:00 AM
**Revolutionizing plant disease management: a deep learning approach with efficientnetb4 for early detection of plant diseases**
*Author(s):* **Seyedali Hosseinirad,** SafetySpect Inc. (United States); **Fereshteh Shahoveisi,** Univ. of Maryland, College Park (United States); **Hamed Taheri Gorji,** SafetySpect Inc. (United States); **Seyed Mojtaba Shahabi,** Corning Incorporated (United States); **Samuel Markell,** North Dakota State Univ. (United States); **Fartash Vasefi,** SafetySpect Inc. (United States)

13060-11 • 11:00 AM - 11:20 AM
**Identification for potato plant abiotic stress through thermal-RGB imaging based on deep learning**
*Author(s):* **Hoonsoo Lee**, **DongHwi Kwak,** Chungbuk National Univ. (Korea, Republic of); **Jung-Il Cho,** Rural Development Administration (Korea, Republic of)

13060-12 • 11:20 AM - 11:40 AM
**Fruit health monitoring system**
*Author(s):* **Prakash Duraisamy,** Univ. of Wisconsin-Green Bay (United States)

13060-13 • 11:40 AM - 12:00 PM
**Design and preliminary evaluation for a machine vision-based automated sweet potato sorting system**
*Author(s):* **Jiajun Xu, Yuzhen Lu,** Michigan State Univ. (United States)

**Lunch/Exhibition Break 12:00 PM - 01:30 PM**

## SESSION 4: PATHOGEN AND CHEMICAL CONTAMINANT DETECTION

23 April 2024 • 01:30 PM - 03:10 PM | National Harbor 15
*Session Chair(s):* **Fartash Vasefi**, SafetySpect Inc. (United States)

13060-14 • 01:30 PM - 01:50 PM
**Elevating food safety standards: real-time contamination detection with the CSI handheld scanner**
*Author(s):* **Hamed Taheri Gorji,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Kaylee Husarik,** SafetySpect Inc. (United States); **Luke Woods,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Jianwei Qin**, **Diane E. Chan**, **Insuck Baek**, **Moon S. Kim,** Agricultural Research Service (United States); **Stanislav Sokolov**, **Nicholas MacKinnon**, **Fartash Vasefi,** SafetySpect Inc. (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States)

13060-15 • 01:50 PM - 02:10 PM
**Detection of E. coli concentration levels using CSI-D+ handheld with UV-C fluorescence imaging and deep learning on citrus fruit peel surfaces**
*Author(s):* **Pappu K. Yadav,** South Dakota State Univ. (United States); **Thomas Burks**, **Snehit Vaddi,** Univ. of Florida (United States); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Mark A. Ritenour,** Univ. of Florida (United States); **Fartash Vasefi,** SafetySpect Inc. (United States)

13060-16 • 02:10 PM - 02:30 PM
**Detection of bacteria contamination in milk through $H_2$ and $CO_2$ measurements by Raman gas spectroscopy**
*Author(s):* **Daniele Barbiero**, **Fabio Melison**, **Lorenzo Cocola**, **Massimo Fedel,** CNR-Istituto di Fotonica e Nanotecnologie (Italy); **Cristian Andrighetto**, **Paola De Dea,** Veneto Agricoltura (Italy); **Luca Poletto,** CNR-Istituto di Fotonica e Nanotecnologie (Italy)

13060-17 • 02:30 PM - 02:50 PM
**Rapid and sensitive detection of thiram and carbaryl pesticides in fruit juice using Plasmonic SERS-based technique**
*Author(s):* **Rahul Joshi**, **Samir Adhikari, Byoung-Kwan Cho,** Chungnam National Univ. (Korea, Republic of)

13060-18 • 02:50 PM - 03:10 PM
**Design of real-time pathogen monitoring device for sampled food products during shipment**
*Author(s):* **Noah Boursier**, **Kal Holder**, **Bruce M. Applegate**, **Bartek Rajwa**, **J. Paul Robinson, Euiwon Bae,** Purdue Univ. (United States)

**Coffee Break 03:10 PM - 03:40 PM**

## SESSION 5: QAT FOR FOOD QUALITY AND SAFETY

23 April 2024 • 03:40 PM - 05:20 PM | National Harbor 15
*Session Chair(s):* **Moon S. Kim**, Agricultural Research Service (United States)

13060-19 • 03:40 PM - 04:00 PM
**Multimode spectroscopy for food quality adulteration and traceability (QAT) applications**
*Author(s):* **Hossein Kashani Zadeh,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Mitchell Sueker**, **Benjamin Hu,** Univ. of North Dakota (United States); **Nicholas MacKinnon**, **Gregory Bearman,** SafetySpect Inc. (United States); **Jianwei Qin,** Agricultural Research Service (United States); **Rosalee S. Hellberg,** Chapman Univ. (United States); **Fartash Vasefi**, **Kaylee Husarik,** SafetySpect Inc. (United States); **Moon S. Kim,** Agricultural Research Service (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States)

13060-20 • 04:00 PM - 04:20 PM
**Portable NIRS Sensors for determining fat content in pullet broiler breeders analyzed in vivo**
*Author(s):* **Dolores C. Pérez-Marín**, **José A. Entrenas**, **Ana Garrido-Varo,** Univ. de Córdoba (Spain); **Juan Carlos Abad**, **Cristina Guerra,** COBB IBERICA (Spain); **Irina Torres-Rodríguez,** Univ. de Córdoba (Spain)

13060-21 • 04:20 PM - 04:40 PM
**Rapid virgin olive oil analysis: a methodological approach using a novel handheld multi-mode spectroscopic device**
*Author(s):* **María del Mar Garrido-Cuevas**, **Ana Garrido-Varo,** Univ. de Córdoba (Spain); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Byoung-Kwan Cho,** Chungnam National Univ. (Korea, Republic of); **Fartash Vasefi**, **Hossein Kashani Zadeh**, **Stanislav Sokolov,** SafetySpect Inc. (United States); **Dolores C. Pérez-Marín,** Univ. de Córdoba (Spain)

13060-22 • 04:40 PM - 05:00 PM
**Authentication of gluten-free flour by dual-modality infrared and Raman techniques**
*Author(s):* **Feifei Tao,** Univ. of Florida (United States), Agricultural Research Service (United States); **Kuanglin Chao**, **Jianwei Qin, Moon S. Kim,** Agricultural Research Service (United States)

13060-23 • 05:00 PM - 05:20 PM
**Design of a portable fluorescence imaging platform for on-site detection target analyte by loop-medicated isothermal amplification**

*Author(s):* **Noah Boursier**, **Junwoo Jang**, **Awadhoot M. Ghatge**, **Kevin Lim**, **Thomas R. McClure**, **J. Paul Robinson, Euiwon Bae,** Purdue Univ. (United States)

## POSTER SESSION

23 April 2024 • 06:00 PM - 07:30 PM | Potomac C
Conference attendees are invited to attend the symposium-wide poster session on Tuesday evening. Come view the SPIE DCS posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster session.

**Poster Setup**: Tuesday 12:00 PM - 5:30 PM
Poster authors, view poster presentation guidelines and set-up instructions at http://spie.org/DCSPosterGuidelines.

13060-24 • 06:00 PM - 07:30 PM
**Bruise detection on mandarin using fluorescence hyperspectral imaging techniques**
*Author(s):* **Ahyeong Lee,** Rural Development Administration (Korea, Republic of); **Moon S. Kim**, **Insuck Baek,** Agricultural Research Service (United States); **Sukju Hong, Jinse Kim,** Rural Development Administration (Korea, Republic of)

13060-25 • 06:00 PM - 07:30 PM
**Non-destructive detection of TVC in pork by machine learning techniques based on spectral information**
*Author(s):* **Jiewen Zuo**, **Yankun Peng**, **Yongyu Li**, **Yahui Chen, Tianzhen Yin,** China Agricultural Univ. (China)

13060-26 • 06:00 PM - 07:30 PM
**Rapid determination of Ractopamine by SERS coupled with size-tunable Au-Ag alloy**
*Author(s):* **Tianzhen Yin**, **Yankun Peng,** China Agricultural Univ. (China); **Kuanglin Chao**, **Jianwei Qin**, **Feifei Tao,** Agricultural Research Service (United States); **Yahui Chen, Jiewen Zuo,** China Agricultural Univ. (China)

13060-27 • 06:00 PM - 07:30 PM
**Rapid quantitative detection of Ractopamine using Raman scattering features combining with deep learning**
*Author(s):* **Tianzhen Yin**, **Yankun Peng,** China Agricultural Univ. (China); **Kuanglin Chao**, **Jianwei Qin**, **Feifei Tao,** Agricultural Research Service (United States); **Yang Li, Zhenhao Ma,** China Agricultural Univ. (China)

13060-28 • 06:00 PM - 07:30 PM
**SERS characterization and concentration prediction of Salmonella in pork**
*Author(s):* **Yahui Chen**, **Yankun Peng, Tianzhen Yin,** China Agricultural Univ. (China)

13060-29 • 06:00 PM - 07:30 PM
**Biomimetic sensor for environmental monitoring of orthophosphate**
*Author(s):* **Geisianny Moreira,** Clemson Univ. (United States); **Alex Shaw,** Phoenix College (United States); **Nafisa Amin**, **Wei Gao,** North Carolina State Univ. (United States); **Eric McLamore,** Clemson Univ. (United States)

13060-30 • 06:00 PM - 07:30 PM
**Optimizing fertilizer application and growth prediction through hyperspectral imaging for napa cabbage**
*Author(s):* **Hoonsoo Lee**, **Hwanjo Jeong**, **DongHwi Kwak,** Chungbuk National Univ. (Korea, Republic of); **Byoung-Kwan Cho,** Chungnam National Univ. (Korea, Republic of); **Seunghwan Wi,** Rural Development Administration (Korea, Republic of)

13060-33 • 06:00 PM - 07:30 PM
**Seafood quality, adulteration, and traceability technology integrated with blockchain supply chain**
*Author(s):* **Shereen Ismail**, **Mitchell Sueker**, **Sayed Asaduzzaman**, **Hassan Reza,** Univ. of North Dakota (United States); **Fartash Vasefi,** SafetySpect Inc. (United States); **Hossein Kashani Zadeh,** Univ. of North Dakota (United States)

13060-34 • 06:00 PM - 07:30 PM
**Enhancing cleanliness monitoring in institutional kitchens: a novel UV fluorescence imaging technology complementing adenosine tri-phosphate (ATP) swab tests**
*Author(s):* **Benjamin Hu,** Univ. of North Dakota (United States); **Luke Woods,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Jianwei Qin**, **Diane E. Chan**, **Insuck Baek**, **Moon S. Kim,** Agricultural Research Service (United States); **Fartash Vasefi**, **Kaylee Husarik,** SafetySpect Inc. (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States); **Hossein Kashani Zadeh,** Univ. of North Dakota (United States), SafetySpect Inc. (United States)

13060-35 • 06:00 PM - 07:30 PM
**Moonlight: a compact illumination system for NASA's space crop health monitoring via reflectance and fluorescence imaging**
*Author(s):* **Abdolrahim Zandi,** Univ. of North Dakota (United States); **Jianwei Qin**, **Diane E. Chan**, **Insuck Baek**, **Moon S. Kim,** Agricultural Research Service (United States); **Stanislav Sokolov**, **Fartash Vasefi,** SafetySpect Inc. (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States); **Kaylee Husarik,** SafetySpect Inc. (United States)

13060-36 • 06:00 PM - 07:30 PM
**Fish fillet species identification and quality assessment using multi-mode spectroscopy and machine learning**
*Author(s):* **Mitchell Sueker,** Univ. of North Dakota (United States); **Nicholas MacKinnon**, **Gregory Bearman,** SafetySpect Inc. (United States); **Sierra Ward**, **Sayed Asaduzzaman**, **Yasser Ahmed,** Univ. of North Dakota (United States); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Fartash Vasefi**, **Kaylee Husarik,** SafetySpect Inc. (United States); **Kouhyar Tavakolian, Hossein Kashani Zadeh,** Univ. of North Dakota (United States), SafetySpect Inc. (United States)

13060-37 • 06:00 PM - 07:30 PM
**Identification of bacterial leaf streak and scab in wheat using multimode imaging and deep learning**
*Author(s):* **Sayed Asaduzzaman,** Univ. of North Dakota (United States); **Gregory Bearman**, **Stanislav Sokolov,** SafetySpect Inc. (United States); **Gabriel Dusek**, **Andrew Friskop,** North Dakota State University (United States); **Hamed Taheri Gorji**, **Kaylee Husarik,** SafetySpect Inc. (United States); **Jianwei Qin**, **Moon S. Kim,** Agricultural Research Service (United States); **Fartash Vasefi,** SafetySpect Inc. (United States); **Hossein Kashani Zadeh,** Univ. of North Dakota (United States), SafetySpect Inc. (United States)

13060-38 • 06:00 PM - 07:30 PM
**Determination of optimal harvest timing for field-grown apple fruits using hyperspectral imaging technology**
*Author(s):* **Eungchan Kim**, **Sang-Yeon Kim**, **Chang-Hyup Lee**, **Sungjay Kim**, **Xianghui Xin,** Seoul National Univ. (Korea, Republic of); **Seul-Ki Lee**, **Jung-Gun Cho,** National Institute of Horticultural and Herbal Science (Korea, Republic of); **Ghiseok Kim,** Seoul National Univ. (Korea, Republic of)

13060-39 • 06:00 PM - 07:30 PM
**Integrating fluorescence-based contamination surface imaging with ATP swabbing for enhanced cleanliness assessment**
*Author(s):* **Luke Woods,** SafetySpect Inc. (United States), Univ. of North Dakota (United States); **Kaylee Husarik,** SafetySpect Inc. (United States); **Hamed Taheri Gorji,** SafetySpect Inc. (United States), Univ. of North Dakota (United States); **Benjamin Hu**, **Mahsa Aliee,** Univ. of North Dakota (United States); **Jianwei Qin**, **Insuck Baek**, **Moon S. Kim**, **Diane E. Chan,** Agricultural Research Service (United States); **Stanislav Sokolov**, **Nicholas MacKinnon**, **Fartash Vasefi,** SafetySpect Inc. (United States); **Michael Johnson,** Aspire Clinical Intelligence (United States); **Zachary Downs,** Aspire Clinical Intelligence (United States), Senior Healthcare Innovation Consortium (United States); **Melanie Metz,** Edgewood Healthcare (United States); **Kouhyar Tavakolian,** Univ. of North Dakota (United States)

13060-40 • 06:00 PM - 07:30 PM
**Optimizing fluorescence imaging in ambient lighting: challenges and advances in food and healthcare facilities**
*Author(s):* **Mahsa Aliee**, **Luke Woods,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Kaylee Husarik,** SafetySpect Inc. (United States); **Hamed Taheri Gorji,** Univ. of North Dakota (United States), SafetySpect Inc. (United States); **Jianwei Qin**, **Insuck Baek**, **Moon S. Kim**, **Diane E. Chan,** Agricultural Research Service (United States); **Nicholas MacKinnon**, **Fartash Vasefi,** SafetySpect Inc. (United States); **Michael Johnson,** Aspire Clinical Intelligence (United States); **Zachary Downs,** Aspire Clinical Intelligence (United States), Senior Healthcare Innovation Consortium (United States); **Melanie Metz,** Edgewood Healthcare (United States); **Bo Liang, Kouhyar Tavakolian,** Univ. of North Dakota (United States)

13060-41 • 06:00 PM - 07:30 PM
**Application of hyperspectral imaging for rapid detection of mycotoxins-contaminated grains**
*Author(s):* **Sungyoun Kim,** National Agricultural Products Quality Management Service (Korea, Republic of); **Insuck Baek**, **Jianwei Qin**, **Chansong Hwang,** Agricultural Research Service (United States); **Kyung-Min Lee,** Texas A&M AgriLife Research (United States); **Yong-Kyoung Kim,** National Agricultural Products Quality Management Service (Korea, Republic of); **Moon S. Kim,** Agricultural Research Service (United States)

13060-42 • 06:00 PM - 07:30 PM
**Determination of water stress in field crops (Solanum tuberosum, Ipomoea batatas) using hyperspectral imaging**
*Author(s):* **Min-Seok Park**, **Hangi Kim,** Chungnam National Univ. (Korea, Republic of); **Hoonsoo Lee,** Chungbuk National Univ. (Korea, Republic of); **Geonwoo Kim**, **Young-Son Cho,** Gyeongsang National Univ. (Korea, Republic of); **Jung-Il Cho,** Rural Development Administration (Korea, Republic of); **Byoung-Kwan Cho,** Chungnam National Univ. (Korea, Republic of)

13060-43 • 06:00 PM - 07:30 PM
**Detection and confirmation of Salmonella Typhimurium by smartphone-enabled optomechanical platform**
*Author(s):* **Hyun Jung Min**, **Hansel Andres Mina**, **Sungho Shin**, **Iyll-Joon Doh**, **J. Paul Robinson**, **Bartek Rajwa**, **Amanda J. Deering, Euiwon Bae,** Purdue Univ. (United States)

13060-44 • 06:00 PM - 07:30 PM
**Evaluation of soluble solid content in Korean melon using near-infrared hyperspectral imaging and machine learning**
*Author(s):* **Changyeun Mo,** Kangwon National Univ. (Korea, Republic of); **Hye-in Lee,** Kangwon National Univ (Korea, Republic of); **Hong Gu Lee**, **Min-Jee kim**, **Woo-Hyeong Yu,** Kangwon National Univ. (Korea, Republic of); **Ahyeong Lee,** National Institute of Agricultural Sciences (Korea, Republic of)

13060-45 • 06:00 PM - 07:30 PM
**Classification of external quality in melon using color image coupled with deep-learning model**
*Author(s):* **Insuck Baek,** Agricultural Research Service (United States); **Ahyeong Lee**, **Sukju Hong**, **Jinse Kim,** Rural Development Administration (Korea, Republic of); **Jianwei Qin, Moon S. Kim,** Agricultural Research Service (United States)

13060-46 • 06:00 PM - 07:30 PM
**Rapid detection of meat residue on cutting boards using fluorescence imaging technique**
*Author(s):* **Chansong Hwang, Moon Kim,** Agricultural Research Service (United States)

13060-47 • 06:00 PM - 07:30 PM
**Feasibility study for water stress evaluation of sweet potato using thermal imaging**
*Author(s):* **Geonwoo Kim**, **Jiwon Choi**, **Soobeen Choi, Young-Son Cho,** Gyeongsang National Univ. (Korea, Republic of)

13060-48 • 06:00 PM - 07:30 PM
**Water stress evaluation of sweet potato using RGB images with machine learning technique**
*Author(s):* **Geonwoo Kim**, **Jiwon Choi**, **Soobeen Cho, Young-Son Cho,** Gyeongsang National Univ. (Korea, Republic of)

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13060-31
**Terahertz sensing through the lens of the Kalman filter: a bibliometric exploration**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

13060-32
**Advanced crop monitoring: incorporating the Kalman filter into modern agriculture**
*Author(s):* **Khaled Obaideen,** Univ. of Sharjah (United Arab Emirates); **Yousuf Faroukh,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Talal Bonny**, **Mohammad AlShabi, Ahmad Alobaid,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13061

# Ocean Sensing and Monitoring XV

**23 - 24 April 2024 | Potomac 5**

***Conference Chair(s):*** **Weilin Hou,** Office of Naval Research (Singapore); **Linda J. Mullen,** Naval Air Warfare Ctr. Aircraft Div. (United States)

***Conference Co-Chair(s):*** **Alexander Ignatov,** NOAA Ctr. for Satellite Applications and Research (United States)

***Program Committee:*** **Dennis V. Delic,** Defence Science and Technology Group (Australia); **Kyle R. Drexler,** Naval Information Warfare Ctr. Pacific (United States); **David W. Illig,** Naval Air Warfare Ctr. Aircraft Div. (United States); **Silvia C. Matt,** U.S. Naval Research Lab. (United States)

## Monday 22 April 2024

### SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

## SESSION 1: OCEAN SENSING

23 April 2024 • 01:00 PM - 02:30 PM | Potomac 5
*Session Chair(s):* **Weilin Hou**, Office of Naval Research (Singapore)
Opening Remarks 1:00 PM to 1:10 PM

13061-1 • 01:10 PM - 01:30 PM
**Assessing magnetic particle content in algae using compact time domain nuclear magnetic resonance**
*Author(s):* **Parker Huggins**, **Win Janvrin**, **Jake Martin**, **Ashley Womer**, **Austin R. J. Downey**, **John Ferry**, **Mohammed Baalousha,** Univ. of South Carolina (United States); **Jin Yan,** PARC, part of SRI International (United States)

13061-3 • 01:30 PM - 01:50 PM
**Estimation of uncertainties in above-water radiometric measurements from hyperspectral and polarimetric imaging**
*Author(s):* **Mateusz Malinowski**, **Eder Herrera Estrella,** The City College of New York (United States); **Robert Foster,** U.S. Naval Research Lab. (United States); **Jacopo Agagliate, Alexander Gilerson,** The City College of New York (United States)

13061-4 • 01:50 PM - 02:10 PM
**Eye on the back: augmented visuals for improved ROV teleoperation in deep water surveillance and inspection**
*Author(s):* **Md Jahidul Islam,** Univ. of Florida (United States)

13061-25 • 02:10 PM - 02:30 PM
**Waterproof UAVs for sensing in coastal zones and estuaries**
*Author(s):* **William Fairman**, **Paul Wills, Bing Ouyang,** Florida Atlantic Univ. (United States)

**Coffee Break 02:30 PM - 03:00 PM**

## SESSION 2: LIDAR

23 April 2024 • 03:00 PM - 04:20 PM | Potomac 5
*Session Chair(s):* **Linda J. Mullen**, Naval Air Warfare Ctr. Aircraft Div. (United States)

13061-5 • 03:00 PM - 03:20 PM
**Initial laboratory and field testing of the modulated underwater laser imaging system**
*Author(s):* **Nick Makrakis**, **David W. Illig, Linda Mullen,** Naval Air Warfare Ctr. Aircraft Div. (United States)

13061-7 • 03:20 PM - 03:40 PM
**Comparison of 20 million airborne lidar optical profiles to anything else**
*Author(s):* **Brian M. Concannon**, **Aaron G. Meldrum**, **Ben P. Decker**, **David W. Illig**, **Aaron D. Pyrah, Anton Vasilyev,** Naval Air Systems Command (United States)

13061-8 • 03:40 PM - 04:00 PM
**Confocal Bistatic LIDAR in Scattering Media**
*Author(s):* **Justin R. Folden**, **Sanjeev Koppal,** Univ. of Florida (United States); **Linda Mullen**, **Derek Alley, David Illig,** U.S. Navy (United States)

13061-9 • 04:00 PM - 04:20 PM
**Ranging through turbid underwater using structured optical beams**
*Author(s):* **Huibin Zhou**, **Yuxiang Duan**, **Hao Song**, **Zile Jiang**, **Murale Ramakrishnan**, **Xinzhou Su,** The Univ. of Southern California (United States); **Robert Bock,** R-Dex Systems, Inc. (United States); **Moshe Tur,** Tel Aviv Univ. (Israel); **Alan Willner,** The Univ. of Southern California (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

### Coffee Break 10:00 AM - 10:30 AM

### SESSION 3: AI/ML I

24 April 2024 • 10:30 AM - 11:10 AM | Potomac 5
*Session Chair(s):* **David W. Illig**, Naval Air Warfare Ctr. Aircraft Div. (United States)
Opening Remarks 10:30 AM to 10:40 AM

13061-11 • 10:30 AM - 10:50 AM
**Automatic litter detection using AI in environmental surveillance aircraft**
*Author(s):* **Tobias Binkele**, **Theo Hengstermann,** OPTIMARE Systems GmbH (Germany); **Tobias Schmid**, **Jens Wellhausen,** Jade Hochschule (Germany); **Carolin Leluschko, Christoph Tholen,** Deutsches Forschungszentrum für Künstliche Intelligenz GmbH (Germany)

13061-13 • 10:50 AM - 11:10 AM
**Cycle-GAN-based synthetic sonar image generation for improved underwater classification**
*Author(s):* **Sunmo Koo**, **Sangpil Youm, Jane Shin,** Univ. of Florida (United States)

### Lunch/Exhibition Break 11:10 AM - 01:30 PM

### SESSION 4: AI/ML II

24 April 2024 • 01:30 PM - 02:50 PM | Potomac 5
*Session Chair(s):* **David W. Illig**, Naval Air Warfare Ctr. Aircraft Div. (United States)

13061-14 • 01:30 PM - 01:50 PM
**Inconsistency-based active learning with adaptive pseudo-labeling for fish species identification**
*Author(s):* **M. M. Nabi,** Mississippi State Univ. (United States); **Chiranjibi Shah,** Northern Gulf Institute, Mississippi State Univ. (United States); **Simegnew Yihunie Alaba,** Mississippi State Univ. (United States); **Ryan Caillouet,** Southeast Fisheries Science Ctr. (United States); **Jack Prior**, **Matthew D. Campbell,** Southeast Fisheries Science Ctr., NOAA Fisheries Service (United States); **Farron Wallace,** NOAA Fisheries Service (United States); **John E. Ball,** Mississippi State Univ. (United States); **Robert Moorhead,** Northern Gulf Institute, Mississippi State Univ. (United States)

13061-15 • 01:50 PM - 02:10 PM
**Active detection for fish species recognition in underwater environments**
*Author(s):* **Chiranjibi Shah,** Northern Gulf Institute, Mississippi State Univ. (United States); **M. M. Nabi**, **Simegnew Yihunie Alaba,** Mississippi State Univ. (United States); **Jack Prior**, **Ryan Caillouet,** National Marine Fisheries Service (United States); **Matthew D. Campbell,** Southeast Fisheries Science Ctr., National Marine Fisheries Service (United States); **Farron Wallace,** NOAA Fisheries Service (United States); **John E. Ball,** Mississippi State Univ. (United States); **Robert Moorhead,** Northern Gulf Institute, Mississippi State Univ. (United States); **Matthew D. Grossi,** National Marine Fisheries Service (United States)

13061-16 • 02:10 PM - 02:30 PM
**Multi-fish tracking for marine biodiversity monitoring**
*Author(s):* **Simegnew Y. Alaba,** Mississippi State Univ. (United States); **Jack Prior**, **Chiranjibi Shah,** Northern Gulf Institute, Mississippi State Univ. (United States); **M. M. Nabi**, **John Ball,** Mississippi State Univ. (United States); **Robert Moorhead,** Northern Gulf Institute, Mississippi State Univ. (United States); **Matthew Campbell,** Southeast Fisheries Science Ctr., National Marine Fisheries Service (United States); **Farron Wallace,** Southeast Fisheries Science Ctr., National Oceanic and Atmospheric Administration (United States); **Matthew Grossi,** Southeast Fisheries Science Ctr., National Marine Fisheries Service (United States)

13061-17 • 02:30 PM - 02:50 PM
**Innovative aquaculture biometrics analysis: harnessing IR lasers and ToF cameras for microscopic fish larvae tracking**
*Author(s):* **Alisa Kunapinun**, **Bing Ouyang**, **William Fairman**, **Shagundeep Singh**, **Paul S. Wills**, **Sahar Mejri, Magaleate Kostelnik,** Harbor Branch Oceanographic Institute, Florida Atlantic Univ. (United States)

**Coffee Break 02:50 PM - 03:20 PM**

## SESSION 5: TURBULENCE

24 April 2024 • 03:20 PM - 04:40 PM | Potomac 5
*Session Chair(s):* **Nathaniel A. Ferlic**, Naval Air Warfare Ctr. Aircraft Div. (United States)

13061-18 • 03:20 PM - 03:40 PM
**Propagation of Laguerre-Gaussian Beams through Underwater Optical Turbulence**
*Author(s):* **Nathaniel A. Ferlic**, **Alan E. Laux, Linda J. Mullen,** Naval Air Warfare Ctr. Aircraft Div. (United States)

13061-19 • 03:40 PM - 04:00 PM
**Comparison between phase retrieval methods for laser light propagated through Rayleigh-Benard underwater convection**
*Author(s):* **Owen O'Malley**, **Nathan Faust**, **Svetlana Avramov-Zamurovic,** U.S. Naval Academy (United States); **Nathaniel Ferlic,** Naval Air Warfare Ctr. Aircraft Div. (United States); **Matthew Kalensky,** Naval Surface Warfare Ctr. Dahlgren Div. (United States); **K. Peter Judd,** U.S. Naval Research Lab. (United States); **Carlos Pirela,** Univ. de los Andes (Chile)

13061-20 • 04:00 PM - 04:20 PM
**Measuring turbulence using spatially encoded QR codes**
*Author(s):* **Kyle R. Drexler**, **Burton Neuner, Skylar Lilledahl,** Naval Information Warfare Ctr. Pacific (United States)

13061-21 • 04:20 PM - 04:40 PM
**Marine surface layer optical turbulence measurements using drone platforms over a vertical path**
*Author(s):* **Peter Lee**, **Svetlana Avramov-Zamurovic,** U.S. Naval Academy (United States); **Miranda van Iersel,** Univ. of Dayton (United States)

**Break 04:40 PM - 04:50 PM**

## BEST PAPER AWARD PRESENTATION

24 April 2024 • 04:50 PM - 05:00 PM | Potomac 5
*Session Chair(s):* **Weilin Hou**, Office of Naval Research (Singapore); **Linda J. Mullen**, Naval Air Warfare Ctr. Aircraft Div. (United States)
Please join us for the presentation of the Ocean Sensing and Monitoring Best Paper Award.

## DIGITAL POSTERS

The posters listed below are available exclusively for online viewing during the week of SPIE Defense + Commercial Sensing 2024.

13061-10
**Analysis of the extended Kalman filter's role in oceanic science**
*Author(s):* **Khaled Obaideen**, **Mohammad A. AlShabi, Talal Bonny,** Univ. of Sharjah (United Arab Emirates)

# CONFERENCE 13062

# Sensors and Systems for Space Applications XVII

**23 - 25 April 2024 | National Harbor 8**

***Conference Chair(s):*** **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States); **Khanh D. Pham,** Air Force Research Lab. (United States)

***Program Committee:*** **Trevor J. Bihl**, **Erik P. Blasch,** Air Force Research Lab. (United States); **Richard M. Buchter,** DEVCOM Army Research Lab. (United States); **Yu Chen,** Binghamton Univ. (United States); **Huaining Cheng,** Air Force Research Lab. (United States); **Joseph L. Cox,** Leidos, Inc. (United States); **Eric K. Hall,** L3 Harris Technologies, Inc. (United States); **Simon Khan,** Air Force Research Lab. (United States); **Hang Liu,** The Catholic Univ. of America (United States); **Uttam Kumar Majumder,** National Geospatial-Intelligence Agency (United States); **Brian K. McComas,** Raytheon Missiles & Defense (United States); **Jeremy Murray-Krezan,** Trusted Space, Inc. (United States); **Tien M. Nguyen,** The Aerospace Corp. (United States); **Tuy Tan Nguyen,** Northern Arizona Univ. (United States); **Nicola Palombo Blascetta,** Satellogic Solutions SL (Spain); **Tod Manning Schuck,** Lockheed Martin Maritime Systems & Sensors (United States); **Carolyn Sheaff,** Air Force Research Lab. - Rome (United States); **Dan Shen,** Intelligent Fusion Technology, Inc. (United States); **John Tower,** SRI International (United States); **Peng Wang,** Univ. of Kentucky (United States); **Hao Xu,** Univ. of Nevada, Reno (United States); **Yiran Yang,** The Univ. of Texas at Arlington (United States); **Yufeng Zheng,** The Univ. of Mississippi Medical Ctr. (United States); **Peter Zulch,** Air Force Research Lab. (United States); **Quanyan Zhu,** New York Univ. (United States)

## Monday 22 April 2024

### SYMPOSIUM PLENARY

22 April 2024 • 05:00 PM - 06:30 PM | Potomac A
*Session Chair(s):* **Tien Pham**, The MITRE Corp. (United States); **Douglas R. Droege**, L3Harris Technologies, Inc. (United States)

View Full Details: spie.org/dcs/symposium-plenary

**Chair welcome and introduction**
22 April 2024 • 5:00 PM - 5:05 PM EDT

**Title to be determined** (Plenary Presentation)
Presenter(s): Dev Shenoy, Principal Director for Microelectronics, Office of the Under Secretary of Defense for Research and Engineering (United States)
22 April 2024 • 5:05 PM - 5:45 PM EDT

**NATO DIANA: a case study for reimagining defence innovation** (Plenary Presentation)
Presenter(s): Deeph Chana, Managing Director, NATO Defence Innovation Accelerator for the North Atlantic (DIANA) (United Kingdom)
22 April 2024 • 5:50 PM - 6:30 PM EDT

## Tuesday 23 April 2024

### SYMPOSIUM PANEL ON MICROELECTRONICS COMMERCIAL CROSSOVER

23 April 2024 • 08:30 AM - 10:00 AM | Potomac A

View Full Details: spie.org/dcs/symposium-panel

The CHIPS Act Microelectronics Commons network is accelerating the pace of microelectronics technology development in the U.S. This panel discussion will explore opportunities for crossover from commercial technology into DoD systems and applications, discussing what emerging commercial microelectronics technologies could be most impactful on photonics and sensors and how the DoD might best leverage commercial innovations in microelectronics.

Moderator:
**John Pellegrino**, Electro-Optical Systems Lab., Georgia Tech Research Institute (retired) (United States)

Panelists:
**Shamik Das**, The MITRE Corporation (United States)
**Erin Gawron-Hyla**, OUSD (R&E) (United States)
**Carl McCants**, Defense Advanced Research Projects Agency (United States)
**Kyle Squires**, Ira A. Fulton Schools of Engineering, Arizona State Univ. (United States)
**Anil Rao**, Intel Corporation (United States)

### SESSION 1: SPECTRAL SENSING FOR SPACE SITUATIONAL AWARENESS: JOINT SESSION WITH CONFERENCES 13031 AND 13062

23 April 2024 • 04:00 PM - 05:00 PM | Potomac 1
*Session Chair(s):* **Miguel Velez-Reyes**, The Univ. of Texas at El Paso (United States); **Jeremy Murray-Krezan**

13062-1 • 04:00 PM - 04:20 PM
**Spectral characteristics of generation after next satellite navigational sensors**
*Author(s):* **Jeremy Murray-Krezan**, **Mark Bolden,** Trusted Space, Inc. (United States); **Erin Griggs,** Trusted Space (United States)

13031-13 • 04:20 PM - 04:40 PM
**Hyperspectral optical modeling of resident space objects at high spatial resolution**
*Author(s):* **Eric Coiro**, **Ugo Tricoli**, **François Margall, Cyril Petit,** ONERA (France)

13031-14 • 04:40 PM - 05:00 PM
**Using neural networks to classify hyperspectral signatures of unresolved resident space objects**
*Author(s):* **Luis Cedillo**, **Kevin M. Acosta,** The Univ. of Texas at El Paso (United States); **Dan F. DeBlasio,** Carnegie Mellon Univ. (United States); **Miguel Velez-Reyes,** The Univ. of Texas at El Paso (United States)

## Wednesday 24 April 2024

### SYMPOSIUM PLENARY ON AI/ML + SUSTAINABILITY

24 April 2024 • 08:30 AM - 10:00 AM | Potomac A
*Session Chair(s):* **Latasha Solomon**, DEVCOM Army Research Lab. (United States); **Ann Marie Raynal**, Sandia National Labs. (United States)

View Full Details: spie.org/dcs/plenary-ai-ml-sustainability

**Welcome and opening remarks**
24 April 2024 • 8:30 AM - 8:40 AM EDT

**AI/ML track plenary** (Plenary Presentation)
Presenter(s): David Pierce, U.S. Army Intelligence (United States)
24 April 2024 • 8:40 AM - 9:20 AM EDT

**FUTUR-IC: A three-dimensional optimization path towards building a sustainable microchip industry** (Plenary Presentation)
Presenter(s): Anu Agarwal, Massachusetts Institute of Technology, Microphotonics Ctr. and Materials Research Lab. (United States)
24 April 2024 • 9:20 AM - 10:00 AM EDT

**Coffee Break 10:00 AM - 10:30 AM**

## WELCOME AND OPENING REMARKS

24 April 2024 • 10:30 AM - 10:40 AM | National Harbor 8
**Genshe Chen**, Intelligent Fusion Technology, Inc. (United States) and **Khanh D. Pham**, Air Force Research Lab. (United States)

## SESSION 2: SENSOR AND DEVICE FOR SPACE APPLICATION

24 April 2024 • 10:40 AM - 12:10 PM | National Harbor 8
*Session Chair(s):* **Jesse Brown**, Corning Incorporated (United States); **Joshua B. Bettinger**, G&H Keene (United States)

13062-2 • 10:40 AM - 11:10 AM
**Advances in spaceborne hyperspectral imagery, a comparative study between nano satellites and large satellites** *(Invited Paper)*
*Author(s):* **Yousuf Faroukh**, **Maryam Alansaari**, **Amel Alhammadi**, **Abdulrahman Sulaiman**, **Fatima Alketbi**, **Tarifa Alkaabi,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates); **Ilias Fernini, Hamid H. K. AlNaimiy,** Sharjah Academy for Astronomy, Space Sciences & Technology (United Arab Emirates), Univ. of Sharjah (United Arab Emirates)

13062-3 • 11:10 AM - 11:30 AM
**Corning's standard low earth orbit (LEO) hyperspectral imaging platform**
*Author(s):* **Jesse Brown**, **Robert Benson**, **Eric Bower**, **Jeffry Santman**, **Leon Desmarais**, **Rick Holasek, Duncan Spaulding,** Corning Incorporated (United States)

13062-4 • 11:30 AM - 11:50 AM
**Countering environmental effects in optical systems using Kapton tape**
*Author(s):* **Joshua B. Bettinger**, **Steven Vogel, Andrew Dugrenier,** G&H | Stingray (United States)

13062-5 • 11:50 AM - 12:10 PM
**Enabling space-qualified opto-electronic systems through photonic wirebonding**
*Author(s):* **Jes Sherman**, **Victoria Rosborough**, **Ruby Gans**, **Juan Ramirez**, **Don Kebort**, **Juergen Musolf**, **Henry Garrett**, **Tom Liu,** Freedom Photonics, LLC (United States); **Amin Nehrir,** NASA Langley Research Ctr. (United States); **Gordon Morrison**, **Leif Johansson, Milan Mashanovitch,** Freedom Photonics, LLC (United States)

**Lunch/Exhibition Break 12:10 PM - 01:40 PM**

## SESSION 3: OPTICAL COMMUNICATION AND SYSTEM

24 April 2024 • 01:40 PM - 02:20 PM | National Harbor 8
*Session Chair(s):* **Genshe Chen**, Intelligent Fusion Technology, Inc. (United States)

13062-8 • 01:40 PM - 02:00 PM
**Radiation testing of 25 Gbaud balanced photoreceivers with bismuth ions for linear energy transfer up to 70 MeV cm^2/mg**
*Author(s):* **Abhay M. Joshi**, **Shubhashish Datta**, **Abigale R. Joshi,** Discovery Semiconductors, Inc. (United States); **Michael Sivertz**, **David Inzalaco,** NASA Space Radiation Lab., Brookhaven National Lab. (United States); **Joel Hatch,** The Ohio State Univ. (United States)

13062-9 • 02:00 PM - 02:20 PM
**Laser-induced diffusion of boron and gallium in silicon carbide for refractive index modulation**
*Author(s):* **Gunjan Kulkarni**, **Yahya Bougdid**, **Chandraika (John) Sugrim,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Ranganathan Kumar,** Univ. of Central Florida (United States); **Aravinda Kar,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States)

## SESSION 4: SPACE DOMAIN AWARENESS AND NAVIGATION

24 April 2024 • 02:20 PM - 05:00 PM | National Harbor 8
*Session Chair(s):* **Ahmed Elaksher**, New Mexico State Univ. (United States); **Yajie Bao**, Intelligent Fusion Technology, Inc. (United States)

13062-10 • 02:20 PM - 02:50 PM
**Advanced motion estimations and predictions of a tumbling, non-cooperative space object during long-term occlusion** *(Invited Paper)*
*Author(s):* **Rabiul Kabir, Xiaoli Bai,** Rutgers, The State Univ. of New Jersey (United States)

13062-11 • 02:50 PM - 03:10 PM
**Shadow imagery resolution advantages from multispectral image stacking**
*Author(s):* **Douglas Ruyle**, **David Curtis,** Air Force Institute of Technology (United States); **Peter McMahon-Crabtree,** Air Force Research Laboratory (United States)

Coffee Break • 03:10 PM - 03:40 PM

13062-12 • 03:40 PM - 04:00 PM
**Demonstration of the frequency and correlation behavior of a forward scatter baseline crossing event**
*Author(s):* **Justin K. A. Henry, Ram M. Narayanan,** The Pennsylvania State Univ. (United States)

13062-13 • 04:00 PM - 04:20 PM
**Improvements to global ionospheric forecasting with a recurrent convolutional neural network**
*Author(s):* **Joseph Dailey,** Univ. of Nevada, Reno (United States); **Khanh D. Pham,** Air Force Research Lab. (United States)

13062-14 • 04:20 PM - 04:40 PM
**Rigorous photogrammetric push-broom sensor modeling for lunar and planetary image processing**
*Author(s):* **Ahmed Elaksher, Islam Omar,** New Mexico State Univ. (United States)

13062-15 • 04:40 PM - 05:00 PM
**Requirements modeling of resilience-aware human-on-the-loop PNT of multiple UASs**
*Author(s):* **Yajie Bao**, **Dan Shen**, **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States); **Khanh Pham, Erik Blasch,** Air Force Research Lab. (United States)

## Thursday 25 April 2024

### SESSION 5: AI/ML FOR SPACE APPLICATION

25 April 2024 • 08:10 AM - 10:00 AM | National Harbor 8
*Session Chair(s):* **Yu Chen**, Binghamton Univ. (United States); **Hao Xu**, Univ. of Nevada, Reno (United States)

13062-16 • 08:10 AM - 08:40 AM
**A homogeneous low-resolution face recognition method using correlation features at the edge** *(Invited Paper)*
*Author(s):* **Xuan Zhao,** Binghamton Univ. (United States); **Deeraj Nagothu,** Intelligent Fusion Technology, Inc. (United States); **Yu Chen,** Binghamton Univ. (United States)

13062-17 • 08:40 AM - 09:00 AM
**A decentralized information fusion-based vehicle classification for accurate EV-to-ICE ratio in smart cities**
*Author(s):* **Deeraj Nagothu,** Intelligent Fusion Technology, Inc. (United States); **Yu Chen,** Binghamton Univ. (United States); **Erik Blasch,** Air Force Office of Scientific Research (United States)

13062-18 • 09:00 AM - 09:20 AM
**Convolutional variational autoencoders for secure lossy image compression in remote sensing**
*Author(s):* **Alessandro Giuliano**, **S. Andrew Gadsden**, **Waleed Hilal,** McMaster Univ. (Canada); **John Yawney,** Adastra Corp. (Canada)

13062-19 • 09:20 AM - 09:40 AM
**Machine learning-based real-time task scheduling for Apache storm**
*Author(s):* **Cheng-Ying Wu,** The Catholic Univ. of America (United States); **Qi Zhao,** Intelligent Fusion Technology, Inc. (United States); **Cheng-Yu Cheng,** The Catholic Univ. of America (United States); **Yucheng Yang,** Intelligent Fusion Technology, Inc. (United States); **Hang Liu,** The Catholic Univ. of America (United States); **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States)

13062-20 • 09:40 AM - 10:00 AM
**Enhanced state estimation for legged robot using physics-informed neural networks and multimodal proprioceptive data**
*Author(s):* **Yuqing Liu,** Univ. of Nevada, Reno (United States); **Yajie Bao**, **Peng Cheng**, **Dan Shen**, **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States); **Hao Xu,** Univ. of Nevada, Reno (United States)

**Coffee Break 10:00 AM - 10:30 AM**

### SESSION 6: REMOTE SENSING AND SPACE CONTROL

25 April 2024 • 10:30 AM - 11:40 AM | National Harbor 8
*Session Chair(s):* **Waleed Hilal**, McMaster Univ. (Canada); **Alexandre McCafferty-Leroux**, McMaster Univ. (Canada)

13062-21 • 10:30 AM - 11:00 AM
**Networked control systems and their applications to smart satellites: a survey** *(Invited Paper)*
*Author(s):* **Alexandre McCafferty-Leroux**, **Yuandi Wu, S. Andrew Gadsden,** McMaster Univ. (Canada)

13062-22 • 11:00 AM - 11:20 AM
**Adaptive SIF-KF estimation for fault detection in attitude control experiments**
*Author(s):* **Alexandre McCafferty-Leroux**, **Waleed Hilal**, **S. Andrew Gadsden,** McMaster Univ. (Canada); **Mohammad A. AlShabi,** Univ. of Sharjah (United Arab Emirates)

13062-23 • 11:20 AM - 11:40 AM
**Parameter estimation and control of an automatic balancing system for CubeSat research and applications**
*Author(s):* **Alexandre McCafferty-Leroux**, **S. Andrew Gadsden, Andrew Newton,** McMaster Univ. (Canada)

**Lunch/Exhibition Break 11:40 AM - 01:10 PM**

## SESSION 7: COMMUNICATION AND NETWORKING

25 April 2024 • 01:10 PM - 02:30 PM | National Harbor 8
*Session Chair(s):* **Qi Zhao**, Intelligent Fusion Technology, Inc. (United States)

13062-25 • 01:10 PM - 01:30 PM
**Low-cost collision avoidance in microverse for unmanned aerial vehicle delivery networks**
*Author(s):* **Qian Qu**, **Yu Chen**, **Xiaohua Li,** Binghamton Univ. (United States); **Erik Blasch,** Air Force Office of Scientific Research (United States); **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States); **Erika Ardiles-Cruz,** Air Force Research Lab. (United States)

13062-26 • 01:30 PM - 01:50 PM
**Distributed edge computing for cooperative augmented reality: enhancing mobile sensing capabilities**
*Author(s):* **Cheng-Yu Cheng,** The Catholic Univ. of America (United States); **Qi Zhao,** Intelligent Fusion Technology, Inc. (United States); **Cheng-Ying Wu,** The Catholic Univ. of America (United States); **YuCheng Yang,** Intelligent Fusion Technology, Inc. (United States); **Hang Liu,** The Catholic Univ. of America (United States); **Genshe Chen,** Intelligent Fusion Technology, Inc. (United States)

13062-27 • 01:50 PM - 02:10 PM
**Space-qualification of laser diode components for integration into spaceborne communication systems**
*Author(s):* **Michael Martin**, **Ron Bechtold**, **Jason Sorger, Eric Takeuchi,** DRS Daylight Solutions (United States)

13062-28 • 02:10 PM - 02:30 PM
**Integrating power beaming and communication through laser modulation**
*Author(s):* **Daniel O'Flaherty**, **Charles Nelson, Michael Sanders,** U.S. Naval Academy (United States)

## NOTES

**2025** | ROTATION: ANCHORED ON THE EAST COAST

# SPIE. DEFENSE+ COMMERCIAL SENSING

**Conferences and Courses:**
**13–17 April 2025**
**Exhibition:** 15–17 April 2025
Orlando, Florida, USA

**THE EVENT FEATURING SENSING TECHNOLOGIES BEING RAPIDLY ACQUIRED AND DEPLOYED WITHIN INDUSTRIAL, SECURITY, AND GOVERNMENT APPLICATIONS.**

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