ESIT 2026

Earth & Space：from Infrared to Terahertz International Conference 2026

Sept. 18 - 20 / Shanghai, China

Hosts

Fudan University

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Executive Organizers

Institute of Optoelectronics, Fudan University

State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, CAS

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Element Science

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上海市真空学会

General Information

Conference Venue

Venue: Crowne Plaza Shanghai Noah Square（上海圣诺亚皇冠假日酒店）
Address: No. 1699, Jinshajiang Road, Putuo District, Shanghai, China（上海普陀区金沙江路 1699 号）

Onsite Speaker Preparation

Oral presenters are required to be in the session room at least 30 minutes prior to their scheduled talk to upload and check their presentation.

Onsite Poster Preparation

Authors should prepare their poster before the poster session starts. Authors are required to be standing by their poster during the poster session to answer questions and further discuss their work with attendees.

Poster Board Size: 1m (Length) * 2.235m (Height)
Recommended Poster Size: 0.8m (Length) * 1.4m (Height)
Poster Session: 17:00-18:30, Saturday, 19 September
Location: Pre-function Area, 3F（三楼 会场序厅）
Poster presenters are responsible to remove their poster, and the conference staff will not collect the posters left at the end of the poster session.

Lunches

Location: Noah Cook All Day Dining, 1F（一楼 诺亚厨房）
12:00-13:30 Friday, 18 September
12:00-13:30 Saturday, 19 September
12:00-13:30 Sunday, 20 September

Dinner

Location: Noah Cook All Day Dining, 1F（一楼 诺亚厨房）
18:00-20:00 Friday, 18 September

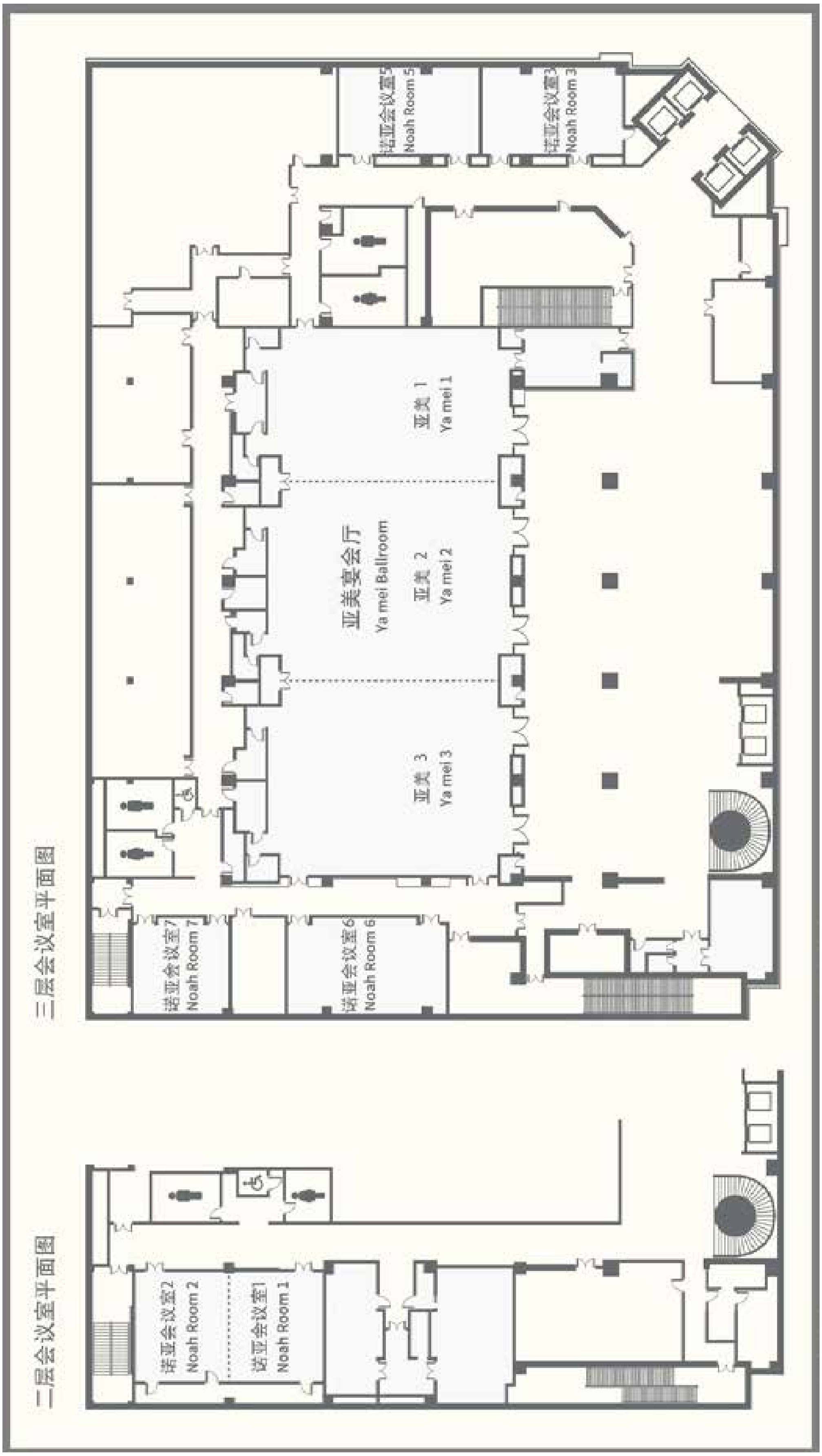
Banquet & Awards

Location: Ya Mei Ballroom, 3F（三楼 亚美宴会厅）
18:30-20:30 Saturday, 19 September
Best Poster Awards will be presented at the banquet.
(Best Oral Awards will be determined after the conference based on the combined scores from the judges.)

Tip

Volunteers are in yellow slings. You can also go to the registration desk if you need any help.

Conference Map



Conference Schedule

Plan	Sep.18	Sep.19	Sep.20	Location
Registration	09:00-19:00	08:00-18:00	08:00-15:00	Lobby, 1F 一楼 大堂
Opening Ceremony		08:30-09:00		Ya Mei Ballroom, 3F 三楼 亚美宴会厅
Plenary Session		09:00-12:00		Ya Mei Ballroom, 3F 三楼 亚美宴会厅
Track 1: Infrared physics and devices		13:30-17:15	08:30-17:00	Ya Mei Ballroom 2, 3F 三楼 亚美 2
Track 2: Terahertz and Millimeter Waves		13:30-17:20	08:30-14:30	Ya Mei Ballroom 1, 3F 三楼 亚美 1
Track 3: Remote Sensing and Space Exploration		13:30-16:45	08:30-15:05	Noah Room 6, 3F 三楼 诺亚会议室 6
Track 4: Digital Earth and Intelligent Cognition		13:30-16:55	08:30-15:35	Noah Room 3, 3F 三楼 诺亚会议室 3
Track 5: Infrared and Interdisciplinary Fields		13:30-17:15	08:30-16:50	Ya Mei Ballroom 3, 3F 三楼 亚美 3
Young Scientists Forum		13:30-16:25		Noah Room 1+2, 2F 2 楼 诺亚会议室 1+2
Poster Session		17:00-18:30		Pre-function Area, 3F 三楼 会场序厅
红外光电技术产业论坛	13:30-18:00			Noah Room 5, 3F 三楼 诺亚会议室 5
《红外与毫米波学报》第九届编委会第一次工作会议暨改版发布会	13:30-15:30			Noah Room 3, 3F 三楼 诺亚会议室 3
Banquet & Awards		18:30-20:30		Ya Mei Ballroom, 3F 三楼 亚美宴会厅

Opening Ceremony & Plenary Talk

Sep.19 Saturday, Ya Mei Ballroom, 3F	
08:30-09:00	**Opening Ceremony & Launch of the MSDE Early Warning Research Platform**
Presider: Jianlu Wang, Fudan University	
09:00-09:40	Plenary Talk **From Visible to Terahertz Detection: Device Innovation Driven by Laser Precision Manufacturing** Hongbo Sun, Tsinghua University
09:40-10:20	Plenary Talk **Cascade structures for single and multi-pixels IR detectors** Piotr Martyniuk, Military University of Technology
10:20-10:40	Coffee Break
Presider: Antoni Rogalski, Military University of Technology	
10:40-11:20	Plenary Talk **Miniaturised Computational Light Detection** Tawfique Hasan, University of Cambridge
11:20-12:00	Plenary Talk **Metasurfaces for Controlling Light: From Interfacial Phases to Flat Optics** Lei Zhou, Fudan University
12:00-13:30	Lunch

From Visible to Terahertz Detection: Device Innovation Driven by Laser Precision Manufacturing

Hongbo Sun

Tsinghua University

Abstract: Ultrafast laser micro/nano processing offers unique capabilities including high precision, low thermal damage, and cross-material fabrication, enabling us to tailor functional device structures for detection needs across different frequency bands. In the visible range, we have fabricated highly sensitive low-light-level and night-vision detectors, which effectively enhance the capture of weak optical signals. In the infrared band, we employed this technique to produce blackbody structures with high absorptivity, providing a stable and reliable calibration reference for infrared systems. For microwave field detection, we developed an integrated Rydberg atom-based field sensing chip, where the atomic vapor cell and optical path are monolithically integrated, significantly improving system stability and portability; this technical approach can be directly extended to the terahertz regime. Our series of works demonstrate that ultrafast laser micro/nano processing serves as a unified, integrable technological platform supporting cross-band detection from visible light to terahertz frequencies.

Biography: Hong-Bo Sun received BS/PhD degrees in electronics from Jilin University, China, in 1992/1996. He worked as postdoctoral researcher at the University of Tokushima (1996-2000), assistant professor at Osaka University (2000-2006), Changjiang professor at Jilin University (2006-2017) and Tsinghua University since 2017. His research interest is ultrafast laser manufacturing. So far, he has published over 600 papers in above fields, which are cited for 51000+ times, and H factor is 118, according to Googlescholar. He is CAS academician, IEEE, OSA, SPIE, COS and CSOE fellow, editor-in-chief of PhotoniX, and executive editor-in-chief of Light Science and Applications.

Cascade structures for single and multi-pixels IR detectors

Piotr Martyniuk

Military University of Technology

Abstract: This talk presents the current status and future prospect of the InAs/InAsSb T2SLs ICIPs and MCT PVMs designed to operate at HOT conditions as a single pixel devices and arrays. The design of the device resolves the problem of the low QE of the traditional "thick absorber" of the photovoltaic detectors optimized for HOT conditions. The cascade devices are seen to exhibit a performance potential in MWIR/LWIR/VLWIR ranges circumventing the problems of the short carrier diffusion length at HOT (even > 300 K) conditions.

Biography: Piotr Martyniuk has been a professor at the Institute of Applied Physics (IAP), Military University of Technology (MUT) in Warsaw, Poland. The main subjects of his research are $A^{II}B^{VI}$-HgCdTe, $A^{III}B^{V}$ InAsSb, type-II superlattice InAs/GaSb, InAs/InAsSb IR detectors and 2D materials ("new wave materials"). He authored or co-authored over 200 reviewed journal papers and conference publications. In addition he co-authored three monographs: "Antimonide-based infrared detectors: a new perspective" and "Room Temperature Photon Detectors" and "Infrared detectors – Status and Outlook" on IR detectors. He closely collaborates with industry to include: VIGO Photonics S.A. and Photin sp. Z O.O. In addition, closely cooperates with the KIND Lab at Ohio State University (OSU), the Microelectronics Research Group at the University of Western Australia (UWA) and Shanghai Institute of Technical Physics (SITP), Chinese Academy of Science. He received an award from the Polish Academy of Science—Dean of Division Four: Engineering Sciences for his study "Barrier IR detectors as a new generation HOT sensors". He also received an award from the Minister of Defense (President of Republic of Poland honorable patronage) for the best completed project within the defense area "HOT IR detectors with short response time". In 2021, he received a 10-month Fulbright scholarship to the OSU KIND Laboratory. He was visiting professor at Shanghai Institute of Technical Physics (SITP), where he was dealing with avalanche photodiodes and single-photon detectors (2022-2024)

Miniaturised Computational Light Detection

Tawfique Hasan

University of Cambridge

Abstract: Optical instruments are usually judged by how much information they can separate, resolve and measure. Conventional systems achieve this through carefully arranged optical components, including lenses, filters, gratings and scanning elements. Miniaturised light-field detectors and spectrometers challenge this model. By replacing part of the optical complexity with engineered materials, device physics and computational reconstruction, they offer a route towards compact instruments that can measure rich optical information outside the controlled environment of the laboratory.

In this talk, I will discuss this emerging design philosophy for miniaturised computational light detection, with a focus on the visible regime. The central idea is to use constrained hardware not as a limitation, but as a physical encoder of optical information. Computation is then used to reconstruct the underlying spectral, spatial or other light-field content from the resulting measurements. This approach shifts the emphasis from simply shrinking conventional instruments to co-designing the material response, device architecture and reconstruction algorithm. In doing so, it points towards optical systems that are not only smaller, but also more manufacturable, task-specific and suitable for real-world sensing and portable spectroscopy.

Biography: Tawfique Hasan is Professor of NanoEngineering in the Department of Engineering at the University of Cambridge. His research group develops nanomaterials, printable electronics, optoelectronic devices and computational sensing systems. His work spans gas sensors, tactile sensors, flexible and recyclable electronics, photodetectors and miniaturised computational spectrometers, with a central interest in structuring materials and device architectures, then using computation to extract information from complex electrical and optical responses.

Tawfique is an Editor of Advanced Photonics, has served as a Distinguished Lecturer of the IEEE Photonics Society and is a Fellow of Optica.

Metasurfaces for Controlling Light: From Interfacial Phases to Flat Optics

Lei Zhou

Fudan University

Abstract: Metasurfaces are ultra-thin metamaterials composed by artificial planar meta-atoms arranged in some specific macroscopic orders, which exhibit extraordinary capabilities to control light waves. In this talk, I will give a brief overview on the historical development of metasurfaces, starting from the concept of "Interfacial phases" to the establishment of flat optics, focusing particularly on recent development of using metasurfaces ro generating and controlling vectorial light fields.

Biography: Zhou, Lei received his PhD in Physics from Fudan University, Shanghai, China, in 1997. He then went to Institute for Material Research in Tohoku University and the Hong Kong University of Science and Technology for postdoctoral research. He joined Physics Department of Fudan University in 2004, is now Vice President of Fudan University. He got the NSFC "Grant for Outstanding Young Scientist" in 2007 and was entitled "Chang Jiang Scholars Program" Chair Professor in 2010. He was an elected Fellow of OPTICA (2019), APS (2024) and COS (2024), a co-editor-in-chief of Photonics Insights and Optics and Photonics Research. He got many prestigious awards including the highly competitive National Natural Science Award of China (second class, 2019). He has published over 250 papers in journals such as Nature Materials and Nature Nanotechnology, was cited by over 27000 times (Google Scholar), and was a Clarivate world-wide Highly Cited Researcher in 2019-2024.

ESIT2026 Young Scientists Forum

Committee

Chairs:

Weida Hu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Junhao Chu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Shengli Sun, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Wei Lu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Jiang Tang, Huazhong University of Science and Technology
Chunlai Li, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
Kai Zhang, Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences
Haiding Sun, University of Science and Technology of China
Xiaopeng Hao, Tsinghua University
Qiming Zhang, University of Shanghai for Science and Technology
Junpeng Lu, Southeast University
Zhenhua Ni, Southeast University
Jianlu Wang, Fudan University

Time: September 19, 2026, Saturday, 13:30–16:25
Venue: Noah Meeting Room 1+2, 2nd Floor, Crowne Plaza Shanghai Noah Square, Putuo District, Shanghai

Program

Presider: Weida Hu

Time	Agenda
13:30-13:40	Opening Remarks
13:40-13:50	**Infrared Astronomical Detectors for Deep Space Exploration** Peng Wang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
13:50-14:00	**CWafer-Scale Fabrication and Automated Integration of p-Type Semiconductors** Bei Zhao, Southeast University
14:00-14:10	**Quantum Geometry as a New Resource for Infrared and Terahertz Photocurrents** Anyuan Gao, Shanghai Jiao Tong University

14:10-14:20	**Optical Enhancement and Sensing in Two-Dimensional Optoelectronics** Li Gao, Nanjing University of Posts and Telecommunications
14:20-14:30	**Multidimensional Intelligent Infrared Photodetectors** Hangyu Xu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
14:30-14:40	**Polarization Sensing and Enhanced Photodetection in Low-Dimensional Semiconductors** Ziqi Zhou, Institute of Semiconductors, Chinese Academy of Sciences
14:40-14:50	**Infrared optical comb spectroscopy and imaging** Ming Yan, East China Normal University
14:50-15:00	**Weak-Signal Infrared Detectors and Their Intelligent Remote-Sensing Applications Research** Fang Wang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
15:00-15:15	Coffee Break
15:15-15:25	**Non-Pixelated Intelligent Sensing Based on Position-Sensitive Detectors** Wenhui Wang, Southeast University
15:25-15:35	**Encapsulation epitaxy of 2D superconductors for quantum circuits** Kenan Zhang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
15:35-15:45	**Space Photovoltaic Device** Hong Zhang, Fudan University
15:45-15:55	**Monolithically Integrated SWIR Imaging Chip** Boxiang Song, Huazhong University of Science and Technology
15:55-16:05	**Terahertz programmable and intelligent metasurface** Jingbo Wu, Nanjing University
16:05-16:15	**Narrow-bandgap van der Waals semiconductor and their infrared light-emitting devices** Junyong Wang, Suzhou Institute of Nano-Tech and Nano-Bionics (SINANO), Chinese Academy of Sciences
16:15-16:25	**Optical Neuromodulation and Infrared Vision** Zhen Wang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Tips: Presentation: 7 mins, Q&A: 3 mins

Infrared Astronomical Detectors for Deep Space Exploration

Peng Wang
State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Infrared detection technology is a crucial means for exploring the origin of the universe, searching for Earth-like exoplanets, studying the evolution of galaxies and the origin of life, and other major scientific issues. In the deep space environment, the temperatures of most celestial bodies and space debris are extremely low, often below 200 K, some even as low as 50 K, 20 K, or only a few Kelvin. The cosmic background temperature is even lower, at only 2.7 K. These distant targets emit infrared photons with extremely low energy, weak signals, and long distances, making the observation extremely difficult, like searching for faint images in the dark. To achieve the observation of these very weak signals, it is urgently necessary to have infrared detectors with high sensitivity, low noise, and the ability to work under extreme conditions. This report will introduce our research progress in infrared astronomical detectors. We focus on the key scientific issues of the origin and regulation mechanism of light/dark carrier physics for approaching the infrared detection limit in astronomical observations, we have carried out systematic research on the physical origin of noise dark current, methods for enhancing signal photocurrent, infrared astronomical detectors operating at extremely low temperatures, and their exploration of applications, demonstrating their potential for astronomical observation applications in ground-based and future space-based infrared telescopes.

CWafer-Scale Fabrication and Automated Integration of p-Type Semiconductors

Bei Zhao
Key Laboratory of Quantum Materials and Devices of Ministry of Education, School of Physics, Southeast University

Abstract: In the development of atomic-level CMOS integration and next-generation high-performance chips, two-dimensional semiconductors (2DSCs) have emerged as an important candidate for breaking through the technical bottlenecks of silicon-based technology. They possess atomic-level thickness, excellent short-channel effect suppression capabilities, and outstanding electrical properties. However, achieving high-performance, low-power, and truly symmetrical two-dimensional CMOS still faces key challenges such as insufficient p-type device performance and limitations in wafer-level integration. Two-dimensional p-type semiconductors have bottlenecks in material systems, stability, and carrier control, being susceptible to defects, impurities, and interface states. Meanwhile, band matching, Fermi level pinning, and interface defects limit the hole injection efficiency, resulting in high contact resistance for p-type devices. Additionally, wafer-level transfer of two-dimensional materials faces issues such as contamination, wrinkles, cracks, interface damage, and insufficient alignment and repeatability. To address these challenges, we utilized mold interfaces to precisely fabricate double-layer 3R-WSe_2 on wafers at the wafer level. Through III-type band alignment and gate control, we achieved hole super-doping, constructing high-performance p-type two-dimensional transistors with a contact resistance of approximately 0.041 kΩ·μm and an on-state current density of approximately 2.30 mA·μm^{-1}. On this basis, we built a fully automatic, dry, wafer-level intelligent non-destructive transfer platform to achieve precise transfer and multi-layer stacking of high-quality two-dimensional materials, with a transfer efficiency approximately 10 times higher than manual methods, and a 2-inch wafer yield exceeding 99%. Further, we completed the integration of large-area two-dimensional transistors and van der Waals logic arrays, establishing a complete technical path from wafer-level material preparation, high-performance p-type device construction, automated non-destructive transfer to large-scale CMOS integration, providing an important foundation for low-power, large-scale chip manufacturing of two-dimensional semiconductors.

Quantum Geometry as a New Resource for Infrared and Terahertz Photocurrents

Anyuan Gao
Tsung-Dao Lee Institute, Shanghai Jiao Tong University

Abstract: Quantum geometry describes the geometric properties of Bloch wave functions and has recently become a major focus in condensed matter physics. Due to its quantum characteristic, the geometric tensor in solids consists of two parts: the real part, known as the Berry curvature, and the imaginary part, referred to as the quantum metric. By measuring the Berry curvature of wave functions in quantum materials using circularly polarized light, researchers have observed phenomena such as the circular photogalvanic effect and valley photogalvanic effect. However, how the quantum metric couples with light—and whether this coupling can enhance photocurrents—remains largely unexplored.

Optical Enhancement and Sensing in Two-Dimensional Optoelectronics

Huijuan Zhao[1,2], Yuanfang Yu[2], Sumei Wang[2], Lin Yan[1,2*]

[1] State Key Laboratory of Flexible Electronics, Nanjing University of Posts and Telecommunications, China

[2] School of Science, Nanjing University of Posts and Telecommunications, China

Abstract: Two-dimensional (2D) materials offer strong light–matter interaction and design flexibility beyond bulk semiconductors, but their atomic thickness imposes an intrinsic limit: low absorption. A long-sought goal is to overcome this limit through complementary absorption enhancement—either by energy transfer (ET) using suitable materials or by light trapping via metasurface design. Here, we report highly efficient ET in a 2D hybrid organic–inorganic heterostructure (HOIST) of Me-PTCDI/WS_2. We then discuss a novel strategy combining an ultrathin TMD-based distributed Bragg reflector with a dielectric light-trapping metasurface to enhance light absorption and overall photodetection performance. The talk will conclude with several application examples, including neuromorphic inference enabled by microcavity MoS_2 photodetector arrays and a dual-mode vdW phototransistor for multi-state image encryption.

Multidimensional Intelligent Infrared Photodetectors

Hangyu Xu[1], Weida Hu[1]*
State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Optical detectors give artificial intelligence the ability to "perceive" the environment. As the data volume continues to grow, the transmission and processing of massive perceptual information have become a significant bottleneck restricting the efficiency of the system. In the last century, the invention of field-effect transistors promoted the development of information processing and integrated circuits. In recent years, memristors have provided a new path for efficient information processing through in-situ reconfigurable conductance programming and computing.

This development paradigm also provides important insights for intelligent optical detection. However, compared to the relatively simple representation form of electrical signals, the optical field naturally carries multi-dimensional information such as spatial distribution, temporal evolution, and spectral components, which correspond to the target shape, dynamic behavior, and material properties, and are indispensable information sources for complex scene perception and intelligent recognition. Optical detection urgently needs to evolve from passive signal acquisition to reconfigurable active perception, so that the physical response of the device can directly participate in information representation, and complete in-situ encoding and processing of multi-dimensional optical information at the sensing front end. To achieve this goal, a multi-dimensional optical information encoding framework centered on carrier behavior regulation was constructed: by regulating carrier transport, establish a mapping between the spatial distribution of incident light and programmable light response weights, to achieve convolution encoding and feature extraction of spatial information; by regulating the storage, separation, and capture dynamics of carriers, convert the temporal evolution of light signals into a maintainable device state, to achieve cross-frame information fusion, motion trajectory extraction, and dynamic target recognition; by regulating the generation and nonlinear transport process of carriers excited by different wavelengths, construct low-correlation, reconfigurable spectral response channels, to achieve wide-band spectral reconstruction and weak infrared features extraction under strong background. The above research unified spatial, temporal, and spectral information to the controllable carrier state, providing a new device foundation for multi-dimensional optical information to move from "passive acquisition" to "physical encoding and in-situ computing".

In the future, it will be possible to further integrate spatial, temporal and spectral encoding units onto the same perception platform through vertical stacking and monolithic three-dimensional integration, enabling parallel processing of multi-dimensional information and reducing energy

consumption caused by analog-to-digital conversion and data transmission. On this basis, it is expected to further achieve collaborative perception and intelligent fusion of multimodal signals such as optical, tactile, and bioelectric signals, providing a highly integrated and low-power intelligent perception foundation for artificial retinas, electronic skins, intelligent robots, and next-generation autonomous systems.

Polarization Sensing and Enhanced Photodetection in Low-Dimensional Semiconductors

Ziqi Zhou[1], Can Liu[2], Kaihui Liu[3], Zhongming Wei[1]*
[1]1 State Key Laboratory of Semiconductor Physics and Chip Technologies, Institute of Semiconductors, Chinese Academy of Sciences
[2] Key Laboratory of Quantum State Construction and Manipulation (Ministry of Education), School of Physics, Renmin University of China
[3] State Key Laboratory for Mesoscopic Physics, Frontiers Science Centre for Nano-optoelectronics, School of Physics, Peking University

Abstract: Polarization, as an important degree of freedom of the light field, contains rich information such as the shape of the target, the state of the interface, the anisotropy of the material, and the interaction between light and matter. It provides information dimensions that are difficult to obtain through traditional intensity detection in complex environments, enabling high-contrast imaging, target recognition, and intelligent sensing. However, traditional polarization detection usually relies on external polarization filters or micro-nano polarization arrays, which not only increase the complexity of the optical path and optical loss but also limit the integration degree and weak light detection capability of the devices. Low-dimensional semiconductors with intrinsic anisotropy or broken spatial inversion symmetry provide a new material and physical basis for direct polarization light perception. The report focuses on the high sensitivity perception and enhanced detection of polarized light in low-dimensional semiconductors, introducing different strategies such as material intrinsic anisotropy, micro-nano structure light field control, and symmetry engineering. Firstly, by utilizing the strong in-plane anisotropic optical and electrical response of GeSe, a sub-wavelength structure is introduced to stimulate localized light field enhancement, achieving a significant amplification of the difference in polarization photocurrent, and further combining the high transconductance characteristic of the transistor's sub-threshold region to perform secondary amplification of weakly polarized electrical signals, thereby improving polarization state resolution and weak light target recognition ability. In addition, through low-dimensional structures and symmetry control, axial polarity is constructed in the chair-shaped WS_2 one-dimensional strip, generating polarization-dependent spontaneous photocurrent, and using the symmetry breaking of the interface in the black arsenic/TMD van der Waals heterostructure to enhance the polarization light response.

Infrared optical comb spectroscopy and imaging

Ming Yan

State Key Laboratory of Precision Spectroscopy, East China Normal University

Abstract: An optical frequency comb (optical comb) is a highly bright and wide-band coherent light source. It exhibits ultra-short pulse sequences in the time domain and a million of equally spaced frequency teeth in the frequency domain. It can be used for precise measurement of optical frequencies, with an accuracy reaching the level of atomic clocks, thus triggering a technological revolution in precise molecular spectroscopy. Currently, the spectral measurement technology based on femtosecond optical combs plays a significant role in molecular dynamics, high-sensitivity optical remote sensing, high-spectrum-broadband biological molecule imaging, and laser radar, etc. The emerging optical comb spectroscopy and time dispersion Fourier spectroscopy technologies provide new approaches for molecular spectroscopy measurement. For instance, the dual optical comb spectroscopy technique, through the optical heterodyne beat frequency detection method between two asynchronous optical combs, enables the Fourier spectroscopy system to break free from the limitations imposed by the moving arm on the measurement time and spectral resolution, thereby achieving high-resolution and rapid wide-spectrum-band molecular spectroscopy measurement. The report will discuss the Fourier infrared spectroscopy technology with high time-frequency resolution and its applications, focusing on technologies such as ultra-sensitive infrared optical comb molecular fingerprint spectroscopy and ultra-high-speed nonlinear time stretching spectroscopy, as well as their applications in real-time gas molecule detection.

Weak-Signal Infrared Detectors and Their Intelligent Remote-Sensing Applications Research

Fang Wang
State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: As China's lunar exploration and deep-space exploration continue to advance, there are increasingly strict requirements for high-sensitivity and weak-signal infrared detection in scientific goals such as polar exploration of the lunar surface and observation of faint celestial bodies. This report focuses on the research of weak-signal infrared detectors and their intelligent remote sensing applications, aiming at the needs of deep space infrared spectroscopy of lunar geology. It explores key bottlenecks such as large dark current in long-wave, very long-wave, and avalanche infrared detectors, and conducts research on device mechanisms, characterization methods, and exploration of new materials. In the HgCdTe long-wave devices, the single-pole barrier localized field technology is proposed to suppress multi-subspecies dark current and achieve 10 μm long-wave infrared detection. For very long-wave devices, a polarization localized field passivation mechanism is established to suppress surface tunnel leakage, achieving 15 μm very long-wave infrared detection. For avalanche detectors, a new protection ring structure is developed to suppress pre-breakdown effects and achieve a significant improvement in 10^4 avalanche gain and signal-to-noise ratio, while establishing a three-dimensional depth photoelectric characterization method to solve the problem of fine characterization of APD junctions. Further exploration of related electronic new materials such as Kagome is carried out, using van Hove singularities reconstruction and charge density wave phase transition regulation to achieve enhanced light response, supporting new infrared signal detection systems. Relevant achievements have been published in high-level journals such as Nature's subsidiary journal and IEEE series, and the technical results serve China's Chang'e series and other deep space remote sensing projects. These studies provide a device foundation for obtaining weak infrared signals in extreme deep space environments and have significant supporting value for the development of China's aerospace remote sensing technology.

Non-Pixelated Intelligent Sensing Based on Position-Sensitive Detectors

Wenhui Wang

Key Laboratory of Quantum Materials and Devices of Ministry of Education, Southeast University

Abstract: Visual information accounts for over 80% of human perception of the external environment and is the core pathway for intelligent systems to interact with the environment, understanding the world, and making decisions. However, the essence of perception is not merely obtaining high-resolution images, but rather efficiently extracting useful information from complex light fields, such as target positions, motion trajectories, and key semantic elements like contour features. Position-sensitive detectors (PSDs) are photodetectors based on lateral photoelectric effects, capable of directly sensing the centroid position of light spots. Compared to the massive data generated by millions of pixel array sensors, PSDs only require four output signals to achieve target positioning and tracking, demonstrating significant application potential in low-power intelligent sensing systems. This report proposes and constructs gain-type graphene-based PSD based on interface confinement, not only pushing the detection limit from micro-watt level to nano-watt level, but also extending the working wavelength to the near-infrared band (1550 nm), enabling precise measurement and target tracking. Furthermore, a retinal-like sensor and eye-tracking system are constructed based on PSD, achieving low-power human posture recognition and eye-controlled typing, eye-controlled games, and other human-computer interaction applications, providing an important physical foundation and technical path for the next-generation high-performance, low-power intelligent optoelectronic systems.

Encapsulation epitaxy of 2D superconductors for quantum circuits

Kenan Zhang[1], Xudong Zheng[2]

1State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

2Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology

Abstract: Two-dimensional superconductors are gradually becoming an important material platform for studying strong correlation physics and quantum information science. Their low-dimensional characteristics and atomic-level smooth interfaces give them unique advantages in constructing compact lumped components in superconducting circuits. However, due to the easy oxidation of two-dimensional superconductors in air, the controlled preparation of large-area single-layer two-dimensional superconductors still faces significant challenges. We report an "encapsulation epitaxy" mechanism that enables the growth of large-area, air-stable single-layer $NbSe_2$ films, and further explores its potential application in superconducting quantum circuits. This mechanism represents a unique epitaxial growth phenomenon. A two-dimensional encapsulation layer pre-deposited on a three-dimensional substrate not only serves as an epitaxial growth template, inducing the epitaxial growth of $NbSe_2$ at the encapsulation layer–substrate interface, but also acts as a protective layer to prevent the material from degrading in the environment. The prepared graphene/$NbSe_2$ exhibits stable superconducting properties, with a superconducting transition temperature $T_C \approx 1$ K, and shows a significantly enhanced charge density wave with a transition temperature $T_{CDW} \approx 177$ K. Further, we have achieved the integration of $NbSe_2$ in superconducting circuits by developing an oxidation-free transfer technology and superconducting edge contact technology. The $NbSe_2$ in the circuit exhibits a dynamic inductance of approximately 0.7 nH^{-1}, which is particularly suitable for quantum circuits requiring high dynamic inductance components. This encapsulation epitaxy method provides a completely new technical path for the preparation of air-stable two-dimensional superconductors, and is expected to promote the realization of wafer-level single-chip integrated superconducting quantum circuits.

Space Photovoltaic Device

Zhijie Wang[1], Haiyun Li[1], Hong Zhang[1*], Junhao Chu[1]

State Key Laboratory of Photovoltaic Science and Technology, Shanghai Frontiers Science Research Base of Intelligent Optoelectronics and Perception, Institute of Optoelectronics, Fudan University

Abstract: In response to the strategic demand of the country for space photovoltaics, the presenter focused on the stability research of space-used perovskite/silicon tandem solar cells, and reported the following results. The transient ion correction diffusion-drift model and interface characterization new technology were proposed, revealing the degradation mechanism of the device caused by iodide ion migration in perovskite materials under complex environments. An asymmetric dual cation anchoring strategy was proposed, and the most stable calcium/silicon tandem battery was developed, establishing a stable battery structure model suitable for extreme space environments. A 2D/3D hybrid dimension perovskite heterostructure was proposed, optimizing carrier transport, achieving the highest efficiency perovskite/ perovskite/silicon tri-junction tandem battery (32.2%). The perovskite / perovskite intermediate isolation layer technology was invented, solving the problem of interlayer ion migration, and achieving efficient and stable large-area calcium/calcium/silicon tri-junction tandem battery components (27%).

Monolithically Integrated SWIR Imaging Chip

Boxiang Song

Wuhan National Laboratory for Optoelectronics, Huazhong University of Science and Technology

Abstract: Short-wave infrared imaging chips have broad application prospects in fields such as security monitoring, industrial inspection, autonomous driving, and defense equipment. However, traditional devices have long faced bottlenecks such as high costs, difficulties in manufacturing large-area arrays, and a single functional dimension. This report focuses on the core direction of " Monolithically Integrated SWIR Imaging Chip", systematically presenting the research progress in device physics, on-chip integration, and multi-dimensional perception in recent years. This report will introduce the research work on low-cost, large-area, multi-dimensional all-silicon-based infrared information perception chips, centered around the development of silicon-based CMOS-compatible short-wave infrared detection chips, as well as the monolithic integration of metasurface and silicon-based infrared detection chips.

Terahertz programmable and intelligent metasurface

Jingbo Wu
Research Institute of Superconductor Electronics (RISE) & Key Laboratory of Optoelectronic Devices and Systems with Extreme Performances of MOE, School of Electronic Science and Engineering, Nanjing University

Abstract: Programmable and intelligent metasurfaces provide new technical approaches for the dynamic control of terahertz waves, and have shown significant application potential in areas such as wireless communication and imaging perception. This report focuses on the programmable control of terahertz metasurfaces, large-scale arrays and communication applications, as well as intelligence. Based on tunable materials such as liquid crystals, dynamic modulation and programmable control of terahertz phases are achieved. By developing new array addressing and control architectures, programmable metasurfaces are extended to large-scale arrays, enabling two-dimensional beamforming and high-speed non-line-of-sight wireless communication. Further, by leveraging the environmental response characteristics of phase change materials, intelligent metasurfaces with dynamic beam tracking and adaptive control capabilities are constructed, promoting the development of terahertz metasurfaces from programmed control to autonomous perception and response.

Narrow-bandgap van der Waals semiconductor and their infrared light-emitting devices

Junyong Wang[1], Kai Zhang[1]
Suzhou Institute of Nano-Tech and Nano-Bionics (SINANO), Chinese Academy of Sciences

Abstract: Light source devices are one of the core components of photonic integrated chips. Currently, in the free-space optical communication, lidar, infrared countermeasures and material composition detection, chip-level photoelectric integration and silicon-based light sources urgently need breakthroughs. Semiconductor materials with narrow bandgap layered van der Waals semiconductors, such as black phosphorus, have high integration freedom and multi-dimensional light emission control capabilities, providing a new light source material solution for silicon-based optoelectronic chips. In this report, we have developed a silicon-based fabrication technology for van der Waals mid-infrared light-emitting semiconductor single-crystal thin films, and further utilized the light emission characteristics of narrow bandgap two-dimensional semiconductor black phosphorus and tellurium in the mid-infrared band to construct new light source devices, including optically pumped mid-infrared laser devices, communication band exciton light-emitting diodes, and mid-infrared polarization tunable light-emitting devices, providing a new path for silicon-based photonic integration in the mid-infrared band.

Optical Neuromodulation and Infrared Vision

Zhen Wang
State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Visual restoration technology is moving from bionic substitution to function expansion. This report focuses on the bulk photovoltaic effect of narrow-bandgap tellurium (Te) semiconductors and its light-electrochemical coupling with neural tissues, elaborating on visible light-infrared wide-spectrum optical neural regulation, device realization and visual restoration applications. Utilizing the non-centrosymmetry of one-dimensional helical chain tellurium nanowires, through defect engineering and hetero-interface regulation, their bulk photovoltaic response covers ultraviolet to mid-wave infrared (390nm-3.8μm). A symmetrical-breaking P-type infrared semiconductor-neural cell membrane interface band matching model is established. After the semiconductor comes into contact with the neural cell membrane, the interface charges act on it, causing the conduction band and valence band to bend downward, significantly reducing the electron transport barrier; visible-infrared light excites photogenerated electron-hole pairs, and the symmetrical-breaking bulk photovoltaic effect drives the conduction band electrons to migrate directionally to the cell interface, where they undergo redox-type charge transfer with extracellular Na^{+}, Ca^{2+}, K^{+}, etc. ions, achieving cross-interface transduction with "infrared light – neural signal", enabling neural cells to perceive infrared signals beyond the visible spectrum, and opening up a new path for "sensing – conversion – computing – vision" integrated infrared visual enhancement and clinical transformation.

Track 1: Infrared physics and devices

Sep.19 Saturday, Ya Mei Ballroom 2, 3F （三楼 亚美 2）	
Presider: Chunlai Xue, Institute of Semiconductors, Chinese Academy of Sciences	
13:30-13:55	Keynote Talk **Recent Progress in Light-Matter Interactions in 2D Materials from Visible to THz** Jianbin Xu, The Chinese University of Hong Kong
13:55-14:20	Keynote Talk **Second Harmonic Generation From Centrosymmetric Graphene Induced by Interfacial Charge Doping** Xuetao Gan, Northwestern Polytechnical University
14:20-14:35	Invited Talk **Research on High Performance and Multifunctional Infrared Detection Technology Using Organic Materials** Jun Wang, University of Electronic Science and Technology of China
14:35-14:50	Invited Talk **Crosstalk study on InGaAs/InP short wavelength single-photon focal plane arrays** Yanli Shi, Yunnan University
14:50-15:05	Invited Talk **AI-native robotic vision enabled by in-sensor computing** Changsoon Choi, Sungkyunkwan University
15:05-15:20	Coffee Break
Presider: Jianbin Xu, The Chinese University of Hong Kong	
15:20-15:45	Keynote Talk **Silicon-Based Group IV Thin Film for Extended-Wavelength Infrared Photonics** Chunlai Xue, Institute of Semiconductors, Chinese Academy of Sciences
15:45-16:10	Keynote Talk **2D Polarization-Sensitive Photodetectors** Zhongming Wei, Institute of Semiconductors, Chinese Academy of Sciences
16:10-16:35	Keynote Talk **Van der Waals Hetero-integration for Infrared Photodetection** Junpeng Lv, Southeast University
16:35-16:50	Invited Talk **Low-Dimensional Antimonide and Optoelectronic Devices** Zaixing Yang, Shandong University

16:50-17:05	Invited Talk **Direct tensor processing with coherent light** Yufeng Zhang, Aalto University
17:05-17:15	Oral Talk **Solid-state Transparent Infrared Electrochromic Device Based on Aluminum-doped Zinc Oxide Nanocrystals** Xu Zheng, National University of Defense Technology
17:00-18:30	Poster Session
18:30-20:30	Banquet

Track 1: Infrared physics and devices

Sep.20 Sunday, Ya Mei Ballroom 2, 3F（三楼 亚美 2）	
Presider: Kai Wei, Zhejiang University	
08:30-08:55	Keynote Talk **Room temperature terahertz detector integrated with 2D materials** Kai Zhang, Suzhou Institute of Nano-Tech and Nano-Bionics,CAS
08:55-09:20	Keynote Talk **Hybrid integration of superconducting nanowire single photon detectors** Qingyuan Zhao, Nanjing University
09:20-09:35	Invited Talk **III-V Semiconductor Based Nanostructures for High-Performance Infrared Photodetection and Imaging** Ziyuan Li, Beijing Institute of Technology
09:35-09:50	Invited Talk **Broadband absorption limit of terahertz and infrared waves by nanofilms and its optoelectronic detection applications** Tao Zhao, University of Electronic Science and Technology of China
09:50-10:05	Invited Talk **Quantum Dot-based Intelligent Sensing and Imaging Systems** Kun Ba, Shanghai University
10:05-10:20	Invited Talk **Infrared Upconversion Photodetector Based on Colloidal Quantum Dot** Wenjia Zhou, ShanghaiTech University
10:20-10:30	Oral Talk **Encapsulation and beyond encapsulation of 2D semiconductors** Guichen Teng, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
10:30-10:45	Coffee Break
Presider: Qingyuan Zhao, Nanjing University	
10:45-11:10	Keynote Talk **Advances in Optical Phased Arrays for Long-Range All-Solid-State Integrated Lidar and Communication** Kai Wei, Zhejiang University

11:10-11:35	Keynote Talk **Colloidal Quantum Dot Superlattice for Infrared Photodetectors and Light Emitting Diode** Zhijun Ning, ShanghaiTech University
11:35-11:50	Invited Talk **Research Progress of HgCdTe Two-color Detectors at Kunming Institute of Physics** Gang Qin, Kunming Institute of Physics
11:50-12:05	Invited Talk **Nonlinear Hall Responses in CsV_3Sb_5 toward Wireless Rectification** Shanshan Liu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
12:05-12:20	Invited Talk **InP nanostructures and their optoelectronic devices** Xutao Zhang, Northwestern Polytechnical University
12:20-12:30	Oral Talk **Mid-Infrared Fluoride Glass Optical Fibers and Devices** Changjun Xu, Northeast Normal University
12:30-13:30	Lunch

Track 1: Infrared physics and devices

Sep.20 Sunday, Ya Mei Ballroom 2, 3F（三楼 亚美 2）	
Presider: Junpeng Lv, Southeast University	
13:30-13:55	Keynote Talk **TBA** Wenfu Zhang, Xi'an Institute of Optics and Precision Mechanics
13:55-14:20	Keynote Talk **TBA** Jiang Tang, Huazhong University of Science and Technology
14:20-14:35	Invited Talk **Reversible Switching for Mid-Wave and Long-Wave Infrared Dual-Band I** Menglu Chen, Beijing Institute of Technology
14:35-14:50	Invited Talk **Manipulation of Carrier Dynamics in Narrow-Bandgap Semiconductors and Their Optoelectronic Devices** Qisheng Wang, Nanchang University
14:50-15:05	Invited Talk **Broadband Infrared Photodetection and Emerging Optoelectronic Devices for Integrated Sensing and Computing** Hai Huang, Fudan University
15:05-15:15	Oral Talk **Dual-band Colloidal Quantum Dot Focal Plane Array** Yunxiang Di, Fudan University
15:15-15:30	Coffee Break
Presider: Menglu Chen, Beijing Institute of Technology	
15:30-15:55	Keynote Talk **Two Dimensional Semiconductors based Broadband Photodetector for Neural Network Recognition** Zhigao Hu, East China Normal University
15:55-16:10	Invited Talk **T2SL technology developments in MWIR band operating at high operating temperature** Donghai Wu, Institute of Semiconductors, Chinese Academy of Sciences

16:10-16:25	Invited Talk **Mid-infrared single-photon upconversion spectroscopy based on temporal-spectral** E Wu, East China Normal University
16:25-16:40	Invited Talk **Infrared Visualization: From Monochromatic to Full-Color Upconversion** Ge Mu, Beijing Institute of Technology
16:40-16:50	Oral Talk **Band-Engineered Novel Blackbody-Sensitive vdW Infrared Detectors** Runze Sun, Hangzhou Institute for Advanced Study, UCAS
16:50-17:00	Oral Talk **High-quality mid-wave infrared HgCdSe grown on GaSb substrates with molecular beam epitaxy** Zekai Zhang, Jiangnan University

Recent Progress in Light-Matter Interactions in 2D Materials from Visible to THz

Jianbin Xu

The Chinese University of Hong Kong

Abstract: Hierarchically stacked two-dimensional (2D) semiconductors and their heterointerfaces can be treated as an atomically thin, reconfigurable photonic platform — not merely as passive optical materials. By coupling van der Waals (vdW) excitons to designed nanophotonic modes, we show that polariton hybridization, giant interlayer dipoles, and valley contrast can be engineered at room temperature and transferred into device-relevant configurations. This talk highlights four aspects:

(1) Self-coupled polariton metaphotonics without etch damage.

Using a CVD bottom-up route, we build TMD metasurfaces in which the excitonic material is itself the photonic resonator. This self-coupled polariton platform yields the interference with plasmonic lattices, etch-free high-Q vdW resonances, and tunable Kerker scattering. Complementary all-dielectric metasurfaces further enable strong coupling to monolayer J-aggregate crystals, offering a pathway for polariton control.

(2) Layer-engineered interlayer excitons with deterministic plasmonic gain.

By stacking architecture rather than chemistry alone, we observe giant out-of-plane dipole moments of interlayer excitons. A plasmonic lattice-on-mirror then provides spatially deterministic enhancement of interlayer-exciton emission, converting a delocalized moiré excitation into an addressable photonic source.

(3) Room-temperature valley control by synergistic coupling.

Valley polarization in monolayer WSe_2 is steered at room temperature through the synergistic action of a chiral metasurface and hot-carrier injection—combining photonic selection rules with non-equilibrium carrier injection instead of relying on cryogenic magnetic or optical pumping.

(4) From polaritons to functional 2D optoelectronics.

The same light–matter design principles are extended to waveguide-integrated 2D photodetectors and a retina-inspired near-infrared sensor with a phototransistor–readout (PRO) architecture, pointing toward on-chip sensing and imaging.

These results show collectively a bottom-up strategy for 2D nanophotonics: to grow or to stack the active lattice, to hybridize it with a tailored photonic mode, and to use that hybridization to program polaritons, excitons, valleys, and photocurrent.

Acknowledgements.

This presentation is supported in part by the Research Grants Council of Hong Kong (AoE/P-701/20, 14206721, 2151231, 14203623).

Biography: Professor Dr. Jian-Bin Xu is an Associate Dean of Engineering, and a Choh-Ming Li Chair Professor of Electronic Engineering at The Chinese University of Hong Kong. He earned his doctorate from Universität Konstanz, Germany, in 1993, particularly under supervision by Prof. Dr. h.c. mult. Klaus Dransfeld. Professor Dr. Xu is an internationally renowned scholar in electronic materials and devices. His research interests include nanotechnology for electronics and photonics, 2-dimensional materials and devices, nanoscopic characterization, functional materials, physics of organic semiconductors, thermal science and thermal management. He has secured more than 50 research grants and yielded plentiful research outputs. He is a prolific scholar, having published over 650 technical papers and held a dozen of patents. He is a Fellow of the Institute of Electrical and Electronic Engineers (IEEE) and Optica, a Foreign Fellow of European Academy of Sciences. He has received several international and national awards. He has also served in numerous technical conferences and funding agencies as well as professional journals. He is currently serving as an Editor of IEEE Transaction of Electron Devices and a Member of Editorial Advisory Board of ACS Nano, npj 2D Materials and Applications.

Second Harmonic Generation From Centrosymmetric Graphene Induced by Interfacial Charge Doping

Xuetao Gan

Northwestern Polytechnical University

Abstract: Benefiting from the unique linear dispersion and massless Dirac fermions, graphene represents an attractive optical material for both linear and nonlinear optics. Unfortunately, the absence of second-order nonlinearity in the centrosymmetric graphene overshadows its decent optical responses. Numerous efforts have thus far been made to pursue $\chi^{(2)}$ in graphene, where the symmetry breakings are mostly achieved by an external electric field or van der Waals interlayer stacking. Here, we report a simple strategy to realize remarkable $\chi^{(2)}$ in naturally AB-stacked bilayer graphene (BLG) via the encapsulation of a MoO_3 thin film. The SHG intensity of MoO_3-covered BLG is about 2 times of that in monolayer MoS_2. As transition metal oxide with a high work function, MoO_3 has been used for improving hole injection or collection, as well as doping in two-dimensional materials. By forming the physical contact between MoO_3 thin film and BLG, their large work function difference could drive the spontaneous electron transfer from BLG to MoO_3, facilitating the formation of a hole accumulation layer in the top layer of the BLG, resulting in effective hole doping and symmetry breaking. Our results not only reveal that interfacial charge doping is an effective way to break the inversion symmetry of BLG but also indicate that SHG spectroscopy is a valid technique to probe interfacial charge doping on two-dimensional materials.

Biography: Xuetao Gan received the B.S. degree in optical information science and technology and Ph.D. degree in optical engineering from Northwestern Polytechnical University, Xi'an, China, in 2007 and 2013, respectively. From 2010 to 2012, he was a visiting scholar at Columbia University, New York, USA. He is currently a Professor of applied physics at Northwestern Polytechnical University. His research interests mainly include nonlinear nanophotonics, optoelectronics in graphene and other layered materials, nonlinear optical spectroscopy of low-dimensional materials. He has published more than 130 papers as first or corresponding author in journals such as Nature Photonics, Nature Communications, Science Advances, Light Science & Applications, Optica, Advanced Materials, Advanced Functional Materials, Nano Letters, ACS Nano, and Laser Photonics Reviews, etc.

Research on High Performance and Multifunctional Infrared Detection Technology Using Organic Materials

Jun Wang

University of Electronic Science and Technology of China

Abstract: Infrared detectors are widely used in military and civilian fields such as night vision reconnaissance, biomedicine, and environmental monitoring. Traditional room-temperature operating photodetectors primarily acquire scalar parameters like light intensity and exhibit limited detection functionality, failing to meet the demands of intelligent detection and sensing. Novel narrow-bandgap/zero-bandgap materials possess excellent electro-optical properties, making them suitable for infrared detection applications. This research combines two-dimensional graphene materials with organic heterojunctions, utilizing the photo-gating effect of organic heterolayers to enhance the performance of photodetectors; develops a novel hydrographic transfer process to effectively suppress device noise; designs a bidirectional response device structure combining polar and nonpolar materials to improve polarization detection capabilities. We present a high performance two-terminal asymmetric back-to-back organic spectrometer that utilizes a bias-controlled multi-peak modulation strategy to mitigate the ill-posed inverse problem common in single-point architectures.

Biography: Prof. Wang Jun is from School of Optoelectronic Science and Engineering, University of Electronic Science and Technology of China (UESTC). He received his BSc degree and PhD degree of Optical Engineering from UESTC. Prof. Wang's research activities are focused on infrared and terahertz detector technology at room temperature, presided more than 20 projects. Prof. Wang has published more than 100 papers indexed by SCI in academic journals including Nat Commu, Sci Adv, Advanced Materials, Light: Science & Applications, etc., and applied over 70 item patents of invention in China. He has won three second prizes of national technology invention, national defense technology invention and education university technology invention, and obtained National Natural Science Foundation-Outstanding Youth Foundation and Education Ministry's New Century Excellent Talents Supporting Plan.

Crosstalk study on InGaAs/InP short wavelength single-photon focal plane arrays

Yanli Shi

Yunnan University

Abstract: InGaAs/InP short wavelength single-photon focal plane arrays (FPAs) offer several advantages, including near-infrared single-photon sensitivity, ease of integration, and near-room-temperature operation, making them highly attractive for applications in quantum communication, three-dimensional LiDAR, deep-space detection, and low-light imaging. As these arrays continue to evolve toward larger formats, higher pixel densities, and smaller pixel pitches, device optimization has gradually shifted from improving the detection efficiency and dark count rate of individual pixels to the coordinated optimization of multiple performance metrics, including photon detection efficiency, fill factor, dark count rate, and inter-pixel crosstalk. Among these, inter-pixel crosstalk has become a critical factor limiting the performance of high-density single-photon FPAs. Secondary photons generated during avalanche multiplication can propagate to neighboring pixels. Since single-photon avalanche diodes (SPADs) operate in Geiger mode, even a single crosstalk photon, once absorbed in a neighboring pixel and successfully triggering an avalanche, may produce a false count that is difficult to distinguish from a genuine photon event. Theoretical and experimental investigations were therefore carried out to clarify the key structural factors affecting crosstalk in InGaAs/InP single-photon FPAs and their underlying modulation mechanisms. The results show that crosstalk depends not only on pixel spacing, but also on the combined effects of trench dielectric materials, substrate thickness, backside microstructures, and peripheral metal structures. In particular, the design of backside microlenses and metal structures plays an important role in crosstalk regulation and overall performance optimization of single-photon FPAs. These findings provide useful guidance for the structural design and performance optimization of high-density InGaAs/InP single-photon FPAs with low crosstalk and high photon detection efficiency.

Biography: Shi Yanli, PhD, Professor at Yunnan University, PhD supervisor. Main research directions include design and development of infrared photodetectors. Published over 100 articles and delivered more than twenty invited presentations at important domestic and international conferences. editorial board member of Infrared and Laser Engineering, Infrared Technology, and Journal of Infrared and Millimeter Waves.

AI-native robotic vision enabled by in-sensor computing

Changsoon Choi

Sungkyunkwan University

Abstract: Artificial intelligence (AI) is accelerating the evolution of robotics from task-specific automation to general-purpose autonomy, enabling robots to perform high-level tasks in unstructured and dynamic environments. One of the key enablers in this evolution is the integration of AI with robotic vision systems, which provide accurate perception and contextual interpretation of complex surroundings. Here, we introduce AI-native robotic vision system featuring high-performance imaging and data processing capabilities. First, we developed bio-inspired cameras that emulate the optical features of biological eyes, offering a compact form factor ideal for high-mobility robotics. Then, we introduce robotic vision systems capable of in-sensor computing, streamlining the image signal processing steps and thus enhancing data processing efficiency.

Biography: Changsoon Choi received his B. S. degree (2012) from the Department of Material Science and Engineering at the Seoul National University and his M. S. degree (2014) and his Ph. D. degree (2020) from the School of Chemical and Biological Engineering at the Seoul National University. He was a postdoctoral fellow in School of Engineering and Applied Science, Harvard University (2020-2021), and a senior research scientist of Post-silicon Semiconductor Institute, Korea Institute of Science and Technology (KIST) (2021-2026). He is currently an assistant professor in School of Electronic and Electrical Engineering, Sungkyunkwan University. His research interests include bio-inspired optoelectronics and in-sensor computing.

Silicon-Based Group IV Thin Film for Extended-Wavelength Infrared Photonics

Chunlai Xue

Institute of Semiconductors, Chinese Academy of Sciences

Abstract: Silicon-compatible Group-IV semiconductors have emerged as an attractive platform for next-generation infrared photonics, offering the combined advantages of CMOS compatibility, scalable manufacturing, and broad spectral coverage. Among them, epitaxial Ge and GeSn thin films provide versatile material platforms for realizing high-performance photodetectors operating beyond the conventional telecommunication bands.

This presentation will review our recent progress on the epitaxial growth, material engineering, and device applications of silicon-based Ge and GeSn thin films. Starting from the controlled epitaxy of Ge on silicon, we demonstrate how defect engineering and optical structure design can be integrated to simultaneously improve crystalline quality, light absorption, and device functionality. Building upon this platform, GeSn epitaxial films with tunable bandgaps are developed to further extend the detection wavelength while supporting high-speed and low-power photodetection for emerging optical interconnects. These developments demonstrate the growing potential of Group-IV epitaxial thin films as a key enabling technology for future integrated infrared sensing, imaging, and extended-wavelength optical communication systems.

Biography: Chunlai Xue is a Professor and Deputy Director of the Institute of Semiconductors, Chinese Academy of Sciences, and a recipient of the National Science Fund for Distinguished Young Scholars. He received his Ph.D. from the same institute in 2007. His research interests include epitaxy of silicon-based heterostructure materials, silicon photonics devices and integration technology, covering group-IV band-engineered light sources, monolithic SWIR detector arrays, and integrated photodetectors. He has published 130+ SCI papers and led multiple national key R&D programs.

2D Polarization-Sensitive Photodetectors

Zhongming Wei

Institute of Semiconductors, Chinese Academy of Sciences

Abstract: As a typical representative of two dimensional (2D) semiconductors, group-IV chalcogenides have sparked considerable interest on account of its lattice structure, high compatibility with key semiconductor technology, and remarkable electrical and optical performance. Using group-IV chalcogenides with in-plane anisotropy as the photodetector's light absorption layer can effectively simplify the existing complex lens system, which can further promote device volume development toward miniaturization. Here, we demonstrate the application of polarizer-free polarization-sensitive photodetector/image sensors made of 2D in-plane anisotropic layered semiconductors such as GeSe, SnSe, and GeAs, which are extremely sensitive to polarized light due to their reduced in-plane structural symmetry.

Biography: Zhongming Wei received his B.S. from Wuhan University in 2005, and Ph.D. from Institute of Chemistry, Chinese Academy of Sciences in 2010. From August 2010 to January 2015, he worked as a postdoctoral fellow and then Assistant Professor at University of Copenhagen, Denmark. Currently, he is working as a Professor at Institute of Semiconductors, Chinese Academy of Sciences. His research interests include low-dimensional semiconductors and their optoelectronic devices.

Van der Waals Hetero-integration for Infrared Photodetection

Junpeng Lv

Southeast University

Abstract: Infrared photodetectors are key components of modern electronic and information systems and play important roles in national security, industrial monitoring, medical diagnostics, and many other fields. With the continued expansion of infrared sensing applications, next-generation infrared photodetectors are expected to simultaneously provide uncooled high-sensitivity detection, multidimensional information acquisition, and energy-efficient operation. Emerging two-dimensional materials and their van der Waals heterojunctions, featuring dangling-bond-free surfaces, weak interlayer van der Waals coupling, intrinsic in-plane anisotropy, and tunable optoelectronic properties, provide a promising research platform for highly sensitive room-temperature detection and multidimensional infrared information acquisition. In this talk, we will present our recent progress in van der Waals heterogeneous integration for infrared photodetection, with particular emphasis on the tuning of photoelectric conversion processes in two-dimensional materials and heterostructures toward highly sensitive room-temperature detection. We will also introduce our recent advances in two-dimensional heterojunction devices for multi-dimensional infrared information acquisition and intelligent visual sensing.

Biography: Junpeng Lv is a Professor and Vice Dean of the School of Electronic Science and Engineering at Southeast University, China. He received his B.S. degree in Optical Information Science and Technology from Shandong University in 2009 and his Ph.D. degree in Physics from the National University of Singapore in 2013. From 2013 to 2017, he worked as a Research Fellow at the National University of Singapore, and he joined Southeast University in 2017. He was appointed a Distinguished Professor under the Changjiang Scholars Program of the Ministry of Education in 2022. From 2022 to 2024, he served as a Program Director of the Division of Information Sciences, National Natural Science Foundation of China. His research focuses on physical electronics and micro/nano-optoelectronics, particularly optoelectronic devices based on emerging semiconductor materials, ultrafast spectroscopy, terahertz spectroscopy, and terahertz metamaterials. He has published more than 90 SCI-indexed papers in journals including Nature Nanotechnology, Nature Electronics, and Nature Communications.

Low-Dimensional Antimonide and Optoelectronic Devices

Zaixing Yang

School of Physics, Shandong University

Abstract: Low-dimensional semiconductor optoelectronic materials are the core of the research on next-generation information materials. The construction of one-dimensional GaSb nanowires, on the one hand, is able to develop the next-generation high-performance room temperature infrared detectors. On the other hand, it can fabricate the new integrated circuits. Many research groups are devoted to the development of high-performance GaSb nanowire optoelectronic devices. However, the performance of the devices is still confined to low hole mobility. First, the "surfactant effect" of the antimony element would cause serious disordered radial growth, resulting in uncontrollable diameter of GaSb nanowires, rich surface states and low mobility. Next, GaSb nanowires have rich crystal structures and different polarities., contributing to uncontrollable carrier scattering, carrier concentration and uniformity of mobility. In the end, the association between mobility and photodetection performance is still unknown experimentally. To solve these scientific difficulties, we conduct the researches based on "precisely controlling the surfactant effect of antimony element", "regulating carrier transport properties" and "regulating the surface state of nanowires" for a long term.

Biography: Zai-xing Yang is a full professor of School of Physics at Shandong University, China. His research interest mainly focuses on the controlled fabrication of low-dimensional semiconductors for electronic and optoelectronic device applications, including field-effect-transistors, CMOS invertors, photodetectors, and photovoltaic devices. He has published 111 SCI papers so far, including Nat. Commun., PNAS, Nano Lett., ACS Nano, Adv. Funct. Mater. and so on.

Direct tensor processing with coherent light

Yufeng Zhang

Aalto University

Abstract: We propose a parallel optical matrix-matrix multiplication scheme implemented using a single propagation of coherent light and extend it to tensor-matrix multiplication via wavelength multiplexing. Building on this framework, we investigate its application in different optical neural network architectures.

Biography: Dr. Yufeng Zhang is currently a Marie Skłodowska-Curie Fellow in the Photonics Group at the Department of Electronics and Nanoengineering, Aalto University, under the supervision of Prof. Zhipei Sun. His research interests include optical computing, optical signal processing, and quantum computing. He has authored several peer-reviewed publications in high-impact journals, including Nature Photonics. His work has also featured technical and general media outlets such as Forbes, Nature, and Optica.

Solid-state Transparent Infrared Electrochromic Device Based on Aluminum-doped Zinc Oxide Nanocrystals

Xu Zheng

National University of Defense Technology, China

Abstract: Infrared electrochromic devices, which can efficiently modulate infrared radiation beyond vision, have emerged as an attractive technology in the energy and information fields. The realization of the independent modulation of visible and infrared spectra is a challenging and important task for the application of infrared electrochromic devices in the fields of smart thermal management and multispectral camouflage. The electrochromic infrared emissivity device based on aluminum-doped zinc oxide nanocrystals (AZO NCs) can control the carrier concentration of AZO NCs through electrochemical means and dynamically adjust the position of LSPR absorption peak, thus achieving infrared modulation. Here, we report a quasi-solid-state infrared electrochromic device based on aluminium-doped zinc oxide (AZO) nanocrystals that can achieve independent modulation of the infrared emissivity while maintaining a high visible transparency (81.23% at 380~800 nm). The device shows high degree of emissivity regulation (0.49 at 3~5 μm, 0.36 at 8~14 μm), fast response (< 300ms), long cycle life (> 104 cycles), and and long at-rest stability (>28 days). This transparent infrared emissivity regulator provides opportunities for applications such as on-demand smart thermal management, multispectral displays, and adaptive camouflage.

Room temperature terahertz detector integrated with 2D materials

Kai Zhang

Suzhou Institute of Nano-Tech and Nano-Bionics, CAS

Abstract: Terahertz (THz) detector is essential for applications in national security, next-generation communication, and biomedical diagnosis, driving an urgent requirement for the improvement of its $SWaP^3$ metrics—size, weight, performance, power, and cost. Conventional THz detectors are fundamentally constrained by material properties and band-structure-based photoresponse mechanisms, resulting in a room-temperature gap that limits the simultaneous achievement of broadband, high speed, and high sensitivity. Emerging two-dimensional materials, featuring rich band structures, nonlinear quantum transport, and excellent integration compatibility, offer great opportunities for THz optoelectronics. This talk presents our recent advances in: (1) room-temperature highly sensitive THz detectors combining novel mechanisms referring to antiferromagnetic weak localization, topological surface states, etc., as well as new device architecture as ultrashort channel and dual-gate engineering; (2) high-frequency THz detectors enabled by the integrations of van der Waals metal contact and all-dielectric metasurface lens; and (3) ultrafast THz detectors for THz wireless communications.

Biography: Professor Kai Zhang is Deputy Director of Suzhou Institute of Nano-Tech and Nano-Bionics (SINANO), Chinese Academy of Science (CAS). He received his PhD degree in applied physics from The Hong Kong Polytechnic University in 2011. Prior to joining SINANO in 2015, he experienced postdoc research in Massachusetts Institute of Technology and National University of Singapore, respectively. He was the recipient of the honor and awards of the CAS 100 Talents Program in 2015, Jiangsu 333 Talents Program in 2018, Excellent Scientists and Technologists Award by The Chinese Institute of Electronics (CIE) in 2018, Excellent Young Scholar by National Natural Science Foundation of China (NSFC) in 2019, Young Rising Star in Semiconductor Research by Journal of Semiconductors (JOS) in 2020, Nano Research Young Innovators (NR45) Award in 2021, First Prize of Innovation Award by China Association of Inventions in 2022, Distinguished Young Scholar by NSFC in 2023, and ICFM Frontier Materials Young Scientists Award in 2025. His research interests are in the areas of two-dimensional (2D) materials and optoelectronic devices, with research activities ranging from the controllable growth of narrow-gap 2D semiconductors (such as black phosphorus, topological materials) to the development of infrared & terahertz lasers and photodetectors. He has published over 150 peer-reviewed papers in Nature Mater., Nature Commun., Light Sci. Appl. etc., and holds 21 patents. He has given many Plenary/Invited talks in international conferences. He has been serving as the Executive Editor-in-Chief of Nano Apex, Editorial Board of Advanced Materials and Devices (Spring Nature), Frontier of Physics and TPC Chairs and Session Chairs in various conferences.

Hybrid integration of superconducting nanowire single photon detectors

Qingyuan Zhao

Nanjing University

Abstract: Over the past two decades, superconducting nanowire single-photon detectors (SNSPDs) – which utilize superconducting nanowires as the photodetector sensing elements – have been proven to be excellent detectors for the infrared wavelength range. Traditional SNSPD fabrication employs advanced semiconductor manufacturing processes, and significant breakthroughs have been achieved in areas such as thin-film materials, nanowire fabrication, and optical structure design. This report will introduce a fabrication methodology for the large-scale, reliable production of SNSPDs based on a hybrid integration approach, and, drawing on recent advancements, will elaborate on the additional performance and cost benefits offered by this hybrid integration scheme.

Biography: Zhao Qingyuan is a professor and doctoral advisor at the School of Electronic Science and Engineering, Nanjing University. He graduated with a bachelor's degree from the Department of Electronic Science and Engineering at Nanjing University in 2008, and subsequently pursued a combined master's and doctoral program in Radio Physics at the same university, earning his Ph.D. in Science in 2014. During his doctoral studies, he spent 17 months as a visiting scholar at the Massachusetts Institute of Technology (MIT); from 2014 to 2017, he returned to the MIT RLE Laboratory to conduct postdoctoral research for three years. In 2017, Zhao Qingyuan was recruited back to China through the Nanjing University Peak Talent Recruitment Program. His research interests include high-performance superconducting single-photon detectors and imaging devices, superconducting digital circuits, as well as the application and industrialization of these high-performance quantum devices.

III-V Semiconductor Based Nanostructures for High-Performance Infrared Photodetection and Imaging

Ziyuan Li

School of Optics and Photonics, Beijing Institute of Technology

Abstract: Infrared photodetection is in high demand for many applications such as free-space communications, night vision, and biomedical imaging. In recent years, III-V semiconductor-based nanostructures have drawn intensive attention for infrared photodetector applications due to their direct bandgap, unique optical and electrical properties, as well as flexibility to create heterostructures and/or grow on a foreign substrate such as Si. In this work, we demonstrate III-V nanostructure arrays as high-performance infrared photodetectors with multidimensional detection capabilities. GaAsSb nanowire arrays exhibit tunable spectral response in the visible and near-infrared dual bands, originating from strong resonance modes, showing potential for multispectral imaging. InAs nanowire and nanosheet arrays achieve an ultrawide room-temperature photoresponse from 500 to 3500 nm with a high responsivity exceeding 0.4 A/W at zero bias. Furthermore, on-chip integration of metasurfaces with the nanostructure arrays enables both linear and circular polarization-resolved detection. Our work demonstrates that III-V nanostructure arrays, through optimized material growth and geometry design, hold great promise for high-performance infrared photodetection with ultra-broadband, multispectral, and polarization-resolved capabilities.

Biography: Dr. Ziyuan Li received her PhD degree in Electrical Engineering from the University of New South Wales in 2013 in Australia. She is currently the associate professor in the School of Optics and Photonics at Beijing Institute of Technology (BIT), China. Her current research interests are in semiconductor nanostructure based optoelectronic devices, in particular for infrared photodetection and imaging applications. A/Prof. Li has published over 90 peer-review publications (69 SCI journal papers), 2 book chapters, and 8 patents. She has led multiple national-level projects, including the Young Scientists Fund and the General Program of the National Natural Science Foundation of China (NSFC). She was the receiver of the Australian Research Council Discovery Early Career Research Award (ARC DECRA) and the title of Excellent Innovation and Entrepreneurship Mentor in the Beijing Division of China International College Students' Innovation Competition 2024. She also delivered invited talks and/or served as a topic co-chair/session chair-person/early- and mid-career researcher committee member at more than 10 international conferences.

Broadband absorption limit of terahertz and infrared waves by nanofilms and its optoelectronic detection applications

Tao Zhao

University of Electronic Science and Technology of China

Abstract: TBD

Biography: TBD

Quantum Dot-based Intelligent Sensing and Imaging Systems

Ba Kun

Shanghai University

Abstract: Colloidal quantum dots (CQDs) feature prominent merits including size-tunable bandgap, facile integration with CMOS readout circuits and low fabrication cost, rendering them promising for both military and civilian applications. Nevertheless, limitations in carrier mobility and doping modulation substantially restrict their deployment in infrared photodetectors. This report addresses critical pathways to tackle these bottlenecks. It first introduces precise synthesis strategies for PbS CQDs to lay a material foundation for high-performance devices, then elaborates innovative designs of PbS CQD-based infrared photodetectors, and finally reviews progress toward multi-functionally integrated optoelectronic sensing chips and systems. Through in-depth analysis of these research topics, this report systematically discusses the scientific value and application prospects of PbS CQDs in advancing photodetection technologies and enabling next-generation imaging techniques.

Biography: Dr. Ba Kun, Associate Professor at the School of Microelectronics, Shanghai University, obtained his BSc from Zhengzhou University in 2014 and PhD from Fudan University in 2021. He then completed his postdoctoral research at the Institute of Chip and System Frontier Technologies, Fudan University. Targeting national major demands in intelligent sensing and precision detection, he conducts systematic research on dual-/multi-color photodetection integrated systems for synchronous multi-spectral feature acquisition, to realize accurate target recognition and tracking under highly integrated and complex environments. As first or corresponding author, he has published high-impact papers in journals including Nature Communications, Advanced Science, Materials Today, Applied Catalysis B: Environmental, ACS Catalysis, IEEE Electron Device Letters and Materials Today Electronics. He is the principal investigator of the Young Scientists Fund of the National Natural Science Foundation of China and the 17th Special Support Program for China Postdoctoral Researchers.

Infrared Upconversion Photodetector Based on Colloidal Quantum Dot

Wenjia Zhou

ShanghaiTech University

Abstract: Infrared-to-visible upconversion offers a promising route to infrared visualization by converting otherwise invisible radiation into visible emission that can be detected using conventional cameras. Colloidal quantum dots are attractive materials for this application because of their size-tunable infrared absorption, solution processability, and compatibility with heterogeneous device integration. However, achieving efficient upconversion while maintaining low background emission remains challenging. Herein, we report solution-processed optical upconversion photodetectors with a high photon-to-photon conversion efficiency of 6.5% and low turn-on voltages of 2.5 V. We also fabricated a large-area upconversion device of 3 cm × 3 cm with an equivalent pixel scale over seven million. Finally, we extended the upconversion wavelength range to 2000 nm.

Encapsulation and beyond encapsulation of 2D semiconductors

Guichen Teng

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Two-dimensional (2D) semiconductors are widely regarded as promising candidates to overcome the scaling limitations of silicon-based technologies. Currently, research in 2D electronics has rapidly evolved from proof-of-concept single-device studies to wafer-scale fabrication, scale integration and "lab to fab" transition. Challenges related to stability and variability remain critical hurdles. Among various strategies, encapsulation has emerged as the most effective method to preserve device performance and shield against environmental degradation. However, encapsulation technology has received comparatively less attention than other aspects of 2D electronics. In this review, we present a comprehensive and forward-looking analysis of the encapsulation landscape for 2D electronics. We begin by examining the molecular-level degradation mechanisms of representative 2D materials, and then systematically summarize and categorize current mainstream encapsulation approaches into in-situ growth (both high- and low-energy routes), in-situ oxidation, and van der Waals (vdW) encapsulation. To address future integration challenges, we introduce the concept of "Encapsulation by Design", advocating for the development of tailored encapsulation schemes aligned with specific device functions and scalable manufacturing requirements. Further, we propose a concept of "Beyond Encapsulation", which redefines encapsulation not merely as a protective layer but as a multifunctional platform capable of enhancing and expanding the capabilities of 2D devices. Within this framework, we outline three emerging directions: 1) Encapsulation for material functionalization; 2) Encapsulation for further vdW technologies; 3) Encapsulation for monolithic 3D integration, which can encourage broader awareness of the multifunctional and transformative roles encapsulation can play in 2D field.

Advances in Optical Phased Arrays for Long-Range All-Solid-State Integrated Lidar and Communication

Kai Wei

Zhejiang University

Abstract: The growing demand for long-range, high-resolution, and rapidly reconfigurable optical sensing in Autonomous driving systems, low-altitude UAVs, and Earth and space applications, drives the development of compact and highly integrated solid-state LiDAR. Optical phased arrays (OPAs), featuring non-mechanical beam steering, high integration density, and fast beam agility, provide a promising platform for next-generation sensing and free-space optical communication (FSOC). However, conventional chip-scale OPAs are fundamentally constrained by limited optical power, aperture size, transmission loss, and large-scale phase-control complexity.

Here, we present recent advances in high-power optical phased arrays and their applications in long-range all-solid-state LiDAR and FSOC. At the device level, heterogeneous Si/SiN photonic integration is developed to enhance the power-aperture product while reducing optical loss. A 4096-element OPA with a 4×1024 architecture demonstrates a single beam divergence of 0.017°, and continuous-wave optical output power up to 1.5 Watts. OPA-based systems have demonstrated 1km FSOC at 1.25 Gbps and 10km target detection. These results highlight the potential of high-power, large-aperture photonic phased arrays as a scalable platform for future integrated sensing-and-communication systems.

Colloidal Quantum Dot Superlattice for Infrared Photodetectors and Light Emitting Diode

Zhijun Ning

ShanghaiTech University

Abstract: The bottom-up assembly of colloidal quantum dots (CQDs) into superlattice structures is attractive to leverage nanocrystal quantum features into films and optoelectronic devices. However, current CQD superlattice often requires tedious control of the assembly kinetics, and it suffers from either excessively long interfacial distances, which impede carrier transport, or facet fusion, which brings high defect density. These hinder CQD superlattice application in optoelectronic devices, where low defect density and large carrier diffusion lengths are essential. Herein, we developed a close and ordered packed infrared CQD superlattice netted by organic metal halogenide (QD@OMH), giving rise to a high carrier diffusion length (>250 nm). The superlattice-based infrared photodetectors achieve a responsivity of 0.663 A W^{-1} at 1560 nm and an order-of-magnitude reduction in noise current density, yielding a detectivity exceeding 10^{13} Jones. Furthermore, the infrared light-emitting diodes achieve a high radiance (22.4 W sr^{-1} m^{-2}) and an operational T_{90} lifetime exceeding 200 h under continuous operation at peak luminance.

Biography: Dr. Zhijun Ning is a tenured full professor at the School of Physical Science and Technology, ShanghaiTech University. His research focuses on optoelectronic conversion materials and devices. He has developed quasi-two-dimensional tin-based perovskite material systems for thin-film solar cells, and pioneered halide-ligand-based quantum dot inks as well as quantum dot device architectures with spatially graded electrical doping concentrations. His current research interests include the growth kinetics control of perovskite thin films, precise regulation of the surface and interface coordination structures of nanomaterials, AI-assisted design and fabrication of optoelectronic materials, and the architectural design and construction of solar cells and photodetectors. He has been named as Clarivate Highly Cited Researcher (Cross-Field category) and an Elsevier Highly Cited Researcher in Materials Science.

Research Progress of HgCdTe Two-color Detectors at Kunming Institute of Physics

Gang Qin

Kunming Institute of Physics

Abstract: Two-color infrared detectors can acquire target radiation information in two infrared wavebands simultaneously. They can effectively suppress background interference and enhance the anti-interference performance of target recognition, and are core devices in the field of infrared detection. Kunming Institute of Physics has long carried out research on HgCdTe two-color infrared detector technology, and has conducted systematic research on molecular-beam epitaxy (MBE) material growth, two-color device structural design, and focal-plane fabrication. In terms of materials, precise control of composition and thickness for HgCdTe heterojunction thin-films with different compositions has been realized, and key challenges such as stress-strain in heterojunction thin-films and the suppression of macroscopic surface defects have been resolved. At the device level, the structural design of n-on-p stacked devices has been optimized. Process bottlenecks including deep-mesa dry etching, surface passivation, and ion-implantation junction formation have been overcome. Two-color focal-plane including 640×512@20μm MW/MW, MW/LW, and 1280×1024@30μm SW/MW devices have been developed. To develop future MW/MW, MW/LW and LW/LW two-color detectors with higher device performance and smaller pixel sizes, NPN-structured HgCdTe two-color material and device technologies based on MBE extrinsic in-situ doping have been developed. NPN-structured prototype focal-plane devices of 640×512@20μm MW/MW and 256×256@30μm MW/LW have been demonstrated.

Biography: Qin Gang (male) is a Ph.D. candidate majoring in Electronic Information at Tsinghua University. He is a professor at Kunming Institute of Physics and serves as the Director of the Detector Chip Technology Research Department, State Key Laboratory of Infrared Detection. His main research interests cover molecular-beam epitaxy (MBE)-based HgCdTe thin-film material preparation technology, as well as novel-structure HgCdTe infrared focal-plane array (FPA) device technologies, including near-room-temperature operating devices based on extrinsic doping, dual-/multi-color devices, absorption-multiplication separated avalanche devices, and computational spectral devices. He has published more than 30 academic papers, among which over ten are indexed by SCI or EI. He holds more than ten authorized and pending invention patents, and has been awarded one Second-Class Provincial-Ministerial Science and Technology Progress Award.

Nonlinear Hall Responses in CsV_3Sb_5 toward Wireless Rectification

Shanshan Liu

Shanghai Institute of Technical Physics

Abstract: Nonlinear Hall transport offers a powerful probe of quantum geometry and symmetry breaking in correlated materials. Here, we investigate higher-order nonlinear responses in the quasi-two-dimensional Kagome superconductor CsV_3Sb_5, which hosts intertwined charge-density-wave, nematic, and superconducting orders. Second- to sixth-harmonic transverse responses are observed, and in the superconducting state, higher-harmonic peaks emerge near the critical current and disappear above Tc, consistent with nonlinear vortex dynamics. First-principles calculations show that chiral loop-current order generates sizable Berry-curvature quadrupoles near the Fermi level, providing a microscopic basis for the third-order response. The pronounced even-order nonlinear Hall response could enable AC-to-DC conversion, suggesting a potential route toward compact, antenna-coupled wireless rectifiers and high-frequency optoelectronic detectors.

Biography: Shanshan Liu received the B.S. degree in Physics from East China Normal University in 2015, and the Ph.D. degree in Physics from Fudan University in 2020. She subsequently conducted postdoctoral research at Fudan University (2020-2022) and National University of Singapore (2022-2026). She is currently a Professor at Shanghai Institute of Technical Physics, Chinese Academy of Sciences. Her research interests focus on low-dimensional magnetic and superconducting materials, quantum transport and related applications in infrared and microwave detection devices.

InP nanostructures and their optoelectronic devices

Xutao Zhang

Northwestern Polytechnical University

Abstract: Nanoscale optoelectronic devices are essential components of high-performance photonic integrated systems for applications in high-speed signal processing, optical interconnects, and sensing. However, conventional devices face significant challenges during miniaturization, including difficulties in heterogeneous integration, defect generation caused by lattice mismatch, and limited fabrication precision, which compromise device efficiency, response speed, and reliability. Selective-area heteroepitaxy offers an effective approach to overcome these limitations by precisely controlling the growth regions and interfacial properties. It can alleviate lattice-mismatch-induced strain and enable the growth of high-quality semiconductor nanostructures while simultaneously forming optical resonant cavities. The resulting optical confinement and cavity enhancement strengthen light–matter interactions and improve light absorption, thereby enhancing the responsivity and sensitivity of photodetectors. This strategy also provides a promising route toward the integration of high-performance light sources and photodetectors. Here, we present a multistep selective-area epitaxy strategy for constructing InP-based nanowires and cavity-enhanced photodetectors featuring high sensitivity.

Biography: Zhang Xutao, associate Professor and Doctoral Supervisor at the Flexible Electronics Research Institute, Northwestern Polytechnical University (NPU), and recipient of the NPU "Aoxiang New Star" program. He obtained his Ph.D. from the Shanghai Institute of Technical Physics, Chinese Academy of Sciences. From 2017 to 2018, he was a visiting scholar at The Australian National University. He joined NPU in 2019, with his research primarily focusing on nanoscale optoelectronic devices. Over the past five years, he has published more than 20 SCI papers as first author or corresponding author in leading journals, including Light: Science & Applications, ACS Nano, and Applied Physics Reviews. He has led some research projects, including the National Natural Science Foundation of China (NSFC) General Program, NSFC Young Scientists Fund, and key R&D projects under the Shaanxi Provincial Key Core Technology Program. He has received multiple awards, including the Category A Youth Project of the Shaanxi Natural Science Basic Research Program, Longwen Special Prize, and has been selected for the Shaanxi Provincial Science and Technology Innovation Team.

Mid-Infrared Fluoride Glass Optical Fibers and Devices

Changjun Xu

Northeast Normal University

Abstract: The mid-infrared band possesses abundant molecular vibrational absorption features and has important application value in fields such as spectral sensing, environmental monitoring, and advanced photonic technologies. Fluoride glasses, owing to their low phonon energy, broad mid-infrared transmission window, and excellent rare-earth doping capability, have become an important material platform for mid-infrared fibers and devices. This report will focus on the current status and frontier progress of mid-infrared fluoride glass fibers and devices, with emphasis on the composition and performance regulation of fluoride glasses, low-loss fiber fabrication, rare-earth-doped mid-infrared fiber lasers and amplifiers, and the development of novel devices such as microstructured fibers. At the same time, in light of key issues facing this field, including material stability, fiber loss, power scaling, and wavelength extension, it will discuss the future development trends and application prospects of mid-infrared fluoride fibers and devices.

TBA

Wenfu Zhang

Xi'an Institute of Optics and Precision Mechanics

Abstract: TBD

Biography: TBD

TBA

Jiang Tang

Huazhong University of Science and Technology

Abstract: TBD

Biography: TBD

Reversible Switching for Mid-Wave and Long-Wave Infrared Dual-Band Photodetection

Menglu Chen

Beijing Institute of Technology

Abstract: Dual-band infrared photodetection across the MWIR and LWIR is attractive for spectrally selective sensing and imaging. Yet realizing this functionality on QDs platforms remains very challenging, since the multilayer-stacking device architectures tuned by electrical bias suffer from interlayer coupling, dark current and limited scalability. Here, we report a straightforward alternative, a reconfigurable MWIR and LWIR dual-band photodetector based on a single absorbing layer of $HgSe_{0.1}Te_{0.9}$ ternary QD, by in-situ switching the dominant photoexcitation pathway between interband and intraband transitions. This reversible QDs doping and Fermi level modulation is tuned by QD surface ion exchange through microfluid. We demonstrate that the dual-band transition operates reversibly over 1,000 cycles, with switching frequency above 2 Hz at 200 K. This dual-band photodetector reaches peak specific detectivities of 2.0×10^9 Jones at 5 μm in MWIR interband mode and 5.7×10^8 Jones at 11 μm in LWIR intraband mode at 80 K. We further demonstrate 640 × 512 focal plane arrays operating in either interband or intraband modes with an operable pixel factor of 99.99%.

Biography: Dr. Menglu Chen became a Professor at School of Optics and Photonics, Beijing Institute of Technology in 2021. She obtained her B.S. at School of Gifted Young, University of Science and Technology in 2015. From 2015 to 2020, as a PhD student with Prof. Philippe Guyot-Sionnest, she started work on infrared colloidal quantum dot. She firstly systematically measured the energy band structures on mercury chalcogenide colloidal quantum dot, clarifying their electron transport behaviors. She achieved novel quantum dot device like intraband photodetectors, high-operating temperature homojunction photodetectors, long-wave and very long-wave infrared photodetectors. She obtained Yodh Prize(2019), Young Elite Scientist Sponsorship by CAST(2021)，Beijing Nova Program(2021)，Distinguished Young Scholars Overseas(2021)， IAAM Scientist Medal(2022), First Prize of the Provincial/Ministerial Invention Award(2024).

Manipulation of Carrier Dynamics in Narrow-Bandgap Semiconductors and Their Optoelectronic Devices

Qisheng Wang

Nanchang University

Abstract: The relaxation of non-equilibrium carriers in semiconductors is a core physical process that determines the photovoltaic conversion efficiency. In narrow-bandgap semiconductors, strong electron-phonon coupling typically causes hot-carrier relaxation losses exceeding 60%, constituting a major bottleneck to the Shockley-Queisser efficiency limit (~33%). This project takes lead selenide (PbSe), a prototypical narrow-bandgap semiconductor, as a model system and, starting from the manipulation of non-equilibrium carrier dynamics, explores new pathways to surpass the quantum efficiency limit. (1) Spatial confinement and hot-carrier regulation. Low-dimensional confinement structures are designed to exploit boundary-enhanced phonon scattering, creating a "phonon relaxation bottleneck" that effectively suppresses hot-carrier energy dissipation. Based on this strategy, short-wave infrared (SWIR) photodetectors achieve an external quantum efficiency (EQE) exceeding 100%. (2) Defect passivation for prolonged cold-carrier lifetime. Iodine is introduced to passivate deep-level traps such as selenium vacancies, thereby suppressing non-radiative Auger recombination. Pump-probe spectroscopy reveals that the cold-carrier lifetime is extended to the order of 10 picoseconds. In iodine-passivated PbSe mid-wave infrared (MWIR) devices, the EQE increases from 23.9% (unpassivated) to 83.7% at 4 μm wavelength. (3) Heterojunction band engineering and multi-field coupled regulation. PbSe-based heterojunction band structures are constructed, uncovering an interfacial "photon-electron-ion-defect" coupling mechanism. This enables active control over the entire process of generation, transport, and collection, leading to high-dynamic-range multiband photodetectors. This project advances the physical understanding of non-equilibrium dynamics in narrow-bandgap semiconductors and provides a multi-dimensional regulatory paradigm for breaking through traditional efficiency limits.

Biography: Prof. Qisheng Wang is a Professor and Doctoral Supervisor, a recipient of the National High-level Young Talent Program (Overseas), and currently serves as the Director of the Jiangxi Provincial Key Laboratory of Photodetection. He has long been dedicated to research on the physics and integration of semiconductor optoelectronic devices. He developed the world's first room-temperature mid-infrared photodetector based on PbSe single-crystal thin films, which have been widely promoted and applied across defense-related enterprises, state-owned institutions, and private-sector companies. Prof. Wang has published 24 SCI-indexed papers as first author (including co-first) and corresponding author (including co-corresponding) in prestigious journals, including Nature Communications, Science Advances, Advanced Materials (5 papers), Nano Letters (4 papers), ACS Nano (2 papers), Advanced Science, ACS Photonics, and Applied Physics Letters (4 papers). His total citations exceed 6,000, with an h-index of 36. He is also the authorized inventor of 15 national invention patents in China.

Broadband Infrared Photodetection and Emerging Optoelectronic Devices for Integrated Sensing and Computing

Hai Huang

Fudan University

Abstract: Photodetectors are essential for infrared sensing, imaging, and machine vision. Beyond broader spectral coverage and higher sensitivity, emerging applications increasingly demand the integration of sensing with memory and information processing. The rich physical processes in emerging materials and devices provide new opportunities to extend photodetection beyond conventional photoelectric conversion. In this talk, I will present our recent progress in photodetection based on the modulation of electronic, charge, and ionic states. By exploiting critical electronic phase transitions, weak optical perturbations can be converted into pronounced conductance changes, enabling sensitive broadband detection from the visible to the long-wave infrared, as well as blackbody radiation sensing. Optoelectronic charge modulation further enables optical signals to be detected, stored, and dynamically encoded through controllable charge states. In addition, ion–electron coupling and ion migration provide continuously tunable and nonvolatile photoresponses, enabling optoelectronic synaptic functions and in-sensor information processing. These studies illustrate a progression from broadband photodetection and signal amplification to memory and in-sensor computing, providing new opportunities for advanced infrared sensing and intelligent optoelectronic systems.

Biography: Hai Huang obtained his Ph.D. degree from the University of Chinese Academy of Sciences in 2018. From 2016 to 2020, he conducted doctoral and postdoctoral research in Stanford University / SLAC National Accelerator Laboratory (USA). Since 2021, he has been an associate professor in Institute of Optoelectronics at Fudan University, China. His research interest focuses on the novel low dimensional optoelectronic materials and devices, particularly the development of advanced photodetectors operating across a broad spectral range—from deep ultraviolet to mid- and far-infrared. He has authored more than 40 papers in SCI-indexed journals, which have garnered over 3,000 citations.

Dual-Band Colloidal Quantum Dot Focal Plane Array

Yunxiang Di

Fudan University

Abstract: Near-infrared (NIR) and short-wave infrared (SWIR) dual-band detection has emerged as a pivotal enabling technology in across diverse applications spanning material identification, biological diagnostics, and machine vision. Current dual-band device architectures based on vertically stacked photodetectors such as those employing two-dimensional materials or back-illuminated colloidal quantum dots (CQDs) remain constrained by limited large-area manufacturability and incompatibility with standard readout integrated circuits. Here, we report a top-illuminated p-i-n-i-p dual-band photodetector using two distinct sizes of solution-processed PbS CQDs, which enables bias-switchable spectral response between NIR and SWIR regimes. The device achieves a specific detectivity exceeding 1×1011 cm·Hz1/2·W−1 in both bands, with SWIR crosstalk of 0.5% and NIR crosstalk of 7.7%. The successful fabrication of a monolithic integrated 128×128 dual-band focal plane array showcases a functional dual-band infrared imager. This work establishes a scalable and silicon-compatible platform toward high-performance, low-cost dual-band infrared imagers.

Two-Dimensional Semiconductors based Broadband Photodetector for Neural Network Recognition

Zhigao Hu

East China Normal University

Abstract: Low-dimensional semiconductors exhibit extraordinary optoelectronic responses covering ultraviolet-visible-infrared-terahertz spectral bands, showing great promise for earth observation and space-borne optoelectronic systems. In this presentation, we will present our recent progress on two-dimensional optoelectronic semiconductors, including their band-structure engineering, polarization-coupled photoelectric effects, as well as prototype device performances for wide spectrum detection. We will also discuss key challenges and feasible pathways toward high-performance and broadband photodetector for neural network recognition. This work may provide insights for next-generation earth-and-space optoelectronic sensing hardware.

Biography: Zhi-Gao Hu is a professor and doctoral supervisor in Department of Physics, School of Physics, East China Normal University. He was selected as an excellent academic leader of Shanghai in 2014, and a special professor of Shanghai (Oriental Scholar) in 2014. His research interests include Optoelectronic functional materials and micro/nano devices; Two-dimensional semiconductors and electronic devices; Theoretical model of solid state spectroscopy and device designs. He has published over 200 peer-reviewed academic papers.

T2SL technology developments in MWIR band operating at high operating temperature

Donghai Wu

Institute of Semiconductors，CAS

Abstract: Infrared detectors are the core devices for sensing infrared information. They have advantages like all-weather operation, passive detection, long-range capability, and strong anti-interference ability, making them highly valuable in fields like national defense, aerospace, security and fire protection, and industrial inspection. One of the main challenges for the next generation of infrared detectors is how to further suppress dark current and noise, achieve near-room-temperature focal plane arrays, and reduce the detector's reliance on cooling systems. Type II superlattice (T2SL) materials are a new kind of intrinsic narrow-bandgap semiconductor that have emerged in recent years. They offer flexible structural design possibilities, and by customizing the superlattice band structure, the response spectrum can be tuned from the short-wave to the very long-wave range. This material system has good lattice stability, easy device uniformity, and its structure can be designed and controlled through 'band engineering' to suppress dark current and enable high-temperature operation detectors. In this report, we'll share some key recent progress in high-temperature detectors using Type II superlattices. High-operating-temperature MWIR nBn photodetector and FPA based on an InAs/InAsSb T2SL absorber and an AlSb/AlAsSb superlattice barrier have been demonstrated. A shallow mesa etching terminated below the barrier, together with composite passivation, effectively suppresses sidewall leakage and enables low dark current in both single-element and array devices. The FPA further enables discernible imaging of room-temperature human targets up to 230 K under f/2 optics with only two-point nonuniformity correction, while retaining imaging capability for a high-temperature soldering iron target at 300 K. These results demonstrate the promise of InAs/InAsSb T2SLbased nBn photodetectors and FPAs for compact, thermoelectrically cooled MWIR imaging with reduced cooling demand and high systemvperformance.

Biography: Dr. Donghai Wu received Ph.D. degree in Microelectronics and Solid-State Electronics from Institute of Semiconductors, CAS in 2008. After graduation, Dr. Wu joined Tsinghua Tongfang Co. Ltd, and worked as engineer, product manager and R&D director. He was responsible for the development of GaN-based high brightness LED products. From 2014 to 2020, Dr. Wu worked as a Research Assistant Professor at the Center for Quantum Devices of Northwestern University. His research interests include design, epitaxial growth, device fabrication and characterization of III-V semiconductor optoelectronic devices, such as quantum cascade lasers and infrared photodetectors. In Nov 2020, Dr. Wu joined Institute of Semiconductors, CAS as a full professor. Dr. Wu has authored/co-authored over 150 technical papers, published in refereed journals.

Mid-infrared single-photon upconversion spectroscopy based on temporal-spectral quantum correlation

E Wu

East China Normal University

Abstract: Mid-infrared (MIR) region is related to inherent characteristics of complex molecules' vibrations or rotational transitions. MIR spectroscopy constitutes an enabling tool in modern researches, such as biochemical research, clinical medicine, and material study.We reported a MIR frequency upconversion spectroscopy based on the temporal-spectral quantum correlation with single-photon sensitivity. The unique quantum features of the two-photon states pave the way for non-destructive and robust single-photon-level MIR spectroscopy. The temporal correlation inherited by the upconverted photons and the heralding photons greatly reduces the noise influence and improves the sensitivity in comparison with the classical MIR upconversion spectroscopy. In the experiment, the MIR photons span the wavelength range of 3.14-3.80 μm, resulting in a spectral detection window larger than 660 nm. Ultra-sensitive MIR upconversion quantum spectroscopy can be achieved with an incident MIR photon flux of 0.09 average photons per pulse, even when the pump-induced noise in the upconversion process is excessive to drown out the upconverted photons. Our results provide a platform, satisfying the long-awaited anticipation of MIR spectroscopy with single-photon sensitivity and non-destructive of radiation-sensitive subjects for numerous applications.

Biography: E Wu, Professor of State Key Laboratory of Precision Spectroscopy, East China Normal University. She has scored achievements in the research field of the single-photon generation, single-photon interference, single-photon frequency conversion and applications. She has demonstrated several single-photon sources based on the defects in diamond, SiC, and AlGaN covering the visible to the near infrared. She has achieved single-photon frequency upconversion for the near/mid-infrared and applications. She has more than 150 publications in SCI journals such as Science, Science Adv. and so forth. She has been awarded the Rao Yutai basic optics award, second prize of technology and invention award in Shanghai.

Infrared Visualization: From Monochromatic to Full-Color Upconversion

Ge Mu

Beijing Institute of Technology

Abstract: Infrared detecting and imaging technologies play an irreplaceable and vital role in fields such as national defense, industrial inspection, biomedicine, and autonomous driving. Infrared-to-visible upconversion imaging technology disrupts the traditional infrared imaging paradigm via a linear photon conversion mechanism. By directly coupling the infrared detection and visible light emission units, this technology circumvents the complex processes inherent in traditional focal plane arrays—such as electrical signal collection, integration, and amplification required by integrated readout circuits—thereby achieving hardware-level, real-time conversion from the infrared spectrum to visible light. We demonstrate a significant leap from monochromatic imaging to pseudo-color and true-color imaging from the perspective of spectral information display dimensions.

Biography: Assistant Professor, School of Optics and Photonics, Beijing Institute of Technology. Selected for the Young Talent Support Project of the China Association for Science and Technology in 2024. Presides over national-level research projects including the General Program and Youth Program of the National Natural Science Foundation of China, as well as the General Grant of the China Postdoctoral Science Foundation. As the first author or corresponding author, she has published more than 30 research papers in top journals such as Nature Photonics (2 papers, ESI Highly Cited Papers), Science Advances (2 papers, Cover Articles), Light: Science & Applications, PhotoniX, and Advanced Materials. She serves as the Youth Editorial Board Member for the journals PhotoniX and Chinese Optics Letters.

Band-Engineered Novel Blackbody-Sensitive vdW Infrared Detectors

Runze Sun

Hangzhou Institute for Advanced Study, UCAS

Abstract: Mid- and long-wave infrared detectors capable of blackbody response are widely employed in remote sensing, gas leak monitoring, and thermal imaging, yet their bulk counterparts require harsh fabrication processes and cryogenic cooling. Two-dimensional (2D) materials, free from dangling bonds and lattice mismatch, offer new opportunities for developing next-generation low-cost room-temperature infrared detectors. Nevertheless, most 2D detectors currently face challenges including narrow spectral response, high dark current, and a lack of blackbody response capability. In this work, we exploit band engineering to realize several types of 2D-material-based infrared detectors with blackbody response. First, to overcome the narrow spectral response at room temperature, we leverage the strong anharmonicity and low thermal conductivity arising from the phonon flat bands of Nb3I8, achieving sensitive bolometric responses extending up to 20 μm at room temperature. Second, to address the high dark current issue, we design a mid-wave infrared detector featuring a van der Waals complementary barrier structure. The fabricated device achieves a low dark current approaching the room-temperature Auger-7 limit and a blackbody detectivity as high as 9.21 × 109 cm·Hz1/2·W-1. Furthermore, we exploited the synergistic electron–phonon modulation enabled by the STO interface to enhance the device's mid-wave infrared photoresponse and long-wave infrared photothermal response. Our work paves the way for achieving high-performance room-temperature mid- and long-wave infrared detectors.

High-quality mid-wave infrared HgCdSe grown on GaSb substrates with molecular beam epitaxy

Zekai Zhang[1,2*], Wenwu Pan[2], Shuo Ma[2], and Wen Lei[2*]

School of Integrated Circuits, Jiangnan University

Department of Electrical, Electronic and Computer Engineering, The University of Western Australia

Abstract: Recenetly, mercury cadmium selenide ($Hg_{1-x}Cd_xSe$, MCS) has been proposed as an emerging infrared (IR) material for making next generation IR detectors with features of larger array format size and lower production cost [1-3]. Current high-performance IR technology is based on HgCdTe grown on lattice-matched CdZnTe (CZT) substrates which, however, suffers severe limitations, including low device yield, high cost, and limited array format size [4]. HgCdSe, a material having similar infrared capabilities to HgCdTe, is close lattice-matched with GaSb substrates (lattice mismatch of ~ 0.4%), which are readily available as epi-ready substrates with features of low cost, large wafer size (up to 6-inch diameter) and low defect density (as low as 500 cm^{-2} in terms of etch pit density) [1]. Thus, high-performance HgCdSe detectors on GaSb substrates could provide an effective solution to address the primary challenges confronted by current HgCdTe detector technology: high cost and limited array format size. Although some preliminary studies have demonstrated the feasibility of growing HgCdSe epilayers on GaSb substrate with molecular beam epitaxy (MBE) technique, the reported of HgCdSe epi-layers presented a poor crystal quality in terms of a larger full width at half maximum (FWHM, 110 to 250 arcsec) of the X-ray diffraction (XRD) in comparision to that of HgCdTe grown on CZT (typically≤60 arcsec). This work reports MBE-grown mid-wave infrared (MWIR) HgCdSe epilayers on GaSb (211) substrates with superior crystal quality (FWHM ~55 to 65 arcsec) which is comparable to that of HgCdTe on CZT. In additon, the optimal temperature window for growing HgCdSe on GaSb substrate was found to be ~ 10 °C, which is much wider than that of HgCdTe on CZT (~ 5 °C). The as-grown MWIR HgCdTe epilayer shows a minority carrier lifetime of ~1.2 μs and an electron mobility of 1.6×10^4 cm^2/Vs with a background electron concentration of 2.2×10^{17} cm^{-3} at 77K, see Figure 1[6]. Differented from the fragile featurtes of HgCdTe, the hardness of HgCdSe is 50% larger than that of HgCdTe with the similar bandgap[5]. Based on these material properties, one single pixel (600 μm * 600 μm) HgCdSe photoconductor devices were fabricared with 400 nm ZnS passivation laryer. Figure 2 shows the schematic sample structrue of HgCdSe photocondcutors and the XRD spectrum of the HgCdSe/ZnTe/GaSb sample used for making the photoconductors. Figure 3 shows the responsivity spectra of the HgCdSe IR photoconductors at 295 K and 77 K with 1mA bias current. The peak responsivity is up to around 40V/W and the cut-off wavelength is about 4.2 μm under 77 K measurement conditions. Combined with the noise level, which is measured to be around 2nV/$Hz^{0.5}$ level, the specific detectivity (D_λ^*) of this MWIR HgCdSe photoconductor is calculated to be 1.2 x 10^9 $\mathrm{cm} * Hz^{1/2}/W$ at 77 K. Considering this is our first effort without further research on postgrowth anneaing and device process optimation, these preliminary results indicate that HgCdSe grown on GaSb provdies a potential candiatdate material for making high performance IR detectors with features of larger array format and lower procudtion cost.

Track 2: Terahertz and Millimeter Waves

Sep.19 Saturday, Ya Mei Ballroom 1, 3F（三楼 亚美 1）	
Presider: Yiming Zhu, University of Shanghai for Science and Technology Dongwen Zhang, National University of Defense Technology	
13:30-13:55	Keynote Talk **Terahertz Wavefront Engineering with Active Metasurfaces** Yan Zhang, Capital Normal University
13:55-14:20	Keynote Talk **Quantum Cascade Lasers: Research Progress and Application Prospects** Junqi Liu, Ocean University of China
14:20-14:35	Invited Talk **Surface-Emitting THz Quantum Cascade Lasers via Valley-Edge Topological Cavities** Qi Qin, Shenzhen University
14:35-14:50	Invited Talk **Dynamic terahertz beam manipulation for communication and imaging applications** Jierong Cheng, Nankai University
14:50-15:05	Invited Talk **Research on High-Performance and High-Efficiency Photonic Terahertz Sensing and Communication Integrated System** Min Zhu, Southeast University
15:05-15:20	Invited Talk **Reconfigurable Terahertz Diffractive Spiral Zone Plates from Patterned Carbon Nanotube Films on Stretchable Elastomers for OAM and Focal Control** Nikolay Petrov, Harbin Institute of Technology/ITMO University
15:20-15:30	Oral Talk **A scalable platform for high-cooperativity and multi-mode ultrastrong plasmon–phonon coupling** Li Yu, Shanghai Institute of Technical Physics Chinese Academy of Sciences
15:30-15:45	Coffee Break
Presider: Yan Zhang, Capital Normal University Junqi Liu, Ocean University of China	
15:45-16:10	Keynote Talk **Terahertz Intelligent Diffractive Devices and Their Applications in Next-Generation Communications** Yiming Zhu, University of Shanghai for Science and Technology

16:10-16:35	Keynote Talk **Weak Temperature Dependence of Electron-Ion Coupling in Warm Dense Gold from Single-Shot Terahertz Time-Domain Spectroscopy** Dongwen Zhang, National University of Defense Technology
16:35-16:50	Keynote Talk **Research on thin-film-based micro-nano photonic devices** Shaowei Wang, East China Normal University
16:50-17:05	Invited Talk **Terahertz surface-emitting photonic devices for vortex beam generations and wireless communications** Song Han, Zhejiang University
17:05-17:20	Invited Talk **Terahertz heterogeneous integrated photonic devices** Xuecou Tu, Nanjing University
17:00-18:30	Poster Session
18:30-20:30	Banquet

Track 2: Terahertz and Millimeter Waves

Sep.20 Sunday, Ya Mei Ballroom 1, 3F（三楼 亚美 1）	
Presider: Hai Zhang, Harbin Institute of Technology Huabin Wang, Chongqing Institute of Intelligence	
08:30-08:55	Keynote Talk **High-Speed Terahertz Direct Modulation and Indoor Omnidirectional High-Speed Information Hub Technologies** Yaxin Zhang, University of Electronic Science and Technology of China
08:55-09:20	Keynote Talk **Terahertz photoacoustics and applications** Zhen Tian, Tianjin University
09:20-09:35	Invited Talk **Complex structured light manipulations enabled by metasurfaces and metasystems** Shulin Sun, Fudan University
09:35-09:50	Invited Talk **Combined Resonant Tunneling and Rate Equation Model for Room Temperature THz Quantum Cascade Lasers** Feihu Wang, Quantum Science Center of Guangdong-Hong Kong-Macao Greater Bay Area
09:50-10:05	Invited Talk **Quantum-Geometry Effect-for-Infrared and Terahertz Optoelectronics** Lin Wang, Shanghai Institute of Technical Physics
10:05-10:20	Invited Talk **Broadband Terahertz Comb Spectroscopy and Applications** Min Li, University of Shanghai for Science and Technology
10:20-10:30	Oral Talk **Transient Chirp Dynamics in Terahertz Quantum Cascade Lasers** Xianglong Bi, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences
10:30-10:45	Coffee Break
Presider: Zhen Tian, Tianjin University Shulin Sun, Fudan University	
10:45-11:10	Keynote Talk **Three-Dimensional Wide-Bandwidth Quantum Energy Truncation Terahertz Coherence Tomography** Hai Zhang, Harbin Institute of Technology

11:10-11:25	Invited Talk **Terahertz bio-detection of single proteinmolecules** Huabin Wang, Chongqing Institute of Intelligence
11:25-11:40	Invited Talk **Recent development of room temperature terahertz sources based on difference-frequency generation from mid-IR QCLs** Quanyong Lu, Beijing Academy of Quantum Information Sciences
11:40-11:55	Invited Talk **Design and Application of Carbon Nanotube Terahertz Metasurface Sensors for Trace Substance Detection** Yue Wang, Xi'an University of Technology
11:55-12:10	Invited Talk **Terahertz semiconductor laser chaos** Binbin Liu, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences
12:10-13:30	Lunch

Track 2: Terahertz and Millimeter Waves

Sep.20 Sunday, Ya Mei Ballroom 1, 3F（三楼 亚美 1）	
Presider: Min Li, University of Shanghai for Science and Technology	
13:30-13:45	Invited Talk **Optoelectronic Devices for Millimeter-Wave & Terahertz Generation and Detection** Feiliang Chen, University of Electronic Science and Technology of China
13:45-14:00	Invited Talk **On-Chip Light Field Manipulation with Metasurfaces: From Surface Waves to Vector Optical Fields** Zhuo Wang, Fudan University
14:00-14:10	Oral Talk **Multifunctional Vectorial Optical Field Generation with on-chip Metasurface** Shuai Du, Fudan University
14:10-14:20	Oral Talk **Millimeter-Wave/Sub-Terahertz Metadevices and Circuit Design: Progress and Perspectives** LePeng Zhang, Southeast University
14:20-14:30	Oral Talk **Quantum-Geometry-Enabled Terahertz Rectification in the Weyl Semimetal TaP** Wenqi Mo, Hangzhou Institute for Advanced Study, UCAS

Terahertz Wavefront Engineering with Active Metasurfaces

Yan Zhang

Capital Normal University

Abstract: Active metasurfaces overcome the passive limitations of conventional counterparts by incorporating tunable materials into subwavelength meta-atoms, enabling flexible terahertz wave manipulation. This talk proposes two types: a stretchable metasurface based on carbon nanotubes on silicone substrates, which achieves continuous focal length tuning (19.4 mm to 28.2 mm) and beam steering (−19.69° to −16.01°) via the Pancharatnam–Berry phase with excellent stability over 1,000 cycles; and an optically addressable programmable metasurface based on vanadium dioxide, which enables pixel-level independent encoding in a 50×50 array with full 2π phase modulation under patterned pulsed optical excitation, allowing a single device to simultaneously support a zoom metalens, focused vortex beam generation, and dynamic holographic imaging, with free switching among these functions by varying the pump beam intensity distribution. These results demonstrate that active metasurfaces offer a promising and versatile platform for next-generation terahertz wavefront engineering and reconfigurable photonic devices.

Biography: Zhang Yan, is a Professor in the Department of Physics at Capital Normal University. He serves as the Director of the Key Laboratory of Terahertz Optoelectronics, Ministry of Education, and the Beijing Key Laboratory for Metamaterials and Devices. He is a Fellow of Optica (formerly OSA). His research primarily focuses on terahertz spectroscopy and imaging, terahertz metasurface devices, and optical information processing. He has published over 300 papers in journals such as Nature Photonics, Nature Communications, and Physical Review Letters, with more than 14,000 citations on Google Scholar.

Quantum Cascade Lasers: Research Progress and Application Prospects

Junqi Liu

The State Key Laboratory of Physical Oceanography and the Faculty of Information Science and Engineering, Ocean University of China

Abstract: Quantum cascade lasers (QCLs) mark a groundbreaking advance and a key milestone in the development of semiconductor laser technology. Featuring a compact structure, high electro-optical conversion efficiency, and ultra-broad spectral tunability across the mid-infrared to terahertz band, QCLs have become core optoelectronic devices for high-precision spectral detection. Capitalizing on the unique molecular fingerprint absorption characteristics of mid- and far-infrared spectra, together with the inherent advantages of laser sources such as high sensitivity, high spectral resolution and fast response, QCL-based spectroscopy has evolved into a robust analytical technique. It enables precise, rapid and non-destructive detection, supporting widespread high-value applications including atmospheric environmental monitoring, industrial gas analysis, biomedical diagnosis, chemical component identification, and energy resource exploration. Accordingly, QCLs exhibit immense application potential and academic significance in the fields of optoelectronic sensing and analytical spectroscopy. This report summarizes our recent research progress achieved in high-performance QCL devices and their relevant applications.

Biography: Prof. Liu Junqi is a PhD supervisor and Professor at the Ocean University of China, also a concurrent research fellow at the Institute of Semiconductors, CAS. He obtained his PhD from the Institute of Semiconductors, CAS. His research focuses on infrared & terahertz semiconductor devices and quantum cascade lasers (QCLs) & detectors. He has achieved landmark innovations: developing the world's first practical room-temperature high-speed QCL and Asia's first GaAs/AlGaAs-based QCL, with a breakthrough of over 1 W terahertz QCL output power. He has led and undertaken more than 20 national key projects, published 200+ academic papers and applied for 40+ patents. He is a member of IEEE and other academic societies, a winner of the Second Prize of Beijing Municipal Technology Invention Award, engaging in cutting-edge optoelectronic research.

Surface-Emitting THz Quantum Cascade Lasers via Valley-Edge Topological Cavities

Qi Qin

City University of Hong Kong

Abstract: Terahertz quantum cascade lasers (THz QCLs) are promising compact sources for spectroscopy, imaging, and communications, but simultaneously achieving efficient surface emission, stable single-mode operation, and a well-shaped far field remains difficult. This talk presents a theoretical surface-emitting THz QCL combining a valley photonic-crystal cavity with a second-order distributed-feedback (DFB) grating. Armchair terminations intentionally introduce controlled intervalley backscattering, allowing valley edge states to form a Fabry-Pérot-like linear cavity, while periodic top-metal apertures provide distributed feedback and out-of-plane radiation. Three-dimensional finite-element simulations show strong interface localization and efficient surface outcoupling. Changing aperture width can reorganize the band structure and reverse the symmetry ordering of the band-edge modes, consistent with band inversion. In useful regimes, a lower-band-edge mode supports stable single-mode operation with calculated radiation efficiencies above 80% and divergence angles mostly around 9°. For narrow apertures, a central π phase shift converts the native double-lobed emission into a dominant on-axis lobe. The design demonstrates how engineered intervalley scattering can be exploited for confinement, mode selection, and beam shaping in active topological THz emitters.

Biography: Qi Qin received his B.S. degree in Physics from Nanjing University, and Ph.D. degree in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology. Before joining City University of Hong Kong, he was working in the industry in different roles. His research interests include semiconductor light sources, terahertz and mid-infrared quantum cascade lasers, integrated and topological photonics, optical phased arrays, LiDAR, and quantum sensing. His work broadly combines device physics, photonic integration, and system-level sensing, with an emphasis on developing compact, high-performance photonic devices and architectures for spectroscopy, communications, imaging, and advanced sensing.

Dynamic terahertz beam manipulation for communication and imaging applications

Jierong Cheng

Nankai University

Abstract: Terahertz waves serve as a core technical enabler for cutting-edge areas such as next-generation high-speed wireless communications, high-precision radar detection, and non-destructive security imaging. Nevertheless, THz radiation suffers from severe path loss and atmospheric attenuation during free-space propagation, which severely limits the transmission range and operational stability of THz systems. Accordingly, high-precision and dynamic manipulation of THz beam direction and wavefront morphology is critical to boosting beam gain, counteracting propagation losses, and ensuring stable THz information transmission under dynamic mobile scenarios. This report systematically investigates dynamic beam manipulation technologies for THz waves using liquid-crystal programmable metasurfaces. The developed THz modulation devices realize versatile wide-range and wide-band beam scanning. Furthermore, principle verification and feasibility demonstration are completed targeting typical application scenarios including high-speed wireless communications and single-pixel imaging.

Biography: Jierong Cheng, got a Ph.D. from Northeastern University in 2016, now works as a professor in Nankai University. At present, she is mainly engaged in the research of terahertz beam manipulation techniques and applications in 6G communications and imaging. In recent years, she has published more than 50 SCI academic papers in Laser & Photonics Reviews, Photonics Research and other journals. She holds 5 authorized national invention patents and has authored one academic monograph. She was twice awarded the Second Prize of Tianjin Natural Science Award as a key participating member. She has presided over multiple National Natural Science Foundation projects, including the Excellent Young Scientists Fund, Key Program and General Program.

Research on High-Performance and High-Efficiency Photonic Terahertz Sensing and Communication Integrated System

Min Zhu

Southeast University & Purple Mountain Laboratory

Abstract: The terahertz frequency band, due to its abundant spectrum resources, is widely regarded as an important candidate frequency band for future 6G. Photonic terahertz, with its inherent advantages such as large bandwidth and wide range of frequency adjustment capabilities, demonstrates great potential for large-capacity communication and high-precision sensing. However, the integration of communication and sensing is urgently driving the design of integrated waveform and system architecture. Most existing terahertz communication-sensing integrated systems are facing serious time-frequency competition, such as low time-frequency efficiency of communication-sensing waveforms and low utilization rate of system hardware architecture. This report will mainly share the progress in improving the time-frequency efficiency of photonic terahertz communication-sensing integrated waveforms, using methods such as multi-carrier spectrum overlap, communication-sensing inter-embedding. Finally, the future research directions for high-time-frequency efficiency photonic terahertz communication-sensing integrated waveform design will be presented.

Biography: Professor, National Key Laboratory of Mobile Communications, Southeast University, and head of a research group at Purple Mountain Laboratory. He has received awards including the National Innovation Pioneers Award, First Prize in Shanghai Natural Sciences, Top Ten Scientific and Technological Achievements of the Chinese Communications Society, Gold Medal at the Geneva International Invention Exhibition, etc. He has published over 200 papers including more than 60 papers indexed in JCR Q1 and over 40 presentations at top-tier conferences in optical communications, OFC and ECOC. He has led two projects under the China Communications Standards Association (CCSA). He holds 8 international PCT patents and 30 authorized Chinese invention patents.

Reconfigurable Terahertz Diffractive Spiral Zone Plates from Patterned Carbon Nanotube Films on Stretchable Elastomers for OAM and Focal Control

Nikolay Petrov

Harbin Institute of Technology/ITMO University

Abstract: The development of compact, tunable elements for wavefront shaping is central to advancing terahertz (THz) light-field manipulation, particularly for the generation and control of vortex beams carrying orbital angular momentum (OAM). We present mechanically reconfigurable diffractive spiral zone plates (SZPs) fabricated from ultrathin films of single-walled carbon nanotubes (SWCNTs) on stretchable elastomer substrates. The SWCNT films are patterned using an aerosol chemical vapor deposition method combined with a dry, waste-free imprinting approach, which allows reliable reproduction of features down to 200 μm and enables scalable fabrication of continuous diffractive elements without additional lithography.

Two tuning mechanisms are integrated: radial stretching and azimuthal rotation. Stretching the elastomeric substrate alters the SZP period, thereby shifting the focal plane. For SZPs, a 12% strain shifts the focal position by up to 44% while preserving the generated OAM state. The SWCNT films exhibit exceptional mechanical robustness: after 1,000 stretch–release cycles at 0–10% strain, the peak intensity varies by less than 10%, and after 500 cycles at 0–20% strain the performance remains stable. In a bilayer SZP configuration, mutual rotation of the two layers introduces an additional phase difference, allowing fine modulation of the generated vortex field. Moreover, flipping one SZP inverts its topological charge, and the bilayer then operates as a mode switch: rotation redistributes the OAM spectrum rather than adding a uniform phase shift.

To characterise the vortex field without extra optical components, we employ single-beam multiple-intensity reconstruction (SBMIR). From the evolution of the intensity distribution along the propagation direction, the phase profile is retrieved iteratively, and the OAM spectrum is obtained by decomposition into angular harmonics. This phase-retrieval method works directly on the generated beam and avoids the need for Shack–Hartmann sensors, Dammann gratings, or log-polar converters.

The operational bandwidth of the SZPs extends far beyond a single frequency. Numerical modelling using the complex transmission spectrum of a 150-nm SWCNT film identifies a continuous working range from 215 GHz to 1.767 THz (more than three octaves) defined by the intersection of energy efficiency and OAM spectral purity criteria (deviation from maximum below 20%). The same SZP geometry is predicted to operate at the π-plasmon resonance in the ultraviolet, indicating that the concept can be scaled across the electromagnetic spectrum.

The combination of mechanical stretchability, rotational tuning, broadband operation, and simple fabrication from SWCNT films on elastomers makes these SZPs a versatile tool for THz vortex-field generation and adaptive wavefront control, with potential applications in imaging and communications.

A scalable platform for high-cooperativity and multi-mode ultrastrong plasmon–phonon coupling

Li Yu

Shanghai Institute of Technical Physics Chinese Academy of Sciences

Abstract: Hybrid light-matter quasiparticles, or polaritons, are foundational to next-generation photonic and quantum technologies; however, their practical application is strictly limited by a fundamental trade-off between interaction strength and optical loss. Here, we overcome this limitation using a scalable semiconductor platform that achieves ultrastrong coupling (USC) between surface plasmons and lattice phonons with exceptional coherence. By fabricating epsilon-near-zero (ENZ) nanocavities directly into high-quality crystalline III-V semiconductors, we preserve the material's intrinsic long-range atomic order, enabling a pristine phononic response. This "crystal advantage" yields a normalized coupling strength (g/ω_0) of up to 0.28 and a cooperativity ($2g/\gamma_{avg}$) exceeding 14—a sevenfold improvement over previous systems based on disordered materials. Our top-down fabrication approach compresses the optical mode volume by five orders of magnitude below the diffraction limit while remaining compatible with mature 80-nm-node semiconductor manufacturing processes. Furthermore, we demonstrate the platform's versatility by realizing the simultaneous ultrastrong coupling of a single plasmon mode to multiple distinct phonon modes within a semiconductor heterostructure. This work establishes a new paradigm for low-loss on-chip polaritonics, opening avenues for mass-producible terahertz devices and the exploration of many-body quantum phenomena.

Terahertz Intelligent Diffractive Devices and Their Applications in Next-Generation Communications

Yiming Zhu

University of Shanghai for Science and Technology

Abstract: As large language models (LLMs) and 6G communications converge, intelligent hardware has become the limiting factor beyond software-level advances. Terahertz (THz) technology, key to high-capacity and low-latency 6G links, still relies on immature devices and infrastructure, and conventional electronic architectures cannot yet combine multifunctionality, compactness, and high-fidelity wavefront control. Here, we propose and develop a series of THz intelligent diffractive devices that transcend the fundamental limits of conventional electronic architectures by means of diffractive neural networks (DNNs). By incorporating multiple physical dimensions as independent manipulation degrees of freedom, we overcome the long-standing trade-off in functional multiplexing and achieve high-capacity, high-fidelity THz multiplexing within an exceptionally compact and structurally simple architecture. Furthermore, by extending the diffractive multiplexing framework to detachable, reconfigurable diffractive processors, we establish a scalable and modular paradigm for multifunctional diffractive computing that decouples functional design from underlying hardware constraints. We further demonstrate a high-security THz data-exchange communication framework enabled by polarization-selective DNNs, and validate the proposed intelligent THz devices in representative 6G application scenarios. Collectively, these works advance both the theoretical foundations and engineering capabilities of THz wavefront manipulation, and provide a versatile design paradigm for next-generation THz functional devices with strong potential for AI-driven 6G systems.

Biography: Professor Yiming Zhu is Vice Director of the Shanghai Key Lab of Modern Optical System and the Terahertz Technology Innovation Institute at the University of Shanghai for Science and Technology (USST), where he also serves as a "Youth Science and Technology Innovation Leader." A Ph.D. graduate of the University of Tokyo, he is recognized as a national "Young Yangtze Professor" and holds both the NSFC Outstanding Youth Foundation and the Special State Council Allowance. His work centers on THz instruments and radar systems for detection and sensing. He has published over 100 papers, more than 40 in Nature Communications, Science Advances, and Light Sci. & Appl.; nine are ESI highly cited. He has led over 20 national and provincial research projects. His honors include First-Class Technological Invention Awards from both the Ministry of Education and the Shanghai Municipal Government, and the Outstanding Youth Science and Technology Contribution Award. Professor Zhu heads several THz research programs and sits on the councils of major academic societies in THz. His group has reported mode splitting and Fano resonances in THz plasma devices, THz spectroscopy for biomolecule quantification, metasurface-based super-resolution imaging, and sparse algorithms for high-efficiency THz SAR imaging.

Weak Temperature Dependence of Electron-Ion Coupling in Warm Dense Gold from Single-Shot Terahertz Time-Domain Spectroscopy

Dongwen Zhang

National University of Defense Technology

Abstract: Warm dense matter (WDM), a state between condensed matter and hot plasma, occurs naturally in the interiors of large planets and small stars. The transient nature of this state when created in a laboratory, as well as the difficulties in probing the strongly coupled interactions between the electrons and the ions, make it challenging to develop a complete understanding of matter in this regime. The electron-phonon coupling of nonequilibrium WDM is a fundamental parameter for which various models and experimental data offer diverging predictions. Using single-shot terahertz time-domain spectroscopy, we measure the electric conductivity of warm dense gold with picosecond resolution. We find that the ions remain in their initial solid structure for several picoseconds, despite electron temperatures ranging from a few to several eV after the laser illumination. With the combination of state-of-the-art Two Temperature Model (TTM), we extract the electron-phonon coupling of warm-dense gold, which is weakly dependent on the peak of electron temperature from 2.2×10^{16} W m^{-3} $K^{-1}$to 5.0×10^{16} W m^{-3} $K^{-1}$for maximal specific energy density to 0.66 ±0.02 MJ/kg. This work demonstrates a new method for experimental exploration of the exotic properties of WDM and the accurate electron-phonon coupling can constraint advanced theories on WDM.

Biography: Dongwen Zhang received the Ph.D. degree in physics from the National University of Defense Technology, Changsha, China, in 2008. He is currently a Professor with the College of Science, National University of Defense Technology. His research interests include strong field physics, photon-based THz technology, time-resolved THz spectroscopy of ultrafast phenomena, and high-harmonic generation spectroscopy in condense matter.

Research on thin-film-based micro-nano photonic devices

Shaowei Wang

East China Normal University

Abstract: This talk presents our group's progress in the design, fabrication, and application of micro-nano photonic devices leveraging optical thin-film platforms. It will first cover our work on perfect absorber that achieve near-unity light trapping across visible to infrared bands. We then highlight our pioneering efforts in integrated narrow bandpass filters started from 2000. We have realized on-chip wavelength division device and high-resolution spectral sensors. They form the core of our miniaturized spectrometer prototype in 2007, which offer compact footprint, low power consumption, and CMOS-compatible fabrication, paving the way for micro spectrometer and applications in environmental monitoring, biomedical diagnostics, and industrial inspection etc. Furthermore, we discuss the interaction between low dimensional optical gain media (e.g., black phosphorus) and thin-film micro-cavities for developing micro-scale light sources. By integrating thin gain layers with high-Q film-based resonators, we demonstrate single mode and low-threshold lasing, and on-chip integrated light source chip with different wavelengths.

Biography: Shaowei Wang is a distinguished professor at State Key Laboratory of Precision Spectroscopy, East China Normal University. His research interests include field manipulation using metasurfaces, microcavity photonics, spectral chip, miniature spectrometer, and application of spectroscopy technology. He has published more than 120 journal (including Science Advances) papers and chapter for Handbook of Modern Coatings Technologies (published by Elsevier publisher). He got LU JIAXI Young talent award (2009), RAO YUTAI basic optical award (2007), National Natural science award (2014, 4th principal achiever), National Technological Invention Award (2011, 5th principal achiever), Shanghai Technological Invention Award (2020, 2th principal achiever & 2010, 7th principal achiever), Shanghai Natural science award (2007, 5th principal achiever) etc. (Please see https://faculty.ecnu.edu.cn/_s29/wsw/main.psp for more information).

Terahertz surface-emitting photonic devices for vortex beam generations and wireless communications

Song Han

College of Information Science & Electronic Engineering, Zhejiang University

Abstract: Integrated photonics are increasingly demanded in applications such as large-scale data centers, intelligent sensing, and next-generation wireless communications, where compact, multifunctional, and energy-efficient components are essential. Here, we present two strategies for surface-emitting photonic devices that can convert the in-plane guided THz wave to be beam-engineered free-space THz wave: 1. We develop a staged-annealing topological optimization (SATO) framework tailored for the design of integrated terahertz (THz) beam-shaping devices. 2. We construct topological leaky-wave antennas that can robustly function as highly collimated wireless communication links.

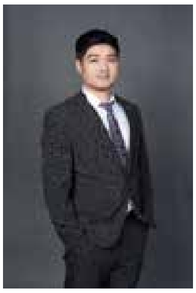
Biography: Dr. Han's research focuses on terahertz semiconductor devices and physics, photonic crystals and metamaterials, terahertz chip-integrated devices and systems. He has co-authored or served as a corresponding/first author on over 50 academic papers with citations >3000 and h-index 31. He holds one authorized international patent and two domestic patents. He has also led several research projects, including the National Key R&D Program Young Scientist Project, the Excellent Young Scientists Fund (Overseas), and a General Program of the National Natural Science Foundation of China

Terahertz heterogeneous integrated photonic devices

Xuecou Tu

Nanjing University

Abstract: With the advancement of silicon photonic chip manufacturing technology, silicon-based optoelectronic integration has made significant strides in areas such as optical detection, optical communication, and optical computing. Silicon-based optoelectronic integration offers valuable insights for terahertz chip technology research. By combining optical techniques and solid-state circuit technology, the developed terahertz waveguide integrated circuits can effectively reduce transmission losses and parasitic effects. This opens up new avenues for the realization of integrated high-speed terahertz devices and holds the potential to construct a new generation of terahertz communication architectures, thereby supporting the development of future terahertz communication systems. This presentation will focus on the design and fabrication of optical waveguide structures, such as silicon-based waveguides, and their application in the design and development of terahertz integrated devices. The goal is to achieve efficient transmission and control of on-chip terahertz signals. Furthermore, the presentation will explore the hybrid integration of active chips like Schottky diodes with functional silicon-based waveguide chips, aiming to enhance or expand the detection efficiency and functionality of terahertz detectors.



Biography: Xuecou Tu, a professor researcher at Nanjing University, is a distinguished member of the Dengfeng Talent Program, a national-level young talent, and an outstanding youth talent in Jiangsu Province. He serves as the Executive Deputy Director of the Jiangsu Key Laboratory of Advanced Electromagnetic Wave Regulation Technology. His research primarily focuses on THz integrated photonic devices. His achievements have earned him two provincial and ministerial-level awards. As the first or corresponding author, he has published multiple papers in prestigious journals such as Nature, with over 1,000 citations. Four of his papers have been recognized as ESI Highly Cited Papers. Additionally, he holds more than 30 authorized Chinese invention patents. This presentation will mainly report on the progress made in silicon-based waveguides and integrated terahertz devices.

High-Speed Terahertz Direct Modulation and Indoor Omnidirectional High-Speed Information Hub Technologies

Chunyang Bi, Sen Gong, Yaxin Zhang

University of Electronic Science and Technology of China

Abstract: Terahertz communications offer ultra-wide bandwidth and ultra-high-speed transmission capability, and are an important direction for future high-speed communications. For practical terahertz communication systems, high-speed and low-complexity signal modulation remains a key challenge. The strong directivity of terahertz wireless links and their limited indoor coverage also need to be addressed. This presentation will introduce our recent progress in high-speed terahertz direct modulation and indoor omnidirectional high-speed communication systems. For high-speed terahertz amplitude modulation, we developed a direct modulation technology based on Schottky diodes. At 0.2 THz, a transmission rate of 140 Gbit/s with PAM-4 modulation was achieved. We also realized a DSP-independent point-to-point wired real-time transmission system operating at 112 Gbit/s with PAM-4. For high-speed indoor wireless access, we further proposed an omnidirectional high-speed information hub technology. Using a terahertz omnidirectional antenna, 360° coverage was achieved with a system transmission capacity of 30 Gbit/s. These results provide a new approach to reducing the complexity of terahertz communication systems, improving indoor high-speed wireless coverage, and supporting future ultra-high-speed indoor wireless networks.

Biography: Yaxin Zhang is a Professor and Ph.D. supervisor at the University of Electronic Science and Technology of China (UESTC). He is currently Dean of the School of Aeronautics and Astronautics at UESTC and Executive Dean of the Sichuan Institute of Unmanned Aerial Vehicles. He has been selected for a national leading talent program. His research interests include terahertz meta-RF chips and devices, and high-speed terahertz communication and networking for unmanned aerial vehicles.

Terahertz photoacoustics and applications

Zhen Tian

Tianjin University

Abstract: The application of terahertz waves in biomedicine faces the challenge of strong absorption by biological systems, which represents the major bottleneck for further utilization of terahertz waves in the field of bioelectromagnetics. To overcome these limitations, we have developed a series of terahertz radiation sources and terahertz photoacoustic technologies. These approaches enable biomedical detection and testing without invasive sampling or chemical labeling, thereby providing an in vivo method to measure the concentrations of biomolecules—particularly in blood—in real time, while simultaneously allowing for real-time in vivo determination of protein chirality (L-/D-proline). This method offers a new potential solution for terahertz biomedical applications.

Biography: Zhen Tian, Chair Professor, Doctoral Supervisor, and Optica Fellow, currently serving as the Director of the Degree Office at Tianjin University and the Head of the Optical Engineering discipline at Tianjin University. He has presided over projects such as the National Natural Science Foundation of China (NSFC) Excellent Young Scientists Fund and Key Program, as well as the Tianjin Outstanding Youth Fund. His research focuses on terahertz photonics, micro/nano photonics, and photoacoustic optics. He has published over 100 papers in journals including Nature Communications and Advanced Materials, with an h-index of 48. Related achievements have been awarded the First Prize of Natural Science by the Ministry of Education and the Tianjin Youth Science and Technology Award.

Complex structured light manipulations enabled by metasurfaces and metasystems

Shulin Sun

Fudan University

Abstract: The ability to arbitrarily manipulate the fundamental properties of optical fields on demand is not only of profound scientific significance but also holds great promise for applications in information communication, optical imaging, and security detection. However, conventional optical field control devices based on natural materials typically operate through refractive or diffractive effects, which often suffer from drawbacks such as bulky footprints, low efficiency, and poor integrability. In recent years, metasurfaces have emerged as a powerful platform for optical field manipulation, enabling subwavelength-scale control over light's properties. Nevertheless, previous metasurfaces still face challenges such as limited functionality and constrained efficiency. In this report, we present our recent progress in optical field manipulation enabled by on-chip metasurfaces and metasystems, including efficient wavefront shaping, generation and reconstruction of vector beams, and manipulation of high-order vortex optical fields.

Combined Resonant Tunneling and Rate Equation Model for Room Temperature THz Quantum Cascade Lasers

Feihu Wang

Quantum Science Center of Guangdong-Hong Kong-Macao Greater Bay Area

Abstract: Terahertz quantum cascade lasers (THz QCLs) serve as compact coherent light sources covering the 1–5 THz spectral range, enabling widespread applications in security screening, non-destructive imaging, high-speed communication, astronomical detection and biomedical spectroscopy. Despite decades of development, room temperature continuous-wave operation of THz QCLs remains a critical challenge. From a modeling perspective, state-of-the-art simulation tools including the non-equilibrium Green's function method and density matrix formalism deliver high physical fidelity but impose prohibitive computational costs, while traditional semi classical rate equation models neglect coherent resonant tunneling across thick injection barriers and produce unphysical current spikes that deviate from experimental measurements. In this talk, I will present a unified extended CRTRE model that balances computational efficiency and accuracy for both III–V and group-IV THz QCLs. By extending the model to $Ge/Si_xGe_{1-x-y}Sn_y$ heterostructures and optimizing a two-well structure, we theoretically predict room-temperature THz QCL operation. The model provides a high-speed design tool for developing high-performance, silicon-compatible room-temperature THz sources.

Biography: Feihu WANG, Researcher and Scientist at the Quantum Science Center of Guangdong-Hong Kong-Macao Greater Bay Area, National-level Excellent Young Scientist, Guangdong Outstanding Young Scientist. His research focuses on fundamental-physics investigations and device development of quantum-cascade lasers. He received his bachelor's degree from Huazhong University of Science and Technology and carried out his doctoral research at the École Normale Supérieure de Paris and Sorbonne University in France. He previously held academic appointment at Northwestern University (USA) and Southern University of Science and Technology (China). To date, he has published over 30 papers in journals including Optica, Light: Science & Applications, Nature Communications, Laser & Photonics Reviews, Physical Review Applied etc. and has set several performance records for quantum-cascade lasers.

Quantum Geometry Effect for Infrared and Terahertz Optoelectronics

Lin Wang

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Quantum geometry consists of quantum metric and Berry curvature, describe the geometric structure of Bloch electronic states. Their measurable effects depend on the P-T symmetry of quantum materials, invoking great interests in exploring nonlinear quantum phenomena among different materials system such as nonlinear Hall effect, higher-order harmonic generation, as well as electromagnetic harvester from microwave, terahertz and infrared band. This talk will introduce the recent progresses on Berry-curvature and quantum-metric dipole induced nonreciprocal quantum transport and nonlinear electromagnetic effect, as well as extrinsic mechanisms that lead to the nonreciprocal effect. We will discuss the opportunities for the development of quantum geometry-based diode without incorporating any semiconductor junctions that limit the threshold voltage or transit time for high-frequency electronics, and thus open up a new route towards broadband mixing, rectification, and frequency-comb in a single chip.

Biography: Lin Wang, a Professor at Shanghai Institute of Technical Physics, Chinese Academy of Sciences. He received the B. S. degree in Applied Physics (with honors) from Zhejiang University of Science and Technology, Hangzhou, China, in 2008, and the Ph. D. degree in Microelectronics and Solid-State electronics (with honors) from SITP in 2013. He is a member of AAAS, Chinese Physical Society, serving as young Editor's member for Journals such as Research, Exploration, Fundamental Research etc. Wang's research group is dedicated to the physics, nanophotonics and ultrafast phenomena of topological materials, 2D and quantum materials in far-infrared and terahertz band. He has authored approximately 100 peer-reviewed research articles in various journals including Nat. Electronics, Nat. Commun., Sci. Adv., Nano Lett. etc. which have been cited more than 4,000 times.

Broadband Terahertz Comb Spectroscopy and Applications

Min Li

University of Shanghai for Science and Technology

Abstract: Broadband terahertz combs have great application potential in high-resolution molecular spectroscopy, frequency metrology, and precision ranging, but their development has long been constrained by phase noise, intensity noise, and comb linewidth. Recently, we proposed a new passive nonlinear frequency noise suppression method based on soliton self-frequency shift combined with spectral filtering, which solves the problem of suppressing broadband high-frequency noise and extends the coherent band to the terahertz region. We developed a new fast-frequency-swept asynchronous sampling technique, achieving a bandwidth of 0.05–4 THz, a comb linewidth on the order of sub-Hz, and a frequency stability of 8.6×10^{-14} at 1 s, enabling high-precision broadband terahertz comb spectroscopy that can effectively resolve 36,000 comb lines. On this basis, we constructed a terahertz time-of-flight ranging system, improving the terahertz ranging accuracy to the sub-μm level. These advances provide new technical solutions for the study of broadband, low-noise, high-precision terahertz comb spectroscopy systems and are expected to promote their applications in precision spectral analysis, terahertz metrology, industrial inspection, and high-precision sensing.

Biography: Min Li, an associate professor at the University of Shanghai for Science and Technology, has long been engaged in research on precision terahertz comb spectroscopy. She has published more than 30 SCI papers in related fields, and has applied for and been granted over 20 invention patents related to precise control of terahertz optical fields and spectral acquisition.

Transient Chirp Dynamics in Terahertz Quantum Cascade Lasers

Xianglong Bi

Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences

Abstract: Laser frequency chirp is a ubiquitous dynamical process in semiconductor lasers, vital for frequency- modulated photonic systems. In the mid-infrared (MIR) and terahertz (THz) ranges, quantum cascade lasers (QCLs) are ideal sources with high power, narrow linewidth and compact size. While chirp dynamics in MIR QCLs have been studied, the transient chirp behavior of THz QCLs—particularly the thermal chirp on microsecond to millisecond timescales—remains largely unexplored. Here, we experimentally investigate transient thermal chirp dynamics in single-mode THz QCLs via an on-chip heterodyne scheme. Twin monolithically integrated single-mode QCLs are used: one pulsed QCL as the device under test, and one continuous-wave (CW) QCL serving as both local oscillator (LO) and ultrafast THz detector. The frequency chirp is mapped to the radio-frequency (RF) domain by heterodyne down-conversion. By varying current and temperature, we observe three distinct chirp features: unidirectional down-chirp, V-shaped chirp, and unidirectional up-chirp. A two-node thermal model reproduces the dynamics with good agreement with experiments. Chirp dynamics in the multi-mode regime are also identified, showing the potential for sensitive dynamic spectral characterization. These findings deepen the understanding of THz QCL thermal chirp mechanisms and support applications in THz frequency combs, frequency-modulated continuous-wave (FMCW) radar, and high-speed coherent communications.

Three-Dimensional Wide-Bandwidth Quantum Energy Truncation Terahertz Coherence Tomography

Hai Zhang

Harbin Institute of Technology

Abstract: We report a quantum energy truncation terahertz coherence tomography technique that enables highly localized extraction of molecular-species-specific THz responses. The method exploits resonant photon loss when the emitter THz energy matches molecular vibration quanta. Reflected THz radiation is recorded and mapped into depth-coded image sequences, from which subsurface structural information and molecular fingerprints are retrieved to construct three-dimensional tomograms. This approach resolves major limitations of conventional continuous-wave (CW) THz imaging-namely, its lack of spectroscopic specificity and dependence on angular scanning-by directly correlating molecular excitation spectra with depth information. As a result, quantum energy truncation terahertz coherence tomography enables rapid. three-dimensional THz imaging with selective sensitivity to discrete molecular quantum energy transitions. providing new opportunities for nondestructive characterization of material refractive indices, molecular composition, and subsurface structures.

Biography: Hai Zhang is a full professor at Harbin Institute of Technology and an adjunct professor at Laval University. He received his Ph.D. degree from Laval University, Canada, in 2017. His research interests include infrared thermography, three-dimensional photothermal coherent tomography, terahertz imaging, non-destructive evaluation of composite materials, cultural heritage inspection, and biomedical imaging. He has published numerous peer-reviewed papers in international journals and conferences and serves as an editor or reviewer for several international journals, including Infrared Physics & Technology, Measurement, and Quantitative InfraRed Thermography Journal.

Terahertz bio-detection of single protein molecules

Huabin Wang

Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences

Abstract: Terahertz (THz) technology has attracted increasing interest worldwide. In the past years, much progress has been made in THz biomedical research. However, it is a challenge to detect biomolecules at the single-molecule level with THz, which is crucial for single-molecule biophysics. In this presentation, the speaker will share the work made by his group in the study of biomolecules with a super-resolution THz spectral imaging instrument, termed THz s-SNOM. The presentation mainly includes the background of THz bio-detection, the principle of THz s-SNOM, THz nanoscopy of single proteins, the morphology reconstruction of biomolecular structures from their THz images, as well as the imaging of single protein machine in an aqueous solution with THz.

Biography: Prof. Wang received his Ph.D. degree in Inorganic Chemistry from Shanghai Institute of Applied Physics, Chinese Academy of Sciences in 2008. After graduation, he worked for 6 years at the School of Chemistry, University of Melbourne, Australia. In 2014, he took a professor position at Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences. In 2021, he established the Center of Super-resolution Optics and has been appointed as the director for this center. His major research areas include THz near-field instruments, THz spectroscopy and imaging, and atomic force microscopy. He presided over more than ten important scientific research projects including the National Key Research and Development Program of China and the National Natural Science Foundation of China. He has authored/co-authored ~100 scientific articles published in PNAS, ACS Nano, Biotechnology Advances, etc. He has been honored as an Excellent Scientist for THz Biophysics of China (2021) and the China's State Council Special Allowances Expert (2023).

Recent development of room temperature terahertz sources based on difference-frequency generation from mid-IR QCLs

Quanyong Lu

Beijing Academy of Quantum Information Sciences

Abstract: Terahertz sources based on quantum cascade lasers (QCLs), as an type of emerging solid-state emitter of terahertz radiation, have garnered significant attention in numerous application fields such as medicine, sensing, and communication. GaAs-based terahertz QCLs has been able to emit high power up to watt level when cryogenic cooling is applied. Terahertz sources based on difference-frequency generation (DFG) from mid-IR QCLs on the other hand provides a room temperature solution. In this talk, I will introduce the history and future for terahertz sources based on DFG QCLs and discuss our recent progress on monolithic frequency tuning of 2.5-4THz for room temperature THz sources based on DFG QCLs.

Biography: Quanyong Lu received his doctoral degree from Institute of Semiconductors, Chinese Academy of Sciences. He joined Northwestern University as Postdoctoral Researcher and then Research Assistant Professor in 2010 to 2020. He was a Senior RD-chip Engineer in Applied Optoelectronics Inc. in 2020-2021. He joined Beijing Academy of Quantum Information Sciences (BAQIS) in November 2021.His has many achievements in semiconductor laser sources, including the first continuous wave THz semiconductor source based on on-chip difference frequency generation (2014), the first room temperature semiconductor THz comb (2019), the highest power mid-IR single mode laser (2020) and the highest power mid-IR laser array (2019). He has published more than 80 refereed journal publications in Nature Communications, Light Science & Applications, etc.

Design and Application of Carbon Nanotube Terahertz Metasurface Sensors for Trace Substance Detection

Yue Wang, Yizhuo Fan

Xi'an University of Technology

Abstract: Carbon nanotube-based terahertz metasurface trace substance sensing offers the advantages of label-free detection and rapid response, but is limited by issues such as the cumbersome modification of carbon nanotube sensors, difficulties in detecting multiple targets in complex samples, and the complexity of preparing chiral metasurfaces. This report focuses on a series of studies on terahertz metasurface sensors based on carbon nanotube films. Through chemical modification and physical doping, trace detection of serum amyloid A at the femtomolar level has been achieved. We proposed polarization-tunable resonant modes to enable molecule-specific recognition based on multimodal terahertz fingerprint spectroscopy. By combining antibody-functionalized interfaces with multichannel microfluidics, the parallel, highly selective quantitative detection of multiple tumor markers in complex samples has been achieved. In addition, we constructed a non-chiral patterned chiral metasurface to perform polarization-resolved quantitative detection of lactate enantiomers. This series of studies—ranging from ultrasensitive trace detection and molecular-specific recognition to parallel multi-target analysis in complex systems, and further to polarization sensing using chiral metasurfaces—has established a systematic, multidimensional, and highly selective terahertz biosensing approach, effectively advancing the field from fundamental validation toward practical applications in complex systems.

Biography: Yue Wang, Professor, PhD Supervisor, PhD graduated from Harbin Institute of Technology, Leading Talent of Young and Middle-aged Scientific and Technological Innovation in Shaanxi Province; Leader of Young Innovation Team in Universities of Shaanxi Province; High-Level Talent of Xi'an University of Technology. Listed in the World's Top 2% Scientists List, and recipient of the 2024 Wiley Outstanding Contribution Award for Chinese Authors. His research mainly focuses on photonics of carbon nanomaterials in the terahertz band, physics of functional devices based on artificial metamaterials, and their applications in biochemical sensing. In the past five years, he has presided over and participated in a number of key research projects, including the Key Program and General Program of the National Natural Science Foundation of China, Key Projects of Shaanxi Province, Key Program of Shaanxi Natural Science Foundation, and Shaanxi Provincial Innovation Team Project. He has published more than 100 SCI-indexed papers, including 7 cover/back cover papers and 4 ESI highly cited papers. He has won 2 Second Prizes of Provincial Natural Science Award and been granted 20 national invention patents.

Terahertz semiconductor laser chaos

Binbin Liu

Shanghai Institute of Microsystem and Information Technology

Abstract: In the terahertz (THz) range, due to the lack of effective THz light sources, chaos generation in THz semiconductor lasers, e.g., quantum cascade lasers (QCLs), is particularly challenging. Here, we experimentally demonstrate THz chaos sources based on a sole multimode THz QCL without any external perturbations. Such a dynamical regime is characterized by the largest Lyapunov exponent of the measured radio frequency signal of the laser. The experimental results are confirmed by our simulations based on effective semiconductor Maxwell-Bloch Equations. Furthermore, a reduced model based on two coupled complex Ginzburg-Landau equations is derived to systematically investigate the effects of the linewidth enhancement factor and group velocity dispersion on the chaotic regime. It is found that the chaos generation in the THz QCL is ascribed to the defect-mediated turbulence. Our findings pave the way for the generation of controllable and integrated THz chaos sources, as well as potential applications.

Biography: Dr. Binbin Liu received her B.S. from Central South University in 2019 and her M.S. from Shanghai Jiao Tong University in 2022. In September 2025, she earned her Ph.D. from the Shanghai Institute of Microsystem and Information Technology (SIMIT), Chinese Academy of Sciences (CAS). Her research primarily focuses on terahertz (THz) optical frequency combs and chaotic dynamics. Specifically, her work includes developing physical models for the self-mode-locking of THz quantum cascade laser (QCL) frequency combs, broadband THz QCL dual-combs, chaos generation, and the realization of THz tri-comb sources. Dr. Liu has published 11 peer-reviewed journal articles, including four in prestigious journals such as Nature Communications, Laser & Photonics Reviews, ACS Photonics, and Physical Review Applied. Additionally, she holds one authorized national invention patent and was recently selected for the prestigious 2026 Postdoctoral Innovative Talent Support Program.

Optoelectronic Devices for Millimeter-Wave & Terahertz Generation and Detection

Feiliang Chen

University of Electronic Science and Technology of China (UESTC)

Abstract: Photonic millimeter-wave and terahertz (mmW/THz) technology relies on high-frequency, large-bandwidth optoelectronic devices for signal generation and detection, holding broad application prospects in high-speed communications, high-resolution radar, and high-precision sensing. By tuning the wavelength difference between two continuous-wave lasers, a widely tunable, ultra-low-phase-noise mmW/THz source can be obtained using a photomixer; likewise, an optoelectronic mixer enables heterodyne coherent reception of mmW/THz signals, offering significant performance advantages in bandwidth, sensitivity, and integration. We have developed nanoscale air-channel photomixers based on InGaAs and Si/Ge, achieving mmW/THz generation covering an ultra-wide frequency range from DC to 400 GHz. We have also fabricated Fe-doped InP-based InGaAs photoconductive mixing detectors, which realize down-conversion heterodyne detection and direct intensity detection of terahertz signals beyond 260 GHz. These works provide core device support for photonic-electronic converged mmW/THz application systems.

Biography: Feiliang Chen is a researcher at University of Electronic Science and Technology of China. He received his Ph.D. from the Shanghai Institute of Technical Physics, Chinese Academy of Sciences. His main research interests include novel nano-air-channel high-frequency optoelectronic devices, optoelectronic-integrated millimeter-wave and terahertz information technology, semiconductor room-temperature single-photon sources, and novel optical quantum encryption and authentication technologies. He has published over 70 papers in journals such as Adv. Funct. Mater., ACS Nano, and has been granted over 30 invention patents. He serves as a reviewer for dozens of journals including Nat. Commun., Adv. Mater., Optica, and APL.

On-Chip Light Field Manipulation with Metasurfaces: From Surface Waves to Vector Optical Fields

Zhuo Wang

Institute of Optoelectronics, Fudan University, Shanghai, China

Abstract: On-chip devices have become a central component of integrated photonic systems and are widely employed in applications such as super-resolution imaging, optical manipulation, and sensing. Among these applications, the efficient decoupling and combining of surface waves to generate arbitrary vector optical fields is of critical importance. However, conventional diffractive elements, including gratings and periodic scatterers, often suffer from large footprints, low efficiency, and severe crosstalk. In this work, we propose a novel metasurface design strategy based on surface-wave excitation, enabling the efficient conversion of surface waves into far-field vector beams in the terahertz regime. Utilizing geometric-phase metasurfaces, we design a meta-atom with a low polarization conversion ratio to effectively balance wavefront fidelity and radiation efficiency. By interleaving two metasurfaces that independently decouple different spin states in a chessboard-like arrangement and employing orthogonally circularly polarized out-of-plane reference beams, arbitrary and complex vector optical fields can be generated. Experimental results demonstrate that the proposed metasurface devices can achieve multifunctional outputs at the operating frequency, including unidirectional radiation, focusing, vector Bessel beams, and vector holography. The devices exhibit an absolute efficiency of up to 90%, significantly outperforming conventional diffractive elements and waveguide-based metasurfaces. This work provides a practical route toward highly integrated terahertz photonic devices and holds great potential for advanced applications in augmented reality (AR), communications, displays, and image multiplexing.

Biography: Dr. Zhuo Wang received his B.Sc. in 2015 from the School of Physics and Materials Science, Anhui University, China, where he was recognized as an Outstanding Graduate. He earned his Ph.D. in Theoretical Physics from Fudan University, China, in 2020, also receiving the Outstanding Graduate honor. He continued his research as a postdoctoral fellow in the Department of Physics at Fudan University. In 2025, he joined the Academy for Advanced Interdisciplinary Studies (Future Information Innovation Institute), Fudan University, as an Assistant Professor. His research interests include metamaterials, metasurfaces, micro-nano optics, two-dimensional materials, and photodetectors.

Ultifunctional Vectorial Optical Field Generation with on-chip Metasurface

Shuai Du

Fudan University

Abstract: On-chip multifunctional manipulation of electromagnetic (EM) wave is crucial for developing compact photonic devices. While conventional EM devices are hindered by bulky sizes and limited functionality, metasurfaces offer unprecedented EM-control capabilities. Here, we will present a general scheme for designing on-chip terahertz (THz) metasurfaces that efficiently generate multifunctional far-field vectorial optical fields (VOFs) under surface-wave excitation from multiple input ports. By Integrating different phase mechanism, the metasurfaces enable independent phase manipulation of two orthogonal polarization components, thereby allowing the generation of multiple VOFs. These composite-phase metasurfaces achieve versatile SW-PW conversion, such as dual-directional beams, dual-focusing beams and multifunctional VOFs. This work establishes a novel on-chip platform for generating complex vector fields, laying the foundation of numerous integration-optics applications.

Millimeter-Wave/Sub-Terahertz Metadevices and Circuit Design: Progress and Perspectives

LePeng Zhang

Southeast University

Abstract: Millimeter-wave and sub-terahertz bands feature unique advantages including abundant spectrum resources and short wavelengths, making them prime candidate frequency bands for 6G integrated sensing and communication, high-precision radar and high-speed wireless communications. For the aforementioned applications, high-performance radio frequency devices and front-end circuits have become critical hardware foundations that urgently need breakthroughs. Electromagnetic metamaterials enable flexible manipulation of the amplitude, phase and polarization of electromagnetic waves via artificial microstructures, offering a brand-new technical route to break the performance bottlenecks of conventional devices. Integrating metamaterial mechanisms with the co-design of radio frequency circuits is expected to improve the overall performance of high-frequency devices and circuits.

This presentation briefly reviews the development history of metadevices and circuits, and focuses on the research progress achieved by our team in the design of millimeter-wave and sub-terahertz metadevices and circuits. Relevant innovative achievements are introduced, including SSPP-based rotating traveling-wave oscillators, novel sub-terahertz antennas, and large-scale highly integrated terahertz phased arrays. Prospects for the future development of millimeter-wave and sub-terahertz metadevice and circuit design are also discussed.

Quantum-Geometry-Enabled Terahertz Rectification in the Weyl Semimetal TaP

Wenqi Mo

Hangzhou Institute for Advanced Study, UCAS

Abstract: Terahertz (THz) detection and frequency conversion are key technologies for next generation wireless communication, spectroscopy, and imaging. However, conventional room temperature THz detectors still face a trade-off among speed, sensitivity, bandwidth, and integration. Thermal detectors usually suffer from slow heat relaxation dynamics, while semiconductor rectifiers and Schottky barrier devices are often limited by parasitic capacitance and responsivity roll-off at high frequency. In this work, we develop a junction free THz rectifier based on the type-I Weyl semimetal tantalum phosphide (TaP), using its intrinsic quantum geometry as the active detection mechanism. Owing to the noncentrosymmetric crystal structure of TaP, the Berry curvature near Weyl nodes is distributed asymmetrically in momentum space, producing a finite Berry curvature dipole and enabling second order nonlinear Hall rectification of an oscillating THz field into a direct photocurrent without external bias. High quality TaP crystals were synthesized by chemical vapor transport and characterized by structural, chemical, and nonlinear optical measurements. First principles calculations confirm Weyl nodes close to the Fermi level and reveal strongly localized Berry curvature and a nonzero Berry curvature dipole, which provide the microscopic origin of the observed nonlinear response. The fabricated devices integrate exfoliated TaP flakes with Au bow tie antennas and h-BN encapsulation, allowing efficient concentration of the incident THz field while maintaining a clean channel. Under THz irradiation, the device exhibits a clear polarization dependent photocurrent consistent with the symmetry allowed Berry curvature dipole tensor. Broadband zero bias response is obtained from 0.04 to 0.53 THz, covering the millimeter wave and sub-THz regions. At room temperature, the responsivity remains on the order of 10-2 A/W, and the transient response shows a rise time of approximately 0.95 us and a fall time of 0.68 us, indicating a nonthermal and fast rectification process. Cooling to 77 K further enhances the responsivity by more than one order of magnitude. Beyond direct detection, the intrinsic second order nonlinearity of TaP enables THz heterodyne mixing. When radio frequency and local oscillator signals are co-incident on the detector, the device down converts them to an intermediate frequency output through difference frequency generation. The TaP mixer achieves an instantaneous intermediate frequency bandwidth exceeding 20 GHz and a conversion gain up to 25 dB at room temperature. These results establish Berry curvature dipole driven rectification in Weyl semimetals as an efficient route for compact, high performance THz detectors and mixers, offering a promising platform for future 6G-band wireless communication and topological optoelectronics

Track 3: Remote Sensing and Space Exploration

Sep.19 Saturday, Noah Room 6, 3F（三楼 诺亚会议室 6）	
Presider: Fengming Hu, Fudan University	
13:30-13:55	Keynote Talk **Research progress of radiance temperature standard of benchmark infrared remote sensing** Xiaopeng Hao, Tsinghua University
13:55-14:10	Invited Talk **Quartz-enhanced laser spectroscopy gas sensing technology** Yufei Ma, Harbin Institute of Technology
14:10-14:25	Invited Talk **Paradigm Exploration for Infrared Hyperspectral Imaging Instruments** Chunlai Li, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
14:25-14:40	Invited Talk **On-Orbit Radiometric Calibration and Radiometric Reference Transfer of Satellite Infrared Instruments Using the Moon** Yunzhao Wu, Purple Mountain Observatory, Chinese Academy of Sciences
14:40-14:55	Invited Talk **High-Performance Optical Fiber Distributed Acoustic Sensor (DAS)** Bin Pan, Nankai University
14:55-15:05	Oral Talk **Scalable Multi-Pixel Tunable-Tc NbN MKIDs at 4 K: Enabling Cost-Effective Terahertz Detection for Remote Sensing, Space Exploration and Quantum Photonics** Yao Ting, Gusu Laboratory of Materials/Suzhou Rysview Terahertz Technology Co,. Ltd
15:05-15:20	Coffee Break
Presider: Yunzhao Wu, Purple Mountain Observatory, Chinese Academy of Sciences	
15:20-15:35	Invited Talk **Recursive 3D Phase Unwrapping: Towards Weak Prior Model in Multi-temporal SAR Interferometry** Fengming Hu, Fudan University
15:35-15:50	Invited Talk **Intelligent perception of infrared images** Ruiheng Zhang, Beijing Institute of Technology

15:50-16:05	Invited Talk **High-Performance Optical Fiber Distributed Acoustic Sensor (DAS)** Jun He, Shenzhen University
16:05-16:20	Invited Talk **TBA** Ping Zhu, Shenzhen University
16:20-16:35	Invited Talk **Tianwen-2 mission: From laboratory to remote sensing observations** Pengfei Zhang, Institute of Geochemistry, Chinese Academy of Sciences
16:35-16:45	Oral Talk **Spectral imaging for the outer solar system: Missions, instruments and current challenges** Yizhi Du, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
17:00-18:30	Poster Session
18:30-20:30	Banquet

Track 3: Remote Sensing and Space Exploration

Sep.20 Sunday, Noah Room 6, 3F（三楼 诺亚会议室 6）	
Presider: Kemi Xu, Beijing Institute of Technology	
08:30-08:55	Keynote Talk **Compact, Highly Reliable, Radiation-Tolerant Fiber Optic Gyroscopes for Spacecraft** Ningfang Song, Beihang University
08:55-09:10	Invited Talk **A 500-600 GHz Spectrometer for Deep Space Exploration** Haotian Zhu, National Space Science Center, the Chinese Academy of Sciences
09:10-09:25	Invited Talk **Imaging Techniques and Future Application Developments of the CHASE (Xihe) Solar Imaging Spectrometer** Qiang Liu, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences
09:25-09:40	Invited Talk **Intelligent Infrared Perception from Image Restoration to Small Target Detection and RGB-T Tracking** Hanlin Qin, Xidian University
09:40-09:50	Oral Talk **From Infrared to Radio waves in the Environmental Domain** Simona Niculescu, University of Brest/Institut Universitaire Français (IUF)
09:50-10:00	Oral Talk **Identification of Potential Extraterrestrial Materials and Endmember Inversion Based on 266nm Deep-Ultraviolet Raman Spectroscopy** Haotian Xu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
10:00-10:15	Coffee Break
Presider: Kemi Xu, Beijing Institute of Technology	
10:15-10:30	Invited Talk **Improving LST monitoring from space: conceptual design of a multi-angle thermal infrared satellite sensor** Biao Cao, Beijing Normal University
10:30-10:45	Invited Talk **Surface Chemical Engineering and Extreme-Environment Protection for Spacecraft** Songtao Lu, Harbin Institute of Technology

10:45-11:00	Invited Talk **Infrared Astronomy: Advances in Detectors, Observations, and Precision Measurement** Zhuoyue Hu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
11:00-11:10	Oral Talk **Lunar SAR-to-Optical Image Translation for Permanently Shadowed Region Exploration** Tong Xia, Fudan University
11:10-11:20	Oral Talk **Martian Geomorphic Feature Mapping with a Multi-Granular Dynamic Aggregation Transformer** Yonggang Xiong, Tongji University
11:30-13:30	Lunch

Track 3: Remote Sensing and Space Exploration

Sep.20 Sunday, Noah Room 6, 3F（三楼 诺亚会议室 6）

Presider: Luning Li, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

13:30-13:55	Keynote Talk **Single photon & single-photon detector and applications** Kemi Xu, Beijing Institute of Technology
13:55-14:10	Invited Talk **Alternating Multi-scale Stochastic Differential Equations for Accelerated Inverse Problem Solving** Weiwen Wu, Sun Yat-sen University
14:10-14:25	Invited Talk **Embodied Intelligence in Unstructured Environments** Weiying Xie, Xidian University
14:25-14:35	Oral Talk **Image Deblurring via Frequency Learning** Xintian Mao, East China Normal University
14:35-14:45	Oral Talk **Chemometric Analysis of Martian LIBS Data Using Deep Learning and Pretrained-Model-Based Transfer Learning** Zhicheng Cui, Key Laboratory of Space Active Opto-electronics Technology, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
14:45-14:55	Oral Talk **SRRN: A Compact Spectral Residual Refinement Network for Multispectral-to-Hyperspectral Reconstruction of Mars CRISM Data** Lu Lu, Tongji University
14:55-15:05	Oral Talk **Research on Key Technologies and Retrieval Models for Water Ice Information Extraction from Chang'e-7 Infrared Spectral Imaging** Peizheng Liu, Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Research progress of radiance temperature standard of benchmark infrared remote sensing

Xiaopeng Hao

Tsinghua University

Abstract: Aerospace infrared remote sensing technology plays an important role in obtaining global space -time information such as climate research, meteorological forecasting, and homeland security, etc. The precise and quantitative temperature is the most critical in the quantitative parameters of aerospace infrared remote sensing. This report systematically introduces the National Institute of Metrology aim at the problem of radiance temperature tracing for aerospace infrared remote sensing payload laboratory and standard blackbody on satellite in simulated aerospace environment, establishes the radiance temperature measurement standard for aerospace infrared remote sensing payload, implements a new system of radiance temperature tracing for aerospace infrared remote sensing payload, reaches the leading international level, and solves the problem of high precision temperature tracing for aerospace infrared remote sensing payload in China; In allusion to the global problem that the brightness temperature of blackbody on the satellite cannot be verified after entering orbit, and in order to solve the tremendous challenge of 0.1K uncertainty of aerospace infrared radiation measurement proposed by climate change research, we should break through the key technology of miniature phase change fixed point in orbit temperature calibration and emissivity in orbit measurement, realize the space reference blackbody of on orbit self-calibration, and ensure the long-term effectiveness of on orbit application values. This technology will be applied to operational remote sensing satellites for the first time in the world, breaking the key technologies of the orbit temperature calibration and emissivity in orbit measurement of micro -phase transformations, realize the aerospace reference blackbody of in orbit self calibration, and ensure the long-term effectiveness of in orbit application value. This technology will be applied to operational remote sensing satellites for the first time in the world.

Biography: Xiaopeng Hao, Chief Researcher of the State Key Laboratory of Precision Measurement Technology and Instruments, Tsinghua University; Winner of the National Science Fund for Distinguished Young Scholars; Leading Talent of the State Administration for Market Regulation. His research focuses on the mechanism, dissemination methods and key technologies of infrared remote sensing radiometric standards. He has presided over and participated in research projects including the National Key R&D Program of the Ministry of Science and Technology, 863 Program projects, National Natural Science Foundation projects, and research programs funded by the State Administration for Market Regulation. As the first author and corresponding author, he has published more than 100 papers and holds over 20 authorized invention patents. He has won three First Prizes of the Science and Technology Award from the Chinese Society for Measurement. He serves as a member of the Working Group on Climate Change and Environment of the Consultative Committee for Thermometry, International Bureau of Weights and Measures, and the Working Group on Climate and Environment of the World Meteorological Organization. He also holds committee or director positions in multiple important academic organizations in this field, such as the National Space Metrology Technical Committee, the Thermal Infrared Remote Sensing Committee and the Calibration Committee of the Chinese Association for Remote Sensing Application, and the National Metrology Technical Committee for Meteorological Special Measuring Instruments. He is an editorial board member of Infrared and Laser Engineering and Acta Metrologica Sinica.

Quartz-enhanced laser spectroscopy gas sensing technology

Yufei Ma

Harbin Institute of Technology

Abstract: Quartz tuning fork (QTF) is originally used to provide the clock rate in crystal watches, timers and electronic circuits. Standard commercial QTFs possess a resonance frequency of 32.768 kHz and a Q-factor of ~10000 in a standard atmosphere pressure. The unique quadrupole structure of a QTF provides an excellent immunity to environment interference. Photoacoustic spectroscopy (PAS) is identified as an advanced technique for trace sensing. In traditional PAS, a microphone is used as an acoustic wave detector. A recent improvement of microphone-based PAS is quartz-enhanced photoacoustic spectroscopy (QEPAS) technique. This technique uses a low cost, commercially available mm sized piezoelectric QTF as an acoustic wave detector which possesses a high detection sensitivity and immunity to ambient acoustic noise. In this presentation, the latest research progress of our group in QEPAS sensing field will be discussed. It main includes diode laser, quantum cascade laser, EDFA amplified diode laser and solid state laser based QEPAS techniques. The long distance, quasi-distributed measurement will also be discussed.

Biography: Yufei Ma received his PhD degree in physical electronics from Harbin Institute of Technology, China, in 2013. From September 2010 to September 2011, he spent as a visiting scholar at Rice University, USA. Currently, he is a professor at Harbin Institute of Technology, China. He is an Optica Fellow and the winner of National Outstanding Youth Science Fund. His research interests include optical sensors, trace gas detection, laser spectroscopy, solid-state laser and optoelectronics. He has published more than 200 publications and given more than 50 invited presentations at international conferences. He serves as area editor for Elsevier Photoacoustics and Wiley Microwave and Optical Technology Letters, associate editor for Optics Express, SPIE Optical Engineering. He also serves as topical editor for Optics Letters and Chinese Optics Letters.

Paradigm Exploration for Infrared Hyperspectral Imaging Instruments

Chunlai Li

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Infrared hyperspectral imaging is a high-end scientific instrument that non-invasively acquires the infrared "fingerprint spectrum" of materials, endowing each pixel of an image with continuous spectral information. It plays an indispensable role in Earth remote sensing, deep space exploration, and dynamic process observation. At its core, infrared hyperspectral imaging is a problem of synchronous acquisition of four-dimensional information—temporal, spatial, spectral, and energetic. However, sensor chips are limited to three-dimensional physical acquisition (two spatial dimensions plus one temporal dimension). Conventional architectures, including dispersive, Fourier-transform, filter-based, and division-of-aperture systems, all rely on scanning, modulation, or spectral band switching to achieve physical dimensionality reduction, making it difficult to simultaneously obtain complete hyperspectral data and dynamic synchronous observation. This report reviews the development trajectory and major technical architectures of infrared hyperspectral imaging, and presents our team's research achievements in dispersive imagers, full-spectrum multimodal spectrometers, division-of-aperture multi-channel imagers, and aperture-coded computational optical systems. Building on these foundations, we propose a novel "integrated sensing and cognition" paradigm for infrared hyperspectral instruments. Rather than treating complete data reconstruction as a necessary intermediate step, this paradigm acquires multidimensional effective information on demand for scientific cognition, and achieves synchronous, distortion-free acquisition of four-dimensional information through the deep integration of sensing and cognition. This work provides a new developmental pathway for next-generation high-end infrared spectral instruments and next-generation space intelligent perception devices.

Biography: Chunlai Li is a Professor and Ph.D. supervisor at the Shanghai Institute of Technical Physics, Chinese Academy of Sciences (SITP, CAS), and an adjunct professor at the Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences. He is a recipient of the Excellent Young Scientists Fund (Category A) of the National Natural Science Foundation of China in the field of scientific instruments. His research focuses on space optoelectronic information acquisition and intelligent data processing. He has published 13 papers in top-tier instrumentation journals as first or corresponding author, and holds more than 20 authorized invention patents as the first inventor. He serves as the chief scientist of key programs under the Basic Strengthening Plan of the Science and Technology Commission, and as the principal investigator of key national R&D programs.He led the development of China's first airborne thermal infrared hyperspectral imager (ATHIS), which has been deployed in large-scale applications. He has received four provincial- and ministerial-level science and technology awards, and was honored as an

Outstanding Contributor to the Chang'e-4 Mission by six national ministries and commissions. He has been selected as an Outstanding Member of the Youth Innovation Promotion Association of CAS, Shanghai Young Science and Technology Talent, Shanghai Top-notch Talent.

On-Orbit Radiometric Calibration and Radiometric Reference Transfer of Satellite Infrared Instruments Using the Moon

Yunzhao Wu

Purple Mountain Observatory, Chinese Academy of Sciences

Abstract: On-orbit radiometric calibration of infrared instruments is essential for quantitative remote sensing, yet some instruments lack stable onboard blackbody references. Unlike ground-based calibration, the Moon has no atmosphere, stable surface thermophysical properties, large temperature range, and can be repeatedly observed under different illumination and viewing geometries, making it well suited as a spaceborne infrared radiometric reference. For lunar-based infrared calibration, a long-wave infrared thermal emission model was developed by accounting for the thermal emission anisotropy caused by surface roughness, with surface roughness and directional emissivity incorporated to characterize lunar thermal emission under different viewing geometries. The model shows good agreement with observed brightness temperatures across five phase angles (R^2 = 0.96; RMSE = 5.59 K). Mid-wave infrared radiation (e.g., 2.5-5μm) contains both reflected solar radiation and lunar thermal emission. An empirical mid-wave infrared lunar model was established to characterize mid-wave infrared irradiance of the Moon at different phase angles. Lunar spectral information was used to separate reflected and thermal components, enabling radiometric reference transfer to GF-4/IRS. Thermal emission accounts for more than 83% of the lunar radiation in the 3.5–4.0 μm band. GF-4/IRS radiance shows a highly linear relationship with DN values (R^2 = 0.99; RMSE = 0.1528 W m^{-2} μm^{-1} sr^{-1}), with a radiometric transfer uncertainty below 5%. These results demonstrate that lunar thermal emission can serve as a stable spaceborne radiometric reference for on-orbit calibration and inter-satellite radiometric reference transfer for both MIR and TIR bands.

Biography: Yunzhao Wu is leading the Planetary spectroscopy group at Purple Mountain Observatory (PMO), Chinese Academy of Sciences (CAS). He received Ph.D. from Nanjing university in 2005. His research interests are solar system exploration using planetary remote sensing and spectroscopy, mainly including: 1) Reflectance and thermal emission spectroscopy of the Moon and asteroids; 2) photometric model of the moon and asteroids; 3) Satellite calibration using the Moon.

High-Performance Optical Fiber Distributed Acoustic Sensor (DAS)

Bin Pan

Nankai University

Abstract: TBD

Biography: TBD

Scalable Multi-Pixel Tunable-Tc NbN MKIDs at 4 K: Enabling Cost-Effective Terahertz Detection for Remote Sensing, Space Exploration and Quantum Photonics

Yao Ting

Gusu Laboratory of Materials/Suzhou Rysview Terahertz Technology Co,.Ltd

Abstract: Microwave kinetic inductance detectors (MKIDs) offer high sensitivity, intrinsic frequency-division multiplexing, and a natural route to large-format cryogenic detector arrays. We present a scalable multi-pixel MKID platform based on niobium nitride (NbN) thin films with controllable superconducting critical temperature (Tc), designed for practical operation around 4 K and for applications spanning terahertz detection, remote sensing, space science, and quantum photonics.
A key element of the platform is tunable NbN thin-film technology. By adjusting film deposition and fabrication conditions, the superconducting transition temperature and related electrodynamic properties can be engineered over a broad range, allowing the detector operating point to be adapted to different spectral bands, cryogenic environments, and application requirements. This tunability provides flexibility in balancing superconducting gap energy, kinetic inductance, resonator characteristics, quasiparticle response, and photon-detection threshold.
The detector platform is designed to operate with a variety of practical and cost-effective 4 K cryogenic architectures rather than relying on a single refrigeration scheme. It can be integrated with Dewar-based systems, Gifford-McMahon (GM) cryocoolers, and other cryogenic platforms capable of providing sufficient cooling power near the 4 K operating temperature. In parallel with detector development, substantial effort has been devoted to cryogenic system engineering, including long-term temperature stabilization, precision temperature control, ultra-low-temperature thermometry, thermal management, and suppression of mechanical vibration from cryocoolers and associated structures. These measures are important for maintaining stable superconducting resonator operation and reducing low-frequency disturbances in sensitive detector measurements. The resulting system architecture provides a practical alternative to more complex sub-kelvin superconducting detector systems, while retaining compatibility with different instrument configurations.
Scalability is another central feature of the technology. A modular fabrication and packaging process supports detector probes ranging from a single pixel to 271-pixel arrays, enabling both point detection and multi-pixel imaging. The resonator architecture allows multiple pixels to be frequency multiplexed on shared microwave readout lines, providing a direct route toward larger focal-plane arrays while limiting the growth of cryogenic wiring and readout complexity.
For terahertz applications, the platform is being developed for multi-pixel THz imaging as well as the detection and readout of ultrafast and high-field terahertz signals. Operation in the sub-terahertz and terahertz regimes, including frequencies around 0.5 THz, enables applications in remote sensing, astronomical instrumentation, Earth observation, atmospheric measurements, and space-science

experiments. The combination of scalable arrays, 4 K operation, multiplexed microwave readout, and flexible cryogenic integration is particularly attractive for instruments where detector sensitivity, system size, cryogenic complexity, vibration, and cost must be considered together.

The same NbN MKID platform can also be extended to visible and infrared photon detection. At higher photon energies, individual photon absorption produces measurable changes in the superconducting resonator response, providing a route toward photon-resolved detection. Combined with intrinsic frequency-division multiplexing and scalable array fabrication, this architecture is attractive for quantum photonics, photon-number-resolving detection, photonic quantum computing, and related quantum optical measurements. The overlap between astronomical photon detection and quantum photonics is particularly relevant, as both fields increasingly require low-noise cryogenic detectors, scalable arrays, multiplexed readout, and photon-resolved measurement capabilities.

Overall, this work presents a common superconducting detector platform integrating tunable-Tc NbN materials, scalable multi-pixel MKID arrays, practical 4 K cryogenic engineering, and multiplexed microwave readout. By combining 1-to-271-pixel fabrication, flexible low-cost 4 K refrigeration, precision thermal control, vibration suppression, terahertz imaging, ultrafast/high-field THz detection, and a pathway toward visible and infrared quantum-photonic detection, the platform provides a scalable technology route for remote sensing, space exploration, astronomy, and quantum photonics.

Recursive 3D Phase Unwrapping: Towards Weak Prior Model in Multi-temporal SAR Interferometry

Fengming Hu

Fudan University

Abstract: Multi-temporal SAR interferometry (MT-InSAR) is an effective tool for mapping deformation by using the phase between acquisitions obtained by slight different viewing angle. Since the phase unwrapping is ill-posed, a prior deformation model is required to decrease the phase gradient. However, the use of prior deformation model will significantly decrease the success rate of phase unwrapping, especially for non-linear deformation. In this work, the recursive 3D phase unwrapping with the assumption of weak prior deformation model is proposed. The initial time series is unwrapped with the prior deformation model while the following time series is unwrapped by using the temporal smoothing constraint. The experimental results by both the simulated and real data demonstrate that the recursive 3D phase unwrapping has a better performance in non-linear deformation retrieval. , which would be beneficial for identifying deformation risks.

Biography: Fengming Hu (Member, IEEE) received the B.E. and Ph.D. degrees from Tongji University, Shanghai, China, in 2014 and 2020, respectively. From October 2017 to October 2019, he was a visiting Ph.D. student at Delft University of Technology, the Netherlands. From 2020 to 2023, he was a postdoctoral researcher at Fudan University, Shanghai, China. Since 2023, he has been a research associate with the Key Laboratory for Information Science of Electromagnetic Waves (MoE), Fudan University, Shanghai, China. His research interests include multi-temporal synthetic aperture radar interferometry, microwave vision and radar 3-D imaging, and multi-temporal change detection using synthetic aperture radar imagery. He is an Associate Editor of the IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing.

Intelligent perception of infrared images

Ruiheng Zhang

Beijing Institute of Technology

Abstract: Infrared imaging, as an important perceptual method that breaks through the limits of human vision, has unique advantages in complex environment target detection and recognition. However, it still faces the key bottleneck of "unclear, inaccurate, and difficult to dissect" due to factors such as thermal radiation imaging mechanism, complex noise, scarce samples, and insufficient target texture information. This report focuses on the refined perception of infrared imaging, exploring the transition path from low entropy thermal signals to high-order semantic cognition, and looking forward to optoelectronic composite perception for complex adversarial environments, providing new ideas for intelligent perception and refined cognition of infrared imaging.

Biography: Ruiheng Zhang received the B.E. degree in 2014 from Beijing Institute of Technology, China. He was a dual-Ph.D. from University of Technology Sydney, Australia and Beijing Institute of Technology, China. He is an Associate Professor in Beijing Institute of Technology. He is the author of more than 50 research papers, including IEEE TIP, IEEE TMM, IEEE TMC, NeurIPS, CVPR, ICCV and so on, among which 11 are ESI Highly Cited Papers. He has served as AC/TPC of ACM MM, ICDM. His current research interests include object understanding, and multi-modal learning.

High-Performance Optical Fiber Distributed Acoustic Sensor (DAS)

Jun He

Shenzhen University

Abstract: Distributed acoustic sensing (DAS) based on phase-sensitive optical time-domain reflectometry (0-OTDR) is widely used in border security, pipeline monitoring, and structural health diagnosis. However, due to weak backscattered signals along the fiber, pulse-width constraints, and system self-noise, severe trade-offs exist among sensing distance, spatial resolution, frequency response, and noise level, hindering high-performance DAS in practice. To address limited sensing distance, a weak-reflection fiber Bragg grating array extends the sensing distance to 70 km, and remote pump amplification further extends it to 120 km. Combining positive- and negative-swept-pulse O-OTDR with scattering-enhanced fiber achieves a spatial resolution of 1.2 cm and a Doppler frequency shift suppression ratio of 20 dB. A frequency-phase orthogonal coding method overcomes the mutual constraints among sensing distance, spatial resolution, and frequency response, enabling distributed ultrasonic sensing with >1 MHz bandwidth. A deep learning-based Kalman filtering phase demodulation method tracks the complex phase vector evolution, achieving high precision (10 $p\varepsilon/\sqrt{Hz}$ at 45 km). Using fiber self-reference and an oversampling/downsampling algorithm, common-mode noise is suppressed, allowing detection of a 1 mHz signal at 10 km. Finally, optimized FPGA dataflow and parallel computing yield a real-time DAS prototype. Field experiments on underwater sensing and 3D localization of low-altitude drones show maximum positioning and angular errors of 0.1 m and 3°, respectively. This high-performance DAS technology has significant scientific value and engineering application prospects.

Biography: Jun He is a Distinguished Professor at the College of Physics and Optoelectronic Engineering, Shenzhen University, the Deputy Director of the Shenzhen Key Laboratory of IoT Photonic Devices and Sensing Systems, and a recipient of the National Excellent Young Scientist Fund. His research has long been dedicated to fiber-optic sensing technologies in extreme environments. He has led a number of major national-level research projects, including the Key Program and Joint Fund Key Program of the National Natural Science Foundation of China (NSFC), the National Outstanding Youth Science Fund, and the Young Scientist Program of the National Key R&D Plan of China. Prof. He has published 132 SCI-indexed papers, garnering over 4,300 citations with an h-index of 42, and holds 25 authorized Chinese invention patents. He is the recipient of the Second Prize of the Natural Science Award from the Ministry of Education of China and the First Prize of the Shenzhen Natural Science Award. He serves on the editorial boards of Photonic Sensors, Chinese Optics Letters, and Infrared and Laser Engineering, and is a committee member of both the Laser Processing Committee of the Chinese Optical Society (COS) and the Fiber Optic Sensing Committee of the Chinese Society for Optical Engineering (CSOE).

TBA

Ping Zhu

Shenzhen University

Abstract: TBD

Biography: TBD

Tianwen-2 mission: From laboratory to remote sensing observations

Pengfei Zhang

Institute of Geochemistry, Chinese Academy of Sciences

Abstract: Tianwen-2 is the fourth asteroid sample return mission in human history. It will return samples from an Earth quasi-satellite, 469219 (Kamo'oalewa), and conduct on-orbit observations of the main-belt active asteroid 311P. Currently, Tianwen-2 is conducting on-orbit observations of Kamo'oalewa. Previously, based on ground-based telescope observations, Kamo'oalewa was linked to S-complex asteroids and lunar rock (1, 2) or LL chondrite fragment (3). Recently, the observation from the JWST found that Kamo'oalewa has a high albedo and flat spectral slope (4), differing from previous observations. The JWST result proposed that Kamo'oalewa is probably an Aubrite-like small body (4), belongs to E-type, implying that it underwent high-temperature evolution and was relatively reducing. Here, I will review the systematic ground-based studies of Kamo'oalewa and discuss some important scientific questions.

Biography: TBD

Spectral imaging for the outer solar system: Missions, instruments and current challenges

Yizhi Du

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Spectral imaging is a key technique for investigating the surface composition and geological properties of objects in the outer solar system. Over the past few decades, missions to explore these objects have been conducted. According to different types and scientific objectives, these missions can be broadly categorized into three phases: reconnaissance, detailed characterization, and habitability assessment. The technology development and performance characteristics of imaging spectrometers onboard these spacecraft are systematically reviewed. As the performance of spectral imaging payloads approaches its limits and deep-space missions venture ever closer to the edge of the Solar System, three key technical challenges have emerged: photon-limited conditions, constrained data downlink capability, and communication delays. To address these issues, solutions are discussed across three levels: data acquisition, data management, and mission execution. This framework provides valuable guidance for designing imaging spectrometers for future outer solar system missions.

Compact, Highly Reliable, Radiation-Tolerant Fiber Optic Gyroscopes for Spacecraft

Ningfang Song

Beihang University

Abstract: Highly reliable, long-life fiber optic gyroscopes (FOGs) are an important cornerstone for spacecraft attitude control and navigation. Supported by major national programs such as the National High-resolution Earth Observation System, Mars exploration, and the national satellite internet constellation, we have achieved breakthroughs in core technologies including the design, materials, and fabrication processes of miniaturized, lightweight, and radiation-tolerant FOGs, and has established an independent and controllable system of solutions, components, production, and product families, with the overall level of its achievements leading domestically and advanced internationally. Since 2013, more than 600 units have been launched and are operating in orbit, and have been applied to missions such as the national satellite internet constellation (Xingwang), the Qianfan G60 constellation, the lunar relay satellite, the Tianwen-1 Mars probe, and the Tianwen-2 asteroid probe, providing core component support for key space equipment such as large-scale multi-functional satellite networks and major aerospace engineering projects.

Biography: Ningfang Song (female) is a second-tier professor and doctoral supervisor at Beihang University, a Distinguished Professor of the Changjiang Scholars Program, the leader of a Key Field Innovation Team of the Ministry of Science and Technology, and a leading talent in science and technology innovation under the "Ten Thousand Talents Program". She is a recipient of the Special Government Allowance of the State Council, the China Youth Science and Technology Award, and the New Century Talent Program of the Ministry of Education. She serves as an expert of the National Expert Group for Strategic High Technology, a chief scientist of the National 973 Program, and a member of a professional group of a department of the Central Military Commission. She was a delegate to the 12th Beijing Municipal Congress of the Communist Party of China and was awarded the title of "Most Beautiful Woman Striver" of the capital.

For more than 30 years, she has devoted herself to teaching, research, and talent cultivation in fiber optic gyroscope and optical inertial integrated navigation system technology. She has led projects including the National 973 and 863 Programs, Major Instrument Special Projects of the Ministry of Science and Technology, general and key projects of the National Natural Science Foundation of China, major exploratory projects of weaponry and equipment, key funds, and major national defense engineering and weapon-model projects. She has won two Second Prizes of the National Technological Invention Award (both ranked 2nd) and 12 awards at the provincial and ministerial level and from first-class academic societies (ranking 1st in 8 of them). She has published more than 150 SCI papers and holds more than 170 authorized invention patents.

A 500-600 GHz Spectrometer for Deep Space Exploration

Haotian Zhu

National Space Science Center, CAS

Abstract: A 500-600 GHz spectrometer, equipped with 12.5 cm Cassegrain mirror, single-pole three-throw waveguide switch, sub-harmonic mixer and 250 GHz tripler, W-band source and 1 GHz data spectrometer, has been developed. The total mass and power consuming of the 500-600 GHz spectrometer is 4 kg and 25 W, respectively. The spectrometer can be used for exploring the atmosphere of Venus, Mars, Jupiter, Uranus, and Neptune, and plume of Europa, Enceladus, Triton, and Ceres.

Biography: Haotian Zhu, Researcher and Ph.D. Supervisor at the National Space Science Center, Chinese Academy of Sciences. He has long been dedicated to research on terahertz hybrid integrated circuits and spaceborne radiometer systems. He has pioneered terahertz 3D stacked hybrid integration technology based on microfabrication, and developed key components such as frequency multipliers, mixers, and diplexers with internationally leading performance. Using these components based on hybrid integrated circuit technology as core parts, he led the development of three prototypes of spaceborne radiometers for space applications (including Earth science and deep space exploration), and realized the localization of core devices for multiple spaceborne radiometer systems.

Imaging Techniques and Future Application Developments of the CHASE (Xihe) Solar Imaging Spectrometer

Qiang Liu

Changchun Institute of Optics,Fine Mechanics and Physics, Chinese Academy of Sciences

Abstract: The solar space H a imaging spectrometer is the main payload carried on the first solar exploration science and technology experimental satellite "Xihe". As a newly developed high integration multifunctional payload, it has overcome multiple key technologies such as high-precision scanning optical field of view imaging, high-precision integrated manufacturing and detection, large tolerance pre filter window, and full link solar radiation calibration, achieving the development and in orbit application of the world's first solar space H a imaging spectrometer. The solar H a imaging spectrometer has a spectral resolution of 0.024 Å for solar pixels in orbit, and can complete full surface scanning of the solar spectrum within 46 seconds. Both spectral and temporal resolutions have reached the international advanced level.

Biography: Liu Qiang, male, Ph.D., researcher, doctoral supervisor, high-level talent in Jilin Province, has won one second prize for Scientific and Technological Progress from the Aerospace Science and Technology Group Corporation and the first author of one outstanding achievement award from the Changchun Institute of Optics, Fine Mechanics and Physics. As the executive leader, he completed the development of the high-resolution camera for the GF-6 satellite under the National High-Resolution Earth Observation System Major Project and the solar Ha imaging spectrometer for China's first solar exploration mission "Xihe." As the project leader, he led the development of the wide-swath multispectral camera for the Ministry of Water Resources' first satellite—Land Water Resources Satellite and the spectral magnetic telescope project for the Sun-Earth L5 Solar Exploration (Xihe-2). He has published over 20 SCI/EI papers, obtained 13 patents, and authored two monographs.

Intelligent Infrared Perception from Image Restoration to Small Target Detection and RGB-T Tracking

Hanlin Qin

Xidian University

Abstract: Infrared optoelectronic perception supports long-range sensing for counter-UAV surveillance, maritime search and rescue, forest fire prevention, and low-altitude security. Passive, covert imaging by day and night and resistance to jamming make infrared sensing well suited to observing small, slow-moving targets such as birds, drones, and powered paragliders. These non-cooperative targets challenge conventional visible-light and radar sensors because of their small size and low radar cross sections. This talk presents our progress from image restoration and small target detection to cross-modal tracking and system deployment.

To suppress stripe noise caused by focal-plane nonuniformity, the asymmetric sampling correction network ASCNet (IEEE TGRS, 2025; ESI Highly Cited Paper) combines residual Haar wavelet downsampling with a column self-calibration decoder to separate stripe noise from vertical scene structures. Complementary contributions include IRSTDID-800 (IEEE TGRS, 2024), the first benchmark for joint destriping and small target detection, and DestripeCycleGAN (IEEE TIM, 2024), an unsupervised destriping method.

For small target detection, SCTransNet (IEEE TGRS, 2024; ESI Highly Cited Paper) enhances spatial – channel interactions across feature levels. SP-KAN (ISPRS J. Photogramm. Remote Sens., 2026) uses a pattern complementarity module and a sparse-sine Kolmogorov – Arnold layer to modulate global context through sparse nonlinearities. PGDNet (IEEE TCSVT, 2026) guides spatial – spectral fusion with DINOv3 semantic priors, achieving state-of-the-art mIoU scores of 78.83, 94.64, and 75.50 on NUAA-SIRST, NUDT-SIRST, and IRSTD-1K, respectively. Single-point interactive annotation (IEEE JSTARS, 2025) reduces labeling effort, while heterogeneous distillation reduces parameter count and computation by factors of 17.6 and 27.6, respectively, with negligible accuracy loss, facilitating deployment on edge devices.

For RGB-T tracking, GPTrack combines a multi-relation topology graph for early interaction between RGB and thermal features with physics-aware geometry – saliency cross-attention, achieving state-of-the-art performance on five benchmarks. These algorithms have been deployed in fully domestic multi-source counter-UAV systems for ground-based, vehicle-mounted, and airborne applications. Future work will explore vision – language models for weak-target perception.

Biography: Hanlin Qin, Ph.D. He is a professor and doctoral supervisor at the School of Optoelectronic Engineering, Xidian University. He leads the Xi'an Key Laboratory of Infrared Technology and System and several innovation centers. His research focuses on light-field control, optoelectronic fusion, low-altitude intelligent systems, embodied optoelectronics, generative intelligence, and brain – computer interfaces.

He has published more than 130 papers in journals and conference proceedings, with work appearing in IEEE TCSVT, IEEE TGRS, IEEE TMM, IEEE TIM, IEEE TAES, IEEE GRSL, Pattern Recognition, Optics Express, Optics Letters, and Optics & Laser Technology. He has led over 40 research projects supported by national, provincial, and municipal funding programs and commercialized 17 patents.

His honors include the Ministry of Education First Prize for Technological Invention (2016), the Shaanxi Provincial Second Prize for Technological Invention (2025), the Shaanxi Higher Education First Prize for Technological Invention (2020 and 2024), and the Shaanxi Electronics Society First Prize for Technological Invention (2024).

From Infrared to Radio waves in the Environmental Domain

Simona Niculescu

University of Brest/Institut Universitaire Français (IUF)

Abstract: In the midst of a global environmental crisis on various fronts—climate change, biodiversity loss, the depletion of natural resources, air, water, and soil pollution, natural hazards, and more—satellite observation, ranging from infrared to radio waves, is becoming of paramount importance not only to the scientific community but also to society at large. In this context of global change, the contribution of remote sensing to our understanding of environmental challenges is invaluable, as these observations across different wavelengths enable remote sensing to detect, extract, and analyze comprehensive geographic information on these issues. This work provides several concrete examples of geographic information on major environmental issues (biodiversity loss, natural hazards) in various environments (temperate, tropical, Mediterranean, and equatorial) using infrared, lidar data …, among others.

Identification of Potential Extraterrestrial Materials and Endmember Inversion Based on 266nm Deep-Ultraviolet Raman Spectroscopy

Haotian Xu

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: This study focuses on the spectral detection requirements for the surface material composition of Callisto. Based on previous deep-space exploration missions and related scientific findings, this work systematically investigates the geological structure and evolution of Callisto, as well as the geological minerals, hydrated minerals, and organic compounds that may exist on its surface. On the basis of the principles of Raman spectroscopy, the characteristics and analytical methods of 266 nm laser Raman spectroscopy are summarized. According to the possible material characteristics of Callisto's surface reported in the literature, more than ten geological samples, including enstatite, gypsum, plagioclase, olivine, and urea, were selected for spectral measurements using a 266 nm ultraviolet Raman spectrometer. MATLAB was used to preprocess the spectral data, including baseline correction, smoothing, and peak fitting. The material components in the spectra were then identified and analyzed based on known information and spectral databases. In addition, a multivariate linear regression algorithm based on non-negative least squares was applied to quantitatively retrieve the spectral intensity ratios of enstatite, gypsum, and epsomite, and to evaluate the in-situ detection capability of the 266 nm Raman spectrometer for typical minerals on the surface of Callisto. The experimental results show that the 266 nm laser Raman spectrometer can obtain characteristic peak information from some candidate minerals and organic compounds related to Callisto. Among them, gypsum, urea, methanol, and ethyl acetate exhibited relatively clear Raman responses. In contrast, magnetite, troilite, saponite, montmorillonite, and chlorite did not yield spectra with sufficiently clear Raman features due to limitations in sample preparation and processing. Nevertheless, this result indirectly suggests that iron-bearing minerals, strongly ultraviolet-absorbing materials, and dark-colored materials may reduce the effective Raman scattering cross section and weaken the detection performance. This may be attributed to the strong ultraviolet absorption of iron-bearing materials in the 200 nm wavelength region, where the main Fe^{3+}–O absorption band is generally located at approximately 210–230 nm and the main Fe^{2+}–O absorption band is generally located at approximately 250–270 nm. For other materials, however, the 266 nm Raman spectrometer can produce relatively strong Raman responses with a low fluorescence background. Therefore, in comparison, the 266 nm Raman spectrometer shows better detection performance for iron-poor materials.

This study also used Raman spectra from the RRUFF endmember spectral database to simulate mixed mineral spectral data that may be obtained under actual measurement conditions. Peak fitting was performed in MATLAB to extract characteristic peak information from the endmembers and identify the material components corresponding to the mixed spectra. A multivariate linear regression

algorithm based on non-negative least squares was then used to retrieve the spectral contributions of different endmembers. The total error between the retrieved spectral contributions and the simulated component proportions was less than 3%, and the model R^2 was 0.938890. These results indicate that this method can effectively identify the main endmember components in simulated mixed spectra and provide a useful reference for the analysis of complex geological samples.

Improving LST monitoring from space: conceptual design of a multi-angle thermal infrared satellite sensor

Biao Cao

Beijing Normal University

Abstract: Thermal radiation directionality (TRD) characterizes the anisotropic signature of most surface targets in the thermal infrared (TIR) domain. It introduces uncertainties in land surface temperature (LST) retrieval from TIR remote sensing data. Multi-angle quasi-synchronous observation is the most direct and effective approach to addressing the TRD effect. Currently, only the ATSR series sensors offer dual-angle observations, which are insufficient to capture the TRD effect. Designing a wide-swath multi-angle TIR satellite sensor is expected to globally capture the TRD effect and further support the angular normalization of the LST product. For that, this study aimed to determine the optimal angle combination for multi-angular linear array imaging, based on 10,200 groups of 4SAIL model-simulated hemispherical distributed directional brightness temperature (DBT, containing 71 view zenith angle × 360 view azimuth angle for each group) and 220 groups of limited multi-angle combinations (considering the field of view effect and image displacement due to Earth's curvature). The LSF-Chen kernel-driven model was selected as the fitting tool to simulate hemispherical distributed DBT with the inputs of limited multi-angular DBTs extracted from 4SAIL reference data. Then, the optimal angle combination could be determined according to the Root Mean Square Error (RMSE) and the Average Proportion of Absolute Error within 0.5 K (APAE≤0.5 K). Results indicate that: 1) The 5-angle combination (0°, ±22.1°, ±50.3°) with a typical satellite altitude of 800 km and a 100° field of view (i.e., with a swath width of 2127.6 km) is suggested. 2) The RMSE of the optimal 5-angle combination increases from the array center (0.49 K) to the array edge (1.30 K) when a random error of [-0.5 K, 0.5 K] is considered. In addition, this optimal 5-angle combination was evaluated using MODIS data with 0.5 K random noise, which shows its overall RMSE is 0.58 K. This study provides a new insight for designing a new wide-swath multi-angle TIR satellite sensor for upcoming Earth observation.

Biography: Biao Cao received the B.Sc. degree in geographic information system from Beijing Forestry University, Beijing, China, in 2009, and the Ph.D. degree in cartography and geographic information system from the Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences (CAS), Beijing, in 2014. He worked at the Chinese Academy of Sciences (CAS) from 2014 to 2023. He is currently a Professor with the Faculty of Geographical Science, Beijing Normal University, Beijing. He is a senior member of IEEE and a young editorial board member of Journal of Remote Sensing. His research interests focus on 1) thermal radiation transfer model for complex land surface, 2) land surface temperature estimation, and 3) thermal anomaly detection.

Surface Chemical Engineering and Extreme-Environment Protection for Spacecraft

Songtao Lu

Harbin Institute of Technology

Abstract: Photothermal control coatings are essential for spacecraft thermal management, optical detection, and long-term service. To meet the demanding requirements of crewed spaceflight and deep space exploration, we have developed a series of functional coatings for thermal control, radiation resistance, and stray light suppression, achieved through the creation of functional building blocks and the construction of micro/nano structures. Specifically, lightweight alloy surface functionalization enables weight reduction by replacing aluminum with magnesium, while balancing high emissivity and adhesion. Ultra-high light absorption coatings, based on a three-dimensional gradient-index "micro-forest" light-trapping structure, achieve broadband absorption from ultraviolet to mid-infrared. Molecular contamination protection integrates source tracing, transport simulation, effect evaluation, and efficient adsorption. These achievements have been applied to multiple spacecraft, providing key material support for the development of lightweight, high-precision, and high-reliability spacecraft.

Biography: Lu Songtao (male) is a professor and doctoral supervisor at Harbin Institute of Technology, where he serves as Vice Dean of the School of Chemistry and Chemical Engineering. He is a national-level young talent and a core member of a science and technology innovation team under a national ministry. He was a finalist for the inaugural "MIIT Outstanding Youth Award", nominated for the "Power-Nation Young Scientist Award", and has received the "Heilongjiang Provincial Youth Science and Technology Award".

His research focuses on advanced functional materials for extreme environments. He has led more than 20 projects, including sub-projects of the National Key R&D Program of China, projects commissioned by national ministries, and grants from the National Natural Science Foundation of China. As a principal contributor, he has obtained two Second-Class Prizes of the National Technological Invention Award and five Provincial-Ministerial First-Class Awards covering natural science, technological invention, and scientific and technological progress.

Infrared Astronomy: Advances in Detectors, Observations, and Precision Measurement

Zhuoyue Hu

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Infrared observations are essential for studying star and planet formation, the interstellar medium, and galaxy evolution. Recent advances in infrared detector technology in China, together with ongoing development and characterization of devices for astronomical applications, have laid an important foundation for future space-based infrared instrumentation. This talk begins with progress in astronomical infrared detector performance in China and experience from ground-based observations. Drawing on detector characterization results and observational data, it reviews current detection and measurement capabilities and examines key challenges in achieving high sensitivity and precision. Building on technological developments and lessons from representative space observatories such as JWST, the talk then discusses cryogenic testing, faint point-source response characterization, the spatial and temporal stability of detector response, and precision radiometric calibration. It concludes with an outlook on pathways from detector testing and ground-based observations toward large-aperture cryogenic infrared space observatories.

Biography: Zhuoyue Hu is an Associate Professor at the Shanghai Institute of Technical Physics, Chinese Academy of Sciences. Her research focuses on infrared astronomical observations, high-precision radiometry, and on-orbit radiometric calibration of satellite instruments. She received the First Prize of the Shanghai Technological Invention Award as the third-ranked contributor and has been supported by the Shanghai Oriental Young Talent Program.

Lunar SAR-to-Optical Image Translation for Permanently Shadowed Region Exploration

Tong Xia

Fudan University

Abstract: Permanently shadowed regions (PSRs) at the lunar poles receive little or no direct sunlight, making optical observation of their surface morphology difficult. Although ShadowCam can image PSRs using scattered light, large illumination angles and terrain occlusion still limit the observation of secondary shadowed regions (SSRs) and rock distributions. Synthetic aperture radar (SAR) can observe PSRs independently of sunlight, but speckle noise, geometric distortions, and complex scattering responses make SAR images difficult to interpret.

To improve the visual interpretation of lunar SAR data, we constructed the Lunar Optical–SAR Aligned Dataset (LOSAD-14K), containing 14,460 co-registered SAR–optical image pairs. Optical images with the same incidence and azimuth angles as the corresponding SAR observations were generated using lunar topographic data and photometric models. Based on this dataset, we developed Lunar SAR to Optical Image U-Net (LunarS2OUNet), a dedicated SAR-to-optical translation network with a Local–Global Attention Module that jointly captures local high-frequency details and global contextual information.

Experimental results show that LunarS2OUNet effectively suppresses SAR noise while preserving important surface structures such as crater boundaries, terrain textures, and rock-rich regions. The generated images achieve PSNR, SSIM, FSIM, and LPIPS values of 26.45 dB, 0.85, 0.88, and 0.05, respectively. Compared with CycleGAN, Pix2Pix, and diffusion-based methods, LunarS2OUNet provides more stable structural reconstruction.

For lunar south-polar PSRs, the generated 14.8 m/pixel, relatively low-incidence-angle optical-like images complement ShadowCam observations by providing additional information on SSR morphology, crater-wall rock distributions, and rock-rich ejecta. The generated images can also support pixel-level registration between SAR and optical imagery. This study provides a new approach for lunar PSR interpretation and offers potential support for landing risk assessment, traverse planning, and future lunar polar exploration.

Martian Geomorphic Feature Mapping with a Multi-Granular Dynamic Aggregation Transformer

Yonggang Xiong

Tongji University

Abstract: A diverse range of geomorphic units at varying spatial scales has formed on the Martian surface under the combined influence of tectonic activity, impact processes, weathering, and erosion. Intelligent classification and mapping of typical geomorphic features are essential for Mars exploration tasks, including landing-site selection, safety assessment, rover-route planning, and geological evolution analysis. To address the limitations of existing Martian geomorphic feature mapping methods, including insufficient spatial feature aggregation, inadequate representation of fine-grained features, and difficulty in distinguishing similar categories, this report presents MarsMapFormer, a multi-granular dynamic aggregation Transformer for Martian geomorphic feature mapping. Its dynamic aggregation Transformer module replaces conventional attention-based token mixing with a dynamic residual-convolution synergy mechanism, enhancing the representation of complex spatial patterns in Martian scenes. A multi-granular feature interaction mechanism is further introduced to facilitate the interaction and fusion of geomorphic information across different scales and granularities, thereby improving the model's ability to distinguish between similar geomorphic categories. Experimental results on a public Mars dataset and across multiple representative Martian regions demonstrate that the proposed method achieves high classification accuracy and effective mapping performance, validating its effectiveness for Martian geomorphic feature mapping.

Single photon & single-photon detector and applications

Kemi Xu

Beijing Institute of Technology

Abstract: A single photon represents the fundamental quantum unit of light, exhibiting particle-like properties that are essential for exploring quantum phenomena. Single-photon detectors are devices capable of registering individual photons, enabling ultrasensitive optical measurements. Key technologies include avalanche photodiodes (APDs), photomultiplier tubes (PMTs), and superconducting nanowire single-photon detectors (SNSPDs), each offering trade-offs among detection efficiency, dark count rate, timing resolution, and recovery speed. These detectors are indispensable in quantum information processing (e.g., quantum key distribution and optical quantum computing), fluorescence lifetime imaging, light detection and ranging (LiDAR), and deep-space optical communication. Advances in detector performance continue to push the frontiers of both fundamental quantum optics and practical photon-starved applications.

Biography: Kemi Xu, female, Ph.D., Professor, and recipient of the Basic Talent Program. She currently serves as Director of the Center for Quantum Optical Precision Measurement at Beijing Institute of Technology and as Head of the Quantum Computing, Communication, and Precision Measurement Group of the Young Scientists Committee of the Chinese Society for Optical Engineering.

Her primary research interests include quantum precision measurement and advanced manufacturing. She has led a number of major research projects, including a National Major Scientific Research Instrument Development Project, a Major Project under the 173 Basic Research Enhancement Program, a national key project on indigenous and controllable technologies, and projects funded by the National Natural Science Foundation of China.

She has published more than 40 SCI-indexed papers in journals including Light: Science & Applications, with over 1,500 SCI citations, and holds 11 authorized invention patents. She received the First Prize of the Natural Science Award from the Chinese Society for Optical Engineering in 2025, among other honors.

Alternating Multi-scale Stochastic Differential Equations for Accelerated Inverse Problem Solving

Weiwen Wu

Sun Yat-sen University

Abstract: Classical Langevin equations are inherently constrained by a restrictive single timescale framework, which impairs their ability to accurately capture complex multi-scale dynamics phenomena. Building on generalized Langevin dynamics, diffusion models (DMs) excel at solving ill-posed inverse problems. However, DMs inherit the single timescale sampling limitation: they cannot naturally capture abrupt state changes and strong fluctuations, and typically require thousands of sampling steps, resulting in a severe computational bottleneck. To tackle these challenges, we proposed a novel Alternating Multi-scale Stochastic Differential Equation (AmSDE) framework that breaks the single timescale assumption by modeling particle trajectories across multiple hierarchical scales. This framework enables dynamic switching between coarse-scale and fine-scale sampling modes, significantly releasing exposure bias. Then, we developed an AmSDE solver comprising three key components: a non-Markov bridge for rapid initial sampling, a link path for smooth scale transitions, and a Markov bridge for iterative refinement. It systematically minimizes cumulative exposure errors, achieving an optimal trade-off between sampling speed and output quality. Our work includes theoretical analysis of exposure bias and error bounds under the appropriate assumptions. Extensive empirical tests across inverse problem tasks, including limited-data CT, under-sampled MRI reconstruction, and natural image generation.

Biography: Weiwen Wu, PhD Supervisor. He is a recipient of the Guangdong Distinguished Young Scholar Award, the sole 2025 Xiaomi Young Scholar at Sun Yat-sen University, and a Shenzhen Pengcheng Distinguished Talent. He has published 56 SCI papers as first or corresponding author, including 36 IEEE full-length articles, among which 9 are ESI Highly Cited Papers and 4 are ESI Hot Papers. He has been listed in the World's Top 2% Scientists for three consecutive years. He presides over key vertical research projects at national, provincial and municipal levels, such as the National Natural Science Foundation of China, Guangdong Distinguished Young Scholar Program and Shenzhen Major Industrial Program, and has undertaken a number of industry-sponsored horizontal projects. He holds 31 granted/pending invention patents and 2 PCT patents. Deep industry-technology translation collaborations have been established with leading medical-imaging enterprises. His research achievements have been featured in special reports by national-level media

Embodied Intelligence in Unstructured Environments

Weiying Xie

Xidian University

Abstract: In extreme deep-space environments, edge embodied agents often face challenges such as scarce training data, dynamically changing environments, and unstable execution performance. To address these challenges, this report focuses on unmanned-system capabilities in complex unstructured environments and presents an integrated communication, computing, and control architecture, together with key technologies for edge-oriented data platforms, visual understanding, decision-making, and execution. Specifically, the technical approach comprises building a Sim2Real multi-source hierarchical data flywheel platform to provide edge-deployed embodied models with a high-fidelity, physically consistent data foundation; enabling robust environmental understanding under extreme conditions and challenging viewpoints; and further introducing brain-inspired policy planning incorporating spatial-intelligence constraints, together with a brain-cerebellum collaborative control mechanism, to support autonomous decision-making and robust execution in long-horizon sequential tasks. Meanwhile, we establish an Earth-Moon collaborative testbed for embodied intelligence, providing an experimental environment for validating the integrated communication, computing, and control capabilities of unmanned systems in unstructured environments.

Biography: Weiying Xie (Senior Member, IEEE) received the Ph.D. degree in communication and information systems from Xidian University, Xi'an, China, in 2017. Currently, she is a Professor with the State Key Laboratory of Integrated Services Networks, Xidian University. She has published over 100 articles in refereed journals and proceedings, including IEEE TPAMI, IEEE TIP, IEEE TCSVT, IEEE TGRS, IEEE TNNLS, IEEE TCYB, and Conference on CVPR, NeurIPS, ICCV, AAAI, etc. Prof. Xie currently serves as an Associate Editor for IEEE Transactions on Image Processing, IEEE Transactions on Geoscience and Remote Sensing, Pattern Recognition, and Neural Networks. She is also a recipient of the Excellent Young Scholars Fund from the National Natural Science Foundation of China. Her research interests include model/gradient compression, distributed machine learning, multimodal remote sensing, and on-device learning.

Image Deblurring via Frequency Learning

Xintian Mao

East China Normal University

Abstract: Deep learning has advanced image deblurring, but mainstream methods perform pixel-level restoration that ignores the physical convolution process of blur degradation. Recent research reveals that applying a non-linear ReLU activation to an image's frequency domain representation isolates its degradation components, faithfully capturing the blur's direction and kernel pattern. This insight drives the Res FFT-ReLU block, which fuses frequency-spatial dual-domain representations to leverage both high-level kernel patterns and pixel-level details. Building on this, our Frequency Learning Module (FLM) explicitly models the physical convolution process by estimating global kernels directly from the frequency spectrum. FLM simulates degradation by multiplying these estimated kernels with network-extracted spatial features in Fourier space, operating entirely without external kernel supervision. Our method achieves state-of-the-art deblurring performance while maintaining low computational complexity.

Chemometric Analysis of Martian LIBS Data Using Deep Learning and Pretrained-Model-Based Transfer Learning

Zhicheng Cui

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Laser-Induced Breakdown Spectroscopy (LIBS) has been successfully applied in Mars exploration (i.e. ChemCam, SuperCam, MarSCoDe). Deep learning (e.g., CNN) requires many labeled samples, which are scarce on Mars. Meanwhile, large lab databases exist, but the profile discrepancies between Mars in-situ spectra and laboratory spectra can be a prominent challenge for the joint use of the two-source data. Instead of conventional data conversion, we propose a new scheme by integrating transfer learning technique, which focuses on "knowledge transfer" rather than conventional "data transfer". The ChemCam LIBS data quantification is taken as an example to illustrate the effectiveness. We trained a deep CNN quantitative model on 59,760 lab LIBS spectra, fine retrained it with 175 in-situ LIBS spectra acquired from ChemCam calibration targets on Mars, and tested it on 575 in-situ LIBS spectra from 3 Martian natural targets. Regarding overall quantification accuracy, our scheme can noticeably surpass the four alternative deep learning schemes by up to 3 times, and show approximately equal performance to the ChemCam scheme. The results indicate that transfer learning is a promising booster for deep learning methods to accurately and efficiently analyze Mars in-situ data collected from SuperCam, MarSCoDe, and future payloads.

SRRN: A Compact Spectral Residual Refinement Network for Multispectral-to-Hyperspectral Reconstruction of Mars CRISM Data

Lu Lu

Tongji University

Abstract: Hydrated minerals are key tracers of past aqueous activity on Mars, mapped globally by the now-retired Compact Reconnaissance Imaging Spectrometer for Mars (CRISM). Distinguishing specific mineral phases requires the dense spectral sampling of its targeted observations (544 channels), which cover only ~3% of the surface; across the near-global multispectral survey (72 channels, ~86% coverage), the sparser sampling differentiates mineral classes rather than individual phases. Reconstructing full spectra from the multispectral mode channels could extend such discrimination across significantly broader surfaces, though such methods have so far been developed mainly for natural images and Earth observations, not planetary spectra, where mineral identification demands finer spectral fidelity. We propose the Spectral Residual Refinement Network (SRRN), a compact model that adds a residual-in-residual correction to an interpolated initial estimate, letting the network concentrate on the nonlinear absorption structure between measured wavelengths that linear interpolation cannot capture, under a spectral-derivative loss that preserves absorption shape. For training and evaluation, we build a paired dataset from 150 CRISM targeted observations, each spatially and spectrally degraded to simulate the survey mode, retaining the full spectrum as the reconstruction target. SRRN lowers mean relative absolute error by 38% over interpolation and 33% over the strongest learning-based baseline (MIRNet), using only 1.16 M parameters. Its reconstructions also recover the diagnostic mineral absorptions with higher fidelity than the baselines, indicating a route toward extending detailed mineralogical analysis across CRISM's multispectral survey coverage.

Research on Key Technologies and Retrieval Models for Water Ice Information Extraction from Chang'e-7 Infrared Spectral Imaging

Peizheng Liu

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Detection of water ice in permanently shadowed regions (PSRs) of the lunar polar areas is of significant scientific value for revealing the volatile evolution history of the Earth–Moon system and supporting future in-situ resource utilization. To meet the requirements of the Chang'E-7 mission, this study develops a spectral unmixing and abundance retrieval method for lunar polar water ice based on the Wide-spectrum Infrared Spectral Imager (WIRIS). Preliminary work analyzed the imaging mechanism of WIRIS and established radiometric calibration and preprocessing workflows for the visible and shortwave infrared dual-channel data, providing data support for algorithm validation. Considering the discrepancy between laboratory spectra and spectra acquired under actual lunar surface conditions, the retrieval strategy combines laboratory validation with remote sensing spectral simulation. Specifically, a Hapke radiative transfer forward model was constructed using measured olivine spectra as background endmembers, and a convolutional neural network (CNN) was trained accordingly. This model was then applied to WIRIS measurements of water-bearing samples, yielding an estimated water ice abundance of 28.88%. This result indicates that the retrieval model based on measured substrates is applicable to actual payload data.

Furthermore, the average spectrum of dry lunar regolith in sunlit regions near the south pole acquired during the M3 OP2C period was selected as the substrate endmember. Thermal emission, space weathering reddening, and albedo fluctuations were incorporated into spectral forward modeling to generate a simulated ice–regolith mixture spectral library. To address the issue that the continuum slope can easily mask weak water ice absorption features, a feature-decoupled dual-branch retrieval architecture was proposed. The main branch uses continuum removal (CR) combined with a multi-scale CNN to estimate water ice abundance, while the auxiliary branch performs grain size classification via spectral angle mapping (SAM) in the continuum-removed space. Applying this algorithm to M3 coverage of Shackleton, Shoemaker, and other south polar craters yielded 7286 valid water-ice pixels. Statistical analysis shows a markedly right-skewed abundance distribution, with 66.88% of valid pixels concentrated between 1% and 30%. Regarding phase composition, approximately 59.7% of the water ice occurs as surface frost with grain sizes on the order of 70 μm, whereas 21.1% is identified as coarse-grained ice around 1360 μm, likely resulting mainly from regolith gardening driven by micrometeorite impacts. ArcGIS spatial mapping further reveals that, influenced by secondary scattering from local topography, water ice is not strictly confined to PSR floors; it is also clearly present on some crater walls and within micro cold traps. The quantitative spectral extraction mechanism for trace volatiles established in this work can provide a direct analytical reference for interpreting in-orbit data from the Chang'E-7 infrared payloads.

Track 4: Digital Earth and Intelligent Cognition

Sep.19 Saturday, Noah Room 3, 3F（三楼 诺亚会议室 3）	
Presider: Chun Liu, Tongji University	
13:30-13:55	Keynote Talk **From Near-Space Airships to Tethered Balloons: Earth System Observation from Aerostat Platforms** Xianbin Cao, Beihang University
13:55-14:10	Keynote Talk **Advances in Onboard Intelligent Information Processing and Applications: Some Reflections** Xiyang Zhi, Harbin University of Technology
14:10-14:25	Invited Talk **Advances in Multimodal Remote Sensing Large Models** Zhenwei Shi, Beihang University
14:25-14:40	Invited Talk **MSDE: Memory-driven Self-evolving Digital Earth** Hui Xie, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
14:40-14:55	Invited Talk **Reflective Tomography-LiDAR for High-Precision 3D Reconstruction of Space Targets** Xinyuan Zhang, National University of DefenseTechnology
14:55-15:05	Oral Talk **Physics-Informed Coupled Modeling of Spaceborne Infrared Detection of Weak Aerial Targets** Liyuan He, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
15:05-15:20	Coffee Break
Presider: Xiang Li, East China Normal University	
15:20-15:45	Keynote Talk **Geoscience Knowledge Graph** Xinbing Wang, Shanghai Jiao Tong University
15:45-16:00	Invited Talk **TBA** Dapeng Tian, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences

16:00-16:15	Invited Talk **Perspectives on the Application of Artificial Intelligence in opto-electronic Imaging** Fei Liu, Xidian University
16:15-16:30	Invited Talk **Multi-scale Issues in Cross-media Detection** Pingyue Lv, Shanghai institute of technical physics, Chinese academy of sciences
16:30-16:45	Invited Talk **Intelligent Algorithm-Empowered Novel Optical Measurements** Jiamiao Yang, Shanghai Jiao Tong University
16:45-16:55	Oral Talk **Characterization of the Land Surface Thermal Infrared Background and Comparison with Satellite Observations for the March 28, 2025 Myanmar Earthquake** Ningbo Zhang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
17:00-18:30	Poster Session
18:30-20:30	Banquet

Track 4: Digital Earth and Intelligent Cognition

Sep.20 Sunday, Noah Room 3, 3F（三楼 诺亚会议室 3）	
Presider: Lei Lv, Henan University of Technology	
08:30-08:55	Keynote Talk **Spatiotemporal Intelligence Driven Air Ground Collaborative Perception: Technologies and Progress** Chun Liu, Tongji University
08:55-09:20	Keynote Talk **Remote Sensing Big Data Platform and Its Applications in Sustainable Development in the Digital Intelligence Era** Xiaoping Du, Aerospace Information Research Institute, Chinese Academy of Sciences
09:20-09:35	Invited Talk **Generative deep-learning-embedded asynchronous structured light for three-dimensional imaging** Lei Lv, Henan University of Technology
09:35-09:50	Invited Talk **Towards World Model-Empowered Integrated Sensing, Communication, and Decision for Complex Unmanned Systems** Yongpeng Wu, Shanghai Jiao Tong University
09:50-10:05	Invited Talk **Discussion on Datasets and Typical Problems of Comprehensive Maritime Target Recognition** Junfeng Wu, Naval Aviation University
10:05-10:15	Oral Talk **AEF-FloodLM: Integrating AlphaEarth Embeddings for Visual Question Answering in Remote Sensing Flood Scenes** Xinzhi Zhang, Beihang University
10:15-10:25	Oral Talk **Large dynamic range Shack-Hartmann wavefront sensing based on a graph-theoretic computational model** Lintong Du, Shanghai Jiao Tong University
10:25-10:40	Coffee Break

Presider: Xinyuan Zhang, National University of DefenseTechnology	
10:40-10:55	Invited Talk **Low-Altitude Intelligent Remote Sensing and Its Applications in Areal Inspection** Xiang Li, East China Normal University
10:55-11:10	Invited Talk **Research on Key Technologies and Applications of Fengyun-3 Meteorological Satellites for Arctic Sea Ice Monitoring and Identification** Cailan Gong, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
11:10-11:25	Invited Talk **Modeling and simulation of micro-level crowd behaviors** Wenhang Li, Aerospace Information Research Institute, Chinese Academy of Sciences
11:25-11:40	Invited Talk **Construction and performance of Multi-dimensional Photonic Information Detectors** Wenjie Deng, Beijing University of Technology
11:40-11:50	Oral Talk **Tool-Augmented LLM Agents for Trustworthy Earth System Analysis** Luyu Han, Shanghai Jiao Tong University
11:50-12:00	Oral Talk **Intelligent Recognition Enabled by Large-Scale, Gate-Tunable MoS_2 Optoelectronic Arrays** Kunyu Wang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
12:00-13:30	Lunch

Track 4: Digital Earth and Intelligent Cognition

Sep.20 Sunday, Noah Room 3, 3F（三楼 诺亚会议室 3）

Presider: Fei Xue, Zhejiang University

13:30-13:55	Keynote Talk **2D Ferroelectric Materials for Neuromorphic Computing** Fucai Liu, University of Electronic Science and Technology of China
13:55-14:10	Invited Talk **2D Electronic Devices for In-memory-computing** Fan Wu, Fudan University
14:10-14:25	Invited Talk **2D ferroelectric materials and devices** Fei Xue, Zhejiang University
14:25-14:40	Invited Talk **Gate-Reconfigurable Multifunctional Photodetection Through Realigning Energy Band** Shenglan Hao, East China Normal University
14:40-14:55	Invited Talk **Low-Dimensional Heterostructures for Near-Infrared Neuromorphic Optoelectronics: From Photocarrier Physics to In-Sensor Hardware Integration** Sichao Du, Zhejiang University
14:55-15:05	Oral Talk **Counterfactual Remote-Sensing Screening and Detectability Assessment of Localized Thermal Anomalies Associated with Tunnel Engineering in High-Altitude Cold Regions** Haochen Bao, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
15:05-15:15	Oral Talk **MST-Mamba: Multi-Scale Token-Enhanced Mamba for Hyperspectral Image Generation** Yuanyi Zhang, Beihang University
15:15-15:25	Oral Talk **Bidirectional Cross-Spatial Fusion Method of LiDAR Point Clouds and Images for Autonomous Driving** Zhenglei Dou, National University of Defense Technology
15:25-15:35	Oral Talk **Gate-Tunable Multi-Junction Competition for Joint Position and Wavelength Sensing** Yuelin Zhang[1,3], Xiao Fu[1,2*] [1]State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics [2]University of Chinese Academy of Sciences [3]Hubei University

From Near-Space Airships to Tethered Balloons: Earth System Observation from Aerostat Platforms

Xianbin Cao

Beihang University

Abstract: Earth observation is shifting from element-oriented surveying to process-oriented observation, and its scientific objective from static mapping to continuous tracking and mechanistic understanding of key dynamic processes. This transition, however, is constrained by an inherent trade-off between spatial and temporal resolution: low-orbit satellites are limited by sparse revisit intervals, and airborne platforms by finite endurance. Together these leave a capability region uncovered—one requiring observation means that combine meter- to sub-meter-scale spatial resolution with hours-to-days of continuous dwell on a single target. Aerostat platforms fill this region. This report uses typhoon tracking with a near-space airship as the entry point and systematically describes the aerostat-based Earth observation system developed by our team. In the payload dimension, the system provides full-spectrum detection spanning the visible, infrared, hyperspectral, and electromagnetic signature bands. In the observation-target dimension, it covers the macroscale dynamical structure of typhoon vortices, the microphysical properties of cloud and precipitation particles, and precision measurement of target signatures such as the radar cross-section (RCS) of unmanned aerial vehicles, forming an observation chain that is both multi-scale and multi-domain.

Aerostat platforms are not a substitute for satellite or airborne remote sensing; rather, they serve as a complement to and a capability multiplier for the existing Earth observation system. They hold the potential to become an ideal platform for high-precision Earth observation and high-sensitivity measurement of target signatures.

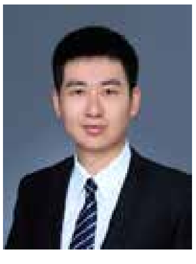
Biography: Cao Xianbin, Professor, Doctoral Supervisor, Dean of the School of Information of Beihang University, National-level high-level talent. Deputy Director of the National Key Laboratory of Air-Ground Integrated New Navigation System Technology, Director of the Key Laboratory of Aerospace Mobile Communications of the Ministry of Industry and Information Technology, and Chairman of the Avionics and Air Traffic Management Branch of the Chinese Society of Aeronautics and Astronautics. Led and won one National Technology Invention Award (Second Prize) and one National Science and Technology Progress Award (Second Prize). Recipient of the National Award for Innovation and Excellence, the Qian Xuesen Outstanding Contribution Award, the Feng Ru Aviation Science and Technology Elite Award, etc.

Advances in Onboard Intelligent Information Processing and Applications: Some Reflections

Xiyang Zhi

Harbin University of Technology

Abstract: Recent conflicts, including the U.S.–Israel–Iran conflict and the Russia–Ukraine war, have underscored major challenges in space-based remote sensing, particularly in high-value target detection and tracking and onboard decision-making for large-scale satellite constellations. This report examines the concepts, technical challenges, and capability requirements of intelligent onboard remote-sensing data processing. It reviews recent advances in space-based computing in China and abroad, analyzes key issues and trends in system architecture, low-power high-reliability computing, and on-orbit deployment, and summarizes the team's progress in onboard algorithms, software, and hardware architectures. Future development priorities and recommendations are also discussed.



Biography: Zhi Xiyang, Professor, Doctoral Supervisor, Vice Dean of the School of Astronautics at Harbin Institute of Technology (HIT), academic leader of the Optical Engineering discipline, and Director of the Space Optical Engineering Research Center, National-level high-level talent and a leading talent of a major engineering project under the GF Science, Technology and Industry Bureau. He has presided over more than 40 national vertical projects, including the 863 Program etc. He has published more than 60 high-level academic papers, applied for and been granted more than 60 invention patents, and authored 2 textbooks and monographs under national key planning. As the first completer, he won the First Prize of GF Science and Technology Progress Award, the National "Twelfth Five-Year Plan" Science and Technology Tackling Innovation Star, and the Outstanding Contribution Award for High-Tech Development and Construction Engineering, etc.

Research Progress Of Multimodal Remote Sensing Large Model

Zhenwei Shi

Beijing University of Aeronautics and Astronautics

Abstract: The multimodal remote sensing large model is the deep integration of today's space remote sensing technology and the basic frontier of artificial intelligence, and is the inevitable highland for the success of future science and technology strategy under the guidance of major national needs. In this report, the research work and related application cases of the research group in the field of multimodal remote sensing large-scale model in recent years will be introduced, including the large-scale model of remote sensing image generation, the large-scale model of remote sensing visual language, and the agent of remote sensing multimodal interpretation; Finally, the future research directions and potential applications of space remote sensing large model are prospected.

Biography: Shizhenwei is a second-class professor at Beijing University of Aeronautics and Astronautics, a winner of the National Science Fund for Distinguished Young Scholars, the head of the national innovation team, a member of the academic committee of Beijing University of Aeronautics and Astronautics, the head of the discipline of wide range flight intelligent control and information processing, and the head of the discipline of aircraft control and information engineering. He is mainly engaged in the research of remote sensing image processing, remote sensing large-scale model and spatio-temporal intelligence. He has published more than 300 scientific research papers (including more than 100 IEEE Trans Journal Papers) and cited more than 28000 times. Won the 2025 International Association for Geosciences and remote sensing's most influential paper award. Served as editorial board member of academic journals IEEE Transactions on Geoscience and remote sensing, pattern recognition and Infrared Physics&technology; He served as the deputy editor in chief of China Space Science and technology, the Chinese Journal of image and graphics, and the editorial board of data acquisition and processing. Currently, he is the supervisor of China image and graphics society.

MSDE：Memory-driven Self-evolving Digital Earth

Hui Xie

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: The Early Warnings for All initiative calls for universal early warning coverage by end-2027. Coverage, however, is not accessibility: what remains scarce is not raw data but the capacity to turn it into defensible conclusions — a capacity concentrated in expert teams and therefore hard to replicate, transfer, or extend to capacity-limited regions. We present MSDE (Memory-driven Self-evolving Digital Earth), an Observation-as-a-Service infrastructure for early warning. Organized around the event, it harmonizes the spatiotemporal semantics of satellite remote sensing, geoscientific observations, hazard records and numerical models, and federates distributed observing resources into on-demand services. Large language models and geospatial AI perform intent understanding, task planning, data retrieval, model invocation and result articulation, enabling non-specialists to reach analysis-ready conclusions. Its core mechanism is task memory: evidence, execution traces, quality assessments and failure causes accumulated during a task are consolidated into structured memory, then replayed and validated to refine data selection, workflow orchestration and capability composition. MSDE thus shifts Earth observation from supplying data to supplying warning capability, yielding reusable, transferable, traceable and contestable assets. Task memory offers an engineerable route to warning capabilities replicable across institutions and regions.

Biography: Xie Hui holds a Ph.D. in Engineering and is an Associate Research Fellow (Youth Program) at the Shanghai Institute of Technical Physics, Chinese Academy of Sciences. His research focuses on the intelligent interpretation of remote sensing data, and he has long been dedicated to tackling key technologies for building digital earth platforms for multi-scale infrared early warning. As principal investigator, he has led several projects, including the Basic Strengthening Program of the Science and Technology Commission, the Strategic Priority Research Program of the Chinese Academy of Sciences, and projects under the State Key Laboratory of Infrared Detection. In recent years, he has published 10 SCI-indexed journal papers and 3 conference papers, and filed 5 patent applications.

Reflective Tomography-LiDAR for High-Precision 3D Reconstruction of Space Targets

Xinyuan Zhang

National University of Defense Technology

Abstract: Long-range reflective tomography LiDAR imaging suffers from incomplete angular sampling, blurred depth features and incomplete target reconstruction, which limit the accuracy and stability of remote-target detection and positioning. To tackle these problems, this paper proposes a 3D reflective tomography LiDAR imaging and weighted barycenter reconstruction method for long-range scenarios. Based on filtered back-projection, a Gaussian template-matching deconvolution strategy is adopted for high-precision depth extraction, and a triple boundary-filling scheme is used to supplement volumetric information for complete 3D point-cloud reconstruction. Outdoor experiments at 10.38 km demonstrate that the proposed method achieves an in-plane resolution better than 2 cm and an axial resolution superior to 3.5 cm. Intensity-weighted barycenter calculation effectively suppresses noise and reconstruction artifacts, yielding stable and accurate target centroid coordinates under real atmospheric conditions. This method provides a practical solution for high-precision 3D imaging and positioning of long-distance targets.

Biography: Zhang Xinyuan, Associate Research Fellow at the College of Electronic Countermeasures, National University of Defense Technology. His research mainly focuses on long range laser detection and optoelectronic countermeasure applications. He has published more than 40 papers and authored one monograph. He was selected for the Young Talent Support Project of the China Association for Science and Technology and the Young Elite Program of National University of Defense Technology. He has won one First Class Prize for China Industry University Research Cooperation Innovation Achievements and one Nomination Award for Innovative Papers from the Chinese Society for Optical Engineering. He serves as a youth editorial board member for four high level journals including Journal of Infrared and Millimeter Waves.

Physics-Informed Coupled Modeling of Spaceborne Infrared Detection of Weak Aerial Targets

Liyuan He

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Spaceborne detection of weak aerial targets is governed by the coupled effects of target radiometry, sensor configuration, detector noise, background clutter and image-processing performance. Accurate characterization of these interactions is essential for translating detector-level specifications into reliable predictions of target visibility and for informing sensor and payload design. Existing studies often model these factors separately or conflate signal-to-noise ratio (SNR), clutter-to-signal ratio (SCR) and task-level detection performance, thereby limiting the physical interpretation of payload assessments. Here we develop a physics-informed coupled imaging model for multiband spaceborne infrared detection of weak aerial targets. The model propagates target and background radiance through aperture, ground sampling distance and integration time, incorporates band-dependent noise-equivalent detectable radiance, and distinguishes system-noise SNR from clutter-limited SCR and their joint effective SNR. The framework further combines parameter-sensitivity analysis, spectral-band and payload screening, controlled weak-target sequence generation, detection and tracking evaluation, and Monte Carlo validation under perturbed sensor and background conditions. It is designed to quantify how spectral band, sensor configuration, transmission uncertainty, detector noise and background-clutter assumptions jointly determine target observability and task-level reliability. By connecting physical imaging formation with algorithmic validation, this work establishes a reproducible basis for assessing spaceborne infrared detection performance and supporting the selection of spectral bands and payload configurations.

Geoscience Knowledge Graph

Xinbing Wang

Shanghai Jiao Tong University

Abstract: As the Earth system becomes increasingly complex, scientific discovery is shifting from reliance on individual experience toward collaboration at scale across data, knowledge, and collective intelligence. Geoscience knowledge graphs seek to assemble global data across space, connect historical literature through time, and link evidence through interdisciplinary collaboration, thereby establishing a knowledge foundation for understanding the Earth system and enabling scientific discovery.

This talk will present the bidirectional empowerment and practical applications of geoscience knowledge graphs. First, we explore how the creation, diffusion, and recombination of knowledge can be understood from massive scholarly literature. Over the past decade, our team has developed Acemap, a scholarly knowledge graph system containing billions of entities and relations. Acemap advances scholarly analysis beyond "counting numbers" in traditional bibliometrics toward AI-enabled exploration of knowledge structures and analysis of research content. Building upon this foundation, we have developed knowledge-driven scientific agents to support national agencies, including the National Natural Science Foundation of China, the Ministry of Education, and the Ministry of Science and Technology, in technology forecasting, expert identification, and domain analysis. We are also exploring the end-to-end integration of AI into Earth Science Horizons, a China-based geoscience journal. Second, we investigate how knowledge graphs can facilitate the development of independent geoscience databases and enable new scientific discoveries. To address the fragmentation and heterogeneity of geoscience data, as well as the limited use of long-tail resources, we have developed a suite of scholarly big-data mining tools and spatiotemporal data integration techniques. In response to major scientific challenges—including climate change, deep-sea resources, and One Health—we have constructed and released Jingwei, a global gridded spatiotemporal data product for multiple ocean variables, facilitating AI-driven analysis and understanding of interactions across Earth system spheres.

Our experience demonstrates that geoscience knowledge graphs are both tools for science and a science of tools in their own right. They enable machines to understand scientific questions, allow fragmented evidence to corroborate one another, and generate new knowledge from the continuous evolution of existing knowledge. In doing so, they are becoming a new scientific infrastructure for investigating the complex Earth system.

Biography: Wang Xinbing, Professor of Shanghai Jiao Tong University, recipient of the National Science Fund for Distinguished Young Scholars, and lead principal investigator of an NSFC Innovative Research Group. He previously served as Chair of ACM China Council, Vice Dean of the School of Electronic Information and Electrical Engineering, and Executive Director of the John Hopcroft Center for Computer Science at Shanghai Jiao Tong University. His core research addresses fundamental scientific problems on the representation and measurement of data, information and knowledge in large scale complex graph networks. He led the development of ACEMAP (www.acemap.info), the first knowledge graph system with hundreds of millions level nodes, and built the world's largest multimodal geoscience knowledge graph containing over 19 million entities and more than 140 million relational links. After ten years of operation, the system has accumulated 1.93 million lines of source code and received more than 64 million visits from 199 countries and regions worldwide. He serves on the editorial boards of multiple international journals including IEEE Transactions on Information Theory and IEEE/ACM Transactions on Networking. He is the chief author of the textbook Introduction to Mobile Internet, now updated to its 5th edition, adopted by over 290 universities in China and listed in the 14th Five Year Plan textbook catalogue of the Ministry of Education. Three of his supervised PhD students have earned Excellent Doctoral Dissertation awards from ACM China, the Chinese Institute of Electronics and the China Institute of Communications respectively. Up to now, 61 of his former students work at domestic universities and 19 hold faculty positions overseas.

TBA

Dapeng Tian

Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences

Abstract: TBD

Biography: TBD

Perspectives on the Application of Artificial Intelligence in opto-electronic Imaging

Fei Liu

Xidian University

Abstract: Artificial Intelligence (AI), originally conceived to "enable machines to possess intelligent thinking", has evolved from coarse-level perception to a stage that aspires toward deeper understanding. Over more than six decades of development, it has revitalized both individual disciplines and interdisciplinary research. Opto-electronic imaging, as a transformative paradigm in optoelectronic technology, is undergoing a profound transition from a purely physics-driven framework to a hybrid paradigm integrating physical modeling and data-driven intelligence. Leveraging its powerful capabilities in data analysis and prediction, AI has progressively replaced portions of traditional optical information processing within imaging systems. Grounded in the fundamental principles of both AI and opto-electronic imaging, this paper systematically investigates the enabling roles of AI from three perspectives: implicit spatial information representation, physics-guided differentiable AI architecture design, and systematic trustworthy opto-electronic imaging. It further analyzes the associated physical and mathematical challenges arising from these dimensions, and provides insights into future directions for the deep integration of AI and opto-electronic imaging.

Biography: Liu Fei, Professor, PhD supervisor, recipient of Shaanxi Provincial Distinguished Young Scholar and national young talent honor. He is Deputy Director of Xi'an Key Laboratory of Computational Imaging and Guest Professor at the National Defense Key Laboratory of Optical Information Control and Security Technology. He currently acts as Associate Editor of Advanced Imaging, editorial board member for journals including Optics and Lasers in Engineering, and youth editorial board member for PhotoniX and Opto Electronic Advances. He is also an OPTICA Travel Lecturer of Optica. His research focuses on computational imaging and image processing. He has published more than 60 papers in internationally renowned journals such as Light: Science & Applications, Advanced Photonics, Photonics Insights, Opto Electronic Advances and Photonics Research, with over 6000 citations.

Multi-scale Issues in Cross-media Detection

Pingyue Lv

Shanghai institute of technical physics, Chinese academy of sciences

Abstract: With the continuous development of long-range detection toward longer standoff ranges, lower signature targets and more intricate environments, traditional detection methods that depend on a single physical field and a single observation scale are increasingly limited by physical boundaries, detection performance and environmental adaptability. In cross medium scenarios, direct observation of targets is impossible. Only subtle perturbations generated by targets at medium interfaces can be measured. As signals propagate through the transmission path, their spatial, temporal, energy and physical field characteristic scales span multiple orders of magnitude. These scale parameters are mutually restrictive—optimizing performance for one scale inevitably compromises others. Instead of treating scale merely as a processing step, we can incorporate it as an independent dimension in detection models. Based on the author's research in precision optical metrology and weak target detection, this report describes the underlying physical mechanism of this problem, identifies the dimensions that produce multiscale features, and introduces several cross-scale sensing schemes, providing potential innovative approaches for cross-domain applications of next-generation detection.

Biography: Lv Pingyue, Young Associate Research Fellow, PhD. Her research focuses on perception and processing for space based detection, with long term efforts on key technologies for weak signal processing in early warning space borne infrared detection. As principal investigator, she has undertaken multiple projects including Basic Strengthening Program of the Science and Technology Commission, Strategic Priority Research Program of CAS, and key deployment projects of Shanghai Institute of Technical Physics. She also participates in several national major projects as a core technical member. She has published more than ten papers on signal enhancement and processing in journals and conferences, and obtained over ten patents. Her honors include the second prize of the Tianzhi Cup AI Challenge organized by the Military Space Force, finalist award of the 2022 Xiaomi Annual Technology Award, Emerging Scholar Award at the 2nd Space Information Technology Conference (2025), and selective youth talent support from key deployment programs of the Chinese Academy of Sciences.

Intelligent Algorithm-Empowered Novel Optical Measurements

Jiamiao Yang

Shanghai Jiao Tong University

Abstract: As optical metrology advances toward higher precision, broader measurement ranges, greater environmental adaptability, and increased automation, conventional approaches relying on high-performance hardware and tightly controlled environments face growing constraints in physical limits, cost, and real-world robustness. By jointly designing optical systems, physics-based models, and computational algorithms, valuable measurement information can be extracted from noise- and disturbance-contaminated data, enabling high-precision measurement under non-ideal conditions. This presentation highlights recent advances in intelligent computing-enabled laser interferometry, Shack–Hartmann wavefront sensing, and extended-depth-of-field microscopy. These studies demonstrate how computational intelligence can mitigate traditional trade-offs among accuracy, speed, range, and robustness, offering a promising pathway toward next-generation intelligent optical metrology systems.

Biography: Yang Jiamiao, Tenure Track Associate Professor and PhD supervisor at Shanghai Jiao Tong University, and Director of the Institute of Intelligent Optoelectronic Perception. He has been awarded the National High Level Overseas Talent Recruitment Program, Shanghai High Level Overseas Talent Program, and Shanghai Pujiang Talent Program. His long term research covers high precision optical metrology & imaging, light field manipulation and optical computing. He has led research projects supported by the Organization Department of the CPC Central Committee, National Natural Science Foundation of China, and Shanghai Science and Technology Commission. As first or corresponding author, he has published more than 30 papers in top SCI journals including Nature Communications, Science Advances, Light: Science & Applications and Optica. His research achievements have been reported by CCTV News Network, AIP Science Lights, Phys.org and other special featured science media platforms.

Characterization of the Land Surface Thermal Infrared Background and Comparison with Satellite Observations for the March 28, 2025 Myanmar Earthquake

Ningbo Zhang

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Land surface temperature (LST) is jointly influenced by multiple factors, including solar radiation, meteorological conditions, and surface properties, and therefore exhibits significant spatiotemporal variability. Characterizing the normal background is fundamental to the analysis of land surface thermal infrared variations. Focusing on the characterization of the land surface thermal infrared background, this study selects the March 28, 2025 Myanmar earthquake as an observational case. Land surface temperature data from a geostationary meteorological satellite are used to obtain continuous thermal infrared observations over the study area and to characterize the background state and its spatiotemporal variations. On this basis, the characterized background is compared with actual satellite observations during the earthquake period to analyze the spatiotemporal differences between the observed temperature and the background state, as well as their temporal evolution. Relevant environmental information is also incorporated to assist in the analysis of the observational results. Through the comparison between actual satellite observations and the characterized background, this study provides a case study for the construction of dynamic land surface thermal infrared backgrounds and their subsequent applicatio

Spatiotemporal-Intelligence-Driven Air-Ground Collaborative Perception: Technologies and Progress

Chun Liu

Tongji University

Abstract: The low-altitude economy is undergoing a dual leap in industrial chain cultivation and infrastructure development: industrial-grade UAVs have become the dominant market force, and eVTOL aircraft are developing rapidly. Nevertheless, the sector still faces constraints such as core technology bottlenecks, lengthy airworthiness certification cycles, and a shortage of takeoff and landing facilities. In response to these challenges, this report proposes a technical pathway that leverages spatiotemporal intelligence to upgrade low-altitude infrastructure: a digital foundation built on real-scene 3D models covering "airspace, facilities, industry, and scenario" maps; hierarchical airspace management with zoning, layering, and grading; a three-tier air route network; and a low-altitude intelligent connected network regulatory architecture supported by 5G-A integrated communication-sensing technology and blockchain. On this basis, the report presents a series of achievements by the team: leading the development of China's first national standard for multi-sensor consistency testing in UAV low-altitude remote sensing; proposing the Surface-Groundwater Connectivity Index (SGCI) model, which supported Shanghai's comprehensive elimination of Class V and below surface water; developing the Tongji-ARTEMIS air-ground integrated real-time mapping system, which overcomes the challenge of real-time mapping in disaster emergency response; and building the GeoScan series of mobile mapping equipment together with the TGS Gaussian Splatting rendering engine, serving scenarios such as construction management, facility inspection, and underground utility corridor surveying. Finally, the report looks ahead to four frontier directions in air-ground swarm intelligent perception—a holographic digital twin airspace, swarm networking for collaborative perception, multimodal data fusion, and remote sensing intelligent interpretation—and proposes an intelligent perception foundation model architecture of a "cloud brain plus edge cerebellum," driving the new-quality development of air-ground collaborative perception through spatiotemporal intelligence.

Biography: Liu Chun, Distinguished Tenured Professor at Tongji University, recipient of Special Government Allowance from the State Council, national high level talent, Science and Technology Innovation Leading Talent of the Ministry of Natural Resources, and Shanghai Outstanding Academic Leader. He serves as Executive Vice Dean of both the National Outstanding Engineer Institute and the International Engineer Institute at Tongji University. His main research interest lies in scene perception and mapping combining laser and vision sensing. He has presided over more than 30 national level research projects including National Key R&D Program, key/general programs of NSFC, 973 Program subjects and 863 Program projects. He has received over ten science and technology awards including the Second Class National Prize for Progress in Science and Technology and the First Class Shanghai Municipal Science and Technology Progress Award.

Remote Sensing Big Data Platform and Its Applications in Sustainable Development in the Digital Intelligence Era

Xiaoping DU

Aerospace Information Research Institute, Chinese Academy of Sciences

Abstract: Sustainable development is a critical issue concerning human survival and long-term development. At present, global sustainable development is facing a crisis of being seriously off track from the goals of the 2030 Agenda. Meanwhile, approximately 30% of global indicators still cannot be effectively assessed due to data gaps. This dual challenge of lagging progress and data deficiency has significantly limited the global community's understanding of the severity of these crises and its capacity for effective response. Against this backdrop, it is imperative to establish a remote sensing big data platform empowered by digital and intelligent technologies to provide data, products, and tools for global sustainable development research. This report first introduces the overall architecture, key technologies, data products, and public services of the remote sensing big data platform. It then presents representative applications in areas such as climate action, clean water, and sustainable cities and communities. Finally, the report discusses the future development trends of such platforms in the digital intelligence era.

Biography: Du Xiaoping, Research Professor and PhD supervisor at the Aerospace Information Research Institute, CAS. She is a member of the Academic Committee and Director of the Big Data Technology Department of the International Research Center for Big Data in Sustainable Development. Her research interests include Digital Earth, Earth big data, and intelligent interpretation of remote sensing imagery. She has led more than ten projects in the past five years and published over 80 academic papers.

Generative deep-learning-embedded asynchronous structured light for three-dimensional imaging

Lei Lv

Henan University of Technology

Abstract: Three-dimensional (3D) imaging with structured light is crucial in diverse scenarios, ranging from intelligent manufacturing and medicine to entertainment. However, current structured light methods rely on projector – camera synchronization, limiting the use of affordable imaging devices and their consumer applications. In this work, we introduce an asynchronous structured light imaging approach based on generative deep neural networks to relax the synchronization constraint, accomplishing the challenges of fringe pattern aliasing, without relying on any a priori constraint of the projection system. To overcome this need, we propose a generative deep neural network with U-Net-like encoder – decoder architecture to learn the underlying fringe features directly by exploring the intrinsic prior principles in the fringe pattern aliasing. We train within an adversarial learning framework and supervise the network training via a statistics-informed loss function. We demonstrate that by evaluating the performance on fields of intensity, phase, and 3D reconstruction. It is shown that the trained network can separate aliased fringe patterns for producing comparable results with the synchronous one.

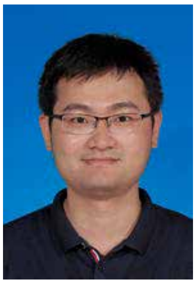
Biography: Lv Lei, Professor and PhD supervisor at Henan University of Technology, and a Leading Basic Research Talent of Henan Zhongyuan Talents Program. He obtained his PhD degree from University of Wollongong, Australia, and completed his post doctoral research at Singapore University of Technology and Design. He joined the School of Information Science and Engineering, Henan University of Technology in 2016. His research focuses on optical 3D imaging, 3D printing and image processing. He has hosted two NSFC projects, published more than 40 SCI papers and won the Third Class Prize for Henan Provincial Science and Technology Progress. He is recognized as a Zhengzhou High Level Talent and Zhengzhou Local Distinguished Contributor Talent.

Towards World Model-Empowered Integrated Sensing, Communication, and Decision for Complex Unmanned Systems

Yongpeng Wu

Shanghai Jiao Tong University

Abstract: Complex unmanned systems comprising satellites, unmanned aerial vehicles (UAVs), unmanned ground vehicles (UGVs), and quadruped robots are increasingly deployed to perform large-scale sensing and autonomous operations. We propose a world model-empowered sensing, communication, decision (SCD) integration framework for complex unmanned communication networks. The proposed architecture establishes a closed-loop system where a unified world model jointly optimizes time-sensitive sensing, wireless communication, and intelligent decision-making. To regulate sensing freshness and reduce redundant data generation, we propose a time-sensitive age of information (AoI)-driven sensing mechanism that dynamically schedules sensing updates based on task urgency and predictive uncertainty. Furthermore, a predictive world model is developed to jointly represent environmental dynamics, wireless channel evolution, and agent mobility within a hybrid deterministic-stochastic latent space. This enables proactive communication scheduling and decision evaluation via latent rollout. To support large.



Biography: Wu Yongpeng, Professor at Shanghai Jiao Tong University and recipient of the National Science Fund for Excellent Young Scholars. His long term research covers theories and methodologies for secure, ultra reliable and low latency communications. He has published over 140 papers in IEEE journals, many of which are ESI hot and highly cited papers, and he has received best paper awards from international conferences including IEEE ICC. His honors include the First Class Natural Science Award from China Institute of Communications (ranked first), the Second Class Huawei Technology Transformation Award, and Elsevier Chinese Highly Cited Researcher. He currently serves on the editorial boards of IEEE Transactions on Information Theory, IEEE Transactions on Wireless Communications and National Science Review. He acts as Deputy Group Leader of the New Generation Multiple Access Task Group for IMT 2030 (6G), and specially invited expert of Shanghai 5G/6G Expert Committee. He has led NSFC projects, National Key R&D Program projects and multiple industrial research projects.

Discussion on Datasets and Typical Problems of Comprehensive Maritime Target Recognition

Junfeng Wu

Naval Aviation University

Abstract: TBD

Biography: Professor, Naval Aviation University. His research focuses on multi-modal situational perception and recognition of unmanned aerial vehicles. He has presided over and participated in 12 research projects including the National Natural Science Foundation of China and the 173 Program. He was awarded the Second Prize of Shandong Technical Invention Award and the Second Prize of Science and Technology Progress Award of the Command and Control Society. He holds more than 30 authorized invention patents and has published over 20 papers.

AEF-FloodLM: Integrating AlphaEarth Embeddings for Visual Question Answering in Remote Sensing Flood Scenes

Xinzhi Zhang

Beihang University

Abstract: Visual question answering (VQA) based on pre- and post-flood remote sensing imagery can provide valuable support for disaster assessment and emergency decision-making. Although general-purpose multimodal large language models (MLLMs) exhibit strong vision–language reasoning capabilities, their application to remote sensing flood scenes still faces two major challenges. First, they lack sufficient adaptation to the characteristics of remote sensing imagery, making it difficult to accurately interpret surface changes induced by flooding. Second, they primarily rely on disaster-related visual cues in the input imagery for reasoning, limiting their access to land-cover and regional environmental information and, consequently, their ability to address questions involving disaster identification, impact assessment, and mechanism reasoning. AlphaEarth Foundations (AEF) integrates multi-source and multi-temporal Earth observation data, and its surface embeddings characterize land-cover and environmental states across spatial and temporal dimensions, thereby providing regional environmental priors for flood-related VQA.

Motivated by these considerations, we propose AEF-FloodLM, an AEF-embedding-enhanced multimodal model for remote sensing flood VQA. Built upon a pretrained multimodal large language model, the proposed model employs a vision encoder to extract features from pre- and post-flood imagery and introduces a Hierarchical Geospatial Prior Modulation (HGPM) module to integrate AEF embeddings with bi-temporal visual representations. HGPM first performs spatial matching based on geographic coordinates and establishes dimensional correspondence between AEF embeddings and visual features through feature projection. It then generates layer-specific gating weights conditioned on the visual states at different encoding layers and progressively injects the geospatial priors through residual modulation, enabling the model to reason jointly over flood-induced changes and regional environmental characteristics. To support model training and evaluation, we construct the FloodVQA dataset, which contains 5,768 pairs of pre- and post-flood remote sensing images and 11,791 question–answer pairs covering four categories of questions: perception, assessment, decision-making, and mechanism reasoning. Of these image pairs, 2,228 are associated with geographic coordinates and corresponding AEF embeddings. In addition, we develop a progressive three-stage training strategy. First, all question–answer pairs are used for flood-domain adaptation to equip the model with bi-temporal scene understanding and VQA capabilities. Next, samples with AEF embeddings are used to train HGPM, enabling the model to learn the association between geospatial priors and visual representations. Finally, HGPM and the model adaptation parameters are jointly optimized to enhance the coordination among visual information, geospatial priors, and language reasoning.

Experimental results demonstrate that flood-domain adaptation substantially improves the task performance of the general-purpose multimodal large language model. Building upon the domain-

adapted baseline, AEF-FloodLM further improves the overall performance by 5.03 percentage points with the introduction of AEF embeddings. On the test subset associated with AEF embeddings, AEF-FloodLM achieves a multiple-choice accuracy of 93.45%, representing a 10.79-percentage-point improvement over the domain-adapted baseline. Ablation studies and qualitative analyses further show that AEF embeddings enable the model to better exploit regional surface environmental information, while HGPM and the three-stage training strategy facilitate the integration of geospatial priors, visual features, and language reasoning. Overall, the results demonstrate the effectiveness of AEF embeddings for enhancing VQA in remote sensing flood scenes.

Large dynamic range Shack-Hartmann wavefront sensing based on a graph-theoretic computational model

Lintong Du

Shanghai Jiao Tong University

Abstract: In space-optical applications such as astronomical observation, space-based remote sensing, and free-space laser communication, optical systems often face complex wavefront sensing conditions involving large aberrations, strong turbulence, and discontinuous sampling. The Shack-Hartmann wavefront sensor offers a simple structure and enables non-interferometric measurement. However, large local wavefront slopes can cause focal spots to shift across subaperture boundaries, overlap with one another, and undergo severe distortion, resulting in measurement errors and limiting its application in complex space-optical scenarios. To address these challenges, this report presents a large-dynamic-range Shack-Hartmann wavefront sensing method based on a graph-theoretic computational model, namely G-SHWS. In this approach, the actual and fitted focal spots are represented as two node sets in a weighted bipartite graph, and their matching relationship is determined through global combinatorial optimization. A graph attention network incorporating matching-topology information is further introduced to fuse the spatial distribution, intensity morphology, and neighborhood relationships of the focal spots, enabling high-precision wavefront reconstruction under strong aberrations. Numerical simulations and experimental results demonstrate that the proposed method maintains strong robustness in the presence of severe spot crosstalk, spot distortion, and partial spot loss. It extends the measurable dynamic range of the Shack-Hartmann sensor to approximately 21 times the conventional limit while maintaining high reconstruction accuracy. This study provides a hardware-independent computational solution for real-time wavefront sensing under complex conditions. It offers valuable technical support for reliable wavefront sensing in applications such as aberration correction in space-optical systems, astronomical adaptive optics, and infrared space exploration.

Low-Altitude Intelligent Remote Sensing and Its Applications in Areal Inspection

Xiang Li

East China Normal University

Abstract: As an important support for the low-altitude economy, low-altitude intelligent remote sensing adopts UAV carriers integrated with multi-source sensing and artificial intelligence technologies. It solves the defects of traditional remote sensing and manual inspection, featuring high precision, high efficiency and low cost, and is widely used in urban governance and emergency security. Focusing on the full-domain inspection demands of smart parks, this talk introduces some technologies and applications in practice. Based on 3D real-scene models and 3DTiles data, it adopts triangular patch reconstruction and visibility analysis algorithms to automatically calculate the optimal UAV inspection viewpoints, effectively solving inspection difficulties caused by tree occlusion and visual field restrictions. Verified by air-ground collaborative inspection, crowd monitoring and risk early-warning scenarios, the technology can fill ground monitoring blind areas, improve inspection intelligence, reduce operation costs and realize advance risk warning. This talk provides a practical reference for the large-scale application of low-altitude remote sensing in refined smart park operation and maintenance.

Biography: Xiang Li is a Professor and PhD supervisor at East China Normal University. He is Deputy Director of the Key Laboratory of Geographic Information Science (Ministry of Education) and Director of the Research Center for Spatial Intelligence Technology of Low Altitude Economy. He has published nearly 200 academic papers and authored three monographs. His interdisciplinary research addresses diverse spatial intelligence problems for cross domain applications. Leveraging AI driven spatiotemporal perception and GIS platforms, he builds domain specific application models for practical real world solutions, with multiple deployed applications in environmental protection, urban planning, traffic management and public security monitoring.

Research on Key Technologies and Applications of Fengyun-3 Meteorological Satellites for Arctic Sea Ice Monitoring and Identification

Cailan Gong

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Arctic sea ice retreat opens summer shipping windows, yet multi-year ice still endangers ordinary vessels even in peak melt seasons. Satellite remote sensing is the primary tool for polar sea ice monitoring, but optical sensors are often hindered by cloud cover. Such inherent deficiencies pose substantial difficulties for the precise and continuous surveillance of sea ice dynamics along Arctic shipping lanes.This study presents a comprehensive framework for sea ice segmentation and motion prediction using FY-3 MERSI-II imagery. For sea ice segmentation, we propose a novel U-ASPP-Net architecture, which integrates an Atrous Spatial Pyramid Pooling (ASPP) module and depthwise separable atrous convolutions into the U-Net framework to enhance multi-scale feature extraction. The network is optimized with a Frequency-Distance Weighted Loss (FDWloss) function, and an overlapping patch strategy is employed to generate the final segmentation maps. To address the limitations of conventional optical flow methods—which fail to simultaneously satisfy the requirements of spatiotemporal forecasting and semantic segmentation—we develop a Multiloss-SAM-ConvLSTM model for sea ice motion prediction. This model incorporates a weighted FDWloss into the SAM-ConvLSTM framework to strengthen spatial semantic representation at each temporal node. Furthermore, given the imbalanced sample distribution, we investigate the threshold shift effect in the post-segmentation process and determine the optimal segmentation threshold via grid search, thereby substantially improving the overall prediction accuracy of sea ice dynamics, and offering a viable solution for operational navigation support in polar regions.

Biography: Gong Cailan, Research Professor at the Shanghai Institute of Technical Physics, CAS. She has long term research experience in remote sensing image processing and quantitative remote sensing information extraction. She has published more than 80 papers, obtained 6 authorized invention patents, and participated in drafting two national standards and one monograph. She has twice won the Shanghai Municipal Science and Technology Progress Award and once received the Second Class Prize of China Geographic Information Science and Technology Progress Award.

Modeling and simulation of micro-level crowd behaviors

Wenhang Li

Aerospace Information Research Institute, Chinese Academy of Sciences

Abstract: This study examines micro-scale crowd behaviors, and proposes an integrated methodological framework that incorporates four core modules: micro-spatial relationship modeling, individual-based micro-scale crowd behavior modeling, simulation-based inference, and the development of a virtual visualization platform. Using a school building as a case study, this work further demonstrates the practical utility of the proposed micro crowd behavior model through typical applications, including emergency evacuation simulation, pedestrian behavioral optimization, and scheme optimization for multi-story building scenarios.

Biography: Li Wenhang, Associate Research Fellow at the Aerospace Information Research Institute, Chinese Academy of Sciences. His main research directions are crowd behavior simulation and virtual reality. He has published 20 SCI indexed papers as first or corresponding author and authored two monographs. He received the First Class Prize for Science and Technology Progress from the Ministry of Education, holds 5 authorized national invention patents and 4 software copyright registrations. He has led multiple research subjects including sub projects of National Key R&D Program and four General Programs of the National Natural Science Foundation of China.

Construction and performance of Multi-dimensional Photonic Information Detectors

Wenjie Deng

Key Laboratory of Optoelectronics Technology of Education Ministry of China, School of Integrated Circuits, Beijing University of Technology

Abstract: Intelligent photodetectors capable of perceiving multi-dimensional optical information—such as wavelength, polarization, and intensity—represent an important development direction in the field of new-generation information technology. However, the operating principles of conventional devices restrict the direct acquisition of multi-dimensional photonic information. To address these challenges, this work focuses on multi-dimensional intelligent photodetectors, taking naturally interface-passivated van der Waals photodetectors as the research object through novel device design and excitonic-state modulation. First, an electric-field regulation strategy for interlayer excitons in van der Waals heterojunctions is proposed, realizing an ultra-compact on-chip near-infrared spectrometer with a characteristic size of approximately 10 μm. Second, an asymmetric lattice-twist-angle unipolar-barrier band design is proposed, enabling full linear-polarization (0–180°) detection over a broad spectral range (1–5 μm). Third, a pulsed artificial vision architecture that fully emulates the characteristics of the human visual system is proposed, achieving highly energy-efficient spatiotemporally fused sensing-computing-integrated detection and recognition. The pulsed optoelectronic detector array consumes energy as low as the picojoule level (with recognition efficiency above 90 %), and achieves a tenfold reduction in computational cost compared with classical algorithms for the same visual task.

Biography: Dr. Wenjie Deng is an Associate Professor and Doctoral Supervisor at the School of Integrated Circuits, Beijing University of Technology. His research focuses on the design and fabrication of novel infrared photodetectors and the underlying device physics. He has published 40 SCI-indexed papers and applied for 15 national invention patents.

Tool-Augmented LLM Agents for Trustworthy Earth System Analysis

Luyu Han

Shanghai Jiao Tong University

Abstract: Earth science increasingly relies on large-scale and heterogeneous data to characterize and predict the dynamics of the Earth system, making efficient and reproducible data analysis essential for scientific discovery. Recent advances in large language models (LLMs) provide new opportunities for intelligent data analysis through natural-language interaction, reasoning, and tool orchestration. However, unconstrained workflow generation and tool use can introduce non-deterministic execution, compromising the reproducibility and reliability required for scientific analysis. To address this limitation, we present a tool-augmented agent for earth science data analysis that translates natural language requests into executable and traceable scientific workflows. By separating high-level reasoning and workflow planning from numerical computation, the agent grounds LLM-based cognition in a curated set of deterministic and domain-specific scientific operators, enabling analytical processes that are physically meaningful, reproducible, and verifiable. Using CMIP6 data, we demonstrate its ability to autonomously execute multi-step analytical workflows and generate integrated scientific reports that combine quantitative results, visualizations, and evidence-based interpretations. This work establishes a framework for integrating LLM-based intelligent cognition with reliable and physically grounded Earth science computation, providing a practical approach toward trustworthy intelligent analysis of Earth system data. Future work will expand the agent's scientific toolkit by incorporating established geoscientific libraries such as ESMValTool, leveraging their standardized diagnostics and model evaluation capabilities to support broader and more systematic Earth system analyses.

Intelligent Recognition Enabled by Large-Scale, Gate-Tunable MoS_2 Optoelectronic Arrays

Kunyu Wang[1,2] and Hangyu Xu[1*]

[1]*State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics*

[2]*School of Physical Science and Technology, ShanghaiTech University*

Abstract: Intelligent visual recognition is crucial for extracting and understanding spatial and spectral information from remote-sensing images. Two-dimensional semiconductors provide a promising platform for this purpose, owing to their strong light–matter interactions, effective electrostatic tunability, and dangling-bond-free surfaces, which enable sensitive photodetection and versatile integration. In particular, their gate-tunable photoresponses allow optical sensing and programmable information encoding within a single device, facilitating intelligent recognition and cognition close to the sensor.

Although individual devices have demonstrated excellent optoelectronic performance and intelligent sensing capabilities, extending these advantages to large-area intelligent photodetector arrays remains challenging. This limitation primarily arises from contamination, structural damage, and trap states introduced during material transfer, together with an insufficient understanding of the underlying transfer and release mechanisms. Consequently, large-scale intelligent optoelectronic arrays remain largely confined to laboratory demonstrations, with limited device uniformity, fabrication yield, and visual recognition performance.

In this study, we develop a capillary-driven, PDMS-stamp-assisted patterned transfer strategy to fabricate MoS_2 optoelectronic arrays for intelligent recognition. Guided by interfacial adhesion engineering, the process coordinates stamp demolding, liquid-assisted delamination, and thermal release to improve transfer reliability while preserving material quality. A 16 × 16 photodetector array achieves a device yield of 98.4% and an average on/off ratio exceeding 10^5, together with gate-tunable, wavelength-dependent photoresponses. Using these response characteristics, we demonstrate a proof-of-concept parallel RGB convolutional neural network for remote sensing image recognition on the EuroSAT dataset. The RGB scheme achieves an accuracy of 86.63%, compared with 80.80% for the grayscale baseline, an improvement of 5.83 percentage points. This work addresses a key fabrication bottleneck in two-dimensional material arrays and links high-yield optoelectronic integration with spectral information encoding for intelligent visual recognition.

2D Ferroelectric Materials for Neuromorphic Computing

Fucai Liu

University of Electronic Science and Technology of China

Abstract: Ferroelectric material featuring switchable polarizations states which can be switched by external electric field, has shown potential applications in nonvolatile memory, and neuromorphic computing. For the conventional oxide ferroelectric materials, especially whose thickness comes to a few unit cells, the notable depolarization effect and intrinsic size effect dominate, leading to the vanishing of the ferroelectric polarization. The rising of two-dimensional van der Waals materials provide a new opportunity for ferroelectricity study. Here, we reported new ferroelectricity discovered at the atomically thin limit, with intriguing physical properties including ferro-ionic coupling, layer number dependent polarization states, and the fatigue-free nature. Such extraordinary physical properties highlight the potential of 2D ferroelectric materials for new concept device applications of neuromorphic computing.

Biography: Dr. Fucai Liu is a full professor at University of Electronic Science and Technology China. He received his Ph.D. degree and B.Sc. degree from Nankai University China. After graduation, he worked as a postdoc in Tohoku University Japan, Nanyang Technological University Singapore. His research interests focus on the study of two-dimensional ferroelectric materials, and their application for photodetection and neuromorphic computing. He has published 61 papers including Science, Phys. Rev. X, Nature Commun., Science Advances, Advanced Materials, as first or corresponding author.

2D Electronic Devices for In-memory-computing

Fan Wu

Fudan University

Abstract: Two-dimensional (2D) semiconductors offer unique opportunities for beyond-CMOS electronics and energy-efficient in-memory computing. In this talk, recent advances in 2D electronic devices, including extreme-scaled transistors, reconfigurable logic devices, and transistor–RRAM integrated in-memory computing devices will be presented. Wafer-scale 2D in-memory computing arrays and static-random-acess-memories are demonstrated, highlighting the potential of 2D electronics for device–architecture co-design and next-generation intelligent computing.

Biography: Fan Wu is an Assistant Professor A (Research Professor) at the Institute of optoelectronics, College of Future Information Technology, Fudan University. His research focuses on extreme-scale transistors, novel ferroelectric memories, and in-memory computing devices and chips for advanced integrated circuits. He has co-authored 44 research papers, including 13 as first or co-first author, with publications in Nature, Nature Physics, Nature Communications (3 papers), and IEDM. His research has been recognized by several major scientific awards and featured among the Top Ten Advances in Chinese Chip Science and Semiconductor Research.

2D ferroelectric materials and devices

Fei Xue

Zhejiang University

Abstract: With the advent of Big Data and Internet-of-the-Things, massive data needs to be processed and stored within a short timeframe. This exacerbates the energy and speed costs in silicon-based mainstream hardware due to the physically separated processing and memory units. To address these issues, novel computing paradigms with parallelly processing and storing capabilities, such as neuromorphic and in-memory computing, are urgently required. Toward this goal, 2D ferroelectric memory devices are excellent building blocks because of their scaled sizes, fast speed, low-power consumption and multifunctionalities. This talk will cover our efforts in the symmetric manipulation of 2D ferroelectric materials and their device implication for next-generation computing paradigms.

Biography: Dr. Fei Xue is now a tenure-track assistant professor in center for quantum matter and school of physics, Zhejiang University, China. He received PhD from University of China Academy of Sciences in 2017. Afterwards, from 2017 to 2021 he worked as a postdoctoral fellow at the King Abdullah University of Science and Technology.His research focuses on low-dimensional ferroelectric materials, ferroelectric memristors, and neuromorphic computing. He has published over 60 peer-reviewed papers in prestigious journals, among which the correspondence authorship papers include Nature Nanotechnology, Science Advances (×2), Nature Communications (×5), Matter (×3) etc. He was filed or granted with 15 Chinese patents. He is an associate editor of Microelectronic Engineering (Elsevier) and was awarded with 2DM Scientis

Gate-Reconfigurable Multifunctional Photodetection Through Realigning Energy Band

Shenglan Hao

East China Normal University

Abstract: Integrating multiple optoelectronic functions into a single photodetector is highly desirable for next-generation intelligent optoelectronics, yet remains challenging due to the reliance on complex device architectures and elaborate material engineering. Here, we demonstrate that realignment of energy band induced electric field enables a simple type-II van der Waals heterojunction composed of indium selenide and black phosphorus (InSe/BP) to realize gate-reconfigurable bipolar photovoltaic and dual mode adaptive photoconductive operation. Notably, the device exhibits excellent broadband detection from 520 to 1550 nm. Furthermore, the InSe/BP heterostructure displays negative differential transconductance (NDT), a characteristic that holds great potential for multi-valued logic and artificial neuron applications. This study not only showcases high-performance electronic and optoelectronic properties but also provides a comprehensive understanding of band modulation for the development of future low-power photodetection, logic devices, and adaptive vision systems.

Biography: Shenglan Hao is an Associate Researcher at the Key Laboratory of Polar Materials and Devices, Ministry of Education, East China Normal University. She received her PhD degree from Paris-Saclay University. Her research focuses on photodetectors and neuromorphic devices based on ferroelectric or two-dimensional (2D) materials, as well as their applications in machine vision systems and in-sensing computing integration. She has published more than 10 peer journal papers, nano letters, advanced functional materials. She was awarded the Shanghai Pujiang Talent Program in 2025.

Low-Dimensional Heterostructures for Near-Infrared Neuromorphic Optoelectronics: From Photocarrier Physics to In-Sensor Hardware Integration

Sichao Du

Zhejiang University City College/ Zhejiang University

Abstract: The rapid development of infrared imaging, machine vision, and edge intelligence is driving infrared optoelectronics beyond conventional signal detection toward intelligent information processing. Emerging low-dimensional materials and their van der Waals heterostructures offer a versatile platform for this transition, owing to their tunable band structures, strong light–matter interactions, and rich photocarrier dynamics.

Here, we present our work on low-dimensional material-based optoelectronic and neuromorphic devices operating in the near-infrared region. By combining different material systems, including transition-metal dichalcogenides (TMDs) and Dirac semimetals, with Schottky-junction and photoconductive structures, the photoresponse can be extended into the NIR through material and structural engineering. These device structures can also be used to regulate nonequilibrium hot-carrier transport, interfacial charge transfer, and photocarrier trapping and relaxation. The interplay between hot-carrier dynamics and interfacial charge trapping can give rise to photoconductive gain, persistent photoresponse, and tunable conductance states.

Beyond individual devices, the development of integrated arrays is enabling a transition from software-based artificial neural network (ANN) simulations toward physical neuromorphic hardware. By mapping device conductance states to synaptic weights, such hardware architectures can support image processing, feature extraction, pattern recognition, and in-sensor intelligent perception.

Overall, these studies connect NIR photodetection and nonequilibrium carrier dynamics with neuromorphic devices, integrated arrays, and hardware-level information processing, and may provide new possibilities for intelligent infrared sensing and imaging.

Biography: Sichao Du is an Associate Professor and Principal Investigator at Zhejiang University City College, with concurrent research appointment at Zhejiang University. He received his Ph.D. from the University of Sydney and completed postdoctoral research at the Australian Centre for Microscopy and Microanalysis and Zhejiang University. His research interests cover non-equilibrium hot-carrier physics, low-dimensional van-der-Waals heterostructures, infrared optoelectronic devices, and neuromorphic in-sensor computing hardware. His group focuses on exploring photocarrier dynamics in two-dimensional materials and developing near-infrared intelligent optoelectronic systems. He is an IEEE Senior Member and serves as Young Editorial Board Member of EcoEnergy.

Counterfactual Remote-Sensing Screening and Detectability Assessment of Localized Thermal Anomalies Associated with Tunnel Engineering in High-Altitude Cold Regions

Haochen Bao

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Land surface temperature (LST) in high-altitude cold regions is jointly controlled by elevation, slope-dependent solar radiation, snow cover, land cover, and weather variability. Thermal responses potentially associated with tunnel construction are typically weak and spatially uncertain, making them difficult to identify using single-scene imagery, simple before–after differencing, or conventional remote-sensing time-series anomaly detection. Using the New Guanjiao Tunnel as a case study, this study develops a counterfactual remote-sensing framework for screening potential engineering-related thermal anomalies. A time-series dataset is constructed from Landsat LST observations during 2001–2021 together with topographic, land-cover, meteorological, and solar-geometry variables. Temporal information and contemporaneous background observations outside the presumed engineering-affected zone are used to reconstruct the LST expected at target locations under a no-disturbance counterfactual. Residuals between observed and counterfactual LST are robustly standardized by acquisition date and examined using multiscale spatiotemporal scanning. To characterize the detection limits of the framework, spatiotemporal injection experiments are conducted in an independent engineering-free background domain, with anomaly magnitude, spatial extent, and persistence systematically varied. The simulations show that detectability is jointly controlled by thermal amplitude, spatial coherence, and the number of valid observations, with temporal persistence exerting the strongest influence. Weak anomalies confined to a few isolated observations are difficult to detect reliably, whereas spatially coherent signals recurring across multiple scenes have substantially higher detection probabilities. The framework supports candidate-area screening and remote-sensing observability assessment of localized thermal anomalies under complex alpine conditions, and provides a basis for independent follow-up verification using higher-resolution imagery and engineering information.

MST-Mamba: Multi-Scale Token-Enhanced Mamba for Hyperspectral Image Generation

Yuanyi Zhang

Beihang University

Abstract: Hyperspectral image (HSI) generation aims to recover rich spectral information from accessible RGB or multispectral observations, providing valuable information for material identification, scene understanding, and remote sensing analysis. By reconstructing dense spectral signatures from low-dimensional observations, HSI generation can reduce the dependence on specialized hyperspectral sensors and provide a practical means for obtaining spectral information in scenarios where direct HSI acquisition is difficult or costly. However, the large number of spectral bands and strong spatial-spectral correlations make it challenging to accurately recover high-dimensional spectral information from limited observations. Traditional methods often rely on handcrafted priors, physical assumptions, or optimization-based formulations, which require task-specific designs and may have limited representation capability. CNN-based methods improve reconstruction through hierarchical feature extraction, but their local receptive fields make it difficult to capture long-range dependencies across spatial and spectral dimensions. Transformer-based approaches introduce global self-attention and provide stronger dependency modeling, yet their computational and memory costs increase substantially with the sequence length and feature dimensionality of hyperspectral data. These limitations motivate more efficient architectures for high-dimensional spatial-spectral representation learning.

We propose MST-Mamba, a HSI generation framework that leverages Mamba to learn high-dimensional representations directly from observed visual information. With linear computational complexity with respect to sequence length and effective long-range dependency modeling, Mamba is well suited to the high-dimensional and highly correlated nature of hyperspectral data. Instead of relying on predefined dimensionality expansion, MST-Mamba directly learns a unified high-dimensional representation through state space modeling. To further enhance the representation of complex ground objects, we introduce a multi-scale spatial-spectral token enhancement strategy that captures spatial variations and spectral response patterns at different scales. During multi-scale feature fusion, the learnable fusion weights are initialized to zero and progressively optimized during training. This zero-initialized design allows the network to initially preserve the original representation while gradually learning the contribution of multi-scale information, reducing the risk of introducing unstable or excessive feature perturbations at the early training stage. Target wavelength information is further encoded as semantic guidance and incorporated into the learned representation through feature modulation, allowing the model to generate the corresponding spectral response conditioned on the target wavelength.

We evaluate MST-Mamba on the DFC 2018 and AVIRIS datasets, covering different spectral characteristics and scene contents. Experimental results demonstrate that MST-Mamba effectively recovers spatial structures and spectral characteristics from RGB observations and achieves

competitive reconstruction performance compared with existing HSI generation methods. Qualitative results further show that the generated HSI preserves detailed spatial structures while maintaining consistent spectral profiles. Ablation studies verify the effectiveness of Mamba-based high-dimensional representation learning and the proposed multi-scale spatial-spectral token enhancement strategy. Additional experiments with different target wavelength positions demonstrate that the learned representation can generate corresponding spectral responses across wavelength positions, supporting wavelength-conditioned spectral reconstruction.

Overall, MST-Mamba provides an efficient approach to HSI generation by combining Mamba-based high-dimensional representation learning with multi-scale spatial-spectral token enhancement. The proposed framework avoids relying on predefined high-dimensional expansion and progressively learns spatial-spectral representations suitable for hyperspectral reconstruction from accessible visual observations.

Bidirectional Cross-Spatial Fusion Method of LiDAR Point Clouds and Images for Autonomous Driving

Zhenglei Dou

National University of Defense Technology

Abstract: Multi-sensor fusion is a core technology in autonomous driving environmental perception. Existing fusion methods mainly face two major bottlenecks: first, after forward projecting 3D point cloud information into the Bird's-Eye View (BEV) space, the compression of the height dimension makes it difficult for the fused features to be accurately "reprojected" back to the original 3D point cloud, hindering the effective transfer of global semantic information to local point-wise features; second, the inherent dimensional and resolution discrepancies between images and point clouds lead to insufficient cross-modal registration accuracy, which in turn affects fusion performance. To address these issues, this paper proposes a bidirectional cross-spatial fusion network (Bi-SFNet) for autonomous driving, which constructs a closed-loop "3D-to-BEV-to-3D" feature enhancement cycle, combined with a two-stage registration and hybrid-level fusion strategy, to achieve deep synergy between image semantics and point cloud geometry. Experimental results on the KITTI and nuScenes datasets demonstrate that the proposed method achieves leading performance in both semantic segmentation and 3D object detection tasks.

Gate-Tunable Multi-Junction Competition for Joint Position and Wavelength Sensing

Yuelin Zhang[1,3], Xiao Fu[1,2*]

1 State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics

2 University of Chinese Academy of Sciences

3 Hubei University

Abstract: Joint acquisition of spatial and spectral information is essential for intelligent optical sensing and remote sensing. However, conventional photodetectors often compress these optical inputs into a single photocurrent amplitude, making them difficult to distinguish within an individual device. Electrically reconfigurable photodetectors offer an opportunity to encode multidimensional optical information directly at the sensing front end.

Here, we demonstrate a gate-tunable multi-junction competition strategy for joint position and wavelength sensing in a single $WSe_2/MoTe_2$ van der Waals heterostructure. The device integrates a central heterojunction and two metal–semiconductor contacts under a common gate. Beyond carrier collection, the contacts actively participate in photocarrier separation and information encoding. Gate modulation tunes the magnitude and polarity of the competing junction contributions, while illumination position and wavelength alter their relative response weights. This interplay maps each position–wavelength input into a characteristic gate-dependent photocurrent vector, encoding optical information in the response shape rather than solely in its amplitude.

Spatially resolved photocurrent mapping reveals gate-induced redistribution of the photoresponse and local polarity reversals, supporting the multi-junction competition mechanism. As a proof of concept, a lightweight fully connected neural network decodes the measured photocurrent vectors and distinguishes nine combinations of three illumination positions and three wavelengths (405, 520, and 830 nm) with an accuracy of 98.26%. These results demonstrate joint position and wavelength recognition in a single detector without optical filters or pixel arrays, establishing a device-level route toward compact multidimensional sensing for intelligent optoelectronic perception.

Track 5: Infrared and Interdisciplinary Fields

Sep.19 Saturday, Ya Mei Ballroom 3, 3F（3 楼 亚美 3）	
Presider: Fan Zhang, Fudan University	
13:30-13:55	Keynote Talk **Neuromorphic devices and integration** Lei Ye, Huazhong University of Science and Technology
13:55-14:10	Invited Talk **Memristor-based in-sensor computing technology for infrared detectors** Qingjiang Li, National University of Defense Technology
14:10-14:25	Invited Talk **Growth Mechanisms of van der Waals Epitaxial Heterointegration and Their Application to Interlayer Excitons** Xiaoming Yuan, Central South University
14:25-14:40	Invited Talk **TBA** Junliang Liu, Jiangnan University
14:40-14:55	Invited Talk **Anisotropic van der Waals Materials and Devices for Broadband Polarization-Sensitive Photodetection from the Ultraviolet to the Short-Wave Infrared** Juehan Yang, Institute of Semiconductors, Chinese Academy of Sciences
14:55-15:10	Invited Talk **Low dimensional semiconductor heterojunction based infrared detectors and their applications** Yufeng Liu, Shanghai Institute of Technology
15:10-15:25	Coffee Break
Presider: Bobo Tian, East China Normal University	
15:25-15:50	Keynote Talk **Far-/Medium-infrared All-sky Explorer (FAMAE)** Chao Liu, National Astronomical Observatories, Chinese Academy of Sciences
15:50-16:05	Invited Talk **拟态计算技术的技术实践与发展 -- 从结构编排与生成到拓扑中心计算** Fan Zhang, Fudan University

16:05-16:20	Invited Talk **Spatial-Spectral Information-guided Hyperspectral Anomaly Detection and Tracking** Huixin Zhou, Xidian University
16:20-16:35	Invited Talk **Mid-infrared upconversion computational imaging** Kun Huang, East China Normal University
16:35-16:50	Invited Talk **Motion tracking with in-sensor graded encoding and compression** Jiewei Chen, South China Normal University
16:50-17:05	Invited Talk **VO_2 based multiband dynamic optical thermal regulation** Shuliang Dou, Harbin Institute of technology
17:05-17:15	Oral Talk **Design of a Readout Circuit Chip for Quantum-Dot Infrared Dynamic Vision Sensors** Weiyi Tang, Fudan University
17:00-18:30	Poster Session
18:30-20:30	Banquet

Track 5: Infrared and Interdisciplinary Fields

Sep.20 Sunday, Ya Mei Ballroom 3, 3F（3 楼 亚美 3）	
Presider: Yang Li, Zhejiang University	
08:30-08:55	Keynote Talk **TBA** Xiubao Sui, Nanjing University of Science and Technology
08:55-09:10	Invited Talk **Metasurface-Integrated Multi-Quantum-Well Detectors for Infrared Applications** Yiyang Xie, Beijing University of Technology
09:10-09:25	Invited Talk **Some new structures of mid-infrared quantum cascade lasers** Bo Meng, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences
09:25-09:40	Invited Talk **Toward self-driving epitaxy: from feedback control to autonomous heterostructure growth** Chao Zhao, Institute of Semiconductors, Chinese Academy of Sciences
09:40-09:55	Invited Talk **Direct All-Electrical Decoding of Infrared Structured Light: From Scalar Vortex to Vector Vortex Beams on Chip** Mingjin Dai, Zhengzhou University
09:55-10:10	Invited Talk **From Resonant Light Trapping to Reconfigurable Strong Coupling in Infrared Dielectric Metasurfaces** Bowen Jia, Wuhan University of Technology
10:10-10:20	Oral Talk **Sensing–memory coupled retinomorphic device for dim-light vision** Xuelong Liu, Fudan University
10:20-10:35	Coffee Break
Presider: Xiaoming Yuan, Central South University	
10:35-10:50	Invited Talk **Noise-resistance photon-correlation parallel LiDAR driven by the non-classical light source** Chengbin Qin, Shanxi University

10:50-11:05	Invited Talk **Scalable Metamaterials for light and thermal management** Yang Li, Zhejiang University
11:05-11:20	Invited Talk **Carbon nanotubes-based flexible electrochemical infrared-tunable device** Kerui Li, Donghua University
11:20-11:35	Invited Talk **Infrared Superconductor Nanowire Single-Photon Detector** Hao Wang, Nanjing University
11:35-11:50	Invited Talk **Bio-inspired Design and Multi-dimensional Perception of Reconfigurable Visual Sensors** Yinlong Tan, National University of Defense Technology
11:50-12:00	Oral Talk **Spatial Optical Encoding with a MoS_2 Floating-Gate Phototransistor Array for Robotic Vision** Mingfei Dang, Shanghai University
12:00-13:30	Lunch

Track 5: Infrared and Interdisciplinary Fields

Sep.20 Sunday, Ya Mei Ballroom 3, 3F（3 楼 亚美 3）	
Presider: Kun Huang, East China Normal University	
13:30-13:55	Keynote Talk **Integrated Ultraviolet Optoelectronics for Communication and Imaging** Haiding Sun, University of Science and Technology of China
13:55-14:10	Invited Talk **Mechanical and Thermal Performance of Diamond as an Infrared Material** Shaobo Cheng, Zhengzhou University
14:10-14:25	Invited Talk **In-situ Fabricated Nanowire Array for Artificial Compound Eye** Yu Zhou, Fudan University
14:25-14:40	Invited Talk **Hetero-Integration of Mixed-Dimensional van der Waals Semiconductors for UV–IR Dual-Color Photodetection** Feng Wu, Huazhong University of Science and Technology
14:40-14:55	Invited Talk **Large-Area Low-dimensional Wide-bandgap Semiconductors for Integrated UV photodetectors** Ziqing Li, Fudan University
14:55-15:05	Oral Talk **Ferroelectric Reconfigurable Homojunction Miniaturized Computational Spectrometers for Dynamic Spectral Sensing** Qianru Zhao, Fudan University
15:05-15:15	Oral Talk **Research on Infrared Detection and Infrared Camouflage Based on Metasurfaces** Qianlong Kang, Shanghai Institute of Technical Physics, Chinese Academy of Sciences
15:15-15:30	Coffee Break
Presider: Shaobo Cheng, Zhengzhou University	
15:30-15:55	Keynote Talk **TBA** Qiming Zhang, University of Shanghai for Science and Technology

15:55-16:10	Invited Talk **Research on the Enhancement of Photodetection Capability of Photodetectors by Interface Effects** Feng Qiu, Yunnan University
16:10-16:25	Invited Talk **Bright dipolar excitons in twisted black phosphorus homostructures** Shenyang Huang, Fudan University
16:25-16:40	Invited Talk **Flexible Active-Matrix Sensor Arrays based on Oxide Thin-Film Transistors** Bowen Zhu, Westlake University
16:40-16:50	Oral Talk **CMOS-Compatible Silicon-Based Integrated Miniaturized Spectrometers: Device Engineering, Spectral Reconstruction, and Applications** Yuhang Hu, Fudan University

Neuromorphic devices and integration

Lei Ye

Huazhong University of Science and Technology

Abstract: Information devices and integrated hardware based on the von Neumann architecture can no longer meet the demands of next-generation information technology applications. Therefore, overcoming the bottlenecks caused by the separated design of the von Neumann architecture has become a frontier issue in today's science and technology. To break through these limitations, new semiconductor layers, novel control mechanisms, innovative device structures, and advanced integration techniques are being employed to propose a functionally integrated design that replaces the traditional separated approach of von Neumann devices. This aims to realize brain-inspired neuromorphic integrated hardware compatible with silicon CMOS, providing a new pathway for the integration of next-generation intelligent information devices.

Biography: Ye Lei is a professor at the School of Optical Information and Electronics, Huazhong University of Science and Technology. He is a national leading talent, a National Natural Science Foundation of China Excellent Young Scientist, and a doctoral supervisor. His research primarily focuses on hardware and algorithms for artificial intelligence. He has published over 80 SCI papers as first or corresponding author in prestigious international journals such as Science, Nature Electronics, Nature Communications, and Advanced Materials. He leads two projects worth tens of millions of yuan, as well as multiple projects funded by the National Natural Science Foundation of China, Key Research and Development Programs, and Huawei Corporation. He has received numerous honors, including the First Prize in Natural Sciences from the Ministry of Education, the First Prize in Natural Sciences from the Chinese Institute of Electronics, the First Prize in Natural Sciences from Hubei Province, and the First Prize in Natural Sciences from the Chinese Society of Optics and Engineering. He is also an editorial board member for journals including Science China Information Sciences, Nano-Micro Letters, and Journal of Semiconductors.

Memristor-based in-sensor computing technology for infrared detectors

Qingjiang Li

National University of Defense Technology

Abstract: To address the "memory wall" and "power wall" challenges faced by traditional von Neumann architectures in the era of artificial intelligence and the Internet of Things, in-sensor computing technology has emerged. This report focuses on in-sensor computing technology based on memristors. Memristors, with their characteristics of in-memory computing, low power consumption, and compatibility with CMOS processes, provide an ideal hardware foundation for realizing this technology. The report will explore how to utilize memristor arrays to achieve sensing, storage, and parallel computation of analog signals on hardware platforms, thereby significantly enhancing the real-time performance and energy efficiency of data processing. Finally, the application potential and future development directions of this technology in edge computing, brain-inspired intelligence, and other fields will be analyzed.

Biography: Li Qingjiang, Professor of NUDT, is a national-level young top-notch talent and a recipient of the Special Government Allowance of the State Council. His research mainly focuses on intelligent information devices. He has led eight projects, including key projects under the 173 Program, key projects funded by the National Natural Science Foundation of China, and topics of the National Key R&D Program of China. He has developed several memristor-based intelligent image processing chips. He has published more than 60 SCI-indexed papers in leading journals in the field, such as Nature Communications and Advanced Materials, and has been granted 25 national invention patents.

Growth Mechanisms of van der Waals Epitaxial Heterointegration and Their Application to Interlayer Excitons

Xiaoming Yuan

Key Laboratory of Micro-Nano Fabrication and Device Manufacturing in Universities of Hunan Province, School of Physics, Central South University

Abstract: Vertically stacked van der Waals (vdWs) heterostructures assembled from two-dimensional (2D) materials provide a highly controllable platform for tuning electronic properties and exploring novel physical phenomena. vdW epitaxy offers a scalable approach for heterostructures fabrication that, unlike conventional epitaxy, circumvents lattice matching constraints, thereby minimizing transfer-induced defect densities and ensuring the formation of high-quality interfaces with strong coupling. Taking interlayer excitons (IXs) as an example, Coulomb-bound electron–hole pairs from distinct materials feature long lifetimes and permanent dipoles, enabling advanced excitonic devices and coherent light sources. However, practical applications with stable and efficient IX emission still face the dual challenges of momentum-matched band alignment and scalable fabrication. This report presents material studies aimed at constructing high-performance IX heterostructures. Specifically, we achieve selective growth of high-quality, large-area inorganic perovskites with controllable thickness and morphology on various transition metal dichalcogenide (TMDCs) and hBN substrates via vdW epitaxy, and conduct two-step growth of 2D organic perovskites on WSe_2 to form stable heterostructures with strong IX emission. Meanwhile, we elucidate the growth mechanisms through lattice matching, epitaxial relationships and kinetic control. Based on these materials, we investigate highly stable photoluminescence properties of IXs and verify the enhancement effects of perovskites on the optoelectronic performance of 2D material devices. Collectively, the work provides a comprehensive foundation for developing IX-based information devices, spanning from material synthesis to property engineering.

Biography: Prof. Xiaoming Yuan, a professor and doctoral supervisor at the School of Physics, Central South University, and the director of Key Laboratory of Micro-Nano Fabrication and Device Manufacturing in Universities of Hunan Province, received the Hunan Outstanding Youth Fund (2025) and Excellent Youth Fund (2021), was selected as a Furong Young Scholar (2020), focuses on the epitaxial growth of low-dimensional compound semiconductors, ultrafast optical properties and optoelectronic applications, has published over 50 papers as first/corresponding author in high-impact journals including Adv. Mater., Adv. Funct. Mater., Nano Lett., and ACS Nano, holds three national invention patents, leads three General Projects and one Youth Project of the National Natural Science Foundation of China, and won the Third Prize of the Hunan Provincial Optics Science and Technology Progress Award in 2021.

TBA

Junliang Liu

Jiangnan University

Abstract: TBD

Biography: TBD

Anisotropic van der Waals Materials and Devices for Broadband Polarization-Sensitive Photodetection from the Ultraviolet to the Short-Wave Infrared

Juehan Yang

Institute of Semiconductors, Chinese Academy of Sciences

Abstract: The joint acquisition of spectral and polarization information offers new opportunities for target identification and multidimensional sensing in complex backgrounds. This presentation reviews advances in anisotropic van der Waals materials and devices, highlighting the roles of intrinsic anisotropy, heterostructure engineering, and alloy engineering in broadband photodetection, polarization sensing, and low-noise imaging, while exploring further extensions to ultraviolet-to-short-wave-infrared multiband sensing and in-sensor image preprocessing. These studies provide a materials foundation and design strategies for miniaturized, integrated multidimensional photodetectors for infrared and space applications.

Low dimensional semiconductor heterojunction based infrared detectors and their applications

Yufeng Liu

Faculty of Materials Technology, Shanghai Institute of Technology, Shanghai

Abstract: Infrared detection is essential for night vision, optical communication, and space exploration. Traditional bulk semiconductor detectors require cryogenic cooling and high fabrication costs. Low-dimensional materials offer exceptional optoelectronic properties, yet suffer from weak absorption and rapid recombination. Constructing heterojunctions with type-II band alignment enables efficient charge separation, suppressed dark current, and enhanced optical gain. This work presents our progress in heterojunction-engineered IR detectors based on heterojunction interfaces and surface-modified structures. Our devices achieve high responsivity (>10^3 A/W), sub-microsecond response, broadband NIR-to-MIR coverage, and stable room-temperature operation. Application prototypes including thermal imaging, free-space optical communication, and spectroscopic sensing are demonstrated. This research paves the way toward lightweight, uncooled infrared detection technologies for next-generation Earth and space applications.

Biography: Liu Yufeng, Professor and Doctoral Supervisor, is a recipient of the Shanghai Outstanding Talent (Top-tier) Program. He currently serves as the Deputy Director of the Faculty of Materials Technology, Shanghai Institute of Technology, Deputy Director of the Shanghai Engineering Research Center for Optical Detection Materials and Devices, and the Principal Investigator of the Infrared Photodetection Materials and Devices Research Group. He is also a council member of the Shanghai Semiconductor Professional Committee. Professor Liu has established a solid research foundation in low-dimensional semiconductor heterojunction infrared photodetection materials and devices, as well as their surface characteristics. He has published over 130 academic papers in prestigious international journals including Advanced Materials etc., and has filed more than 80 invention patents, of which 30 have been authorized.

Far-/Medium-infrared All-sky Explorer (FAMAE)

Chao Liu

National Astronomical Observatories, Chinese Academy of Sciences

Abstract: Far-/Medium-infrared All-sky Explorer (FAMAE) is a space telescope in concept design phase, focusing on far- and mid-infrared (20~100 micron, in astronomical context) spectroscopic sky survey. Due to the specificity of this band, it will help astronomers to answer several key questions in modern astrophysics, including the origin of star, the origin of planet and the origin of life. In order to achieve these goals, frontier infrared instrument techniques such as superconductor detectors and sub-Kelvin refrigeration technology are required.

拟态计算技术的技术实践与发展
--从结构编排与生成到拓扑中心计算

Fan Zhang

Fudan University

Abstract: TBD

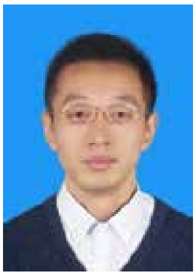
Biography: TBD

Spatial-Spectral Information-guided Hyperspectral Anomaly Detection and Tracking

Huixin Zhou

Xidian University

Abstract: Hyperspectral imagery contains rich information on the spectral and spatial distribution of object materials in a scene. Traditional hyperspectral remote sensing methods mainly focus on pixel-level spectral analysis. On the contrary, computer vision has discovered color, texture, and various spatial and structural features of objects, but not spectral information. It is necessary to bridge the gap between the spectral and spatial analysis in order to invent new tools for effective image analysis and understanding. This talk focuses on anomaly detection and target tracking, with an emphasis on deep feature learning methods. It systematically presents the research methods for these tasks of our team. For hyperspectral anomaly detection, we propose innovative methods based on autoencoders, frequency domain learning, multi-scale reconstruction and diffusion models, aiming to effectively separate anomalies from backgrounds under an unsupervised or weakly supervised conditions. For hyperspectral target tracking, we design a Transformer and Siamese network architecture that integrates spectral-spatial-temporal information, cross-modal spectral complementation, and a state-aware template update mechanism. This talk systematically reviews the design motivations, core innovations, and experimental results of these methods, and explores the potential of deep feature learning in hyperspectral anomaly detection and target tracking, providing a reference for collaborative research ranging from low-level feature extraction to high-level task analysis.



Biography: Huixin Zhou received his M.S. and Ph.D. from Xidian University of China in 2002 and 2004 respectively. He was a Visiting scholar at the National ICT Australia from 2010 to 2011. He is currently the vice-dean and Professor at the School of Physics, Xidian University of China. He is also the Council Member of the Shaanxi Optical Society, Council Member of the Shaanxi Electronic Society, Senior Member of the China Optical Society, and etc. He is also the Associate Editor of the journal of Infrared Physics & Technology. His research interests include optoelectronic imaging & image processing, remote sensing image processing, object detection and tracking, and etc. In recent years, He has published over 100 papers in journals such as IEEE TGRS, PR, JAG, IPM, and JSTARS. He has received numerous awards, including the First Prize for Technological Invention from the Ministry of Education of China and the Second Prize for Teaching Achievements in Higher Education from Shaanxi Province.

Mid-infrared upconversion computational imaging

Kun Huang

East China Normal University

Abstract: The mid-infrared (MIR) region provides a unique window for molecular sensing and material characterization, yet conventional MIR imaging remains constrained by high detector noise, limited room-temperature sensitivity, and the lack of efficient tools for multidimensional optical-field control. In this talk, we present our recent progress in MIR upconversion computational imaging, integrating nonlinear frequency conversion, pump-field engineering, and computational reconstruction. By transferring MIR optical fields to the visible or near-infrared regime, this approach enables room-temperature single-photon-level detection while providing a versatile interface for optical-field manipulation and information encoding. Representative advances in single-photon computational imaging, multidimensional imaging, and high-resolution spectroscopy will be discussed, demonstrating how nonlinear optical control can extend infrared sensing beyond conventional intensity measurements toward ultrasensitive, multidimensional, and intelligent MIR sensing

Biography: Kun Huang received his Ph.D. degree from École Normale Supérieure (ENS-Paris) in 2015, followed by postdoctoral research at Université Pierre et Marie Curie (UPMC), France. He is currently a Professor at East China Normal University (ECNU). His research focuses on mid-infrared single-photon detection and imaging. He has authored or co-authored more than 100 peer-reviewed papers in leading journals such as Nature Photonics, Nature Communications, Science Advances, Physical Review Letters, Optica, and Light: Science & Applications. He also serves on the editorial boards of European Physical Journal D, Scientific Report, Ultrafast Science, PhotoniX, and Infrared and Laser Engineering.

Motion tracking with in-sensor graded encoding and compression

Jiewei Chen

South China Normal University

Abstract: Motion perception is computationally demanding, yet flying insects achieve it with compact vision systems. We used phototransistor arrays to emulate non-spiking graded neurons at the sensory terminal. Shallow-trap charge dynamics encoded temporal visual information at 1,200 bit s^{-1}. The 20×20 array enabled trajectory sensing and attained 99.2% recognition accuracy. Moreover, we extend this in-sensor-perception strategy to the mid-infrared (MIR) through wafer-scale, monolithically integrated telluride-semimetal/Ge heterostructures. Interfacial engineering enhances carrier transport and reduces recombination, enabling room-temperature infrared detection to 10.6 μm, a 91.6 mV mm^{-1} peak sensitivity. Sparse position-sensitive detector array couples MIR tracking with in-sensor perceptual compression, reducing data from 100×100 pixels to 5×5 elements (400×) while achieving 95% accuracy in simultaneous identification and tracking of multiple dynamic targets. Together, these results offer a route to resource-efficient motion analytics and intelligent perception.

Biography: Jiewei Chen is a Professor at the School of Optoelectronic Science and Engineering, South China Normal University. He is Chief Scientist of a youth project under China's National Key R&D Program and a recipient of a national high-level young talent program. His research focuses on bioinspired optoelectronic chips and low-power intelligent Internet of Things. His group develops new optoelectronic devices for efficient sensing and computing, and also investigates topological devices for high-performance, low-power digital and analogue computing.

VO_2 based multiband dynamic optical thermal regulation

Shuliang Dou

Harbin Institute of technology

Abstract: Vanadium dioxide (VO_2) can achieve dynamic modulation across an ultra-wide bandwidth from visible to microwaves. Firstly, by constructing double-sided nanoparticle VO_2 films, the surface plasmon resonance effect in the near-infrared band are utilized to simultaneously enhance visible transmittance and thermal modulation ability. Secondly, by combining the Fabry-Perot resonance effect, significant regulation of infrared emissivity is achieved by VO_2 device. Finally, based on the change in conductivity, VO_2 based composite materials are constructed to realize large-amplitude dynamic electromagnetic modulation over a wide bandwidth.

Biography: Shuliang Dou, a researcher at Harbin Institute of Technology and a doctoral supervisor, has been selected as a young talent support program recipient by the Chinese Association for Science and Technology. Focusing on the major strategic demands of aerospace, he conducts research on the dynamic regulation of infrared emissivity, breaking through the limitation of fixed emissivity in traditional thermal materials that makes it difficult to cope with the thermal radiation mismatch caused by changes in environmental temperature. He has published over 50 SCI-referenced papers in journals such as Adv. Mater., Light: Science & Applications, and Advanced Functional Materials, and has obtained 15 patents. He has also undertaken more than 10 projects including key national research and development plans and projects from national ministries and commissions.

Design of a Readout Circuit Chip for Quantum-Dot Infrared Dynamic Vision Sensors

Weiyi Tang

Fudan University

Abstract: Infrared sensing is of significant value in industrial inspection, night vision, and spectral analysis. Colloidal quantum dot (CQD) infrared detectors, owing to their low cost, high resolution, and compatibility with monolithic CMOS integration, have become an important direction for next-generation infrared sensors. Dynamic vision sensing, which extracts motion events by capturing temporal variations in a scene, features low data redundancy and high temporal resolution, making it highly valuable in high-speed target detection and intelligent surveillance. However, conventional frame-based infrared imaging struggles to efficiently capture high-speed motion, and inherent device noise such as dark current severely degrades the quality of detected dynamic events.

To address these issues, this work investigates a dedicated readout circuit for quantum-dot detectors, which achieves reliable readout of infrared signals through stable detector biasing and linear current-to-voltage conversion. On this basis, a frame-difference-based dynamic vision circuit is designed, which extracts motion events while effectively suppressing random noise and background interference through in-pixel on-chip computation and background suppression, thereby significantly improving the quality of dynamic vision information. By monolithically integrating the quantum-dot array with the readout circuit, motion events are synchronously acquired with low redundancy, avoiding the registration and timing overhead of conventional approaches.

This work provides an energy-efficient and low-latency readout solution for quantum-dot infrared dynamic vision sensing, laying a foundation for intelligent perception systems in high-speed motion detection, intelligent surveillance, and related scenarios.

TBA

Xiubao Sui

Nanjing University of Science and Technology

Abstract: TBD

Biography: TBD

Metasurface-Integrated Multi-Quantum-Well Detectors for Infrared Applications

Yiyang Xie

Beijing University of Technology, Beijing, China

Abstract: To address the growing demand for integrated multifunctional photodetection and intelligent optical signal processing in the infrared regime, we present a monolithic metasurface-coupled multiple-quantum-well (MQW) optoelectronic chip. Fabricated on a semi-insulating GaAs substrate, the device integrates three distinct metasurface arrays to independently reconfigure the active region's photoresponsivity. Specifically, metasurfaces supporting quasi-bound states in the continuum (quasi-BICs) introduce controllable leaky modes via asymmetric rectangular resonators, generating a nonlinear photocurrent response. Meanwhile, split-ring resonator (SRR) arrays leverage the coupling between higher-order electromagnetic resonance modes and MQW transitions to yield a tunable linear photoresponse. Furthermore, Pancharatnam–Berry (PB) geometric-phase metasurfaces map the phase modulation of circularly polarized light directly into photocurrent profiles, endowing the chip with angle-resolved polarimetric detection capabilities. By synergistically unifying linear and nonlinear optoelectronic mechanisms on a single platform, this multifunctional chip not only achieves broadband spectral sensing but also performs in-situ machine-vision preprocessing, paving the way for next-generation infrared smart sensing, optical encryption, and on-chip optical computing.

Biography: Yiyang Xie is a Professor and Ph.D. Supervisor at the School of Integrated Circuits, Beijing University of Technology. He has been selected for the Outstanding Young Scientist Program. His research interests focus on artificial metastructure semiconductor optoelectronic devices, metasurface-based lasers, and integrated micro-nano optoelectronic chips. He has presided over multiple national and provincial-ministerial research projects including the Key Program of the National Natural Science Foundation of China and the Key Project of Beijing Natural Science Foundation. He has published more than 40 peer-reviewed papers in journals such as Nature Nanotechnology, Light: Science & Applications, Nature Communications, and Advanced Materials, and holds a number of authorized patents

Some new structures of mid-infrared quantum cascade lasers

Bo Meng

Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences

Abstract: Quantum cascade lasers serve as highly adaptable mid-infrared sources, capable of delivering both single-mode emission and optical frequency combs across an exceptionally broad spectral window spanning the mid-infrared to the terahertz regime. Nevertheless, their inherently ultrafast carrier lifetimes render them less than ideal for the production of ultra-short optical pulses. One promising avenue involves the direct excitation of optical solitons in ring-cavity quantum cascade lasers, where the deployment of a waveguide with minimal lateral losses drives a spontaneous symmetry-breaking transition between co-propagating and counter-propagating modes, thereby enabling soliton formation. In this presentation, I will discuss our recent advances in extending comb bandwidth through strategic engineering of the active region gain profile and precise control of waveguide dispersion

Biography: Bo Meng is a full professor at CIOMP, CAS. He received his Ph.D. degree from Nanyang Technological University in Singapore in 2015. and subsequently joined the research group of Professor Jérôme Faist at ETH Zurich in Switzerland in 2017. In January 2022, he joined the State Key Laboratory of Luminescence and Applications at the Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences. His research primarily focuses on quantum cascade lasers, optical frequency combs, and semiconductor microcavity lasers. He has published over 10 papers as first author or corresponding author in journals such as Nature Photonics, Light: Science & Applications, Optica, and Laser & Photonics Reviews, and has co-authored more than 50 papers in total.

Toward self-driving epitaxy: from feedback control to autonomous heterostructure growth

Chao Zhao

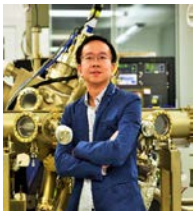
Institute of Semiconductors, Chinese Academy of Sciences

Abstract: We develop a self-driving, AI-guided framework to transform molecular beam epitaxy (MBE) from an experience-driven, trial-and-error process into an autonomous, scalable paradigm for semiconductor heterostructure growth.

We begin by establishing real-time feedback control for epitaxy. By integrating reflection high-energy electron diffraction (RHEED) video with machine learning, we show that surface dynamics can be directly linked to quantum dot (QD) formation. Correlating RHEED patterns with photoluminescence (PL) properties enables real-time optimization of QD laser structures, achieving improved emission intensity and linewidth.

To address scalability limitations, we introduce an unsupervised learning framework for real-time analysis. We integrate these capabilities into SemiEpi, combining in situ monitoring, physics-informed machine learning, and automated decision-making for multi-step heterostructure growth. SemiEpi identifies optimal initial conditions, proposes growth strategies, and performs on-the-fly control, enabling autonomous optimization of InAs QD heterostructures with targeted properties.

Together, these advances establish a unified paradigm for intelligent epitaxy and pave the way toward self-driving laboratories for semiconductor manufacturing.



Biography: Professor Zhao Chao works on large mismatch heteroepitaxial semiconductors, focusing on the physical mechanism of mismatch and the construction of optical chips. He has published more than 130 research papers, with a total citation of 5300 and an H-index of 32. He has been authorized 6 US patents and 4 Chinese patent. He is undertaking national key research and development plan projects, NSFC projects, and high-level talent plans of CAS. He served as associate editor of IEEE PTL and Electronics Express, received the "High-Level Talent Program" of the Chinese Academy of Sciences " (2020); elected as a fellow of the Institute of Physics (IOP) (2022).

Direct All-Electrical Decoding of Infrared Structured Light: From Scalar Vortex to Vector Vortex Beams on Chip

Mingjin Dai

School of Physics and Laboratory of Zhongyuan Light,Zhengzhou University

Abstract: The detection of infrared structured light carrying orbital angular momentum (OAM) and polarization singularities is critical for high-capacity optical communications, quantum information, and infrared imaging. However, on-chip electrical readout of these high-dimensional light fields—especially vector vortex beams—remains a formidable challenge. Here, we present an on-chip photodetection platform operating in the mid-infrared regime, enabling direct, filter-free, all-electrical detection of both scalar and vector vortex beams. By integrating two-dimensional photothermoelectric material with plasmonic couplers, we spatially map OAM and polarization information onto surface plasmon polariton intensity distributions, which are directly transduced into photovoltage signals with distinct amplitudes and polarities. We experimentally demonstrate simultaneous detection of OAM order, spin angular momentum, and polarization azimuthal angle of infrared vortex beams. A proof-of-concept two-dimensional encrypted optical communication is further showcased. This work offers a scalable on-chip solution for high-dimensional infrared light detection, advancing integrated infrared photonics for secure communications and sensing.

Biography: Dr. Mingjin Dai is currently a Distinguished Research Professor at the School of Physics, Zhengzhou University, China. He is a recipient of the National Natural Science Foundation of China Excellent Young Scientists Fund (Overseas). He received his Ph.D. degree from Harbin Institute of Technology in 2019. He then pursued postdoctoral research at Nanyang Technological University, Singapore, and subsequently at the Institute of Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (A*STAR), Singapore. His primary research interest lies in mid-infrared optoelectronic chips for multi-dimensional information sensing. To date, he has published over 60 peer-reviewed SCI papers with more than 4,000 citations on Google Scholar and an H-index of 36. As the first/corresponding author, he has published over 20 papers in prestigious international journals, including Science Advances, Nature Communications, and so on.

From Resonant Light Trapping to Reconfigurable Strong Coupling in Infrared Dielectric Metasurfaces

Bowen Jia

Wuhan University of Technology

Abstract: Dielectric metasurfaces provide a versatile platform for enhancing and controlling light–matter interactions at the subwavelength scale. In this talk, we present a series of studies progressing from resonant light trapping to dynamically reconfigurable high-Q states and strong mode coupling. First, an InSb all-dielectric metasurface is developed for Si-based mid-infrared photodetection, where Kerker-type interference and anapole states enable near-perfect optical absorption. We then introduce a GST225 metasurface supporting dynamically tunable multi-band quasi-bound states in the continuum (q-BICs), in which phase-change-induced permittivity asymmetry enables active control of high-Q resonances for refractive-index sensing. Finally, a magneto-optical metasurface is demonstrated in which a structural q-BIC strongly couples with a magnetically induced q-BIC. External magnetic fields continuously reconfigure the hybrid modes and their coupling strength, offering an additional degree of freedom for tunable nanophotonic sensing.

Biography: Bowen Jia is an Associate Professor at the School of Information Engineering, Wuhan University of Technology. He received his Ph.D. degree from Nanyang Technological University. He has been selected for talent programs of Hubei Province and Wuhan and currently serves as Deputy Secretary-General of the Hubei Institute of Electronics. His research interests focus on optoelectronic technologies, electronic design automation (EDA), and artificial intelligence. He has served as principal investigator for projects funded by the National Natural Science Foundation of China, Hubei Pro vince, and Wuhan, and open funds of national key laboratories. He has published more than 50 papers in journals including Advanced Functional Materials, ACS Photonics, and Optics Letters.

Sensing–memory coupled retinomorphic device for dim-light vision

Xuelong Liu

Fudan University

Abstract: Neuromorphic vision systems aim to process visual information efficiently at the sensor level. However, reliable encoding of weak optical signals remains challenging due to physical incompatibility between transient sensing and stable memory, and inefficient representation of low-intensity features under uniform quantization. Here, we experimentally demonstrate a bio-inspired, hardware-algorithm co-designed sensing-memory coupled retinomorphic device to address the fundamental bottlenecks of traditional neuromorphic visual systems in dim-light environments. The device integrates InSe transient photosensitive transistor (sensing unit) and Ag-based multi-state memristors (memory unit) to achieve intensity-dependent nonlinear responses determined by architectural coupling rather than material intrinsics. The nonlinearity significantly expands current responses in the dim-light region (<30 μW/cm2, sensitivity improved by >4×) while automatically compressing signals under strong light, forming a natural non-uniform current distribution. Based on this, a customized non-uniform gray-scale quantization scheme is proposed, reallocating ~75% of quantization levels toward the dim-light regions, achieving a 1.6× improvement in resolution over uniform quantization and enabling better preservation of dim-light features. In the dim-light flame detection task, the customized quantization scheme significantly enhances feature extraction from weak optical signals, leading to a classification accuracy of 96.1%, compared to 68% under conventional uniform compression. These results establish a direct link between device physics and information representation, and demonstrate that exploiting intrinsic nonlinear response at the hardware level provides an effective pathway for encoding weak optical signals in neuromorphic vision systems.

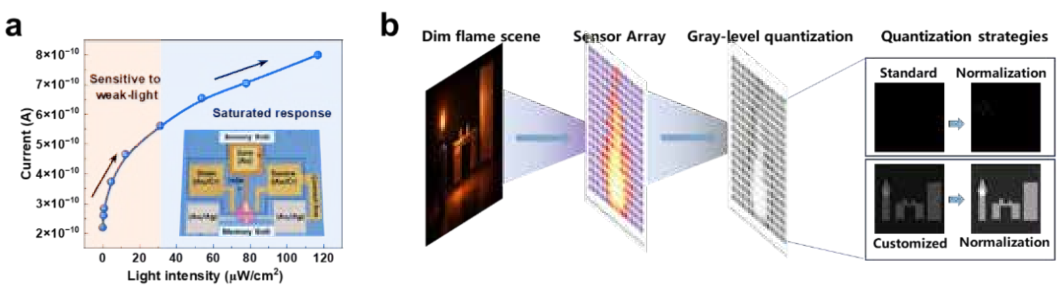


Fig. 1. a Extracted steady-state current as a function of light intensity (insert is the optical image of coupled device). b Schematic illustration of the detection. A dimly lit laboratory scene with a weak flam is processed by the sensing–memory system.

Noise-resistance photon-correlation parallel LiDAR driven by the non-classical light source

Chengbin Qin

Shanxi University

Abstract: Single-photon LiDAR delivers superior detection performance compared to conventional systems in low-detection scenarios, offering a promising solution for precise three-dimensional (3D) environmental perception. At present, noise suppression remains a major obstacle to the advancement of single-photon LiDAR. Breakthroughs in experimental quantum illustration introduce a light-source-based strategy for overcoming noise interference[1-3]. However, entangled photon sources generated by SPDC or SFWM suffer from low brightness and photon flux, limiting their practicality for long-range and real-time detection. Continued innovation in light sources is poised to transform single-photon LiDAR into a viable solution for practical applications. Super-bunching light, a novel nonclassical light source with giant second-order intensity correlations and enhanced multi-photon emission probabilities, holds significant promise as a next-generation illumination source for noise-resistant single-photon LiDAR. In this work, we propose a photon-correlation parallel LiDAR driven by super-bunching light. Remarkably, our LiDAR demonstrates practical imaging with a noise-to-signal photon ratio exceeding 2750, in contrast to the 25-fold noise tolerance achievable with entangled-photon-pair light[4]. Our LiDAR demonstrates the capability to detect targets at a distance of 165 m, well beyond the distance threshold determined by the pulse period, representing an order-of-magnitude improvement over conventional parallel LiDAR[5]. With robust noise resistance and extended detection beyond pulse limits, the photon-correlation parallel LiDAR represents a promising approach for stable operation of single-photon LiDAR in extreme environments.

Biography: Qin Chengbing is a professor and doctoral advisor at State Key Laboratory of Quantum Optics Technologies and Devices, vice director of Institute of Laser Spectroscopy, Shanxi University. He has supported by the National Science Fund for Excellent Young Scientists, and selected as an young talent of the Shanxi Province "SanJin Talents" Support Program in 2019 and Young Academic leader of Innovative Talents in High-Education for Shanxi Province. He has presided over 10 funds, including the national and provincial funds, as well as the defense project. He has developed single-molecule quantum coherence spectrometer with independent intellectual property rights have been used in the areas of military aircraft early warning and air pollution monitoring. He also won the first prize of the Technological Invention Award of Shanxi Province Science and Technology Award (the second winner). In the recent five years, he has also published 50 SCI-cited papers written as the first or corresponding author, including 14 papers published on JCR first zone journals.

Scalable Metamaterials for light and thermal management

Yang Li

Zhejiang University

Abstract: Light–thermal regulating metamaterials have attracted widespread attention due to their important roles in areas such as military camouflage, spacecraft thermal control, and building energy conservation. Since the beginning of this century, the broader field of metamaterials, including light–thermal regulating metamaterials, has made remarkable progress in fundamental mechanisms, performance enhancement, and application exploration. However, a major bottleneck that continues to hinder the practical deployment and widespread adoption of metamaterials, particularly those with micro- and nanoscale features, is the difficulty of large-scale manufacturing.

Addressing this challenge requires more than developing scalable fabrication strategies based on conventional metamaterial principles and designs, as such approaches are often difficult to implement or sustain in practice. More fundamentally, innovations are needed at the level of physical principles and structural design, with new concepts and architectures that are inherently compatible with existing large-scale manufacturing technologies, or that can be implemented with only minor modifications to established processes. Such an approach may provide a pathway to overcoming the manufacturability barrier of metamaterials at its root.

In this talk, I will focus on my efforts and explorations over the past decade toward addressing this challenge, and I look forward to exchanging ideas and perspectives with the audience.

Carbon nanotubes-based flexible electrochemical infrared-tunable device

Kerui Li

State Key Laboratory of Advanced Fiber Materials, College of Materials Science and Engineering, Donghua University

Abstract: Controllable modulation of infrared optical properties has become an ideal technical approach for developing adaptive thermal camouflage, thermal management, thermal comfort, and related fields. To overcome the limitations of existing material systems in modulation amplitude, controllability, and structural complexity, the presenter focused on one-dimensional carbon nanotube materials that combine high electrical conductivity with good mechanical flexibility and strength, thereby simplifying device structures and fabrication processes. Aiming at the multifunctional development of infrared modulation devices, the presenter first enhanced the infrared modulation capability of carbon nanotube functional layers by modifying carbon nanotubes. By using a grid-patterned electrode structure and incorporating a PEDOT coating, the assembled infrared electrochromic thin-film device achieved visible–infrared dual-band modulation. The presenter developed an infrared-actuated dual-responsive film and designed a soft robot with infrared camouflage capability. By integrating core–sheath and parallel-electrode structural strategies, long-range electrochemical controllability and efficient expression of infrared optical–electrochemical properties in fiber form were ensured, enabling continuous fabrication of high-performance infrared electrochromic fibers. The electrochromic fibers exhibited a large emissivity modulation range ($\Delta\varepsilon \approx 0.3$) over a length of 100 m and good cycling stability (2,000 cycles).

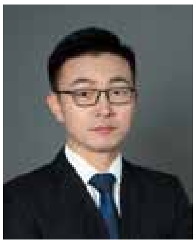
Biography: Li Kerui is a research professor at Donghua University. He was selected for the Excellent Young Scientists Fund (Overseas) of the National Natural Science Foundation of China and the Shanghai Overseas High-Level Talent Program. He has long been engaged in research on broad-spectrum modulation materials and devices. He has led national-level projects/topics, including the NSFC Excellent Young Scientists Fund (Overseas), the General Program, the Young Scientists Fund, and a project of a certain commission. He has received the Second Prize of the Rare Earth Science and Technology Award of the Chinese Society of Rare Earths, the Second Prize of the Textile Higher Education Teaching Achievement Award of the China Textile Federation, and the First Prize of the Shanghai Technological Invention Award. He was selected as a 2023 Emerging Investigator by Journal of Materials Chemistry C. As first/corresponding author, he has published more than 50 papers in well-known materials journals, including Nature Sustainability, Science Advances, Nature Communications, and Advanced Materials.

Infrared Superconductor Nanowire Single-Photon Detector

Hao Wang

Research Institute of Superconductor Electronics, Nanjing University

Abstract: As a core means for sensing extremely weak signals, single-photon detection technology serves as a pivotal technique underpinning the leap-forward development of fields including quantum information and space exploration. Benefiting from the intrinsic advantage of low energy gap, superconducting nanowire single-photon detectors (SNSPDs) have evolved into the single-photon detection technology with the best overall performance in the infrared band. This presentation focuses on reporting recent research advances in key materials and device technologies of SNSPDs, as well as their practical application in fields such as lunar laser ranging and atmospheric environmental monitoring.



Biography: Hao Wang obtained his Doctoral degree in 2018 from Soochow University and spent three years studying abroad at Drexel University and Nanyang Technological University. In 2021, he joined the Research Institute of Superconductor Electronics (RISE) at Nanjing University, focusing on research into key material and device technologies for superconducting single-photon detection. He has published more than 80 SCI-indexed papers in Nat. Common., Adv. Mater., JACS, etc., with total citations over 8,000 times. He serves as a reviewer for more than 20 international journals including Nat. Commun., Angew., ACS Nano, and IEEE Elect. Dev. Lett. He is also a Young Editorial Board Member for journals including eScience and Mater.Futures.

Bio-inspired Design and Multi-dimensional Perception of Reconfigurable Visual Sensors

Yinlong Tan

National University of Defense Technology

Abstract: With advances in high-resolution and high-frame-rate imaging, edge image processing faces a critical mismatch between redundant sensing data and limited bandwidth, struggling to meet low-latency application demands. Novel semiconductor-based visual sensors with in-sensor intelligent processing have become the key to revolutionizing conventional image processing architectures. Taking the low-power, low-latency, highly parallel biological visual system as a bionic prototype, this report implements hardware-software co-design from underlying materials and devices to top-level perception architectures, realizing collaborative innovation across architectural design, device development and physical mechanism research. For microscopic photoresponse modulation of low-dimensional semiconductors, a multi-dimensional regulation method for two-dimensional semiconductor photoresponse is established. Theoretical analysis and experimental verification reveal the modulation mechanisms of surface molecular adsorption and carrier competition on photoresponse, laying a theoretical foundation for reconfigurable photodetector design and fabrication. For intelligent reconfigurable photodetectors, this work extends two-dimensional reconfigurable optoelectronic devices to advanced neuromorphic vision, supporting the physical implementation of in-sensor computing architectures. Based on multi-dimensional property modulation, neuromorphic visual sensors including wavelength differential units, all-optical collision detectors and scalable optoelectronic synapses are developed, offering a new strategy for efficient computing resource allocation in visual cognition. A hierarchical architecture-device-material co-design model is constructed to accelerate innovation and iterative optimization of integrated neuromorphic vision systems, delivering innovative solutions for autonomous driving, target tracking and multi-task learning scenarios.

Biography: Yinlong Tan, Assistant Research Professor of National University of Defense Technology (NUDT). He received his B.S. degree from Nankai University and his Ph.D. degree from National University of Defense Technology. His research focuses on the bio-inspired design of reconfigurable visual sensors and the study of their multi-dimensional perception performance. As first or corresponding author, he has published 16 peer-reviewed papers in journals including Adv. Mater., Nano-Micro Lett., Adv. Funct. Mater., etc. He holds 2 granted invention patents and has published 1 academic monograph. He has led 1 Youth Program of the National Natural Science Foundation of China (NSFC), and undertaken more than 10 key research projects from both military and civilian sectors. His research achievements have received multiple honors, including the Second Prize of the International Bionic Innovation Competition, the Second Prize of Hunan Provincial Natural Science Award, and the Second Prize of the Youth Innovation Award at NUDT.

Spatial Optical Encoding with a MoS_2 Floating-Gate Phototransistor Array for Robotic Vision

Mingfei Dang

Shanghai University

Abstract: With the rapid development of machine vision, autonomous systems, and intelligent sensing technologies, efficient acquisition and processing of visual information have become increasingly important. However, conventional vision hardware typically consists of physically separated sensing, memory, and computing units, and the associated data transfer and processing between these modules increase system complexity and computational overhead. Integrating optical sensing and electrical modulation at the device level provides an effective route to shorten signal-processing chains and simplify vision system architectures. Two-dimensional semiconductors, featuring atomically thin channels, excellent electrostatic controllability, and favorable interface integrability, provide a promising material platform for multifunctional optoelectronic devices. Here, we construct a floating-gate phototransistor composed of an n-type MoS_2 channel, an HfO_2 tunneling dielectric, and a Pd floating gate, and further realize a 10 × 10 array integration. The device exhibits an ON/OFF current ratio of approximately 10^6. Under 455 nm illumination, its photoresponse can be continuously tuned with incident optical power, achieving a maximum light-to-dark current ratio of 126.2 over an optical power range of 10^{-4}-10 mW. Meanwhile, the device shows history-dependent current responses under different optical pulse conditions. At the array level, spatial optical pattern projection produces distinguishable row-current distributions under different optical inputs, enabling the mapping of spatial optical information into electrical responses for pattern discrimination and robotic motion command generation. These results demonstrate that the MoS_2 floating-gate phototransistor array can convert optical intensity, pulse history, and spatial distribution into distinguishable electrical responses, providing a compact device platform for in-sensor optical information encoding and optically responsive intelligent systems.

Integrated Ultraviolet Optoelectronics for Communication and Imaging

Haiding Sun

University of Science and Technology of China

Abstract: The III-nitride family (AlN, GaN, InN, and their alloys) has been regarded as one of the most significant semiconductors, and has therefore been heavily investigated in the past two decades for various optoelectronics (LEDs, lasers, photodetectors, etc.). Excitingly, the InGaN-based light emitters have revolutionized the lighting industry, promoting energy-efficient and eco-friendly modern solid-state lighting and lasing technologies. Similarly, by alloying GaN with AlN, we can synthesize AlGaN ternary alloys with tunable direct bandgaps from 3.4 eV (GaN) to 6.1 eV (AlN), corresponding to a wide ultraviolet (UV) spectral range from 360 nm down to 210 nm. In this presentation, firstly, we will focus on our efforts for the development of highly efficient UV LED/microLED and detectors, and their monolithic integration on single platform to promote on-chip and free-space optical communication. Second, we will share our progress in searching novel GaN-based device architecture for miniaturized on-chip UV spectrometer and spectral imagers.

Biography: Dr. Haiding Sun is currently a Full Professor at the University of Science and Technology of China, where he is leading iGaN Laboratory focusing on the development of wide bandgap group III-nitride semiconductors for efficient ultraviolet (UV) optoelectronic devices and integrated photonics. Dr. Sun has published more than 200 peer-reviewed SCI-index journal papers, including Nature Photonics (2), Nature Electronics (3), Nature Communications (2), Science Advances, Advanced Materials (5), Light: Science and Application (Cover), Laser & Photonics Review, etc., and more than 90 conference invited/regular papers, such as IEDM (4)/CLEO(50+)/Photonics West/IEEE IPC etc. He has written 4 book chapters related to UVLEDs/lasers/detectors and holds 5 USA and 20+ Chinese Patents. He is currently an Associate Editor of IEEE Photonics Technology Letters, SPIE Journal of Nanophotonics and Journal of Semiconductor. He is also serving as a TPC member for IEDM (Optoelectronics session)/CLEO/IEEE Photonics Conferences.

Mechanical and Thermal Performance of Diamond as an Infrared Material

Shaobo Cheng

Zhengzhou University

Abstract: Diamond possesses the highest natural thermal conductivity, low thermal expansion, broadband optical transmittance, and strong chemical stability, making it highly suitable as an infrared window and/or packaging material. Although extensive attention has been paid to diamond research in the past, the discovery of significant elastic strain in diamond micropillars and the emergence of superconductivity in boron-doped diamond under pressure, together with a series of other novel mechanical and electrical properties, have sparked sustained interest in diamond. Additionally, hexagonal diamond structures have been reported recently. However, due to the difficulties in characterizing structures at small scales and the need for breakthroughs in accurately measuring the mechanical and electrical properties of materials, research on the diamond-based atomic-scale devices remains highly limited, greatly constraining their practical applications. Therefore, conducting cross-scale research on the mechanical and electrical properties of diamond holds both scientific significance and practical value. In this presentation, by integrating in situ characterization techniques such as electrical and mechanical testing within transmission electron microscopy, we will conduct real-time dynamic studies of diamond materials and devices at small scales in real space, reciprocal space, and energy space. This will involve investigating their physical properties (mechanical characteristics, size effects, defect regulation, electronic properties, etc.), establishing the structure-property relationships of the materials, providing guidance for material growth, property regulation, and device fabrication, and laying the foundation for the development of diamond-based atomic-scale devices.

Biography: Shaobo Cheng is currently a Professor at Zhengzhou University. He has long been engaged in research on semiconductors. In recent years, he has published a total of 100 academic papers in journals such as Science, Nature. In 2024, he was selected as the leader of the Zhongyuan Science and Technology Innovation Leading Talent Team. In 2021, he received the Outstanding von Neumann Postdoctoral Award from the U.S. Department of Energy Frontier Research Center. In 2020, he received the Postdoctoral Award from the Microscopy Society of America. In 2017, he received the Tsinghua University Outstanding Doctoral Dissertation Award. He currently serves as an early-career ad-hoc editorial board member for American Physical Society (APS) journals and as an early-career editorial board member for other international journals, including Energy & Environmental Science, Carbon Neutralization, and Microstructures. He has long served as a reviewer for journals such as Reviews of Modern Physics, Physical Review Letters, and Nature Communications. He has delivered dozens of invited talks at international and domestic conferences.

In-situ Fabricated Nanowire Array for Artificial Compound Eye

Yu Zhou

Fudan University

Abstract: Bioinspired vision provides an appealing route toward compact, multifunctional artificial visual systems. In this talk, I will present our recent progress in perovskite nanowire optoelectronics based on an in-situ fabricated alumina nanotemplate. We first develop perovskite nanowires as artificial photoreceptor units and demonstrate high-performance photodetectors with broadband and circularly polarized light sensing capabilities. Building on these advances, we integrate a hemispherical high-density perovskite nanowire image sensor array with a three-dimensionally printed honeycomb pinhole optical structure to realize an artificial compound eye. This system delivers an ultrawide field of view, accurate target localization, and motion tracking. In addition, integrating chiral nanowire photodetectors with this compound-eye architecture could open a path toward bioinspired circularly polarized vision. Overall, these results highlight perovskite nanowires embedded in nanochannel as a versatile platform for next-generation intelligent vision systems in robotics and autonomous sensing.

Biography: Yu Zhou is currently an Assistant Professor at College of Future Information Technology in Fudan University. He received B.Eng. and Ph.D. degrees in Materials Science and Engineering from Tsinghua University. Before joining Fudan University, he was a Postdoctoral Research Associate and Research Assistant Professor at the Department of Electronic and Computer Engineering in The Hong Kong University of Science and Technology. His research interest mainly focuses on optoelectronic devices based on micro-nano structures. He has published over 40 papers in esteemed journals, including Science Robotics, Nature Electronics, Nature Reviews Materials, Nature Communications, etc.

Hetero-Integration of Mixed-Dimensional van der Waals Semiconductors for UV–IR Dual-Color Photodetection

Feng Wu

Huazhong University of Science and Technology

Abstract: Ultraviolet (UV) and infrared (IR) photodetection technologies have been widely applied in both military and civilian fields, such as missile warning, flame monitoring, infrared guidance, night vision imaging, and so on. However, with the rapid advancement of jamming techniques or under harsh and complex operating environments, single-band photodetectors have become increasingly inadequate for clear and accurate target identification, facing the technical challenges of "unclear vision and inaccurate detection." Therefore, there is an urgent need to develop UV-IR dual-color photodetection technologies. Monolithically integrated UV-IR dual-color detectors offer advantages such as small footprint, low power consumption, and simplified optical systems, making them a key direction for future dual-color detection. Nevertheless, traditional wide-bandgap and narrow-bandgap semiconductors are difficult to be monolithically hetero-integrated due to lattice and thermal mismatches. Two-dimensional (2D) layered semiconductors, characterized by their dangling-bond-free surfaces and weak interlayer van der Waals forces, provide a feasible route for hetero-integration of different semiconductor systems. Based on our research foundation on the wide-bandgap semiconductor GaN, this report proposes a 2D/3D mixed-dimensional van der Waals hetero-integration strategy. By constructing TeSe/GaN mixed-dimensional van der Waals heterojunctions, we achieve bias-switchable UV-IR dual-color detectors as well as dual-color detectors operating in simultaneous mode.

Biography: Dr. Feng Wu received his B.S. and Ph.D. degree in Optics Engineering from Huazhong University of Science and Technology, Wuhan, China, in 2012 and 2017, respectively. He then joined in Prof. Weida Hu's group as a postdoctor in Shanghai Institute of Technical Physics, Chinese Academy of Sciences. Currently he is an associate professor in Huazhong University of Science and Technology. His research interests focus on the hetero-integration of wide bandgap semiconductors and two-dimensional layered materials, and the corresponding devices such as dual-color photodetectors, neuromorphic in-sensor processing and computing devices. He has authored and co-authored more than 60 technical journal papers and launched 10 patents.

Large-Area Low-dimensional Wide-bandgap Semiconductors for Integrated UV photodetectors

Ziqing Li

Fudan University

Abstract: Large-area integration of low-dimensional wide-bandgap semiconductors (WBSs) is essential for advanced UV photodetectors, yet there still remain challenges such as high defect density, film inhomogeneity, and limited compatibility with mature semiconductors. This report summarizes common strategies for wafer-scale assembly, including orientation control, interface engineering and heterogeneous integration with established semiconductors. These approaches yield uniform, dense films with low trap densities and efficient carrier transport, enabling high responsivity, fast response and self-powered operation. Representative material systems, such as 2D perovskite oxides and lead-free copper halides, demonstrate the generality of these strategies. Large-area flexible arrays achieve conformal UV imaging and motion recognition with high accuracy, while heterojunction devices enable narrowband detection and secure dual-mode communication. The convergence of dimensionality control, interface engineering, and device integration provides a robust foundation for intelligent integrated UV optoelectronic systems.

Biography: Ziqing Li is currently an Associate Professor at the Institute of Optoelectronics, Fudan University. He received Ph.D. degree from the State Key Laboratory of Crystal Materials at Shandong University, and subsequently conducted postdoctoral research in the Department of Materials Science at Fudan University in 2019. His research focuses on photodetecting materials and devices, particularly low-dimensional wide-bandgap semiconductors for UV photodetectors. He has published more than 37 papers as first/corresponding author in SCI-indexed journals, which have have already generated over 4000 citations. His research provides a materials and device foundation for intelligent, integrated UV optoelectronic systems.

Ferroelectric Reconfigurable Homojunction Miniaturized Computational Spectrometers for Dynamic Spectral Sensing

Qianru Zhao

Fudan University

Abstract: Miniaturized spectrometers are crucial for advancing compact, energy-efficient, and real-time spectral sensing systems. However, traditional spectrometer architectures are limited by mechanical components and efficiency, making it difficult to consistently shrink their size. Here, we report a miniaturized computational spectral sensing platform based on a ferroelectrically reconfigurable WSe_2 homojunction, achieving both high-resolution spectral reconstruction and dynamic spectral sensing. The device operates under a non-volatile, near-zero-power standby mode enabled by the retention property of ferroelectric polarization, ensuring energy-efficient monitoring without a continuous power supply. Event-driven triggers combined with computational reconstruction enable real-time spectral tracking with ~32 μs response latency. This system shows broad spectral sensitivity (450 nm–950 nm) and the capability to detect dynamic spectral variations, validated via monitoring reflectance spectra of VO_2 film during phase transitions. This work reveals great potential for low-power, real-time spectral sensing, paving the way for on-site spectral analysis.

Research on Infrared Detection and Infrared Camouflage Based on Metasurfaces

Qianlong Kang

Shanghai Institute of Technical Physics, Chinese Academy of Sciences

Abstract: Infrared detection and infrared camouflage are common in the military field. Both have developed together in the intense confrontations. Therefore, the simultaneous research on advanced infrared detection and infrared camouflage technologies is of vital importance to the national defense. With the development of nanophotonics, the metasurfaces demonstrate a powerful ability to control the light field, which provides an opportunity for the development of infrared detection and infrared camouflage. In this presentation, I introduce the progress made by our research group in the field of infrared detection and infrared camouflage using the optical field control of the metasurfaces. Firstly, we introduce the infrared detection based on metasurfaces. We construct a metasurface composed of polar phonon materials on the infrared detector. By exciting the wavelength-polarization-dependent phonon-polaritonic modes, the infrared detector can achieve high-speed, high-sensitivity multi-dimensional infrared photodetection. Secondly, we introduce the infrared camouflage based on metasurfaces. We integrate phase-change materials into the metasurfaces to construct a tunable infrared emitter. By controlling the temperature, the infrared emitter can dynamically adjust the spectrum and polarization of the target's infrared radiation, making the infrared radiation characteristics of the target consistent with those of the background. As a result, the infrared detector cannot identify the target, achieving infrared camouflage. In summary, the integrated research on infrared detection and infrared camouflage based on metamaterials is necessary for enhancing national defense capabilities.

TBA

Qiming Zhang

University of Shanghai for Science and Technology

Abstract: TBD

Biography: TBD

Research on the Enhancement of Photodetection Capability of Photodetectors by Interface Effects

Feng Qiu

Yunnan University

Abstract: Herbert Kroemer, the father of semiconductor heterojunctions and Nobel Prize winner in Physics, said: “The interface is the device.”. In semiconductor heterostructures, the transition regions or interfaces between different materials are crucial to device performance, establishing the semiconductor device paradigm of "heterogeneous interfaces and band engineering". However, the issue of how to design the interface effect to enhance the detection capability of the photodetector has always been a key challenge in the field of photodetector research. In this study, YBCO barrier contact, interface molecular regulation, plasmon resonance, quantum confinement, etc. were employed for interface design and regulation, achieving research on enhancing the detection capability of photodetectors through interface effects.

Biography: Doctoral supervisor, PhD, Associate Researcher,An an “Industrial Innovation Talent” and “Top Young Talent” under Yunnan Province’s Xingdian Talent Program,the Deputy Technical Director at Yunnan Lincang Xinyuan Germanium Industry Co., Ltd., a member of the inaugural Provincial Expert Talent Industrial Service Group, and the director of the Key Laboratory of Optoelectronics and Microelectronics at Yunnan University. His research encompasses first-principles calculations, two-dimensional material synthesis, Ge/graphene van der Waals epitaxy, and 2D/3D (YBCO, InP, Ge) optoelectronic integration, with a focus on emerging physics, novel materials, and advanced optoelectronic devices.In 2018, he received the First Prize for Natural Science and Technology from the Yunnan Provincial Government. He also serves as Young Editorial Board Member of Chip, Nano-Micro Letters, and Information & Functional Materials high-level journals.

Bright dipolar excitons in twisted black phosphorus homostructures

Shenyang Huang

Fudan University

Abstract: Bright dipolar excitons, which contain electrical dipoles and have high oscillator strength, are an ideal platform for studying correlated quantum phenomena. They usually rely on carrier tunneling between two quantum wells or two layers to hybridize with nondipolar excitons to gain oscillator strength. In this work, we uncovered a new type of bright infrared dipolar exciton by stacking 90°-twisted black phosphorus (BP) structures. These excitons, inherent to the reconstructed band structure, exhibit high oscillator strength. Most importantly, they inherit the linear polarization from BP, which allows light polarization to be used to select the dipole direction. Moreover, the dipole moment and resonance energy can be widely tuned by the thickness of the BP. Our results demonstrate a useful platform for exploring tunable correlated dipolar excitons.

Biography: Dr. Shenyang Huang is a tenured Associate Professor at the Institute of Optoelectronics, Fudan University. He received his PhD in optics from Fudan University in 2020 and worked as a postdoctoral researcher with Prof. Hugen Yan from 2020 to 2023. His research focuses on infrared spectroscopy of low-dimensional quantum materials. He has published 48 papers, including 14 as first/corresponding author in Science, Physical Review Letters, Nature Communications, and Nano Letters. His work was selected as one of China's Top 10 Optical Advances in 2025, and he received the Rao Yutai Fundamental Optics Award.

Flexible Active-Matrix Sensor Arrays based on Oxide Thin-Film Transistors

Bowen Zhu

Westlake University

Abstract: Flexible and wearable sensors play important roles in applications of electronic skin, healthcare, and human-machine interfaces. Thin-film transistors (TFTs) are the core electronic components for constructing large-area, active-matrix flexible sensor arrays with high spatial resolution. Metal oxide semiconductors (MOSs) based TFTs hold great promises for emerging applications in active-matrix flexible sensor arrays by virtue of their high optical transparency, large-area uniformity, sound electrical performance, and capability of being fabricated via low-temperature solution-based processes. Based on the low-cost, solution-processed MOS TFTs, we successfully developed flexible active-matrix sensor arrays, where each sensor pixel is monolithically integrated with one or more TFT devices. In this way, each sensor can be arbitrarily accessed and controlled by TFTs, providing fast-switching speed and high density. With the TFT back-panel, we reshape the flexible tactile sensors by transforming the passive, static, and dispersed sensors into active, dynamic, and highly integrated sensor arrays.

Biography: Bowen Zhu received his B.S. degree in chemistry from Jilin University (China) in 2010. He obtained his PhD degree in materials science and engineering in 2016 from Nanyang Technological University, Singapore. From 2016 to 2017, he was a postdoctoral scholar in the Department of Materials Science and Engineering, UCLA. From 2017 to 2019, he worked at Department of Chemical Engineering at Monash University, Australia, as a Discovery Early Career Researcher Award (DECRA) fellow funded by Australian Research Council. He joined the School of Engineering at Westlake University in August 2019, and now he is an associate professor (tenured) in the Department of Electronic and Information Engineering (EIE). He was recognized as MIT TR35 (Asia Pacific), and a highly cited researcher by Clarivate in 2024. His research is focused on solution processed metal oxide thin film transistors, active-matrix sensor arrays, and neuromorphic devices.

CMOS-Compatible Silicon-Based Integrated Miniaturized Spectrometers: Device Engineering, Spectral Reconstruction, and Applications

Yuhang Hu

Fudan University

Abstract: Miniaturized spectrometers are promising for portable optical sensing, on-chip analysis, and hyperspectral imaging in the visible and near-infrared spectral regions. However, their development is often limited by the trade-off between device footprint and spectral performance, while many reconstructive spectrometers employ structures with limited compatibility with complementary metal–oxide–semiconductor (CMOS) fabrication and rely on manually tuned reconstruction parameters. Here, we present CMOS-compatible silicon-based integrated miniaturized spectrometers that combine compact wavelength-dependent optical encoding structures with computational spectral reconstruction. Several device architectures are investigated, including Fabry–Perot resonator arrays, wedge-shaped silicon nanomembranes with thickness-dependent optoelectronic response, and vanadium-dioxide tunable microcavities. These structures provide diversified spectral responses across the visible-to-near-infrared range and offer routes toward wafer-scalable semiconductor integration. To improve reconstruction robustness and automation, a self-adaptive strategy is further developed by introducing narrow-band spectral information as a self-reference for automatic optimization of reconstruction parameters. Stable reconstruction is demonstrated for quasi-monochromatic, broadband halogen, and LED light sources. Furthermore, the integrated spectrometers are applied to microfluidic optical sensing and hyperspectral imaging. These results highlight the feasibility of integrating CMOS-compatible photonic devices with computational reconstruction for compact and intelligent visible-to-near-infrared spectral sensing.

Poster List

Track 1: Infrared physics and devices

ESIT2026-0813-1
A detector-free scheme for mid-infrared free-space optical communication
Xu Zhao[1;2;3]
1.Division of Quantum Materials and Devices, Beijing Academy of Quantum Information Sciences;2.Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences;3.School of Physical Sciences, University of Chinese Academy of Sciences

ESIT2026-0813-2
Coherent-phase corrected shortwave quantum cascade laser dual comb system for multi-gas spectroscopy
zejun ma[1]
1.beijing academy of quantum information sciences

ESIT2026-0815-1
Multi-Band Infrared Enhanced Detection and Intelligent Recognition Based on van der Waals Photonic Structures
Wei Gao[1];Qianlong Kang[1];Runzhang Xie[1*]
1.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, CAS

ESIT2026-0826-1
Sensitive and fast mid-wave infrared graphene/HgCdTe van der Waals heterojunction empowered by interface engineering
wenxin Li[1];Jiao Hanxue[1];Ruotong Yin[1];Chen Yan[1];Haoran Yan[2*];Dongyang Zhao[1];Yahui Wang[1];Qianru Zhao[1];Zhaobiao Diao[2];Xiaochi Tai[1];Jinchao Tong[1*];Xudong Wang[2*];Junhao Chu[1];Jianlu Wang[1]
1. 复旦大学 ;2. 中国科学院上海市技术物理研究所

ESIT2026-0827-1
量子点异质结载流子输运调控及红外探测性能研究
Research on Carrier Transport Regulation and Infrared Detection Performance of Quantum Dot Heterojunction
dingyue sun[1]
1.Shanghai University of Applied Sciences

ESIT2026-0827-4
Precursor Coordination Engineering Enables Epitaxial-Level Carrier Densities in HgTe Colloidal Quantum Dots
Zhourui Hu[1]
1. 复旦大学

ESIT2026-0827-7
Dynamic Competition Between Ferroelectric Polarization and Interface Charge Trapping in N-type SOI FeFETs
Tao Zeng[1];Guangjian Wu[1*];Jialin Yu[1];Jinhua Zeng[1];Xiangfan Liu[2];Didi Shen[1];Yihan Liu[1];Chenyu Ye[1];Yanming Feng[1];Zhiyao Ye[1];Mengru Zhang[1];Jianlu Wang[1;2*];Junhao Chu[2]
1.State Key Laboratory of Integrated Chips and Systems, College of Integrated Circuits and Micro-Nano Electronics, Frontier Institute of Chip and System, Fudan University;2.State Key Laboratory of Photovoltaic Science and Technology, Institute of Optoelectronics, Fudan University

ESIT2026-0828-1
A non-destructive strategy for high-performance Ohmic contacts to p-HgCdTe devices
Yahui Wang[1;2];Jian Wang[3;2];Hanxue Jiao[1;2*];Ying Zhang[2];Dongyang Zhao[3;2]Xiaochi Tai[3;2]Bisong Tan[1];Yan Chen[3;2];Xudong Wang[2;4*];Junhao Chu[3;2];Jianlu Wang[1;3;2*]
1.State Key Laboratory of Integrated Chips and Systems, College of Integrated Circuits and Micro-Nano Electronics, Frontier Institute of Chip and System, Fudan University, Shanghai 200433, China.;2.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences, No.500 Yutian Road, Shanghai 200083, China.;3.Institute of Optoelectronics, College of Future Information Technology, College of Smart Materials and Future Energy, Fudan University, Shanghai 200433, China.;4.Shanghai Key Laboratory of Optical Coatings and Spectral Modulation, No.500 Yutian Road, Shanghai 200083, China.

ESIT2026-0828-2
Ferroelectric-semiconductor heterostructure for ultrabroadband photodetection and optical-thermal discrimination
yuqing Zheng[1]
1.Shanghai Institute of Technical Physics Chinese Academy of Sciences

ESIT2026-0828-3
Correlation Between 1/f Noise and Dark-Current Components in MWIR and LWIR InAs/GaSb Type-II Superlattice Detectors
Ye Chen[1;2];Xuliang Chai[3];Yihong Zhu[3];Zhaoming Liang[3];Lu Ye[3];Chenkai Fang[3];Ming Huang[3];Jianxin Chen[1;3*]
1.Hangzhou Institute for Advanced Study,University of Chinese Academy of Sciences;2.University of Chinese Academy of Sciences;3.National Key Laboratory of Infrared Detection Technologies, Shanghai Institute of Technical Physics, Chinese Academy of Science

ESIT2026-0828-7
Bias-Switchable Infrared–Ultraviolet Dual-Band Imaging with a PbS Quantum Dot/Ga2O3 Heterojunction
Yi Long[1];Yunxiang Di[1];Lingfeng Ye[1];Kun Ba[1];Jianlu Wang[1*]
1.Fudan University

ESIT2026-0829-2
Bilateral Geiger mode avalanche in InSeSchottky photodiodes
Dongyang Zhao[1]
1.Fudan University

ESIT2026-0830-11
Applications of Low-Temperature AFM in Infrared
Jian Wang[1]
1.Institute of Optoelectronics, Fudan University

ESIT2026-0830-16
Improving the surface passivation of p-type HgCdTe
Xiaochi Tai[1]
1.Fudan University

ESIT2026-0831-11
Comparative Analysis of CTIA, SFD, DI, and BDI Pixel Front Ends for Cryogenic Infrared Readout Circuits
Wang Ruilin[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0831-14
First-Principles Study of the Surface Chemical States and Electronic Structure of InAs
Wanqiu Wang[1;2];Min Huang[2];Jianxin Chen[2]
1.School of Information Science and Technology, ShanghaiTech University;2.Shanghai Institute of Technical Physics, Key Laboratory of Infrared Imaging Materials and Detectors, Chinese Academy of Sciences

ESIT2026-0831-16
Enhanced Responsivity in Antimonide Superlattice LWIR Detectors via Photon Traps
Weihan Liu[1;2];Min Huang[1];Jianxin Chen[1;2*]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences;2.University of Chinese Academy of Sciences

ESIT2026-0831-22
Silicon Very Long Wavelength Infrared Photodetector Enhanced by Light Localization Structures
Yongqi Zhang[1];Ke Deng[1*];Kun Zhang[1];Jiaxiang Guo[1];Tao Zhang[1];Peng Wang[1*];Weida Hu[1]
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ESIT2026-0831-3
Pushing PbS Quantum Dots into the Extended Short-Wavelength Infrared Beyond 2600 nm
Lingfeng Ye[1*]
1.Fudan University

ESIT2026-0831-5
Ultrabroadband Photodetection from Visible to Terahertz based on TCI SnTe
Feng Wu[1*];Zhen Wang[2];Maohua Chen[1]
1.Huazhong University of Science and Technology;2.State Key Laboratory of Infrared Science and Technology, Shanghai Institute of Technical Physics

ESIT2026-0831-6
Novel Optoelectronic Devices Based on Low-Dimensional Ferroelectric Semiconductors
Lu Wang[1]
1.Fudan University

ESIT2026-0831-7
Ultraviolet-Assisted Enhancement of Black Phosphorus-Based Infrared Photodetectors
Xiantai Tian[1*]
1.Huazhong University of Science and Technology

ESIT2026-0831-9
Broadband Mid-Infrared Polarization Converter on InGaAs-InP
Xu Gao[1]
1.Peking University

ESIT2026-0901-1
Comparative Analysis of CTIA, SFD, DI, and BDI Pixel Front Ends for Cryogenic Infrared Readout Circuits
Ruilin Wang[1];Tao Zhang[2];Weida Hu[2];Peng Wang[2]
1.ShanghaiTech University;2.SHANGHAI INSTITUTE OF TECHNICAL PHYSICS, CAS

ESIT2026-0902-3
Bending Canalization Propagation in Twisted Bilayer a-MoO $_3$
tian haoyang[1;2];Ma Lei[3;4];Shen Dechao[5;4];Sun Liaoxin[4;2]
1.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics;2.University of Chinese Academy of Sciences;3.School of Physical Science and Technology, ShanghaiTech University;4.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences;5.College of Sciences, Shanghai University

ESIT2026-0903-1
Ultrafast Dynamics with Crystal-Axis Resolution in van der Waals Layered FePS $_3$
Shen Dechao[1;2];Tian Haoyang[2;3];Ma Lei[4];Sun Liaoxin[2;3*]
1.Department of Physics, Shanghai University;2.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences;3.University of Chinese Academy of Sciences;4.School of Physical Science and Technology, ShanghaiTech University

ESIT2026-0904-4
High-speed infrared thermistor bolometer based on the Gires-Tournois resonator architecture
Yuyang Zhang[1]
1.Fudan University

ESIT2026-0904-7
Tomographic 3D Probe Microscopy for 3D Electronic Diagnostics of Infrared Chips
Bo Zhang[1;2];Ruoshen Yang[3;2];Tianxin Li[1;4];Hui Xia[1;4]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences;Shanghai Normal University;2.ShanghaiTech University;3.Shanghai Institute of Technical Physics, Chine se Academy of Sciences;4.University of Chinese Academy of Sciences

ESIT2026-0904-8
Nonlinear Hall Responses in CsV3Sb5 toward Wireless Rectification
Shanshan Liu[1;2];Prasun Boya[l2];Enze Zhang[3];Kian Ping Loh[2]
1.State Key Laboratory of Infrared Physics, Shanghai Institute of Technical Physics, Chinese Academy of Sciences;2. Department of Chemistry, National University of Singapore;3.National Laboratory of Solid State Microstructures, Collaborative Innovation Center of Advanced Microstructures, School of Physics, Nanjing University

ESIT2026-0905-4
Wafer-Scale (100)-Oriented Te Single-Crystalline Thin Films with Exceptional Electronic and Photodetection Performance
Tao Hu[1];Wei Bai[1*]
1.East China Normal University

ESIT2026-0905-5
Continuous polarization–wavelength mapping with nonlocal metasurfaces
Jie Wang[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0906-1
Growth of Te-Based Thin Films via van der Waals and Remote Epitaxy and Their Optoelectronic Properties
Qiaochu Chen[1]
1.East China Normal University

ESIT2026-0906-2
Robust chirality via merging accidental BICs with net zero topological charge
Guangye Li[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0906-4
Local Band-Profile Control Unlocks Multipeak Spectral Reconstruction in a Single Photodetector
Junzhe Gu[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0906-6
Bias-selective dual-band infrared phototransistor with partially mode-decoupled plasmonic coupling
shunji xia[1]
1.Shanghai Institute of Technical Physics

ESIT2026-0906-8
InAs 基高工作温度中波红外芯片研制与感算一体架构设计
Hao Wu[1];Jinshui Miao[1*];Yi Dong[1];Siyu Long[1];Jingjing Liu[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0909-2
InAs-Based Barrier Infrared Detectorsband Engineering for HOT Imaging
Liuxin Huo[1];Hao Wu[1];Siyu Long[2];Jingjing Liu[1];Yi Dong[1];Jinshui Miao[1*]
1.Shanghai Institute of Technical Physics;2.ShanghaiTech University

ESIT2026-0911-1
Photonic Synaptic Devices Based on Gr/InSe Heterostructures and Their Applications in Logic Gates
ZhangYuehang[1];XieHao[1];DuSichao[1;2*]
1.HangZhou City University;2.Zhejiang University

ESIT2026-0911-2
Twisted Graphene Moiré Superlattices Enable Hot-Carrier Multiplication for Ultra-Sensitive Infrared Photodetection
Ning Li[1];Zhufeng Pan[1];Sichao Du[2;1*]
1.Hangzhou City University;2.Zhejiang University

ESIT2026-0911-3
Wavelength-Dependent Photoresponse Dynamics in WTe_2/MoS_2 van der Waals Heterojunctions for Neuromorphic Visual Perception
Duokai Chang[1];Hao Xie[1];2;Sichao Du[1;2*]
1.Hangzhou City University;2.Zhejiang University

ESIT2026-0911-4
ReS_2/Graphene Optoelectronic Artificial Synapse for Artificial Neural Networks and Neuromorphic Computing
Qiang Wen[1];Sichao Du[2*]
1.Hangzhou City University;2.Zhejiang University

ESIT2026-0911-5
Optoelectronic Artificial Synapse Based on a Transition-Metal Dichalcogenide/Graphene Heterostructure for Reconfigurable Information Encoding
Yichen Yu[1];Sichao Du[1;2*]
1.Hangzhou City University;2.Zhejiang University

ESIT2026-0911-6
Carrier Dynamics and Optoelectronic Sensing in Low Dimensional Materials.
潘朱峰[1]; 汪秋婷[1];DuSichao[1;2*]
1. 浙大城市学院 ;2. 浙江大学

ESIT2026-0911-7
UV–Visible Self-Powered Photodetection in WTe_2/MoS_2 Heterojunctions for Image Recognition
WenBo Li[1];Sichao Du[1;2*]
1. 浙大城市学院 ;2. 浙江大学

ESIT2026-0911-8
Lead-Free CsBi3I10 Perovskite Photonic Synapses for Near-Infrared Neuromorphic Computing and Thermal-Fatigue Monitoring
Nasir Ali[1;2];Sichao Du[1;3*]
1. 浙大城市学院 ;2. 西里西亚理工大学 ;3. 浙江大学

Track 2: Terahertz and Millimeter Waves

ESIT2026-0814-1

Tunable Room-Temperature Terahertz Emission from a Difference-Frequency Generation Quantum Cascade Laser Array with Vertical-Integrated Heaters

Zhao Yanan[1;2;3];Zhang Shichen[1];Lu Quanyong[1*]
1.Beijing Academy of Quantum Information Sciences;2.Institute of Physics, Chinese Academy of Sciences;3.University of Chinese Academy of Sciences

ESIT2026-0831-1

Extreme-thickness Meta-membrane for ControllingTerahertz Vectorial Beams

Yufei Song[1*]
1.Fudan University

ESIT2026-0904-1

High-Sensitivity Terahertz Detection via Critical Order-Parameter Fluctuations in Exciton Insulator Ta2NiSe5

Xunyi Zhou[1]
1.Suzhou Institute of Nano-Tech and Nano-Bionics

ESIT2026-0905-8

Nonlinear Hall Transport in Topological Quantum Materials for Terahertz and Millimeter-Wave Devices

Yao Jiao[1]
1.Shanghai Institute of Technical Physics

ESIT2026-0909-1

Dual Gating Boosts Hot-Carrier-Assisted Photothermoelectric Effect in Black Phosphorus for High-SNR Sub-Terahertz Detection

Keqin Tang[1];Kai Zhang[1*]
1.Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences

Track 3: Remote Sensing and Space Exploration

ESIT2026-0831-18

A Multi-Scale Local–Global Network for Satellite Infrared Image Deblurring

Heyang Wang[1;2];Deng Jie[1;2];Hongyi Chen[1;2];Hongxing Qi[1;2*];Xudong Zhang[1;2*]
1.Hangzhou Institute for Advanced Study, UCAS;2.University of Chinese Academy of Sciences

ESIT2026-0905-9

Chemometric Analysis of Martian LIBS Data Using Deep Learning and Pretrained-Model-Based Transfer Learning

Cui Zhicheng[1;2];Li Luning[1*];Liu Xialin[2];Guo Ying[2];Xu Weiming[1];Shu Rong[1;2*]
1.Key Laboratory of Space Active Opto-electronics Technology, Shanghai Institute of Technical Physics, Chinese Academy of Sciences;2.Key Laboratory for Satellite Digitalization Technology, Innovation Academy for Microsatellites, Chinese Academy of Sciences

Track 4: Digital Earth and Intelligent Cognition

ESIT2026-0830-13

Physics-residual-constrained multi-agent simulation for crowd evacuation

Xiaoyu Gan[1];Wenhang Li[2*];Dongchuan Wang[1];Kaixiang Wei[1];Jianhua Gong[2;3];Na Xu[1]
1.School of Geology and Geomatics, Tianjin Chengjian University;2.Aerospace Information Research Institute, Chinese Academy of Sciences;3.Zhejiang-CAS Application Center for Geoinformatics,Jiaxing,Zhejiang

ESIT2026-0830-14

AI-Assisted Remote Sensing Evidence Review and Decision Support in Public-Interest Litigation

Kaixiang Wei[1];Jianhua Gong[2;3*];Xiaoyu Gan[1];Dongchuan Wang[1];Yu Xu[4];Weidong Hu[3];Yunfeng Ma[3];Yanqing Wang[2]
1.School of Geology and Geomatics,TCU,Tianjin;2.Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing;3.Zhejiang-CAS Application Center for Geoinformatics,Jiaxing,Zhejiang;4.People's Procuratorate of Jiashan County, Jiashan

ESIT2026-0830-15

Rapid Flood Inundation Forecasting at Watershed Scale Using a Physics-Informed Deep Learning Approach

Na Xu[1];Yi Li[2*];Dongchuan Wang[1];Lihui Zhang[1];Jun Sun[2];Jieping Zhou[2]
1.School of Geology and Geomatics, Tianjin Chengjian University;2.Aerospace Information Research Institute, Chinese Academy of Sciences, Beijing

ESIT2026-0830-18

Efficient Transformer-Based Semantic Mapping for On-Site Scene Understanding with Handheld LiDARScanner

Yuqing Shen[1];Chun Liu[1*];Akram Akbar[1];Asan Xirali[1];Yanyi Li[1];Yunze Wu[1]
1.Tongji University

ESIT2026-0830-5

Intelligent 2D Object Recognition in UAV-Based Inspection Imagery

Yan Ding[1];Nanyu Xiao[1];Huan Meng[1];Xiang Li[2*]
1.Key Laboratory of Geographic Information Science (Ministry of Education) and School of Geographic Sciences, East China Normal University;2.Low-Altitude Economy Spatial Intelligence Technology Research Center, East China Normal University

ESIT2026-0830-7

3D Gaussian Scene Representation for Low-Altitude UAV Route Safety

Nanyu Xiao[1];Huan Meng[1];Yan Ding[1];Xiang Li[1;2*]
1.Key Laboratory of Geographic Information Sciences (Ministry of Education) and School of Geographic Sciences, East China Normal University;2.Low-Altitude Economy Spatial Intelligence Technology Research Center, East China Normal University

ESIT2026-0830-8

Spatially informed multi-UAV task assignment and path planning in complex 3D urban airspace

Huan Meng[1];Yan Ding[1];Nanyu Xiao[1];Xiang Li[1*]
1.East China Normal University

ESIT2026-0831-10

Adaptive-GSAR: Adaptive Grounded Self-Audit Recovery for Open Semantic Recognition

Wang Chenming[1];Du Xiaoping[2;1]
1.Fuzhou University;2.Aerospace Information Research Institute, Chinese Academy of Sciences

ESIT2026-0831-20

Feature Enhancement and Motion-Guided Query Selection for Air-to-Air UAV Detection

ma wangyang[1];wangke yixuan[2];Yang Wenjian[1*]
1.Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences;2.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0905-1

Multiscale Event and Infrared Fusion Classification Network for Dim Aerial Target Recognition

Xiaoying Wu[1]
1.Shanghai Institute of Technical Physics, Chinese Academy of Sciences

ESIT2026-0906-9

Vision-Based Multimodal Fusion for Intelligent Perception and State Cognition of On-Orbit Spacecraft

Yang Chen[1*];zhang Zhang[2*];Liang Chang[3]
1.Hangzhou Institute for Advanced Study, UCAS;2.Innovation Academy for Microsatellites of Chinese Academy of Science;3. Innovation Academy for Microsatellites, Chinese Academy of Sciences

Track 5: Infrared and Interdisciplinary Fields

ESIT2026-0807-1

Dual-Supervised Cross-Attention for Infrared Spectral Gas Classification

wenbo wang[1];shijie liu[1*]
1.Hangzhou Institute for Advanced Study, University of Chinese Academy of Sciences

ESIT2026-0808-1

Circular Polarization Selective QWIP Based on Chiral Quasi-BIC Metasurfaces

Haoxiang Xia[1];Dayuan Xiong[1*]
1.East China Normal University

ESIT2026-0828-6

Emulating Heterosynaptic Plasticity with a Gate-Tunable Ferroelectric Memristor

Didi Shen[1];Chenyu Ye[1];Jianlu Wang[2]
1.Fudan University;2.National Natural Science Foundation of China

ESIT2026-0830-17

Reversible Phase-Transition-Enabled Broadband Infrared Photodetection in 1T-TaS_2

Yan Li[1]
1.State Key Laboratory of Photovoltaic Science and Technology, Shanghai Frontiers Science Research Base of Intelligent Optoelectronic and Perception, Institute of Optoelectronics and College of Future Information, Fudan University

ESIT2026-0831-19

Physics-Informed Intelligent Agents for Adaptive Molecular Beam Epitaxy Growth Optimization

Zhaoyang Guo[1];Zichuan Wang[2];Shuaixiong Liu[2];Wei Xiong[1];Jiaxiang Guo[1*];Peng Wang[1*];Weida Hu[1]
1.SHANGHAI INSTITUTE OF TECHNICAL PHYSICS CHINESE ACADEMY OF SCIENCES;2.Wuhan University of Technology

ESIT2026-0831-2

A multi-band and texture feature fusion model for infrared camouflage performance evaluation

Tengteng Jiang[1]
1.Shanghai Institute of Technical Physics

ESIT2026-0902-2

Classification of Hepatocellular Carcinoma Cells Based on Near-Infrared Spectroscopy: A Comparative Study of PCA-PLS and GA-PLS

Zixi Li[1*]
1.Shanghai Institute of Technical Physics

ESIT2026-0904-5

Angle-insensitive multilayer metacoating with dual-band selective emission for infrared camouflage and radiative cooling

Li Liyan[1]
1.Fudan University

红外光电产业技术论坛

红外光电产业技术论坛是 ESIT2026 国际会议下设专题论坛，聚焦红外技术及其产业化应用，旨在研讨红外探测技术在材料、器件及工业领域的产业需求与前沿研究进展。

本次论坛邀请红外领域专家学者、产业界代表与青年科研人才开展主题报告和专题研讨，致力于打造一场思想碰撞、启智创新的高水平学术产业盛会。

诚邀各界同仁踊跃参会、交流互鉴，携手助力我国红外探测技术与遥感应用产业高质量可持续发展。

会议主持：李春来 中国科学院上海技术物理研究所

周　易 中国科学院上海技术物理研究所

会议时间：2026 年 9 月 18 日 13:30-18:00

会议地点：上海圣诺亚皇冠假日酒店 3 楼 诺亚会议室 5，上海普陀区金沙江路 1699 号

时间	内容
13:30-13:45	产业论坛开幕及嘉宾介绍
13:45-14:00	**面向智能时代的传感器技术发展趋势和机遇** **朱佳骐** 秘书长 国家智能传感器创新中心副总裁、中国传感器与物联网产业联盟执行秘书长
14:00-14:15	**红外光电传感器发展趋势及产业化应用** **葛鲁振** 智能决策高级工程师 海尔智家中央研究院
14:15-14:30	**量子点红外探测及成像技术研究** **唐鑫** 首席科学家 中芯热成科技（北京）有限公司
14:30-14:45	**高光谱成像技术及其产业化应用** **马强** 总经理 杭州高谱成像技术有限公司
14:45-15:00	**红外光电传感器在气体泄露监测领域的应用和需求** **卢锋** 总经理 山东泉景道电子科技有限公司
15:00-15:15	茶歇

15:15-15:30	**超构表面多维光学成像** **王漱明** 董事长 南京南智先进光电集成技术研究院有限公司
15:30-15:45	**碲锌镉半导体单晶片与器件产业** **孙士文** 总经理 中科宏芯（常州）传感科技有限公司
15:45-16:00	**制冷型红外探测器发展现状与技术趋势分析** **徐志成** 总经理 中科爱毕赛思（常州）光电科技有限公司
16:00-16:15	**铟镓砷短波红外探测器进展及展望** **刘大福** 总经理 无锡中科德芯感知科技有限公司
16:15-16:30	**商业气象卫星定量遥感仪器和应用展望** **顾明剑** 研究员 中国科学院上海技术物理研究所
16:30-18:00	红外产业技术圆桌讨论会

元素科学（香港）有限公司
Element Science (Hong Kong) Co., Ltd.

Element Science

公司简介

元素科学®，成立于2013年，在上海设有分公司上海素源贸易有限公司，
专业为分子束外延（MBE）实验提供高精密、高纯度、高质量的源材料和半导体衬底，
是世界领先的专业特需材料供应商。
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半导体工艺用衬底（epi ready），金属单晶，金属合金，陶瓷材料，
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半导体衬底 MBE Wafers

- 砷化镓：GaAs，大小：2”，3”，4”，6”
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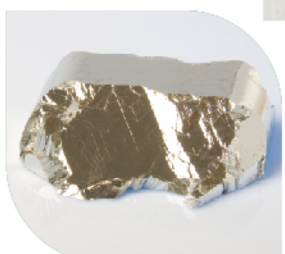
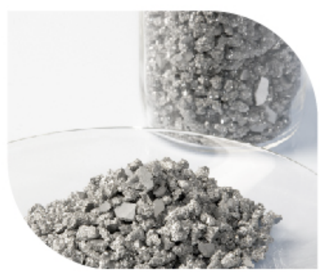
- 锑化镓：GaSb，大小：2”，3”，4”
- 磷化铟：InP，大小：2”，3”
- 氮化镓：GaN，大小：2”，4”
- 硅衬底：Silicon Wafer，大小：2”，3”，4”-12”
- 蓝宝石衬底：Sapphire

高纯源材料 MBE Grade

- 高纯砷：As，形状：颗粒或锭条，纯度：7N，7N5
- 高纯镓：Ga，形状：块状或锭条，纯度：7N，7N5+，8N
- 高纯铟：In，形状：块状或锭条，纯度：7N，7N5
- 高纯锑：Sb，形状：颗粒或锭条，纯度：7N，7N5
- 高纯铍：Be，形状：颗粒，纯度：4N，4N8
- 高纯铝：Al，形状：锭条，纯度：6N5，或更高
- 高纯铋：Bi，形状：块状或片状，纯度：4N，5N，6N





其他高纯材料：

- 高纯硅：Si，形状：片状，电阻率：>10,000 ohm.cm
- 高纯镉：Cd，形状：锭条，纯度：6N，7N
- 高纯碲：Te，形状：锭条，纯度：6N，7N
- 高纯锌：Zn，形状：锭条，纯度：6N，7N
- 高纯镁 Mg，高纯磷 P，高纯化合物：硒化镉（CdSe），碲化镉（CdTe），碲化镓（GaTe），硒化锌（ZnSe），碲锌镉（Poly CZT）

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复创芯简介

COMPANY FUCHUANGXIN

复旦科技园集成电路融创中心（“复创芯”），由复旦科技园、科创板日报和中国传感器与物联网产业联盟联合发起设立的融创平台。平台将依托集成电路行业专家资源，通过荟聚各类半导体产业人才，搭建产学研政金融合的交流共创平台，服务泛半导体全产业链。特别是平台将从行业和企业的实际需求出发，开展针对性的学术研究和人才培养，作为学校产学研转化方面有益补充和探索。

立足**复旦创新**资源
搭建以**集成电路人才**为核心的泛半导体领域
资源融合共创平台
服务泛半导体领域的**高科技人才**
赋能泛半导体领域的**高科技企业**
支持泛半导体发展的**高效能政府**

S-MAT2024中国新材料技术与半导体应用大会暨半导体材料高端论坛

广聚英才

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立足复旦创新资源，跨院系优秀师生思想碰撞，多领域相互赋能；
人才梯队建设，搭建实习求职的在校生与企业面对面沟通的桥梁

成功的企业家

分享企业成功的经验，在更广泛的院系寻找资源，解构最前沿的技术路线，探讨技术与应用的深度结合，跨界创新，为公司发展制定更好的战略规划

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掌握核心技术，创业成功概率高，寻找志同道合、优势互补的创业团队；
创业路上少走弯路，方便创业团队找人、找钱、找资源

2023中国真空技术与半导体应用大会暨半导体真空设备与零部件高端

平台资源

复旦科技园集成电路融创中心成立仪试

复旦大学 微电子学院

SITP 中国科学院上海技术物理研究所

同济大学 电子与信息工程学院

SITRI 上海微技术工业研究院
Shanghai Industrial µTechnology Research Institute

上海交通大学

上海理工大学 光电信息与计算机工程学院

中国科学院上海光学精密机械研究所

上海大学 微电子学院

国家智能传感器创新中心
National Intelligent Sensor Innovation Center