# Conference Program

## 2026 IEEE 9th World Conference on Computing and Communication Technologies (WCCCT 2026)

## Workshop

## 2026 13th International Conference on Wireless Communication and Sensor Networks (icWCSN 2026)

**April 10-12, 2026**

**Qingdao, China**

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# Welcome Message

On behalf of the Organizing Committee, it is my great pleasure to welcome you to the 2026 IEEE 9th World Conference on Computing and Communication Technologies (WCCCT) and its workshop, the 2026 13th International Conference on Wireless Communication and Sensor Networks (icWCSN2026), hosted by the Faculty of Information Science and Engineering, Ocean University of China. The conference will take place in the beautiful coastal city of Qingdao, China, from April 10 to 12, 2026.

WCCCT and icWCSN serves as a premier international forum dedicated to advancing the frontiers of computing and communication technologies—the fundamental pillars of modern science and technology that underpin information and intelligent systems. This year's program highlights cutting-edge developments across areas such as high-performance computing, edge intelligence, intelligent communications, integrated circuits, and marine sensing and communication systems, reflecting the growing convergence of these dynamic disciplines.

The conference features a comprehensive technical program, including keynote speeches, invited talks, parallel technical sessions, and poster presentations. We are honored to host distinguished scholars and industry experts from around the world, who will share their insights on emerging research frontiers and innovative applications. Their expertise greatly enriches the academic quality and impact of WCCCT and icWCSN.

We extend our sincere gratitude to all authors, reviewers, and committee members for their dedication and rigorous work in making this conference possible. Special thanks go to our sponsors and partners—including IEEE, IEEE Qingdao AP/MTT/COM Joint Chapter, and the numerous supporting universities and institutions—for their continued support To all attendees, whether joining us in person or online, we appreciate your enthusiasm and contribution to this vibrant academic community.

Beyond the technical sessions, we hope you will take time to enjoy the unique charm of Qingdao—from its scenic coastline to its renowned hospitality. May your time here be both intellectually rewarding and personally enjoyable.

Welcome to WCCCT 2026 and icWCSN 2026, and we wish you a memorable and productive conference experience!

Bing Zheng
General Co-Chair of WCCCT 2026 and icWCSN 2026
Faculty of Information Science and Engineering
Ocean University of China, China

**Conference Venue**

**青岛西海岸喜来登酒店 | Sheraton Qingdao West Coast**

**地址：**中国青岛青岛西海岸新区太行山路 1 号 266555

**Adress:** No.1 Taihangshan Road, Huangdao District, Qingdao, Shandong, China, 266555

**Web/网站:** https://www.marriott.com/en-us/hotels/tnahu-sheraton-qingdao-west-coast/overview/?clickref=1011lC9b5xbM&aff=MARWW&affname=10l1110&co=WW&nt=PH&cid=AFF_Affiliae

**Time Zone:**

UTC/GMT+8

**Average Temperature of Qingdao in April**

Average daily minimum temperature: 10℃ Average daily maximum temperature: 18℃

**Bank and Foreign Exchange**

The Currency is Chinese Yuan here

**Important Phone Numbers**

Fire: 119 Medical Emergency: 120 Police: 110

**Important Notes**

- ✧ Please take care of your belongings during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants.
- ✧ Please wear delegate badge during the conference. There will be NO access for people without a badge. Never discard your badge at will.
- ✧ Accommodation is not provided. Early reservation is suggested to be made for delegates.
- ✧ Please show the badge and meal coupons during lunch and dinner.
- ✧ Don’t stay too late in the city and don’t be alone in the remote area. Be aware of the strangers who offer you service, signature of charity, etc., at scenic spots. More Tourist Information and Security tips are available online.

**Online APP**

**ZOOM Download Link: https://zoom.us/download**

ZOOM Using & Presentation Instruction:

http://www.wccct.org/kits.zip

**Please rename your screen name before entering the room**

| Rename Screen Name Before Entering the Room | Examples |
|---|---|
| Authors: Paper ID-Name | SZ900-San Zhang |
| Delegate: Delegate- Name | Delegate-San Zhang |
| Keynote Speaker: KN-Name | KN-San Zhang |
| Invited Speaker: IS-Name | IS-San Zhang |
| Committee Member: Committee-Name | Committee-San Zhang |

**Materials Prepared by the Presenters**

- **Oral Presentation: PPT or PDF Display File**

PPT Template: http://www.wccct.org/kits.zip

- **Poster Presentation: Poster (80cm*180cm (height>width), Portrait Format**

Poster Template: http://www.wccct.org/kits.zip

**Duration of Each Presentation**

- Keynote Speech: 40 Minutes of Presentation including Q&A.
- Invited Speech: 20 Minutes of Presentation including Q&A.
- Regular Oral Presentation: 15 Minutes of Presentation including Q&A.
- Poster Presentation: 7 Minutes of Presentation including Q&A

**Note**

- The regular oral presentation time arrangement is for reference only. In case any absence or some presentations are less than 15 minutes, please join your session before it starts.
- An excellent presentation will be selected from each session which will be announced and awarded an excellent presentation certificate.

# Keynote Speaker I

**April 11, Saturday, 09:10-09:50, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Meeting Room:** 凌海厅 Linghai Room ( 3 Floor )

**Prof. Qingsheng Zeng**

**Université du Québec an Outaouais, Canadaa**

**Speech Title: Analysis and Design of Lightweight, High-Efficiency, and Circularly Polarized Antennas for Satellite Platforms**

**Abstract:** In this report, a lightweight and efficient circularly polarized all metal antenna design method suitable for satellite industrial applications is presented. The proposed antenna consists of a rectangular waveguide, which includes a high-order mode cavity, a feed, and a metasurface circular polarizer (MCP). The cavity higher-order mode TE440 is directly emitted from four coupling slots in the waveguide. MCP is placed on the cavity to generate circularly polarized (CP) radiation. Due to the introduction of high-order mode technology and MCP, all metal walls inside the antenna can be removed, significantly reducing weight. In order to reflect the weight advantage, the traditional metal wall loaded waveguide antennas with the same size were designed. The test results indicate that the antenna has a wider impedance and axial bandwidth, as well as higher radiation efficiency. Especially, the proposed antenna is 40% lighter than the comparative antenna, indicating that it is more suitable for satellite platforms with limited payload capacity.

**Bio:** Prof. Qingsheng Zeng, received his Ph.D. from University of Ottawa, Canada, and is currently a professor and PhD advisor of Université du Québec an Outaouais (UQO), an adjunct professor and PhD advisor of University of Ottawa, Carleton University, and Institut National de la Recherche Scientifique -- Centre Energie, Matériaux et Télécommunications (INRS-EMT). He has been a research engineer and a senior research engineer at Communications Research Centre Canada (CRC), Government of Canada. Dr. Zeng has undertaken research and teaching in several fields, including analysis and design of aircraft antennas, electromagnetic compatibility and interference (EMC/EMI), ultrawideband technology, radio wave propagation, computational electromagnetics. He has been the Chair of AP (Antennas and Propagation) / MTT (Microwave Theory and Techniques) Joint Chapter and Secretary of EMC (Electromagnetic Compatibility) Chapter of IEEE Ottawa, a Member of IEEE Canada Industry Relations Committee, and a senior member of IEEE. Dr. Zeng has been a member of the Strategic Projects Grant (SPG) Selection Panel (Information and Communications Technologies B) for the Natural Sciences and Engineering

Research Council of Canada (NSERC), a member of Site Visit Committee of NSERC Industrial Research Chair (IRC), and a reviewer of NSERC Industrial R&D Fellowships.

He has published more than 200 SCI and EI indexed papers and technical reports, authored one book and co-authored two book chapters. His work on the project “Aggregate Interference Analysis and Suitability of Some Propagation Models to Ultra-wideband Emissions in Outdoor Environments” has formed one part of Consultation Paper on the Introduction of Wireless Systems Using Ultra Wideband Technology, Spectrum Management and Telecommunications Policy, Industry Canada, and has been taken as a significant contribution to International Telecommunication Union (ITU). Dr. Zeng has been serving as an editorial board member and a reviewer for a number of technical books and scientific journals, as a conference co-chair, a session chair and organizer, a technical program committee co-chair and member and a reviewer, a short course/workshop/tutorial presenter and a keynote speaker for many international and national symposia. He has won several technical and technical service awards, was ranked as one of the researchers at Communications Research Centre Canada with the strongest impacts in 2011, selected as a distinguished expert under the Plan of Hundreds of Talents of Shanxi Province in China during 2015, a Huashan Mountain Scholar Chair Professor of Xidian University in 2020, and a distinguished expert for HOME Program of China Association for Science and Technology in January 2023, and was elected as a member of the Council of the Academicians and Experts Association of Jilin Province in December 2023.

# Keynote Speaker II

**April 11, Saturday, 09:50-10:30, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Meeting Room:** 凌海厅 Linghai Room ( 3 Floor )

**Prof. Haiyong Zheng**

**Ocean University of China, China**

**Speech Title: Multi-scenario Degraded Image Intelligent Interpretation**

**Abstract:** Degraded images, resulting from synthesis, contamination, low light, and other factors, are ubiquitous. Due to the diversity in degradation types and degrees, various image restoration tasks, such as harmonization, inpainting, and enhancement, have emerged as significant topics in visual understanding and downstream applications. This speech will focus on the intelligent interpretation of degraded images across multiple scenarios, present the causes of quality degradation during image synthesis, occlusion, transmission, and capture, and explore artificial intelligence techniques to achieve efficient and accurate interpretation of degraded images.

**Bio:** Haiyong Zheng is a Professor at the Ocean University of China. His research focuses on AI, computer vision, and their applications in underwater perception and intelligent oceanography. He leads the Micronano Perception and Information Intelligence (MPII) group and has published over 100 papers in premier venues such as IEEE TPAMI, CVPR, and ICCV. Prof. Zheng serves as a Senior Member of IEEE and CSIG, chairs the IEEE OES Technical Committee on Optics and Imaging, and contributes to international working groups on plankton imaging and AI. He is a recipient of the InCoB 2017 Best Paper Award and the TaiShan Scholar Youth Expert title.

# Keynote Speaker III

**April 11, Saturday, 10:50-11:30, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Meeting Room:** 凌海厅 Linghai Room ( 3 Floor )

**Prof. Gui-Lu Long**

American Physical Society Fellow, IOP Fellow

**Tsinghua University, China / Beijing Academy of Quantum Information Sciences, China**

**Speech Title:** Avoiding Decapitation Strikes With Quantum Communication

**Abstract**: Decapitation strikes have become one of the most important offensive tactics in modern warfare. The core of such strikes lies in tracking and precisely locating high-value targets through multi-dimensional means such as satellites, electronic surveillance, and cyber infiltration. Traditional communication systems are incapable of perceiving monitoring when a target's whereabouts have been compromised. Therefore, developing effective anti-monitoring technologies is critical to avoiding decapitation strikes. Quantum secure direct communication uses quantum states as information carriers; once subjected to monitoring, its bit error rate rises sharply, thereby alerting users to the risk of location exposure. This report introduces the principle behind exposure awareness in quantum secure direct communication, presents the current state of development of this technology, and discusses its future prospects.

**Bio:** Gui-Lu Long is a professor at Tsinghua University, and serves as the Vice President of the Beijing Academy of Quantum Information Sciences. He received the National Science Fund for Distinguished Young Scholars, he is also a Fellow of the American Physical Society (APS) and the Institute of Physics (IOP). He holds several key academic and professional roles, including Director of the Quantum Communication Committee of the China Institute of Communications, member of the Quantum Science and Technology Committee of the International Union of Pure and Applied Physics, member of the Quantum Forum at the World Economic Forum, Deputy Head of the expert group for a national ministry, and council member of both the Association of Asia Pacific Physical Societies and the Asia Pacific Center for Theoretical Physics. In addition, he serves on the editorial board of Light: Science & Applications, acts as Editor-in-Chief of Quantum Engineering and AAPPS Bulletin, and holds editorial positions at journals such as Science China, Science Bulletin, Progress in Physics, and EPL. Previously, he was President and Vice President of AAPPS, and held vice-chair and member roles in the IUPAP Working Group on Physics for Development. Among his many honors are National Outstanding Doctoral Dissertation Supervisor, National Outstanding Science and Technology Worker, Elsevier Highly Cited Chinese Researcher for nine consecutive years, IBM Global Outstanding Scholar, and Special Government Allowance from the State Council. With a research focus on quantum information, nuclear

physics, and atomic/molecular/optical physics, he has published over 500 SCI papers, accumulating more than 30000 Google Scholar citations. He has authored four monographs and filed 62 Chinese patents and five U.S. patent. His awards include the National Natural Science Award (Third Prize and Second Prize), Thomson Reuters Research Excellence Award, Rao Yutai Physics Prize, First Prize of the Natural Science Award from the Ministry of Education, and multiple top recognitions in fields such as electronics, communications, and optics.

# Keynote Speaker IV

**April 11, Saturday, 11:30-12:10, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Meeting Room:** 凌海厅 Linghai Room ( 3 Floor )

**Prof. Zunsong Yang**

**Institute of Microelectronics of the Chinese Academy of Sciences, China**

**Speech Title: Low-Jitter and Low-Spur Sampling-Type Phase-Locked Loops**

**Abstract:** Phase-Locked Loop (PLL) is a key building block in both wireless and wireline systems. As their data throughput increases, the PLL jitter requirements become more stringent, pushing sampling-type PLLs to be popular due to their ability to achieve low in-band phase noise. In this report, different techniques will be discussed to greatly improve the jitter and spur performances of the sampling-type PLLs without compromising the jitter-power figure of merit.

**Bio:** Zunsong Yang received the B.E. degree in microelectronics from Qingdao University, Qingdao, China, in 2014, the M.E. degree in electronics and communications engineering from the University of Chinese Academy of Sciences (UCAS), Beijing, China, in 2017, and the Ph.D. degree in electrical and computer engineering from the University of Macau, Macao, China, in 2021. From 2021 to 2023, he was a Project Researcher with The University of Tokyo, Tokyo, Japan, where he worked on the design of low-jitter RF/mmW PLLs. Since 2023, he has been a Professor with the Institute of Microelectronics of the Chinese Academy of Sciences (IMECAS), Beijing, China.

His current research interests include frequency synthesizers, RF and mixed-signal integrated circuits for communications and radars.

Dr. Yang was a recipient of the Akrostar Academic Prize from the University of Macau in 2021 and served as a Session Chair for IEEE ISCAS in 2024. He is currently serving as an Associate Editor for IEEE Solid-State Circuits Letters.

# Invited Speaker I

**April 11, Saturday, 14:10-14:30, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyu（3 Floor）

**Prof. Ji Wei**

**Shandong University, China**

**Speech Title: ISAC networks based Fiber and Photon-assisted Millimeter Wave Technology**

**Abstract:** We propose an Integrated Sensing and Communication (ISAC) architecture simultaneously performing Distributed Acoustic Sensing (DAS) and Distributed Temperature Sensing (DTS) in single-mode fiber. Furthermore, the integration of Photon-assisted millimeter-wave system achieves ISAC in wireless domain. The system achieves parallel multi-parameter sensing based on phase sensitive optical time-domain reflectometry (ϕ-OTDR) and Raman OTDR (ROTDR). We design a customized polarization beam splitter-arrayed waveguide grating to realize a low-complexity polarization wavelength multiplexed integrated sensing and communication system.

By employing an amplitude bit mapping mechanism, the bit inversion probabilistic shaping (BI-PS) scheme dynamically adjusts the probability distribution of constellation points, allowing for seamless conversion between quadrature amplitude modulation (QAM) and phase shift keying (PSK). The Photon-assisted 40-GHz MMW ISAC simulation and experimental systems are established. Through hybrid amplification techniques such as Raman distributed amplification and superposition amplification, we amplify communication signals while reducing ROTDR detection power to 100 mW, sharing the same narrow-linewidth laser source with ϕ-OTDR. To mitigate the degradation of signal-to-noise ratio (SNR) in Rayleigh scattering signals within the ϕ-OTDR caused by excessive peak pulse power triggering nonlinear effects, polarization diversity reception and coherent amplification were employed to enhance signal SNR and improve vibration signal detection sensitivity.

**Bio:** Ji Wei received his M.S. degree in BeiJing Institute of Technology in 2003 and his Ph D degree in 2006 from Beijing University of Posts and Telecommunications. He is working as a professor in Shandong University. In 2012.9-2013.9, he worked as visiting scholar in Queen's University Canada. His researching interests include: Artificial Intelligence, Data Center Networking, High speed optical switching and networking, Optical access networking.

# Invited Speaker II

**April 11, Saturday, 15:50-16:10, GMT+8, Beijing Time**
**Meeting Room:** 凌月厅 Lingyue Room ( 3 Floor )

**Prof. Kwok L. Chung**

Stanford/Elsevier World's Top 2% Scientist

**Guangzhou Institute of Science and Technology, China**

**Speech Title: Optically Transparent Antenna-Thin Film PV Integration: Recent Advances, Core Bottlenecks, and Future Prospects**

**Abstract:** Optically transparent antenna and thin film photovoltaic (OTA-TFPV) integration technology addresses energy self-sufficiency and multi-functional integration in smart terminals, building-integrated photovoltaics (BIPVs), and satellite systems. This article synthesizes global research progress, focusing on transparent conducting oxides (TCOs)—including material diversification, deposition techniques, and the transparency-conductivity balance. It covers integrated design strategies: multi-band electromagnetic adaptation, scenario-targeted applications (aerospace, BIPV, UAVs), and structural optimization, alongside TCO antenna performance limits via skin-depth predictions and loss characterization. Two core bottlenecks hinder commercialization: material performance tradeoffs (conductivity-thickness-frequency constraints, stability issues) and the integration paradox between photovoltaic harvesting and antenna radiation. Future directions include multi-functional material synergy, fabrication innovation, customized design, and standardized testing systems. This work supports OTA-TFPV research, technological iteration, and industrial application in green communication and renewable energy.

**Bio:** Kwok L. Chung (Senior Member, IEEE) earned his Ph.D. in electrical engineering from the University of Technology Sydney, Australia, in 2005. He subsequently directed the Civionics Research Laboratory at Qingdao University of Technology (2015-2021), leading cross-disciplinary work on structural health monitoring, and later served as Distinguished Professor at Huizhou University (2021-2024). Since September 2024 he holds a Distinguished Professorship at Guangzhou Institute of Science and Technology (GZIST). With ~250 peer-reviewed papers spanning electrical and civil engineering, his current research focuses on kesterite-based photovoltaic solar antennas, wireless sensors, and reconfigurable intelligent surfaces. Prof. Chung chairs the IEEE Qingdao AP/MTT/COM Joint Chapter, sits on the International Steering Committee of the IEEE iWEM workshop (General Chair, 2019), and is an Associate Editor of the Alexandria Engineering Journal (Elsevier). A Stanford/Elsevier World's Top 2% Scientist in both single-year and career-long impact since 2020—the only GZIST faculty currently so recognized—he actively reviews for IEEE, Elsevier, IOP and other leading publishers.

# Invited Speaker III

**April 11, Sunday, 16:00-16:20, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 Lingyu Room ( 3 Floor )

**Prof. Laxmisha Rai**

Fellow of the Royal Statistical Society (FRSS), UK

**Shandong University of Science and Technology, China**

**Speech Title: Learning Edge: Model-based Edge Learning through Prompt Engineering for Personalized Education**

**Abstract:** The growth of Large Language Models (LLMs) and the influence of Generative Artificial Intelligence (GenAI) tools have given rise to novel learning paradigms for educators. In this paper, we propose Model-based Edge Learning (MbEL), an "edge learning" framework that shifts learning from centralized, human-centric institutions to the "edge" of the network, where individual users interact conversationally with a pre-trained foundational model to acquire knowledge and skills. Unlike traditional edge computing, which focuses on data processing, MbEL emphasizes cognitive offloading and personalized knowledge acquisition. This paper conceptualizes MbEL, illustrating its principles through case studies conducted with the DeepSeek model using prompt engineering methods such as zero-shot, few-shot, and chain-of-thought (CoT) prompting. As this study focuses exclusively on personalized learning through prompt engineering, to ensure response quality, we established a benchmarking system using LLM-as-a-Judge framework with structured prompt templates. This allows learners to systematically evaluate and verify the answers generated by the model. The proposed method is tested for generation, and evaluation of standard algorithms taught in the undergraduate Data Structures course serving as the evaluation domain. Furthermore, we discuss its profound implications for education, including the shift from knowledge retrieval to reasoning development, and challenges such as model bias and academic integrity. However, ethical considerations such as model hallucinations and trusting incorrect answers remain critical, underscoring the continued necessity of human oversight in guiding the student learning process.

**Bio:** Laxmisha Rai is a professor at College of Electronic and Information Engineering, Shandong University of Science and Technology, Qingdao, China. He received Ph.D degree in Electronics from Kyungpook National University, South Korea. He worked as a Post-Doctoral Fellow, at Intelligent Robot Research Center, Soongsil University of South Korea. He is a Senior Member of IEEE, Senior Member of ACM, and Fellow of the Royal Statistical Society (FRSS), UK. His research interests include generative artificial intelligence, autonomous mobile robots, real-time systems, embedded systems, Internet of Things (IoT), wireless sensor networks, MOOC, and Bilingual Education. He is the author of over 80 publications including patents, books, book chapters, book reviews,

international journal articles, international conference proceedings, and magazine articles. He is currently serving as Associate Editor of IEEE Access Journal, Editorial Board Member of Journal of Information Systems Education, and Editorial Review Board Member of Social Sciences & Humanities Open (Elsevier) Journal. His papers appeared in reputed journals such as Knowledge-Based Systems, IEEE Transaction on Intelligent Transportation Systems, IEEE Potentials, IEEE Sensors Journal, IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans etc.

# Invited Speaker IV

**April 11, Saturday, 13:30-13:50, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 Lingyu Room（3 Floor）

**Prof. Botao Feng**

Stanford/Elsevier World's Top 2% Scientist

**Shenzhen University, China**

**Speech Title: High-Efficiency, Compact Dual-Wideband Circularly Polarized Antenna for GPS and BeiDou Navigation Applications**

**Abstract:** In this report, we introduce a novel compact antenna engineered for simultaneous GPS and BeiDou satellite navigation. The design combines a metallic radiator, realized through an integrated stamping technique, with a feed network and ground plane implemented on a single low-cost FR-4 substrate. To expand the operational bandwidth and improve impedance matching, a recessed gradient-support structure is strategically placed beneath the radiator. A defected ground structure further enhances radiation efficiency, achieving over 62% in both lower and upper frequency bands. The antenna generates right-handed circular polarization (RHCP) with 3-dB axial-ratio bandwidths spanning 1.10–1.23 GHz and 1.54–1.61 GHz, covering GPS L1/L2/L5 and BeiDou B1C/B2a/B2b frequencies. Measured realized gains exceed 3 dBic across both bands. Its highly compact form factor ($0.17\times0.17\times0.04\ \lambda0^3$) and small ground plane footprint ($0.29\times0.29\ \lambda0^2$) make it well suited for integration in vehicle-mounted navigation systems. This work demonstrates a practical pathway toward high-performance, dual-band circularly polarized antennas for next-generation satellite navigation applications.

**Bio:** Dr. Botao Feng (Senior Member, IEEE) is a Tenured Associate Professor at Shenzhen University and Director of the Laboratory of Wireless Communications, Antennas, and Propagation. He received his Ph.D. in Communication and Information Systems from Beijing University of Posts and Telecommunications.

His research focuses on advanced antenna technologies, RF systems, and key enabling techniques for next-generation mobile communications, with an emphasis on system-level electromagnetic design and engineering implementation. He leads a research team at the National Key Laboratory of RF Heterogeneous Integration, spanning fundamental theory, device development, system integration, and engineering prototyping, supported by Sub-6 GHz, millimeter-wave, and emerging high-frequency measurement and simulation platforms.

Prior to academia, Dr. Feng worked at Nokia and China Unicom in mobile communication system engineering and network optimization. He actively promotes industry–academia collaboration, translating research outcomes into practical antenna systems, RF modules, and large-scale wireless coverage solutions.

He has authored over 220 technical publications, two academic books, and holds more than 80 granted patents, several of which have been industrialized. His contributions to 5G/6G antenna and RF system integration have directly supported real-world system deployments and large-scale engineering applications.

Dr. Feng has been listed in the Stanford/Elsevier World's Top 2% Scientists since 2021. He serves the international research community as Associate Editor for several SCI journals, Technical Program Committee Chair and General Chair for IEEE international conferences, and as an expert reviewer for government agencies, industry organizations, and research funding programs.

# Invited Speaker V

**April 11, Saturday, 16:25-16:45, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyun Room ( 3 Floor )

**Prof. Jingjing Cui**

**Southwest Jiaotong University, China**

**Speech Title: Combinatorial Optimisation Meets Quantum Computing**

**Abstract:** Combinatorial optimisation problems lie at the core of mathematics, computer science, and engineering, yet many of them remain computationally intractable at realistic scales. Recent advances in quantum computing offer a promising — though still evolving — pathway to address such challenges. This report provides a mathematically grounded overview of how quantum algorithms interact with classical optimisation theory. We first review key models of combinatorial optimisation and their complexity characteristics. We then introduce fundamental quantum computing concepts and discuss representative quantum and hybrid quantum–classical approaches, including variational algorithms and the Quantum Approximate Optimization Algorithm (QAOA). Particular emphasis is placed on the mathematical structure underlying these methods, their approximation behavior, and the regimes in which quantum resources may provide an advantage. Through illustrative examples and comparative analysis, we highlight both the potential and current limitations of quantum approaches. The report concludes by outlining open problems and research directions at the interface of optimisation theory and quantum computation.

**Bio:** Jingjing Cui (SMl'18) is a Professor at the School of Information Science and Technology, Southwest Jiaotong University. She previously worked as a Research Scientist at Quantinuum in London and held research positions at Southampton, Queen Mary University of London, and Lancaster. Her research interests include classical and quantum optimization, airtificial intelligence algorithms for wireless communications, and quantum information technology.

# Invited Speaker VI

**April 11, Saturday, 14:10-14:30, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 Lingyu Room ( 3 Floor )

**Prof. Xingquan Wang**

**Gannan Normal University, China**

**Speech Title: Circuit design of all solid-state pulsed plasma power supply with high repetitive frequency**

**Abstract:** Plasma technology has a wide range of applications in the fields of electronics and communications, such as plasma electro-optic modulation, plasma antenna, plasma etching, chip manufacturing, plasma stealth and so on. Plasma power supply is the key component to get various plasmas for different applications. Pulsed power supply can offer higher discharge efficiency and smaller energy loss compared to conventional supply. The development of pulse power supply is technically demanding and difficult, so there are few mature and universal products. The key to pulsed power supply lies in the design of switching circuits. The performance of switching devices determines the repetition rate, output power level, and lifespan. In high-voltage pulsed power supply, a variety of switching devices are used, such as gas switches, liquid switches, solid switches, and plasma switches. The solid-state replacement will enhance the reliability and lifespan. Based on a high-performance solid-state switch, we developed a fully solid-state pulsed plasma power supply with high-repetition-rate, addressed issues such as signal generation, isolation, protection, and DC voltage equalization, then getting a high-voltage pulsed output with adjustable parameters of frequency and duty cycle.

**Bio:** Xingquan Wang was born in October 1980. He currently serves as the head of the Master's degree program in Electronic Science and Technology, the chairman of the Physics Society of Ganzhou City, and the member of the Council of Jiangxi Province's Physical Society. He received his Ph.D. degree in optics from Changchun University of Science and Technology in 2010. Following his graduation, he worked as a postdoctor in the Institute of Physics, Chinese Academy of Sciences. In 2012, he became a teacher in Gannan Normal University. He visited Australia as a government-sponsored visiting scholar at Queensland University of Technology for one year in 2016. He engaged in the fundamental research in low-temperature plasma discharge technology and electronic technology applications, publishing over 50 SCI/EI indexed papers and holding more than 30 authorized patents. He has led eight teaching and research projects at or above the provincial level, including projects funded by the National Natural Science Foundation, and has been awarded the Jiangxi Provincial Natural Science Award.

# Invited Speaker VII

**April 11, Saturday, 15:50-16:10, GMT+8, Beijing Time**
**Meeting Room:** 凌涛厅 Lingtao Room ( 3 Floor )

**Assoc. Prof. Guolin Li**

**China University of Petroleum (East China), China**

**Speech Title: Mid-Infrared Photoacoustic Spectroscopy for 13CO2/12CO2 Isotope Analysis in Breath-Based H. pylori Detection**

**Abstract:** Helicobacter pylori infection is closely associated with chronic gastritis, peptic ulcers, and gastric cancer, rendering rapid and noninvasive diagnostic technologies clinically essential. Current breath tests, such as the 13C-urea breath test (13C-UBT), typically rely on breath collection bags followed by offline analysis, which limits real-time monitoring capabilities. To overcome this constraint, we presented a mid-infrared photoacoustic spectroscopy (MIR-PAS) system for real-time detection of CO2 isotopes and evaluation of 13C-UBT responses. A dual-channel differential resonant photoacoustic cell (DPAC) with a minimal sample volume of 10.3 mL was designed to enhance acoustic signal collection, achieving a resonance frequency of 3775.7 Hz and a Q-factor of 27. Target absorption lines of 12CO2 (2299.64 $cm^{-1}$) and 13CO2 (2299.80 $cm^{-1}$) were selected within the strong ν3 band to ensure high-resolution isotopic discrimination using a 4.35 μm quantum cascade laser. The sensor demonstrated excellent linear response ($R2 > 0.994$) across 500 - 2500 ppm and achieved detection limits of 8.98 ppb for 12CO2 and 2.81 ppb for 13CO2 with the optimal averaging. δ13C measurements exhibited a precision of 0.066 ‰ at 76 s averaging time. Breath-sampling tests further revealed distinct temporal release patterns of CO2 isotopes during exhalation. These results confirmed that the developed MIR-PAS system provides a compact, sensitive, and robust platform for isotopic CO2 analysis and demonstrates strong potential for point-of-care H. pylori diagnostics.

**Bio:** Guolin Li is an Associate Professor with the China University of Petroleum (East China). He received the B.S. and Ph.D. degrees from Jilin University, Changchun, China, in 2010 and 2015, respectively. He mainly focuses on research in intelligent sensing and laser measurement and control, optoelectronic information processing and artificial intelligence, as well as advanced detection instruments and control engineering. His work is devoted to promoting sensing technologies from laboratory-level principle verification to practical applications in industrial monitoring, environmental detection, and medical health. He currently serves as a member of the Laser Spectroscopy Professional Committee of the Chinese Optical Society and as a Young Editorial Board Member of Mechanical & Electrical Engineering. He is also a reviewer for several international journals, including Sensors and Actuators B: Chemical, Analytical Chemistry, Measurement, and Optics and Laser Technology.

# Invited Speaker VIII

**April 11, Saturday, 13:30-13:50, GMT+8, Beijing Time**
**Meeting Room:** 凌涛厅 Ling 涛 Room( 3 Floor )

**Assoc. Prof. Chuanting Zhang**

**Shandong University, China**

**Speech Title: Secure Transmission in IRS-THz Systems via CNN-Transformer Based Joint Beamforming and Artificial Noise Optimization**

**Abstract:** This paper focuses on physical layer security (PLS) in an intelligent reflecting surface (IRS)-aided terahertz (THz) multiple-input multiple-output (MIMO) system, where a multi-antenna eavesdropper may intercept the communication signals transmitted from the base station (BS) to the users. To counter this security threat, the BS transmits artificial noise (AN) to interfere with the eavesdropper. Accordingly, we formulate a joint optimization problem for the BS's active beamforming, artificial noise beamforming, and IRS phase shift configuration to maximize the system secrecy rate. To address the challenges of high computational complexity and the difficulty in effectively solving the objective function with conventional optimization methods, this paper proposes a gated selective CNN-Transformer collaborative fusion network (GS-CFNet), enabling joint optimization of the BS's active beamforming, artificial noise beamforming, and IRS phase shifts. Numerical simulation results demonstrate that, compared to traditional DL algorithms, the proposed method maintains comparable security performance while significantly improving computational efficiency, making it particularly suitable for real-time implementation in THz-band communication systems.

**Bio:** Chuanting Zhang is an associate professor at Shandong University, Jinan, China. He previously worked as a senior postdoctoral researcher at the University of Bristol and a postdoctoral researcher at King Abdullah University of Science and Technology (KAUST). His research interests encompass spatiotemporal data mining and intelligent networks. He has led several projects, including those funded by national talent programs, the National Natural Science Foundation of China, and the Shandong Province Excellent Youth Science Fund Project. He has proposed a series of wireless traffic prediction algorithms, with publications in top-tier journals and conferences, including IEEE JSAC and IEEE INFOCOM. His research achievements have been recognized with awards such as the IEEE ICCT Young Scientist Award, the Shandong Province Excellent Doctoral Dissertation Award, the Excellent Doctoral Dissertation Award of the Shandong Artificial Intelligence Society, and the Best Paper Award at IEEE SmartData. He is a Senior Member of IEEE, a Member of ACM, and a committee member of the CCF Technical Committee on Network and Data Communications. Personal Website: https://faculty.sdu.edu.cn/ctzhang

# Invited Speaker IX

**April 11, Saturday, 13:30-13:50, GMT+8, Beijing Time**
**Meeting Room:** 凌月厅 Lingyue Room ( 3 Floor )

**Associate Researcher Shuai Ma**

**Peng Cheng Laboratory, China**

**Speech Title: Theory and Key Technologies of Reliable Semantic Communication for 6G**

**Abstract:** Semantic communication focuses on semantic-level representation and transmission of information, which provides a potential solution for the sustainable development of 6G. However, its practical applications are facing serious challenges, such as the lack of semantic channel capacity theory and low reliability of the target semantic information extraction and transmission. To address the above challenges, we derived a semantic channel coding theorem, proposed a robust information bottleneck theory, proposed an Alpha-Beta-Gamma (ABG) formula to model the relationship between the end-to-end measurement and SNR, and developed a semantic feature division multiple access (SFDMA) paradigm for multi-user semantic networks.

**Bio:** Shuai Ma received the B.S. and Ph.D. degrees in communication and information systems from Xidian University, Xi'an, China, in 2009 and 2016, respectively. From 2014 to 2015, he was a Visiting Scholar with the Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX, USA. From 2016 to 2019, he has been an associate Professor with the School of Information and Control Engineering, at the China University of Mining and Technology, Xuzhou, China. From 2019 to 2022, he worked as a Postdoctoral Fellow with Telecom Paris, France. Since 2023, he has been an Associate Researcher at Peng Cheng Laboratory, Shenzhen, China. His research interests include semantic communications, visible light communications, and network information theory.

# Invited Speaker X

**April 11, Saturday, 13:50-14:10, GMT+8, Beijing Time**
**Meeting Room:** 凌涛厅 Lingtao Room ( 3 Floor )

**Assoc. Prof. Mingjie Shao**

**Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China**

**Speech Title: Quantized Signal Processing in Massive MIMO: Identifiability, Optimization, and Deep Learning Algorithms**

**Abstract:** In this talk, we introduce quantized signal processing in massive MIMO systems, driven by the need to use low-resolution DACs/ADCs to reduce power consumption. However, coarse quantization results in the loss of amplitude information from communication signals, making signal estimation and detection challenging. We present formulations for maximum-likelihood estimation (MLE) and discuss the associated challenges with integrals and nonsmooth objective functions. Identifiability conditions for quantized signal sensing are introduced, quantifying the relationship between the number of measurements and the parameter dimension. Then, we propose novel global optimization algorithms for both signal detection and channel estimation. To enhance performance and efficiency, we incorporate a deep unfolding adaptation, supported by a theoretical analysis of the activation function. Simulation results demonstrate the effectiveness of our approaches.

**Bio:** Mingjie Shao received a bachelor's degree from Xidian University, China, in 2015, as part of the "Excellent Engineer Education Program." In 2020, he earned a Ph.D. in Electronic Engineering from the Chinese University of Hong Kong, supported by the "Hong Kong PhD Fellowship Scheme (HKPFS)" under the supervision of Prof. Wing-Kin Ma (IEEE Fellow). From 2020 to 2023, he worked as a postdoctoral researcher in the Department of Electronic Engineering at the Chinese University of Hong Kong. He was then a Professor, awarded "Qilu Young Scholar", in the School of Information Science and Engineering at Shandong University during 2023-2024. Currently, he is an Associate Professor in the State Key Laboratory of Mathematical Sciences, Academy of Mathematics and Systems Science (AMSS), Chinese Academy of Sciences (CAS), and has been awarded the "Chen Jingrun Future Star."
His main research interests include: 1) Signal processing for wireless communication; 2) Optimization and statistical methods in signal processing and machine learning; 3) Cross-disciplinary research in deep learning and signal processing. In recent years, he has published over 40 SCI/EI papers in top journals and conferences such as IEEE TSP、IEEE JSTSP、IEEE TIFS and IEEE ICASSP. Several of his papers have been recognized multiple times in the "Top 50 Popular Articles" list of IEEE journals.

# Invited Speaker XI

**April 11, Saturday, 13:30-13:50, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyun ( 3 Floor )

**Assoc. Prof. Liwei Yang**

**China Agricultural University, Chinaa**

**Speech Title: State-Aware Multi-Service Scheduling for VLC/WiFi Heterogeneous Networks Based on Reinforcement Learning(SMASS-QL)**

**Abstract:** Addressing the challenges of fairness, latency, and throughput balancing in multi-service scheduling within VLC/WiFi heterogeneous networks, as well as the limited adaptability of existing algorithms, this paper proposes a state-aware multi-service scheduling algorithm (SMASS-QL) based on reinforcement learning. This algorithm models the scheduler as an agent, constructing a state space by discretizing queue head delay urgency, queue congestion status, and channel quality. It integrates four classical scheduling strategies to form the action space and designs a composite reward function incorporating incentive mechanisms, achieving dynamic optimization through Q-Learning. Simulation results demonstrate that SMASS-QL maintains a Jain fairness index consistently above 0.985, achieves average packet delays as low as 0.004−0.008 ms, and attains a system throughput approaching 4000 Mbps. By ensuring fairness and low latency while sacrificing only minimal throughput, it provides an efficient solution for resource scheduling in heterogeneous networks.

**Bio:** Dr. Liwei Yang, professor of China Agricultural University. She received the B.E. degree in Telecommunication Engineering from Chongqing University of Posts and Telecommunications, China, and the Ph.D. degree in Information and Communications Engineering from Beijing University of Posts and Telecommunications, China. From 2009 to 2011, she was a Postdoctoral Research Fellow with the Department of Electronic Engineering, Tsinghua University, China. In 2015, she joined the faculty of the College of Information and Electrical Engineering, China Agricultural University. Her research interests include optical networks, optical wireless communications and visible light communication. She participated in a number of national projects and published more than 100 papers. She served as a TPC member of several international academic conferences and a reviewer for several international journals.

# Invited Speaker XII

**April 11, Saturday, 14:10-14:30, GMT+8, Beijing Time**
**Meeting Room:** 凌月厅 Lingyue Room ( 3 Floor )

**Assoc. Prof. Chengzong Peng**

**Chengdu University of Information Technology, China**

**Speech Title: k-Connected Slice Protection for Heterogeneous Concurrent Attacks on AIGC Services**

**Abstract:** Artificial Intelligence Generated Content (AIGC) services offer significant advantages in enhancing creativity, optimizing decision-making, and reducing costs. However, the inherent complexity of AIGC deployment, coupled with the diversity and dynamism of attack vectors, poses major challenges to traditional security mechanisms. Among these challenges, heterogeneous concurrent attacks, which target multiple different types of objectives simultaneously, represent the greatest threat. To address this issue, we propose the k-connected AC Slice (KS) strategy, a specialized security architecture designed to resist such attacks while minimizing resource overhead. We formulate this security configuration task as the AIGC Component Security Deployment (ACSD) problem and prove it's NP-hard. To solve the ACSD problem, we introduce a novel optimization algorithm, the Bandwidth-optimized KS Deployment (BKS-D) heuristic. Representative simulations are conducted to evaluate the proposed algorithm, benchmarking it against the SACD and SFSE algorithms across multiple performance metrics. The experimental results demonstrate that the proposed BKS-D algorithm significantly outperforms state-of-the-art methods in both protection effectiveness and bandwidth resource consumption.

**Bio:** Chengzong Peng, Ph.D., Associate professor, IEEE member, CCF member. His research focuses on network reliability, cyberspace security, artificial intelligence. He has published over 30 SCI/EI papers, including IEEE INFOCOM, IEEE TNSM, IEEE IoTJ, and Computer Networks. He is currently leading/working on multiple national and provincial-level scientific research projects. He is serving as the TPC of ICNC 2025, and has served as the Session Chair of WCCCT 2024, WCCCT 2025, and the Talk Chair of ACM TURC 2024. He has also served as a reviewer for multiple well-known international academic journals and conferences, such as Big Data Mining and Analytics, Expert System with Applications, and Computer Network.

# Invited Speaker XIII

**April 12, Sunday, 16:00-16:20, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Assoc. Prof. Azhar Imran**

**Beijing University of Technology, China**

**Speech Title: Computational Intelligence in Healthcare: Navigating hope vs hype in China**

**Abstract:** Computational Intelligence (CI) has emerged as a transformative force in healthcare, promising unprecedented advances in diagnosis, treatment, and personalized medicine. Techniques such as machine learning, deep learning, natural language processing, and evolutionary algorithms are redefining how clinicians interpret medical data and make decisions. However, alongside the optimism lies considerable hype exaggerated claims, ethical concerns, data biases, and limited clinical validation that often hinder real-world impact. This speech, Computational Intelligence in Healthcare: Hope vs. Hype, explores the fine balance between technological promise and practical limitations. It highlights success stories in predictive diagnostics, drug discovery, and medical imaging while critically addressing challenges related to data quality, model interpretability, regulatory compliance, and patient trust. The discussion aims to separate genuine innovation from inflated expectations, urging researchers and policymakers to adopt a responsible, evidence-driven approach to integrating CI into healthcare systems. Ultimately, the talk emphasizes that the true hope of computational intelligence lies not in replacing clinicians but in empowering them through transparent, ethical, and human-centered AI.

**Bio:** Dr. Azhar Imran is an Associate Professor of Computer Science at Beijing University of Technology (BJUT), China, and a Senior Member of IEEE. He has over 13 years of academic and research experience in Artificial Intelligence, Data Science, and Machine Learning, with a strong focus on AI-driven healthcare and cybersecurity applications. Dr. Imran has published over 85 research articles in reputed international journals and conferences and has delivered keynote speeches at prestigious AI and biomedical events. He has received several awards, including the Outstanding Graduate Award, Best Researcher Award, and the Embassy Honored Award from the Pakistan Embassy in Beijing. His current research explores explainable AI, multimodal medical imaging, and computational intelligence frameworks for disease prediction and early diagnosis. More about his work can be found at https://sites.google.com/view/azharimran.

# Invited Speaker XIV

**April 12, Saturday, 15:45-16:05, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyun ( 3 Floor )

**Assoc. Prof. Hongwei Wang**

**University of Electronic Science and Technology of China, China**

**Speech Title: Compressive Near-Field Wideband Channel Estimation for THz Extremely Large-scale MIMO Systems**

**Abstract:** We consider the channel acquisition problem for a wideband terahertz (THz) communication system, where an extremely large-scale array is deployed to mitigate severe path attenuation. In channel modeling, we account for both the spherical wavefront and beam-splitting phenomena of the wideband near-field channel. We propose a frequency-independent orthogonal dictionary that generalizes the standard discrete Fourier transform (DFT) matrix by introducing an additional parameter to capture near-field effects. This dictionary enables an efficient two-dimensional (2D) block-sparse representation of the wideband near-field channel. By leveraging this structured sparsity, the wideband near-field channel estimation problem can be effectively solved within a customized compressive sensing framework. Numerical results demonstrate the significant advantages of our proposed 2D block-sparsity-aware method over conventional polar-domain-based approaches for near-field wideband channel estimation.

**Bio:** Hongwei Wang received the B.S. and Ph.D. degrees from Northwestern Polytechnical University, Xi'an, China, in 2013 and 2019, respectively. From December 2019 to July 2024, he was a Post-Doctoral Researcher with the University of Electronic Science and Technology of China, where he is currently an Associate Professor. His research interests include statistical signal processing, compressed sensing and sparse theory, and mmWave/THz wireless communications.

# Invited Speaker XV

**April 12, Sunday, 09:50-10:10, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Lecturer Ruihong Jiang**

**Beijing University of Posts and Telecommunications, China**

**Speech Title: Spaceborne Reconfigurable Intelligent Surface-Enabled Reflective Communications: Modeling and Performance**

**Abstract:** As satellite networks evolve toward 6G integration, Reconfigurable Intelligent Surface (RIS)-enabled spaceborne reflective communication has emerged as a transformative paradigm to enhance coverage and energy efficiency through intelligent, passive signal reflection from orbit. This talk explores the theoretical foundations and performance benchmarks of such systems. We begin by establishing a robust channel model tailored to the unique orbital dynamics and atmospheric propagation constraints of space-to-ground links. Based on this, we derive closed-form outage probability expressions and characterize fundamental performance limits for multi-user scenarios under random channel realizations. Furthermore, we address practical implementation challenges, particularly performance degradation under imperfect channel state information, and discuss how AI-driven channel prediction can mitigate these effects. We also outline emerging opportunities in multi-satellite cooperative RIS networks as a key direction for future research. This session aims to provide a comprehensive roadmap for deploying RIS in next-generation satellite constellations.

**Bio:** Ruihong Jiang received the Ph.D. degree from the School of Computer and Information Technology, Beijing Jiaotong University (BJTU), Beijing, China, in 2021. She has been a lecturer at Beijing University of Posts and Telecommunications since 2022. Her current research interests include satellite/UAV communications, AI-assisted communication, reflection communication, and wireless power transfer communication. She leads a National Natural Science Foundation of China (NSFC) Young Scientists Fund project and has participated in multiple national key projects. She has published over 30 papers and received Best Paper Awards at IEEE PACRIM 2024, IEEE ICC 2021, and CIEIT 2018. She is the author of one academic monograph and holds two granted patents. She serves as Guest Editor for the journal Electronics, Chair of IEEE ICCC ws 2024, and TPC member for IEEE PACRIM 2024 and ICCC 2024, and regularly reviews for leading IEEE journals, including IEEE TWC, IEEE TCOM, and IEEE JSAC, as well as flagship conferences such as IEEE Globecom and IEEE ICC.

# Invited Speaker XVI

**April 11, Saturday, 13:50-14:10, GMT+8, Beijing Time**
**Meeting Room:** 凌月厅 Lingyue Room ( 3 Floor )

**Lecturer Jiachi Zhang**

**Shandong Police College, China**

**Speech Title: Characterization of Doppler Shift for Links Between LEO Satellites and High-Speed Railways**

**Abstract:** Low Earth orbit (LEO) satellite networks offer global coverage and lower latency for on-earth terminals, presenting a promising complementary solution to ensure uninterrupted connectivity for high-speed railways (HSRs). Accurate characterization of wireless channels is fundamental to the development of future intelligent HSR systems. In this paper, we analyze the Doppler frequency shift and its variation rate for satellite-HSR communication links using a proposed line-of-sight (LoS) channel model. First, we introduce the altitude-dependent atmospheric refractive index. Then, a novel satellite-HSR LoS channel model is introduced, incorporating the effective Earth radius to account for atmospheric effects. On this basis, we derive detailed expressions for the Doppler shift and its variation rate with respect to satellite altitude, high-speed train (HST) motion direction, and frequency band. Simulations are conducted to evaluate the impact of these factors. The results reveal that LEO satellites significantly influence the Doppler shift, while the HST motion direction has a notable effect on the variation rate. Additionally, the altitude-varying atmospheric refractive index moderately affects the Doppler shift but has a negligible impact on the variation rate.

**Bio:** Dr. Jiachi Zhang received the B.Sc., M.Eng., and Ph.D. degrees in Communication Engineering and Communication and Information Systems from Beijing Jiaotong University, Beijing, China, in 2013, 2016, and 2023, respectively. He is currently a lecturer with the School of Police Information at Shandong Police College (SDPC), where he teaches cybersecurity and law enforcement–related courses. He concurrently serves as a police officer within the Shandong public security system. He is also affiliated with the Low Altitude Safety Research Institute and the Shandong Engineering Research Center for Deterministic Network Information Security at SDPC.

Dr. Zhang has authored more than 30 peer-reviewed papers as the first author in leading journals and conferences, including IEEE Transactions on Antennas and Propagation, IEEE Transactions on Vehicular Technology, and IEEE International Conference on Communications, etc. He also holds 9 granted Chinese invention patents (as an inventor or co-inventor). He has served as a principal researcher in sub-projects of national key R&D programs, projects funded by the National Natural Science Foundation of China, the Beijing Natural Science Foundation, and open research projects of national key laboratories. He has been invited to deliver presentations at international academic conferences.

In 2025, he received the Second Prize of the Shandong Province Science and Technology Progress Award as a contributing member.

His current research interests focus on wideband channel measurement and modeling for mobile communication systems, including satellite communications, vehicular communications, high-speed railway communications, unmanned aerial vehicle communications, and advanced signal processing techniques.

# Invited Speaker XVII

**April 11, Saturday, 14:30-14:50, GMT+8, Beijing Time**
**Meeting Room:** 凌月厅 Lingyue Room ( 3 Floor )

**Asst. Prof. Pan Yi**

**Shenzhen Technology University, China**

**Speech Title: The Evolution of ASR and the Rise of On-Device Intelligence**

**Abstract:** Automatic Speech Recognition (ASR) has undergone a paradigm shift with the advent of large models, achieving near-human accuracy for clean speech and high-resource languages. However, the mainstream cloud/cloud-edge collaborative architectures face insurmountable challenges in scenarios such as smart home and industrial IoT, where on-device local processing is an industrial rigid demand due to privacy, latency and offline availability requirements. On-device deployment of ASR is hindered by three core barriers: strict computing power constraints of edge hardware, severe speech distortion under extremely low signal-to-noise ratio (SNR) in real environments, and performance degradation caused by artifact introduction in the traditional serial speech enhancement (SE) + ASR architecture. To address these issues, this paper proposes an on-device-oriented collaborative framework for speech enhancement and recognition, abandoning blind parameter stacking for lightweight system design with structural recovery, enhancement-aware modeling and collaborative optimization. Three core innovations are developed: first, a harmonic-aware lightweight SE model (CACE-Net) that recovers damaged speech structures by integrating harmonic saliency maps and fundamental frequency extraction with a lightweight architecture based on causal U-Net, full-band GRU and frequency self-attention; second, an enhancement-aware ASR adaptation mechanism that realizes uncertainty recalibration at the feature layer and harmonic-guided feature injection at the representation layer via parameter-efficient fine-tuning (PEFT) to break the architectural silos between SE and ASR; third, a two-stage collaborative training strategy for on-device adaptation, which achieves smooth alignment of representation spaces through independent convergence followed by small-scale joint fine-tuning with frozen backbones. Phased experimental results validate the superiority of the proposed framework: it exhibits excellent structural recovery capability for speech signals under extreme noise conditions, and outperforms mainstream models such as DeepFilterNet and NSNet2 in terms of parameters and MACs, demonstrating high on-device deployability. This framework verifies the potential of lightweight models in adverse acoustic environments, and lays a foundation for the next generation of robust human-computer interaction. Future research will focus on brain-inspired computing mechanisms (e.g., Spiking Neural Networks) for lower energy consumption, audio-visual multimodal fusion to assist speech processing under extreme conditions, and solving catastrophic forgetting to enable continuous learning and personalized adaptation of on-device ASR systems.

**Bio:** Dr. Pan Yi is an Assistant Professor at Shenzhen Technology University, with a doctoral degree in Engineering and postdoctoral research experience at Tsinghua University.

His research focuses on IoT systems, image and positioning perception processing algorithms, and lightweight deployment and optimization of edge AI models. He has published over 10 academic papers in domestic and international journals and conferences, and delivered oral presentations at multiple international conferences. He has presided over and completed projects including an edge AI box for smart logistics canteen supervision, a multi-modal fusion safe driving vehicle-mounted system, WiFi/UWB-based positioning algorithms, and the eNDOS collaborative IoT operating system. The achievements of these projects have achieved industrial transformation with a scale of over 10 million yuan.

# Invited Speaker XVIII

**April 11, Saturday, 16:40-17:00, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 Lingyu Room ( 3 Floor )

**Assoc. Prof. Danyang Zheng**

**Southwest Jiaotong University, China**

**Speech Title: Cost-Efficient Multi-MoE Inference Models Deployment with Experts Sharing**

**Abstract:** With the growing need for ubiquitous inference at the network edge, Mixture-of-Experts (MoE) models are increasingly adopted to deliver Inference-as-a-Service (IFaaS), as they distribute expert models (EMs) across edge devices and thereby alleviate per-device resource pressure. In practice, supporting ubiquitous edge inference often leads to a setting where multiple MoE models co-exist at the edge and inevitably share a subset of EMs. In this setting, effectively leveraging shared EMs during multi-MoE deployment is essential: it can substantially reduce the effective resource footprint by reusing shared EMs rather than redundantly deploying duplicate copies for each MoE, thereby enabling feasible ubiquitous edge inference. In this paper, we take the first step toward cost-efficient deployment of multiple MoE inference models with shared experts. We first formulate the Multi-MoE Deployment with EM Sharing (MDES) problem with the objective of cost optimization. We then propose the Normalized Hosting Cost-based Multi-MoE Deployment with Sharing Set Identification (MNDS) algorithm that explicitly leverages ISRS and cross-model EM sharing (CMES) to reduce overall deployment cost. Extensive simulations demonstrate that our approach consistently outperforms representative benchmarks, reducing deployment cost by 9.8\% and 24.73\% on average.

**Bio:** Dr. Danyang Zheng is an Assistant Professor at Southwest Jiaotong University. He serves as a Young Editorial Board Member for the journal Big Data Mining and Analytics (Impact Factor: 7.7, SCI Q1 Top). He earned his Bachelor's degree in Computer Science and Technology from the University of Electronic Science and Technology of China in 2016. As a China Scholarship Council awardee, he pursued his PhD at Georgia State University under the supervision of Professor Yi Pan and Professor Xiaojun Cao. He received his doctorate in May 2021, graduating as Outstanding PhD Graduate (top-ranked among 400+ candidates). In August 2021, he joined Soochow University as a University Distinguished Young Scholar. Since January 2023, he has held his current position at Southwest Jiaotong University. He has published over 60 high-impact SCI/EI papers in leading venues including IEEE/ACM ToN, IEEE TDSC, IEEE TCoM, IEEE TNSM, IEEE TCE, IEEE TNSE, IEEE Internet of Things Journal, Computer Networks，IEEE INFOCOM，IEEE ICC，IEEE GLOBECOM, IEEE ICCCN, WCCCT, ICCC. He also serves as the software testing skill competition manager for WorldSkill 2026 Shanghai.

# Invited Speaker XIX

**April 11, Saturday, 13:50-14:10, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyun Room ( 3 Floor )

**Prof. Qian Sun**

**China Waterborne Transport Research Institute, Ministry of Transport, China**

**Speech Title: Development of Maritime Radio Communication and Navigation Technology and International Compliance**

**Abstract:** Addressing the special topic of "Maritime Communication, Sensing, and Computing Integration" at the 2026 IEEE WCCCT, this paper systematically analyzes the evolution path and international compliance practices of maritime radio communication and navigation technologies. The report focuses on the technical substance of the VHF Data Exchange System (VDES) amendments (expected to enter into force in 2028) and the new performance standards (MSC.511/512) for MF/HF and VHF equipment. Targeting the formulation of performance standards for Dual-Frequency Multi-Constellation Satellite-Based Augmentation Systems (DFMC SBAS) and Advanced Receiver Autonomous Integrity Monitoring (ARAIM), which are set to be initiated at NCSR 13 in 2026, the paper discusses technical upgrade directions for shipborne satellite navigation receivers combined with the application of the BeiDou System (BDS). Simultaneously, it interprets the Guidelines for Software Maintenance of Shipborne Communication and Navigation Equipment, which is to be submitted by the International Maritime Organization (IMO) for consideration at MSC 111 in May 2026, analyzing key compliance points regarding remote maintenance, cybersecurity, and lifecycle management. Furthermore, in conjunction with maritime radio spectrum planning and the International Telecommunication Union (ITU) framework, the paper dissects the practical challenges of equipment type approval and multi-standard compliance (e.g., IEC 60945, FCC Part 80), and proposes an integrated solution for communication and navigation systems incorporating edge computing and the Marine Internet of Things (MIoT). Finally, the paper shares China's practical experience in standardization under the frameworks of the IMO and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), providing a technical path and implementation reference for the global shipping industry to address digital transformation and international compliance.

**Bio:** Dr. Sun Qian, female, graduated from Beihang University in 2012. She is currently a Chief Research Fellow at the China Waterborne Transport Research Institute, Ministry of Transport. She also serves as a member of the Leading Group for Radio Management of the Ministry of Transport, a member of the Maritime Communication Counterpart Group of the Ministry of Industry and Information Technology, and a member of the National Technical Committee on BeiDou Satellite Navigation Standardization. She has long been involved in meetings of international organizations

such as the International Maritime Organization (IMO), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), and the International Telecommunication Union (ITU), responsible for issues related to maritime communication, navigation, and information security.

She currently serves as Vice Chair of the IALA Engineering Committee on Navigation. She is also a member of the Sub-committee on International Maritime Safety of Navigation, Communications and Search and Rescue, the Sub-committee on Maritime Radio Communication, the Sub-committee on Satellite Technology Application, the Sub-committee on Navigational Warnings, and the Aids to Navigation Sub-committee of the Ministry of Transport.

Her main research interests include satellite communication and navigation technology for waterborne transport, maritime navigation safety supervision and guarantee technology, BeiDou application and internationalization in waterborne transport, international rules and coordination for maritime navigation, and new-generation waterborne dedicated digital communication. She has presided over or participated in more than 60 national and ministerial-level research projects, won 3 first prizes, 2 second prizes, and 1 third prize of ministerial-level science and technology awards. She has published more than 30 academic papers, presided over the formulation of 13 international standards and 8 national standards, and obtained 13 authorized national invention patents

# Invited Speaker XX

**April 11, Saturday, 16:05-16:25, GMT+8, Beijing Time**
**Meeting Room:** 凌云厅 Lingyun Room ( 3 Floor )

**Dr. Yanqing Xu**

**The Chinese University of Hong Kong, Shenzhen, China**

**Speech Title: Environment-Aware Network-Level Design for Generalized Pinching-Antenna Systems**

**Abstract:** Generalized pinching-antenna (GPA) systems enable a reconfigurable radiation point along a guided medium, offering a new degree of freedom beyond conventional fixed-aperture deployments. While most existing studies focus on link-level optimization for quasi-static users, such designs typically require frequent re-computation as users move or enter/leave the network, and they do not directly capture area-oriented objectives (e.g., region-wide coverage and hotspot service) that evolve on a longer time scale. This talk presents an environment-aware, network-level design framework for GPA systems that shifts the objective from serving specific instantaneous users to shaping area coverage and hotspot service over longer time scales. In particular, we consider two representative settings: traffic-aware and geometry-aware. In the traffic-aware case, we model spatial demand using slowly varying hotspot profiles and optimize the activation/positioning of pinching points to align the radiated energy with traffic intensity, together with resource allocation to balance hotspot performance across the service region. In the geometry-aware case, we incorporate site-map information such as obstacles and visibility constraints into the network metric, and optimize pinching-point deployment to mitigate blockage-induced coverage holes. For each setting, we formulate a network-level optimization problem, develop low-complexity structure-exploiting algorithms, and quantify the performance–overhead tradeoff associated with antenna reconfiguration. Simulation results demonstrate that environment-aware GPA design can substantially improve region-wide coverage and hotspot service quality compared to fixed-aperture baselines and user-driven link-level heuristics, especially in obstructed environments or highly non-uniform traffic scenarios.

**Bio:** Yanqing Xu received the Ph.D. degree in communication and information system from the State Key Laboratory of Rail Traffic Control and Safety, Beijing Jiaotong University, Beijing, China, in 2019. He was a senior engineer with Huawei Technologies Company Ltd., from July 2019 to July 2020. From September 2020 to August 2022, he was a PostDoc researcher with The Chinese University of Hong Kong, Shenzhen, where he is currently working as a research assistant professor. He is also with the Shenzhen Research Institute of Big Data. Dr. Xu′ s current research interest lies in distributed signal processing algorithm designs for large-scale antenna systems. Dr. Xu served as a special session co-organizer and chair in IEEE SPAWC 2024. He was a recipient of the Shenzhen Overseas High-Caliber Personnel, and the Top 3% Paper Recognition of the IEEE ICASSP 2023. Several of his research outcomes have been

successfully deployed in Huawei's base stations, for which he has received the Huawei Technical Cooperation Achievement Transformation Award (1st Prize) in 2024, the Huawei Wireless Product Line Outstanding Technical Cooperation Project Award in 2024, and the Huawei Technical Cooperation Achievement Transformation Award (2nd Prize) in 2022. He is currently serving on the Editorial Board of EURASIP Journal on Wireless Communications and Networking.

# Invited Speaker XXI

**April 11, Saturday, 13:50-14:10, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 LingyuRoom ( 3 Floor )

**Professoriate Senior Engineer Kaikai Liu**

**Chongqing University of Posts and Telecommunications, China**

**Speech Title: Millimeter-Wave ISAC for Millimetre-Level Deformation Monitoring and Landslide Early Warning**

**Abstract:** A narrowband millimeter-wave ISAC system is proposed for micro-deformation monitoring and landslide early warning. Unlike wideband radars, the proposed system operates with only ~200 MHz bandwidth yet achieves sub-millimeter precision (~0.5 mm @ 100 m) through advanced OFDM carrier-phase estimation. A robust signal processing pipeline that includes CSI correction, coarse displacement estimation, and fine interferometric recovery with atmospheric phase compensation overcomes the centimeter-level limit of traditional narrowband systems. Based on spatio-temporal displacement maps, a dual-CNN model is employed to perform risk classification for early warning. The proposed system is 5G-compatible, low-cost, and scalable, enabling real-time monitoring in landslides, mining, and critical infrastructure where detecting millimeter-level deformation can prevent catastrophic failures.

**Bio:** Kaikai Liu is a Doctoral Supervisor and Senior Engineer at Chongqing University of Posts and Telecommunications (CQUPT), China. He obtained his doctoral degree from CQUPT.
With long-term dedication to the field of mobile communications, he has solid industry-academia-research integration experience. He previously held positions at Datang Mobile Communications Equipment Co., Ltd. and China Mobile Group Design Institute Co., Ltd. Chongqing Branch. His current research interests focus on wireless sensing, integrated communication and sensing, and the Internet of Things (IoT).
He has led a series of research projects, including one General Program of the National Natural Science Foundation of China, one Key Program of the Natural Science Foundation of Chongqing, and multiple horizontal projects. He has published over 40 papers indexed by SCI/EI, been granted multiple invention patents, and participated in the formulation of 2 group standards.

# Invited Speaker XXII

**April 13, Sunday, 09:50-10:10, GMT+8, Beijing Time**

Zoom Link: https://us02web.zoom.us/j/84983204262

Zoom ID: 849 8320 4262

Password: 041012

**Lecturer Feng Wang**

**Singapore University of Technology and Design (SUTD), Singapore**

**Speech Title: Non-Terrestrial Networking: Evolution, Opportunities, and Future Directions**

**Abstract:** Non-terrestrial networks (NTNs), especially large-scale multi-layer satellite constellations, pose fundamental challenges for mobility management due to their dynamic multi-coverage and frequent handovers (HOs). Conventional snapshot-based mobility methods make slot-by-slot HO and link-switching decisions, which often results in locally optimal but globally suboptimal HO trajectories, leading to unstable satellite services and degraded user experience. To overcome these limitations, we propose a graph-based mobility learning framework that models all feasible HO opportunities as a graph, enabling global HO planning rather than repeated local decisions. To further enhance decision quality, we employ a modified graph attention network to assign adaptive edge weights in graph, prioritizing HO options with higher link capacity and longer service duration, facilitating globally optimal HO sequence planning. This talk will introduce the key characteristics of NTNs, mobility challenges, and research approaches integrating AI.

**Bio:** Feng Wang received the B.S. and Ph.D. degrees from University of Electronic Science and Technology of China (UESTC) in 2016 and 2022, respectively. He is currently a Research Fellow with Information Systems Technology and Design Pillar at the Singapore University of Technology and Design (SUTD), Singapore. His research interests include non-terrestrial networking (NTN), satellite mobility management, and NTN service orchestration. He was a keynote speaker at SIMUtools 2020 and a tutorial speaker at ICCT 2024, 2025. He received the Best Paper Award at SIMUtools 2019. He has orgnized multiple NTN-related symposia and workshops at international conferences. He served as a Guest Editor of Electronics and is currently a member of Youth Editorial Board of Journal of Information and Intelligence (JII).

# Invited Speaker XXIII

**April 11, Saturday, 14:10-14:30, GMT+8, Beijing Time**
**Meeting Room:** 凌涛厅 Lingtao Room ( 3 Floor )

**Dr. Xiangyi Chen**

**Southwest Jiaotong University, China**

**Speech Title: Toward Fresh and Cost-Efficient Vehicular Digital Twins: A Dual-Timescale Learning Approach**

**Abstract:** The accuracy of digital twin models hinges on the prompt collection of information from the vehicular environment. However, the high mobility of vehicles and the dynamically changing network environment pose significant challenges. Dynamic twin model migration can reduce the Age of Information (AoI) by bringing twin models closer to their vehicles. Existing works rarely consider the inherent differences in optimization cycles between digital twin model migration and data upload, which potentially leads to suboptimal cost efficiency and information freshness. Specifically, real-time vehicular data must be rapidly uploaded to edge servers to ensure the accuracy and timeliness of digital twin models, while frequent migration of twin models over short periods incurs substantial costs. Therefore, we propose a dual-timescale bilevel learning approach, where the upper-layer learning optimizes twin model migration decisions on a long timescale to achieve forward-looking model migration, and the lower-layer learning optimizes data upload and resource allocation decisions on a short timescale to ensure the accuracy and timeliness of digital twin models. Then, we design a multi-agent selective parameter sharing approach based on spatiotemporal dependency correlations to accelerate model convergence and reduce communication costs among agents. Moreover, through a rigorous theoretical analysis, we prove the convergence of the dual-timescale bilevel learning with broad applicability, and extensive experimental results demonstrate the effectiveness of the proposed approach.

**Bio:** Xiangyi Chen, Ph.D., Assistant Professor. Her research interests include multi-access edge computing, edge intelligence, artificial intelligence, federated learning, and deep reinforcement learning. She has published numerous papers in high-impact journals and conferences such as IEEE Journal on Selected Areas in Communications (JSAC), IEEE Transactions on Mobile Computing (TMC), IEEE Transactions on Services Computing (TSC), and IEEE Transactions on Computers (TC). She has led several research projects, including the National Natural Science Foundation of China (NSFC), the China Postdoctoral Science Foundation, the Natural Science Foundation of Sichuan Province, and the Fundamental Research Funds for the Central Universities. She has also participated in national-level programs such as the National Key R&D Program of China and the National Natural Science Foundation of China.
She serves as a TPC member of the 11th IEEE International Conference on Computer and Communications (IEEE ICCC 2025), and the 23rd IEEE International Conference on Ubiquitous Computing and Communications (IEEE IUCC 2024 Workshop), and serves as a reviewer for leading international journals, including IEEE Transactions on

Mobile Computing (TMC), IEEE Transactions on Wireless Communications (TWC), IEEE Transactions on Network Science and Engineering (TNSE), and IEEE Network.

# Invited Speaker XXIV

**April 11, Sunday, 16:20-16:40, GMT+8, Beijing Time**
**Meeting Room:** 凌屿厅 Lingyu Room ( 3 Floor )

**Asst. Prof. Xiaoyi Wang**

**Sichuan University of Media and Communications, China**

**Speech Title: Design and Implementation of an LLM-Based Prompt Chain Framework for Automated Econometric Analysis: A Case Study in Corporate Sustainability**

**Abstract:** Large Language Models (LLMs) are accelerating the democratization of complex data analytics, yet deploying them for rigorous econometric tasks remains a significant challenge due to computational inconsistencies. This study proposes and implements a novel, automated analytical framework based on Prompt Chain Engineering. Utilizing corporate sustainability data (ESG and green innovation) as a complex, high-dimensional testbed, we design a systematic, multi-stage prompt workflow. This pipeline automates data preprocessing, statistical computation, and complex quantitative modeling without relying on traditional econometric programming. The established framework explicitly defines operational pipelines, context-aware prompt templates, and reasoning constraints. To rigorously evaluate the system's reliability, we benchmark the LLM-generated outputs against standard Stata software results. Experimental validation confirms strong alignment in core metrics, including coefficient estimation, significance levels, and robustness checks, thereby demonstrating the framework's computational accuracy. Furthermore, the system extends traditional analytical boundaries by integrating an automated semantic generation module that translates numerical outputs into professional economic interpretations. This dual capability—statistical consistency paired with automated interpretive depth—proves that structured prompt engineering can effectively transform LLMs into highly reliable, accessible, and end-to-end analytical engines for complex domain data.

**Bio:** Xiaoyi Wang is an Assistant Professor at the School of Communication, Economics & Management, Sichuan University of Media and Communications. She earned her Bachelor's degree in Financial Management from Sichuan Normal University in 2017, followed by a Master's in Agricultural Management from Sichuan Agricultural University in 2022, and a Ph.D. in Management from Angeles University Foundation in 2024. Her research focuses on applying artificial intelligence and machine learning to risk prediction and financial investment, including related areas like AI tool implementation and prompt chain design. Dr. Wang has led and participated in multiple research projects at the provincial and municipal levels in Sichuan, and has contributed to several textbook compilations. Additionally, she serves as a reviewer for international academic journals.

# Ocean University of China Tour

Date: April 10, 2026 (Check-in Day)
Venue: West Coast Campus, Ocean University of China
**Gather at Sheraton Qingdao West Coast Lobby at 13:00**

| Time | Activity |
|---|---|
| **14:00 - 14:20** | University Promo Video Screening |
| **14:20 - 14:40** | Introduction to the Faculty and School |
| **14:40 - 15:10** | Laboratory Visit |
| **15:10 - 15:20** | Group Photo |
| **15:20 - 16:00** | Campus & Library Tour |

More details please view: https://wccct.org/visit.pdf

## Day 1- April 10, 2026 (Fri., GMT+8, Beijing Time)

| Onsite Sign-in | | |
|---|---|---|
| **Time** | **Event** | **Venue** |
| 10:00-17:00 | Onsite Sign-in | Sheraton Qingdao West Coast Lobby |
| 14:00-16:00 | Ocean University of China Tour | Gather at Sheraton Qingdao West Coast Lobby at 13:00 |

| Online Pretest | | |
|---|---|---|
| **Time** | **Presenters** | **ZOOM Information** |
| 10:00-17:00 | Keynote Speaker (Online), Invited Speakers (Online), Session Chairs (Online), Committee Members (Online) | Zoom Link: https://us02web.zoom.us/j/84983204262<br><br>Zoom ID: 849 8320 4262<br><br>Password: 041012 |
| | **Online Oral Session 1 -AI-Driven Wireless Transmission and Intelligent Signal Processing for 6G and Beyond**<br><br>QD1015, QD1003-A, QD928-A(IS), QD902-A(IS), QD802, QD921, QD1002, QD1009, QD912 | |
| | **Online Oral Session 2 - Intelligent Image Processing and Multimedia Communication Technologies**<br><br>QD853, QD854, QD923, QD848, QD875, QD866, QD899 | |
| | **Online Oral Session 3 - Modern Electronics and Information Systems**<br><br>QD920, QD829, QD825, QD913-A, QD811, QD849, QD890, QD925 | |

**Online Test Tips:**

✧ Please get your presentation file ready for the pretest.

✧ Please unmute audio and start video while your presentation.

✧ It's suggested to use headset with microphone or earphone with microphone.

## Day 2- April 11, 2026 (Sat., GMT+8, Beijing Time)

**Opening Ceremony and Keynote Speeches**

**Onsite Meeting Room** –凌海厅 Linghai Room ( 3 Floor )
**Zoom Link:** https://us02web.zoom.us/j/84983204262
**Zoom ID:** 849 8320 4262
**Password:** 041012

**Host:** Assoc. Prof. Tingting Lyu, Faculty of Information Science and Engineering, Ocean University of China, China

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|---|---|
| 09:00-09:05 | **Welcome Message**<br>**Prof. Bing Zheng**<br>Faculty of Information Science and Engineering<br>**Ocean University of China, China** |
| 09:05-09:10 | **Opening Remarks**<br>**Prof. Krzysztof Szczypiorski**<br>**Warsaw University of Technology, Poland** |
| 09:10-09:50 | **Keynote Speech I**<br>**Prof. Qingsheng Zeng**<br>**Université du Québec an Outaouais, Canada**<br>**Speech Title: Analysis and Design of Lightweight, High-Efficiency, and Circularly Polarized Antennas for Satellite Platforms** |
| 09:50-10:30 | **Keynote Speech II**<br>**Prof. Haiyong Zheng**<br>**Ocean University of China, China**<br>**Speech Title: Multi-scenario Degraded Image Intelligent Interpretation** |
| 10:30-10:50 | **Group Photo & Coffee Break** |
| 10:50-11:30 | **Keynote Speech III**<br>**Prof. Gui-Lu Long**<br>American Physical Society Fellow, IOP Fellow<br>**Tsinghua University, China / Beijing Academy of Quantum Information Sciences, China**<br>**Speech Title: Avoiding Decapitation Strikes With Quantum Communication** |
| 11:30-12:10 | **Keynote Speech IV**<br>**Prof. Zunsong Yang**<br>**Institute of Microelectronics of the Chinese Academy of Sciences, China**<br>**Speech Title: Low-Jitter and Low-Spur Sampling-Type Phase-Locked Loops** |
| 12:10-13:30 | **Break & Lunch (凌帆厅 Lingfan Room-3 Floor )** |

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|---|---|---|
| 13:30-15:45 | 凌屿厅<br>Lingyu Room<br>( 3 Floor ) | **Special Session 1: Advanced Communication and Sensing Systems with Antenna Technologies**<br><br>**Session Chair:** Professoriate Senior Engineer Kaikai Liu, Chongqing University of Posts and Telecommunications, China<br><br>**Invited Speakers:**<br>Prof. Botao Feng, Shenzhen University, China<br>Professoriate Senior Engineer Kaikai Liu, Chongqing University of Posts and Telecommunications, China<br>Prof. Xingquan Wang, Gannan Normal University, China<br><br>QD827, QD808, QD909, QD1013, QD1018 |
| 13:30-15:35 | 凌月厅<br>Lingyue Room<br>( 3 Floor ) | **Onsite Oral Session 1 - Data-Driven Cybersecurity and Data Privacy**<br><br>**Session Chair:** Prof. Sanshan Sun, Sichuan Normal University, China<br><br>**Invited Speakers:**<br>Assoc. Prof. Shuai Ma, Peng Cheng Laboratory, China<br>Dr. Jiachi Zhang, Shandong Police College, China<br>Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China<br>Assistant Professor Pan Yi, Shenzhen Technology University, China<br><br>QD877, QD834, QD830 |
| 13:30-15:30 | 凌云厅<br>Lingyun Room<br>( 3 Floor ) | **Onsite Oral Session 2 -Wireless Multimodal Communication Fusion Systems and Resource Management Technologies**<br><br>**Session Chair:** Prof. Qian Sun, China Waterborne Transport Research Institute, Ministry of Transport, China<br><br>**Invited Speakers:**<br>Professor Liwei Yang, China Agricultural University, China<br>Prof. Qian Sun, China Waterborne Transport Research Institute, Ministry of Transport, China<br>Prof. Ji Wei, Shandong University, China<br><br>QD857, QD900, QD911, QD908 |
| 13:30-15:35 | 凌涛厅<br>Lingtao Room<br>( 3 Floor ) | **Special Session 2: Wireless Big Data and AI for Intelligent Communications and Networks**<br><br>**Session Chair:** Associate Professor Chuanting Zhang, Shandong University, China<br><br>**Invited Speakers:**<br>Associate Professor Chuanting Zhang, Shandong University, China<br>Assoc. Prof. Mingjie Shao, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China<br>Assistant Professor Xiangyi Chen, Southwest Jiaotong University, China<br><br>QD863, QD862, QD850, QD892 |

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| 13:30-15:08 | 凌泉厅<br>Lingquan Room<br>( 3 Floor ) | **Onsite Poster Session 1 - Digital Image Analysis and Multimedia Application Technologies**<br><br>**Session Chair:** Assoc. Prof. Haoqi Gao, College of Electronic Engineering, National University of Defense Technology, China<br><br>QD814, QD865, QD835, QD907, QD1012, QD893, QD867, QD879, QD820, QD916, QD1008, QD869, QD839, QD1011 |
| 15:00-16:00 | | **Coffee Break** |
| 16:00-18:00 | 凌屿厅<br>Lingyu Room<br>( 3 Floor ) | **Special Session 3: Distributed Large Language Model Training/Inference Systems over Edge Networks**<br><br>**Session Chair:** Assoc. Prof. Danyang Zheng, Southwest Jiaotong University, China<br><br>**Session Co-chair:** Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China<br><br>**Invited Speakers:**<br>Prof. Laxmisha Rai, Shandong University of Science and Technology, China<br>Asst. Prof. Xiaoyi Wang, Sichuan University of Media and Communications, China<br>Assoc. Prof. Danyang Zheng, Southwest Jiaotong University, China<br><br>QD860, QD888, QD905, QD880 |
| 15:50-17:55 | 凌月厅<br>Lingyue Room<br>( 3 Floor ) | **Special Session 4: Smart Materials 360°: AI-Enabled Solutions from RF to Civil Structures**<br><br>**Session Chair:** Prof. Kwok L. Chung, Guangzhou Institute of Science and Technology, China<br><br>**Session Co-chair:** Assoc. Prof. Xingye Chen, Guangzhou Institute of Science and Technology, China<br><br>**Invited Speaker:**<br>Prof. Kwok L. Chung, Guangzhou Institute of Science and Technology, China<br><br>QD1010, QD812, QD885, QD815, QD924, QD870, QD1016 |
| 15:45-18:15 | 凌云厅<br>Lingyun<br>( 3 Floor ) | **Onsite Oral Session 3 -System Modeling, Network Performance Analysis, and Optimization Algorithms in Wireless Communication Systems and Networks**<br><br>**Session Chair:** Assoc. Prof. Hongwei Wang, University of Electronic Science and Technology of China, China<br><br>**Invited Speakers:**<br>Assoc. Prof. Hongwei Wang, University of Electronic Science and Technology of China, China<br>Dr. Yanqing Xu, The Chinese University of Hong Kong, Shenzhen, China<br>Prof. Jingjing Cui, Southwest Jiaotong University, China<br><br>QD851, QD1019-A, QD882, QD906, QD843, QD1007 |

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|---|---|---|
| 15:50-18:10 | 凌涛厅<br>Lingtao Room<br>( 3 Floor ) | **Onsite Oral Session 4 - Digital Signal Detection, Recognition, and Analysis**<br><br>**Session Chair:** Prof. Botao Feng, Shenzhen University, China<br><br>**Invited Speaker:**<br>Assoc. Prof. Guolin Li, China University of Petroleum (East China), China<br><br>QD861, QD858, QD819, QD837, QD856, QD886, QD826, QD845 |
| 15:16-16:54 | 凌泉厅<br>Lingquan Room<br>( 3 Floor ) | **Onsite Poster Session 2 - AI-Driven Intelligent Communication and Signal Analysis Technologies**<br><br>**Session Chair:** Prof. Liwei Yang, China Agricultural University, China<br><br>QD809, QD852, QD883, QD1006, QD807, QD876, QD868, QD855, QD1005, QD859, QD917, QD1004, QD904, QD926 |
| 18:30-20:00 | | **Banquet and Award Ceremony (凌帆厅 Lingfan Room-3 Floor )** |

## Day 3 –April 12, 2026 (Sun., GMT+8, Beijing Time)

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| **Online Sessions**<br>**Zoom Link:** https://us02web.zoom.us/j/84983204262<br>**Zoom ID:** 849 8320 4262<br>**Password:** 041012 | |
| 9:30-11:55 | **Online Oral Session 1 - AI-Driven Wireless Transmission and Intelligent Signal Processing for 6G and Beyond**<br><br>**Session Chair:** Assoc. Prof. Xianbin Xie, West Anhui University, China<br><br>**Invited Speaker:**<br>Lecturer, Feng Wang, Singapore University of Technology and Design (SUTD), Singapore<br>Lecturer Ruihong Jiang, Beijing University of Posts and Telecommunications, China<br><br>QD1015, QD1003-A, QD802, QD921, QD1002 QD1009, QD912 |
| 11:55-14:00 | Break Time |
| 14:00-15:45 | **Online Oral Session 2 - Intelligent Image Processing and Multimedia Communication Technologies**<br><br>**Session Chair:**<br><br>QD853, QD854, QD923, QD848, QD875, QD866, QD899 |
| 15:45-16:00 | Break Time |
| 16:00-18:20 | **Online Oral Session 3 - Modern Electronics and Information Systems**<br><br>**Session Chair:** TBA<br><br>**Invited Speaker:**<br>Assoc. Prof. Azhar Imran, Beijing University of Technology, China a<br><br>QD829, QD825, QD811, QD849, QD890, QD920, QD806, QD925 |

## Special Session 1: Advanced Communication and Sensing Systems with Antenna Technologies

**Time:** 13:30-15:45 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌屿厅---Lingyu Room ( 3 Floor )

**Chaired by:** Professoriate Senior Engineer Kaikai Liu, Chongqing University of Posts and Telecommunications, China

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|---|---|
| **Invited Speech**<br><br>**(QD927-A)**<br><br>**13:30-13:50** | **Speech Title:** High-Efficiency, Compact Dual-Wideband Circularly Polarized Antenna for GPS and BeiDou Navigation Applications<br>**Invited Speaker:** Prof. Botao Feng, Shenzhen University, China<br><br>**Abstract:** In this report, we introduce a novel compact antenna engineered for simultaneous GPS and BeiDou satellite navigation. The design combines a metallic radiator, realized through an integrated stamping technique, with a feed network and ground plane implemented on a single low-cost FR-4 substrate. To expand the operational bandwidth and improve impedance matching, a recessed gradient-support structure is strategically placed beneath the radiator. A defected ground structure further enhances radiation efficiency, achieving over 62% in both lower and upper frequency bands. The antenna generates right-handed circular polarization (RHCP) with 3-dB axial-ratio bandwidths spanning 1.10–1.23 GHz and 1.54–1.61 GHz, covering GPS L1/L2/L5 and BeiDou B1C/B2a/B2b frequencies. Measured realized gains exceed 3 dBic across both bands. Its highly compact form factor ($0.17\times0.17\times0.04\ \lambda_0^3$) and small ground plane footprint ($0.29\times0.29\ \lambda_0^2$) make it well suited for integration in vehicle-mounted navigation systems. This work demonstrates a practical pathway toward high-performance, dual-band circularly polarized antennas for next-generation satellite navigation applications. |
| **Invited Speech**<br><br>**(QD903-A)**<br><br>**13:50-14:10** | **Speech Title:** Millimeter-Wave ISAC for Millimetre-Level Deformation Monitoring and Landslide Early Warning<br>**Invited Speaker:** Professoriate Senior Engineer Kaikai Liu, Chongqing University of Posts and Telecommunications, China<br><br>**Abstract:** A narrowband millimeter-wave ISAC system is proposed for micro-deformation monitoring and landslide early warning. Unlike wideband radars, the proposed system operates with only ~2 MHz bandwidth yet achieves sub-millimeter precision (~ 5 mm @ 1 m) through advanced OFDM carrier-phase estimation. A robust signal processing pipeline that includes CSI correction, coarse displacement estimation, and fine interferometric recovery with atmospheric phase compensation overcomes the centimeter-level limit of traditional narrowband systems. Based on spatio-temporal displacement maps, a dual-CNN model is employed to perform risk classification for early warning. The proposed system is 5G-compatible, low-cost, and scalable, enabling real-time monitoring in landslides, mining, and critical infrastructure where detecting millimeter-level deformation can prevent catastrophic failures. |
| **Invited Speech**<br><br>**(QD824-A)**<br><br>**14:10-14:30** | **Speech Title:** Circuit design of all solid-state pulsed plasma power supply with high repetitive frequency<br>**Invited Speaker:** Prof. Xingquan Wang, School of Physics and Electronic Information, Gannan Normal University, China<br><br>**Abstract:** Plasma technology has a wide range of applications in the fields of electronics and communications, such as plasma electro-optic modulation, plasma antenna, plasma etching, chip manufacturing, plasma stealth and so on. Plasma power supply is the key component to get various plasmas for different applications. Pulsed power supply can offer |

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| | higher discharge efficiency and smaller energy loss compared to conventional supply. The development of pulse power supply is technically demanding and difficult, so there are few mature and universal products. The key to pulsed power supply lies in the design of switching circuits. The performance of switching devices determines the repetition rate, output power level, and lifespan. In high-voltage pulsed power supply, a variety of switching devices are used, such as gas switches, liquid switches, solid switches, and plasma switches. The solid-state replacement will enhance the reliability and lifespan. Based on a high-performance solid-state switch, we developed a fully solid-state pulsed plasma power supply with high-repetition-rate, addressed issues such as signal generation, isolation, protection, and DC voltage equalization, then getting a high-voltage pulsed output with adjustable parameters of frequency and duty cycle. |
| **QD827**<br><br>**14:30-14:45** | **Title:** Analysis of WSN Multipath Key Reinforcement with Sensor Nodes of Different Transmission Ranges<br>**Authors:** Ching-Nung Yang, Jhou-Cian You, Ting-Lun Hsu, Tsung-Chih Hsieh<br>**Presenter:** Ching-Nung Yang, National Dong Hwa University, Taiwan<br><br>**Abstract:** Wireless sensor networks (WSNs) have a wide range of applications because they can collect data through sensor nodes and transmit it to backend databases for information storage, analysis, and retrieval. To ensure the security and privacy of WSNs, key pre-distribution (KP) is usually used to establish link keys for secure communication. Due to the distributed nature of these sensor nodes, they are vulnerable to various attacks. If a sensor node is captured, it may be tampered with or even compromised. Once compromised, a sensor node could leak its encryption key information. To enhance the resiliency against node capture attack (NCA), where attackers capture and compromise nodes to collect keys and thus eavesdrop on the communication between other uncompromised nodes, multipath key reinforcement (MKR) is proposed. In this paper, we will not design a new MKR. Our main contribution is to more accurately analyze the MKR effects of sensor nodes with different transmission ranges in WSNs (called MKRD), which is a more reasonable WSN environment in the real world. |
| **QD808**<br><br>**14:45-15:00** | **Title:** Spatio-Temporal Learning for Human Activity Recognition with Wireless Environment Information Sensing<br>**Authors:** Wei Yang, Lijun Zhang, Yi Pan, Botao Feng, Qi Zhao, Xiaojun Jing<br>**Presenter:** Liang Xiao, Shenzhen University, China<br><br>**Abstract:** With the popularization and application of Internet of Things (IoT) technology, the demand scenarios for human activity information have become increasingly complex. Traditional methods for acquiring human activity information are not only complex in operation but also difficult to implement automated processing. Currently, wireless environment information have a high penetration rate and low transformation costs, enabling the recognition of corresponding human activity through Wi-Fi signals. Meanwhile, the rapid development of computer vision technology has made data processing based on visual signals more accurate and efficient; the effective utilization of visual signals will help improve the accuracy of human activity recognition. Therefore, to further reduce the difficulty of acquiring human activity information in indoor environments and enhance the accuracy of human activity recognition, this study proposes a spatio-temporal learning method that fuses wireless environment information with corresponding video information. Experimental results show that compared with single-modal recognition methods using only wireless signals or video, the accuracy of human activity recognition under the proposed fused modal reaches 96.8%, which is an improvement of 8.2% and 2.3% respectively. This confirms the effectiveness of the proposed scheme. |

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| **QD909**<br><br>**15:00-15:15** | **Title:** A Radiation-Enhanced Magnetoelectric Antenna with Magnetic Flux-Concentrating Wing<br>**Authors:** Wenbiao Zhang, Siyi Zhang, Yujian Jin, Songtao Huang, Qi Wen, Junyang Li<br>**Presenter:** Wenbiao Zhang, Ocean University of China, China<br><br>**Abstract:** This paper proposes a very low frequency (VLF) magnetoelectric (ME) antenna featuring topologically optimized magnetic flux concentrating wing (MFCW). To evaluate its performance, three-dimensional finite element models are constructed to systematically compare the original antenna with rectangular and hemispherical MFCW configurations under a 1-V alternating voltage excitation. The results demonstrate that the optimized hemispherical configuration significantly outperforms the others. Specifically, it achieves a maximum internal magnetic flux density of 2.78 × 1 −4 T. Furthermore, in the near field (at an axial observation distance of .1 m), it generates a magnetic flux density of 714.6 nT, representing a 39.39% enhancement over the 512.66 nT produced by the original antenna. This study provides a highly efficient and miniaturized transmitter design for deep-sea cross-medium communication systems. |
| **QD1013**<br><br>**15:15-15:30** | **Title:** Isolation Enhancement in a Four-Port UWB MIMO Antenna Using EBG and Polarization Diversity Techniques<br>**Authors:** Shenxu Wang, Zexi Song, QINGSHENG ZENG, Zhuo Li<br>**Presenter:** Zexi Song, College of Electronic and Information Engineering, Nanjing University of Aeronautics and Astronautics<br><br>**Abstract:** This paper proposes a four-port MIMO antenna with a synergistic decoupling mechanism to address the mutual coupling challenges in compact Ultra-Wideband (UWB) MIMO systems. By integrating polarization diversity and open-loop square-ring electromagnetic bandgap (EBG) structures, the surface current distribution is effectively reconstructed. This significantly suppresses near-field coupling. Fabricated on a 48mm×48 mm×0.8mm substrate, the proposed antenna achieves an operational impedance bandwidth ranging from 2.8 to 18 GHz. This corresponds to a fractional bandwidth of 147%. Experimental results show that port isolation exceeds 29 dB across the entire operating frequency band and reaches a peak of 52.4 dB at 11 GHz. This design achieves an optimal balance between miniaturization and high isolation performance, providing a robust and reliable solution for applications in 5G+/6G systems and high-density integrated mobile terminals. |
| **QD1018**<br><br>**15:30-15:45** | **Title:** Near-Field SWIPT Performance Enhancement via Initial Blind Scanning<br>**Authors:** Shuqi Li, Fei Xu, Xueyan Cao<br>**Presenter:** Shuqi Li, Inner Mongolia University, China<br><br>**Abstract:** This paper proposes an integrated framework for reconfigurable intelligent surface (RIS)-enhanced near-field simultaneous wireless information and power transfer (SWIPT) with unknown user positions. To tackle the challenges brought by blind access, near-field spherical-wave effects and high-dimensional optimization, the proposed scheme adopts near-field multi-beam scanning with orthogonal Hadamard sequences to realize coarse three-dimensional user positioning. On this basis, the estimated position information is incorporated into channel estimation, and an efficient alternating-optimization method is adopted to jointly design the base-station beamforming, RIS phase shifts and power-splitting ratios. Simulation results show that the proposed framework reduces the distance and angle positioning errors by 48.7% and 70.6%, respectively. Moreover, compared with non-RIS systems, it achieves a 17.52% improvement in spectral efficiency and converges within only 3-5 iterations. This work's core novelty lies in the integrated blind scanning- |

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| | optimization framework and near-field customized multi-beam design for unknown user positions. |

## Onsite Oral Session 1 - Data-Driven Cybersecurity and Data Privacy

**Time:** 13:30-15:35 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌月厅---Lingyue Room ( 3 Floor )
**Chaired by:** Prof. Sanshan Sun, Sichuan Normal University, China

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| **Invited Speech**<br><br>**(QD897-A)**<br><br>**13:30-13:50** | **Speech Title:** Theory and Key Technologies of Reliable Semantic Communication for 6G<br>**Invited Speaker:** Assoc. Prof. Shuai Ma, Peng Cheng Laboratory, China<br><br>**Abstract:** Semantic communication focuses on semantic-level representation and transmission of information, which provides a potential solution for the sustainable development of 6G. However, its practical applications are facing serious challenges, such as the lack of semantic channel capacity theory and low reliability of the target semantic information extraction and transmission. To address the above challenges, we derived a semantic channel coding theorem, proposed a robust information bottleneck theory, proposed an Alpha-Beta-Gamma (ABG) formula to model the relationship between the end-to-end measurement and SNR, and developed a semantic feature division multiple access (SFDMA) paradigm for multi-user semantic networks. |
| **Invited Speech**<br><br>**(QD891)**<br><br>**13:50-14:10** | **Speech Title:** Characterization of Doppler Shift for Links Between LEO Satellites and High-Speed Railways<br>**Authors:** Jiachi Zhang, Baoyue Meng, Xiao Wang, Hao Sun<br>**Invited Speaker:** Dr. Jiachi Zhang, Shandong Police College, China<br><br>**Abstract:** Low Earth orbit (LEO) satellite networks offer global coverage and lower latency for on-earth terminals, presenting a promising complementary solution to ensure uninterrupted connectivity for high-speed railways (HSRs). Accurate characterization of wireless channels is fundamental to the development of future intelligent HSR systems. In this paper, we analyze the Doppler frequency shift and its variation rate for satellite-HSR communication links using a proposed line-of-sight (LoS) channel model. First, we introduce the altitude-dependent atmospheric refractive index. Then, a novel satellite-HSR LoS channel model is introduced, incorporating the effective Earth radius to account for atmospheric effects. On this basis, we derive detailed expressions for the Doppler shift and its variation rate with respect to satellite altitude, high-speed train (HST) motion direction, and frequency band. Simulations are conducted to evaluate the impact of these factors. The results reveal that LEO satellites significantly influence the Doppler shift, while the HST motion direction has a notable effect on the variation rate. Additionally, the altitude-varying atmospheric refractive index moderately affects the Doppler shift but has a negligible impact on the variation rate. |
| **Invited Speech**<br><br>**(QD910-A)**<br><br>**14:10-14:30** | **Speech Title:** k-Connected Slice Protection for Heterogeneous Concurrent Attacks on AIGC Services<br>**Invited Speaker:** Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China<br><br>**Abstract:** Artificial Intelligence Generated Content (AIGC) services offer significant advantages in enhancing creativity, optimizing decision-making, and reducing costs. However, the inherent complexity of AIGC deployment, coupled with the diversity and dynamism of attack vectors, poses major challenges to traditional security mechanisms. Among these challenges, heterogeneous concurrent attacks, which target multiple different types of objectives simultaneously, represent the greatest threat. To address this issue, we |

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| | propose the k-connected AC Slice (KS) strategy, a specialized security architecture designed to resist such attacks while minimizing resource overhead. We formulate this security configuration task as the AIGC Component Security Deployment (ACSD) problem and prove it's NP-hard. To solve the ACSD problem, we introduce a novel optimization algorithm, the Bandwidth-optimized KS Deployment (BKS-D) heuristic. Representative simulations are conducted to evaluate the proposed algorithm, benchmarking it against the SACD and SFSE algorithms across multiple performance metrics. The experimental results demonstrate that the proposed BKS-D algorithm significantly outperforms state-of-the-art methods in both protection effectiveness and bandwidth resource consumption. |
| **Invited Speech**<br><br>**(QD929-A)**<br>**14:30-14:50** | **Speech Title:** The Evolution of ASR and the Rise of On-Device Intelligence<br>**Invited Speaker:** Assistant Professor Pan Yi, Shenzhen Technology University, China<br><br>**Abstract:** Automatic Speech Recognition (ASR) has undergone a paradigm shift with the advent of large models, achieving near-human accuracy for clean speech and high-resource languages. However, the mainstream cloud/cloud-edge collaborative architectures face insurmountable challenges in scenarios such as smart home and industrial IoT, where on-device local processing is an industrial rigid demand due to privacy, latency and offline availability requirements. On-device deployment of ASR is hindered by three core barriers: strict computing power constraints of edge hardware, severe speech distortion under extremely low signal-to-noise ratio (SNR) in real environments, and performance degradation caused by artifact introduction in the traditional serial speech enhancement (SE) + ASR architecture. To address these issues, this paper proposes an on-device-oriented collaborative framework for speech enhancement and recognition, abandoning blind parameter stacking for lightweight system design with structural recovery, enhancement-aware modeling and collaborative optimization. Three core innovations are developed: first, a harmonic-aware lightweight SE model (CACE-Net) that recovers damaged speech structures by integrating harmonic saliency maps and fundamental frequency extraction with a lightweight architecture based on causal U-Net, full-band GRU and frequency self-attention; second, an enhancement-aware ASR adaptation mechanism that realizes uncertainty recalibration at the feature layer and harmonic-guided feature injection at the representation layer via parameter-efficient fine-tuning (PEFT) to break the architectural silos between SE and ASR; third, a two-stage collaborative training strategy for on-device adaptation, which achieves smooth alignment of representation spaces through independent convergence followed by small-scale joint fine-tuning with frozen backbones. Phased experimental results validate the superiority of the proposed framework: it exhibits excellent structural recovery capability for speech signals under extreme noise conditions, and outperforms mainstream models such as DeepFilterNet and NSNet2 in terms of parameters and MACs, demonstrating high on-device deployability. This framework verifies the potential of lightweight models in adverse acoustic environments, and lays a foundation for the next generation of robust human-computer interaction. Future research will focus on brain-inspired computing mechanisms (e.g., Spiking Neural Networks) for lower energy consumption, audio-visual multimodal fusion to assist speech processing under extreme conditions, and solving catastrophic forgetting to enable continuous learning and personalized adaptation of on-device ASR systems. |

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| **QD877**<br><br>**14:50-15:05** | **Title:** Secure Inference Method for Multimodal Large Models Based on Trusted Execution Environments<br>**Authors:** Qinglin Song and Yu Sun<br>**Presenter:** Yu Sun, Beihang University, China<br><br>**Abstract:** Multimodal large models have demonstrated significant advantages in edge intelligence fields such as security inspection, particularly due to their open-vocabulary object detection (OVD) capabilities. However, deploying these valuable models on edge devices introduces the risk of model theft. Existing protection schemes, unfortunately, are not compatible with multimodal models. In this paper, we present the first secure inference framework for multimodal large OVD models based on Trusted Execution Environments (TEEs). By employing orthogonal multi-adapter head combinations, the framework reduces the protection cost of the OVD backbone large model components to fit within the secure memory constraints of the TEE. Additionally, a distribution-preserving obfuscation scheme is introduced to balance both security and real-time performance. Experimental results indicate that our proposed framework reduces secure memory requirements by 95% on edge devices, while ensuring reliable confidentiality, integrity, and maintaining real-time inference performance. |
| **QD834**<br><br>**15:05-15:20** | **Title:** Experimental Demonstration of Congestion Prediction in AI Data Center Networks with Multiple Training Jobs<br>**Authors:** Weiliang Zhang, Wei Wang, Yibo Wang, Yanran Xiao, Yiyang Li, Qiaojun Hu, Yongli Zhao, Jie Zhang<br>**Presenter:** Weiliang Zhang, Beijing University of Posts and Telecommunications, China<br><br>**Abstract:** We present a novel congestion prediction scheme, RSCP, for AI data center networks. This method models the periodic traffic patterns inherent in distributed training tasks and integrates real-time progress awareness directly into the training framework. By leveraging the deterministic nature of computation time, RSCP enables accurate, real-time traffic forecasting, which is aggregated from network nodes to predict the exact timing of congestion events. To demonstrate the practical utility of our prediction scheme, we apply the predicted congestion information to proactively optimize the hyperparameters of the underlying congestion control algorithm. We evaluate our approach using NS-3 simulations in a multi-task scenario with bandwidth contention. Experimental results show that this prediction-driven optimization effectively mitigates network congestion, reducing the average Job Completion Time (JCT) and Flow Completion Time (FCT) by 16.4\% and 14.3\%, respectively, compared to the HPCC baseline. Furthermore, our analysis reveals that an optimal reaction window significantly enhances performance, validating that accurate congestion prediction translates into significant end-to-end performance gains. |
| **QD830**<br><br>**15:20-15:35** | **Title:** Performance Optimization of Dynamic Cooperative MEC Systems Based on WPT<br>**Authors:** Min Hu, Yu Wang, Jun Yang<br>**Presenter:** Yu Wang, Ningxia University, China<br><br>**Abstract:** In smart factories, the integration of WPT and MEC empowers green energy supply and computing. This paper studies a wireless-powered industrial edge system where a single hybrid access point (HAP) serves as both a computing unit and a multi-device management center. The paper proposes a dynamic collaborative cluster mechanism, with each cluster consisting of a source device (SD) and an auxiliary device (AD). After SD divides tasks, they can be processed locally, offloaded to HAP, or remotely executed by AD under HAP's scheduling. Considering the energy causality of devices, the minimum data processing requirements, and the allocation of data value coefficients, the system aims to |

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| | maximize the weighted total computing rate (WSCR) of all operating devices by balancing delay and energy consumption. Firstly, the time and data allocation are jointly optimized. Secondly, the core devices of dynamic clusters are identified based on the value function and the approximate optimal solution is iteratively sought. Finally, an improved deep learning algorithm is designed and the model is compressed to enhance efficiency. Simulation results show that the algorithm performs well, and the enhanced deep learning model significantly improves the computing efficiency of the integrated system. |

# Onsite Oral Session 2 - Wireless Multimodal Communication Fusion Systems and Resource Management Technologies

**Time:** 13:30-15:30 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌云厅---Lingyun Room ( 3 Floor )
**Chaired by:** Prof. Qian Sun, China Waterborne Transport Research Institute, Ministry of Transport, China

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| **Invited Speech**<br>**(QD821)**<br>**13:30-13:50** | **Speech Title:** State-Aware Multi-Service Scheduling for VLC/WiFi Heterogeneous Networks Based on Reinforcement Learning(SMASS-QL)<br>**Authors:** Menghan Ju. Menghan Ju, Liwei Yang<br>**Invited Speaker:** Prof. Liwei Yang, China Agricultural University, China<br><br>**Abstract:** Addressing the challenges of fairness, latency, and throughput balancing in multi-service scheduling within VLC/WiFi heterogeneous networks, as well as the limited adaptability of existing algorithms, this paper proposes a state-aware multi-service scheduling algorithm (SMASS-QL) based on reinforcement learning. This algorithm models the scheduler as an agent, constructing a state space by discretizing queue head delay urgency, queue congestion status, and channel quality. It integrates four classical scheduling strategies to form the action space and designs a composite reward function incorporating incentive mechanisms, achieving dynamic optimization through Q-Learning. Simulation results demonstrate that SMASS-QL maintains a Jain fairness index consistently above .985, achieves average packet delays as low as . 4– . 8 ms, and attains a system throughput approaching 4 Mbps. By ensuring fairness and low latency while sacrificing only minimal throughput, it provides an efficient solution for resource scheduling in heterogeneous networks. |
| **Invited Speech**<br>**(QD887-A)**<br>**13:50-14:10** | **Speech Title:** Development of Maritime Radio Communication and Navigation Technology and International Compliance<br>**Invited Speaker:** Prof. Qian Sun, China Waterborne Transport Research Institute, Ministry of Transport, China<br><br>**Abstract:** Addressing the special topic of "Maritime Communication, Sensing, and Computing Integration" at the 2 26 IEEE WCCCT, this paper systematically analyzes the evolution path and international compliance practices of maritime radio communication and navigation technologies. The report focuses on the technical substance of the VHF Data Exchange System (VDES) amendments (expected to enter into force in 2 28) and the new performance standards (MSC.511/512) for MF/HF and VHF equipment. Targeting the formulation of performance standards for Dual-Frequency Multi-Constellation Satellite-Based Augmentation Systems (DFMC SBAS) and Advanced Receiver Autonomous Integrity Monitoring (ARAIM), which are set to be initiated at NCSR 13 in 2 26, the paper discusses technical upgrade directions for shipborne satellite navigation receivers combined with the application of the BeiDou System (BDS). Simultaneously, it interprets the Guidelines for Software Maintenance of Shipborne Communication and Navigation Equipment, which is to be submitted by the International Maritime Organization (IMO) for consideration at MSC 111 in May 2 26, analyzing key compliance points regarding remote maintenance, cybersecurity, and lifecycle management. Furthermore, in conjunction with maritime radio spectrum planning and the International Telecommunication Union (ITU) framework, the paper dissects the practical challenges of equipment type approval and multi-standard compliance (e.g., IEC 6 945, FCC Part 8 ), and proposes an integrated solution for |

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| | communication and navigation systems incorporating edge computing and the Marine Internet of Things (MIoT). Finally, the paper shares China's practical experience in standardization under the frameworks of the IMO and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), providing a technical path and implementation reference for the global shipping industry to address digital transformation and international compliance. Keywords: Maritime Radio Communication and Navigation; VDES; International Compliance; Satellite Navigation Augmentation; Shipborne Sensing and Intelligent Systems |
| **Invited Speech**<br><br>**(QD884-A)**<br><br>**14:10-14:30** | **Speech Title:** ISAC networks based Fiber and Photon-assisted Millimeter Wave Technology<br>**Invited Speaker:** Prof. Ji Wei, Shandong University, China<br><br>**Abstract:** We propose an Integrated Sensing and Communication (ISAC) architecture simultaneously performing Distributed Acoustic Sensing (DAS) and Distributed Temperature Sensing (DTS) in single-mode fiber. Furthermore, the integration of Photon-assisted millimeter-wave system achieves ISAC in wireless domain. The system achieves parallel multi-parameter sensing based on phase sensitive optical time-domain reflectometry (ϕ-OTDR) and Raman OTDR (ROTDR). We design a customized polarization beam splitter-arrayed waveguide grating to realize a low-complexity polarization wavelength multiplexed integrated sensing and communication system.<br><br>By employing an amplitude bit mapping mechanism, the bit inversion probabilistic shaping (BI-PS) scheme dynamically adjusts the probability distribution of constellation points, allowing for seamless conversion between quadrature amplitude modulation (QAM) and phase shift keying (PSK). The Photon-assisted 40-GHz MMW ISAC simulation and experimental systems are established. Through hybrid amplification techniques such as Raman distributed amplification and superposition amplification, we amplify communication signals while reducing ROTDR detection power to 100 mW, sharing the same narrow-linewidth laser source with ϕ-OTDR. To mitigate the degradation of signal-to-noise ratio (SNR) in Rayleigh scattering signals within the ϕ-OTDR caused by excessive peak pulse power triggering nonlinear effects, polarization diversity reception and coherent amplification were employed to enhance signal SNR and improve vibration signal detection sensitivity. |
| **QD857**<br><br>**14:30-14:45** | **Title:** DBCLNet: Dual Branch Contrastive Learning EEG Network on Emotion Recognition<br>**Authors:** Hao Liu, Yueying Zhou, Shufeng Zhou, Lishan Qiao<br>**Presenter:** Hao Liu, Liaocheng University, China<br><br>**Abstract:** Electroencephalogram-based emotion recognition technology is of crucial importance in the development of affective brain-computer interfaces. Although EEG can reveal the dynamics of brain activity involved in emotion recognition at a millisecond level, its limitations, such as low spatial resolution, noise sensitivity, and the great difficulty of feature extraction, still restrict its practical application. In this paper, we propose a dual-branch contrastive learning model named DBCLNet. First, the original EEG signals are decomposed into multiple frequency bands using a filter bank. Then, multi-band power and inter-channel connectivity features are extracted. Next, the consistency of the two representations is constrained using cross-branch contrastive learning. Finally, high-precision decoding of emotional states is achieved by combining feature concatenation and a |

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| | contrastive classifier. To evaluate the model's performance, we conducted experiments on the public FACED dataset and compared the results with those of previously proposed methods (EEGNET, EEGNEX and FBSTCNet). DBCLNet achieved higher classification accuracy and F1 scores in all comparisons. |
| **QD900**<br><br>**14:45-15:00** | **Title:** Machine Learning–Based Access Quality Prediction and Trigger-Based Mitigation in Wi-Fi Networks<br>**Authors:** Mingjun Lu, Shoudong Lu, Zhiwei Huang<br>**Presenter:** Mingjun Lu, Guangxi University of Foreign Languages, China<br><br>**Abstract:** Wi-Fi access quality can fluctuate under dynamic traffic and interference. This paper studies access quality prediction and trigger-based mitigation in a trace-driven setting using AWID3 Evil Twin Wi-Fi traces. Packet records are aggregated into 1 -second windows, where throughput is modeled as payload-byte rate and packet loss is approximated by retry statistics. After stability and payload-aware filtering, we compare RF, XGBoost, and SVR for next-window throughput prediction; RF achieves the best accuracy. Using predicted throughput as an early-warning signal, prediction-driven triggering reduces throughput shortfall and improves lower-tail throughput compared with a reactive baseline with one-window control delay. These results indicate that prediction-enabled triggering can mitigate unfavorable windows under this trace setting. |
| **QD911**<br><br>**15:00-15:15** | **Title:** TrAISformer++: Adaptive Variable Coupling and Route-aware Conditional Encoding for AIS Trajectory Prediction<br>**Authors:** Wensheng Cao, Yixuan Zhang, Qian Sun, Yufeng Wu, Yali Liu<br>**Presenter:** Wensheng Cao, China Waterborne Transport Research Institute, Beijing, China<br><br>**Abstract:** AIS-based vessel trajectory prediction is a fundamental task for maritime surveillance, collision avoidance, and traffic management. Despite the strong modeling capability of transformer-based approaches such as TrAISformer, two critical limitations remain. First, existing methods independently embed AIS variables without explicitly modeling their intrinsic physical dependencies, which may weaken motion consistency. Second, the absence of route-level motion priors limits the model's ability to efficiently handle multimodal behaviors, particularly in long-term forecasting scenarios. To address these issues, we propose TrAISformer++, an enhanced transformer framework incorporating two lightweight and modular extensions. The first module, Adaptive Variable Coupling (AVC), introduces learnable importance weighting to explicitly capture the interdependencies among latitude, longitude, speed over ground, and course over ground, thereby improving motion-consistent feature representation. The second module, Route-aware Conditional Encoding (Route Token), integrates a set of learnable route tokens to model typical navigation patterns and enables route-conditioned trajectory generation, enhancing multimodal prediction stability. Extensive experiments on the Danish Maritime Authority AIS dataset demonstrate that TrAISformer++ achieves state-of-theart performance. Specifically, the proposed model reduces the 2-hour ADE from .94 (nautical miles)nmi to .87 nmi, corresponding to a 7.4% relative improvement. More importantly, the valid prediction horizon is extended from 9.67 hours to 15 hours, representing a substantial increase over the baseline. Both modules introduce less than 3% additional parameters and can be seamlessly integrated into existing transformer-based architectures, offering an effective yet computationally efficient enhancement. |

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| **QD908**<br><br>**15:15-15:30** | **Title:** Design and Verification of a Ship-Shore Dual-End Phased Array Cooperative System for Long-Distance Broadband Communication at Sea<br>**Authors:** Yufeng Wu, Yongming Zhang, Qian Sun, Yixuan Zhang, Zilai Cheng<br>**Presenter:** Yufeng Wu, China Wateborne Transportation Research Institute, China<br><br>**Abstract:** With the rapid development of the marine economy and intelligent shipping, the demand for long-range, high-bandwidth, and low-latency maritime communication in medium and long-range offshore scenarios has become increasingly urgent. However, traditional narrowband maritime communication, satellite communication, and shore-based public mobile communication all have core bottlenecks in terms of coverage distance, transmission bandwidth, and deployment cost, which make it difficult to adapt to the complex marine channel environment and the transmission requirements of broadband services at sea. To address the above problems, this paper designs a cooperative ship-shore dual-terminal phased array communication system for long-range broadband maritime communication. We construct a three-layer system architecture consisting of a shore-based phased array base station, a ship-borne phased array terminal, and a wireless link transmission layer, establish a sea surface wireless channel propagation model and a calculation model for line-of-sight (LOS) distance and Fresnel zone adapted to the propagation characteristics of the maritime environment, propose a cooperative ship-shore dual-terminal beamforming algorithm, and complete the communication link budget analysis of the system. On this basis, a full-voyage field test under real sea conditions was carried out in the coastal waters of Xiangshan County, Ningbo City, China, to quantitatively verify the core performance of the system, including Received Signal Strength Indicator (RSSI), transmission rate, communication latency, and link connectivity rate. The test results show that the system can establish a stable communication link within an ultra-long range of 85 km, with a link connectivity rate of 1 % in non-signal control areas. The effective transmission rate can reach 345 Mbps at 85 km, and the average end-to-end communication latency of the whole voyage is only 2.76 ms. Its comprehensive performance is significantly better than that of traditional maritime communication schemes. The research in this paper fully verifies the engineering feasibility of phased array technology in medium and long-range offshore broadband communication scenarios, and provides key technical support for the construction of an integrated marine communication, sensing and computing system. |

## Special Session 2: Wireless Big Data and AI for Intelligent Communications and Networks

**Time:** 13:30-15:35 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌涛厅---Lingtao Room ( 3 Floor )
**Chaired by:** Assoc. Prof. Chuanting Zhang, Shandong University, China

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| **Invited Speech**<br><br>**(QD874)**<br><br>**13:30-13:50** | **Speech Title:** Secure Transmission in IRS-THz Systems via CNN-Transformer Based Joint Beamforming and Artificial Noise Optimization<br>**Authors:** Mingyu Ma, Jingping Qiao, Jialei Wang, Zihan Yu, Chuanting Zhang<br>**Invited Speaker:** Assoc. Prof. Chuanting Zhang, Shandong University, China<br><br>**Abstract:** This paper focuses on physical layer security (PLS) in an intelligent reflecting surface (IRS)-aided terahertz (THz) multiple-input multiple-output (MIMO) system, where a multi-antenna eavesdropper may intercept the communication signals transmitted from the base station (BS) to the users. To counter this security threat, the BS transmits artificial noise (AN) to interfere with the eavesdropper. Accordingly, we formulate a joint optimization problem for the BS's active beamforming, artificial noise beamforming, and IRS phase shift configuration to maximize the system secrecy rate. To address the challenges of high computational complexity and the difficulty in effectively solving the objective function with conventional optimization methods, this paper proposes a gated selective CNN-Transformer collaborative fusion network (GS-CFNet), enabling joint optimization of the BS's active beamforming, artificial noise beamforming, and IRS phase shifts. Numerical simulation results demonstrate that, compared to traditional DL algorithms, the proposed method maintains comparable security performance while significantly improving computational efficiency, making it particularly suitable for real-time implementation in THz-band communication systems. |
| **Invited Speech**<br><br>**(QD914-A)**<br>**13:50-14:10** | **Speech Title:** Quantized Signal Processing in Massive MIMO: Identifiability, Optimization, and Deep Learning Algorithms<br>**Invited Speaker:** Assoc. Prof. Mingjie Shao, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China<br><br>**Abstract:** In this talk, we introduce quantized signal processing in massive MIMO systems, driven by the need to use low-resolution DACs/ADCs to reduce power consumption. However, coarse quantization results in the loss of amplitude information from communication signals, making signal estimation and detection challenging. We present formulations for maximum-likelihood estimation (MLE) and discuss the associated challenges with integrals and nonsmooth objective functions. Identifiability conditions for quantized signal sensing are introduced, quantifying the relationship between the number of measurements and the parameter dimension. Then, we propose novel global optimization algorithms for both signal detection and channel estimation. To enhance performance and efficiency, we incorporate a deep unfolding adaptation, supported by a theoretical analysis of the activation function. Simulation results demonstrate the effectiveness of our approaches. |
| **Invited Speech**<br><br>**(QD896-A)**<br>**14:10-14:30** | **Speech Title:** Toward Fresh and Cost-Efficient Vehicular Digital Twins: A Dual-Timescale Learning Approach<br>**Invited Speaker:** Assistant Professor Xiangyi Chen, Southwest Jiaotong University, China<br><br>**Abstract:** The accuracy of digital twin models hinges on the prompt collection of information from the vehicular environment. However, the high mobility of vehicles and |

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| | the dynamically changing network environment pose significant challenges. Dynamic twin model migration can reduce the Age of Information (AoI) by bringing twin models closer to their vehicles. Existing works rarely consider the inherent differences in optimization cycles between digital twin model migration and data upload, which potentially leads to suboptimal cost efficiency and information freshness. Specifically, real-time vehicular data must be rapidly uploaded to edge servers to ensure the accuracy and timeliness of digital twin models, while frequent migration of twin models over short periods incurs substantial costs. Therefore, we propose a dual-timescale bilevel learning approach, where the upper-layer learning optimizes twin model migration decisions on a long timescale to achieve forward-looking model migration, and the lower-layer learning optimizes data upload and resource allocation decisions on a short timescale to ensure the accuracy and timeliness of digital twin models. Then, we design a multi-agent selective parameter sharing approach based on spatiotemporal dependency correlations to accelerate model convergence and reduce communication costs among agents. Moreover, through a rigorous theoretical analysis, we prove the convergence of the dual-timescale bilevel learning with broad applicability, and extensive experimental results demonstrate the effectiveness of the proposed approach. |
| **QD863**<br><br>**14:30-14:45** | **Title:** Hardware-Aware Dynamic Range Calibration for Post-Training Quantization on FPGAs<br>**Authors:** Shuo Liu, Zhiming Li, He Han<br>**Presenter:** Shuo Liu, South China University of Technology, China<br><br>**Abstract:** Post-training quantization (PTQ) enables reduced-precision inference without retraining and is often used to deploy deep neural networks on field-programmable gate arrays (FPGAs). At low bit-widths, accuracy can drop sharply due to activation outliers and calibration schemes that depend on floating-point or runtime rescaling, which are inconvenient for integer-only FPGA datapaths. This work introduces Hardware-Aware Dynamic Range Calibration (HADRC), a PTQ calibration scheme designed for FPGA constraints. HADRC adapts to the target bit-width and restricts range redistribution factors to power-of-two (PoT) values, so rescaling can be folded offline and implemented as shifts at inference time. On CIFAR-1 and ImageNet-1K, HADRC improves W4/A8 accuracy over round-to-nearest baselines while remaining comparable at W8/A8. We also implement an end-to-end FPGA prototype to verify efficient, deterministic integer-only execution. |
| **QD862**<br><br>**14:45-15:00** | **Title:** Explainable Link Prediction for Continuous Dynamic Networks<br>**Authors:** Shikai Liu, Yuhong Zhao and Yao Guo<br>**Presenter:** Shikai Liu, Inner Mongolia University of Science and Technology, China<br><br>**Abstract:** Link prediction in continuously evolving networks remains challenging due to limited continuous-time modeling and interpretability. This paper proposes an explainable link prediction framework that combines pattern mining with dynamic graph neural networks. Time- and frequency-domain analyses and structural description functions are used to capture network evolution patterns and derive interpretable rules. An event-triggered mechanism is further introduced to incrementally learn node representations in continuous time. By integrating node embeddings with interpretable rules, the framework performs effective link prediction. Experiments on multiple real-world datasets demonstrate strong performance and meaningful interpretability, offering insights into link formation mechanisms. |

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| **QD850**<br><br>**15:00-15:15** | **Title:** FedAADC: Model Similarity-based Base Station Clustering for Federated Wireless Traffic Prediction<br>**Authors:** Dongyang Li, Shuo Wang, Xinkun Wang<br>**Presenter:** Shuo Wang, China University of Petroleum (East China), China<br><br>**Abstract:** Wireless traffic prediction plays a central role in enabling efficient resource allocation and performance optimization in next-generation mobile networks by characterizing the spatio-temporal dynamics of future network demands. However, achieving high prediction accuracy while maintaining efficient distributed training remains a significant challenge in large-scale cellular networks, due to pronounced data heterogeneity and limited communication resources. To address this challenge, this paper proposes FedAADC, a model similarity–based clustered federated learning framework for wireless traffic prediction. First, this framework exploits intermediate-layer activation features extracted from local base-station models to characterize model similarity via activation-based kernel alignment. Based on the resulting similarity metrics, base stations are dynamically grouped, enabling delayed and adaptive clustering during the federated training process. Moreover, an attention mechanism is further incorporated to achieve effective intra- and intercluster model aggregation. Experimental results demonstrate that FedAADC significantly improves prediction accuracy, reducing the mean squared error (MSE) by up to 23.66% and the mean absolute error (MAE) by up to 11.36% compared with stateof-the-art baselines, while exhibiting high scalability for largescale distributed base-station networks and meeting practical deployment requirements. |
| **QD892**<br><br>**15:15-15:30** | **Title:** Trust Mechanisms in Intelligent Communication Networks: Perceptual Equivalence of AI-Generated and Human-Created Content<br>**Authors:** Weiqi He and Ahmad Yahya Dawod<br>**Presenter:** Weiqi He, Chiang Mai University, Thailand<br><br>**Abstract:** This study examines trust formation in intelligent communication networks where AI-generated and human-created content coexist. Using a between-subjects experiment (N = 311) and Structural Equation Modeling within the Stimulus–Organism–Response (SOR) framework, we test whether content source and AI disclosure influence perceived authenticity and user trust. Results reveal perceptual equivalence: users show no significant difference in authenticity evaluation between AI-generated and human-created content (t = − .235, p = .815), and perceived authenticity does not mediate the relationship between AI disclosure and trust (indirect effect p = .725). These findings challenge traditional authenticity-based trust models, positioning system-level reliability as the primary trust mechanism in next-generation intelligent communication environments. |

## Onsite Poster Session 1: Digital Image Analysis and Multimedia Application Technologies

**Time:** 13:30-15:08 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌泉厅---LingquanRoom ( 3 Floor )
**Chaired by:** Assoc. Prof. Haoqi Gao, College of Electronic Engineering, National University of Defense Technology, China

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| **QD814**<br><br>**13:30-13:37** | **Title:** Performance Study of Federated Learning for Bandwidth-Constrained Semantic Transmission of UAV Aerial Images<br>**Authors:** Lanqi Ni, Shufeng Li, Junwei Zhang, Xiaohui Bian, and Zhiping Xia<br>**Presenter:** Lanqi Ni, Communication University of China, China<br><br>**Abstract:** Bandwidth-constrained unmanned aerial vehicles (UAVs) cannot upload full aerial images to the cloud. Real-time object detection from UAV imagery is critical for search-and-rescue and traffic management, but radio links impose about 2 MB mission budget. Centralised training demands raw-image upload (1.2 GB for 1 -min 1 8 p video), whereas on-board-only learning suffers from isolated, geographically skewed, non-IID data. We propose FedUAV, a communication-efficient federated-learning framework that jointly trains a YOLO11n detector across a swarm while keeping every picture on board. FedUAV introduces two primary adjustments to fit the 2 MB cap: quantised gradient upload and early-stop round adaptation. On the VisDrone2 19 benchmark split into five non-IID shards, after 3 communication rounds FedUAV reaches 26.58 % mAP@ .5, outperforming isolated training by 3.6 % and achieving 82.96 % of the centralised upper bound (32. 4 %) while consuming only 99.46 MB uplink per round. These results demonstrate that FedUAV offers an effective accuracy–bandwidth trade-off for bandwidth-limited UAV video networks. |
| **QD865**<br><br>**13:37-13:44** | **Title:** A Novel EnvAdaptive-CFAR Radar Target Detection Method in Extreme Environments<br>**Authors:** Yaxuan Zhao, Hao Wu, Xuan Zhu, Xun Ni, Shiao Zhu<br>**Presenter:** Yaxuan Zhao, Naval University of Engineering, China<br><br>**Abstract:** To address the issue of low target detection accuracy of the conventional constant false alarm rate (CFAR) target detection algorithm in the extreme clutter environment, this paper proposes a novel environment-adaptive CFAR algorithm in extreme environment. The environment is evaluated across four dimensions to derive an environment-adaptive false alarm rate threshold, which is input the CFAR algorithm to improve detection accuracy in different environments. Then, the density-based spatial clustering of applications with noise (DBSCAN) is used to optimize the position of the target center. Experimental results show that the accuracy and F1 score of EnvAdaptive-CFAR are 1 .5% and 8.5% higher than that of the conventional CFAR algorithm, respectively. The proposed method enhances robust target detection in extreme environments and thus serves as a critical supplement for developing highly reliable radar systems. |
| **QD835**<br><br>**13:44-13:51** | **Title:** An Improved YOLOv8n Visual Detection Method for Radar Dim and Small Targets<br>**Authors:** Xuan Zhu, Shiao Zhu, Xun Ni, Yaxuan Zhao, Jin Meng, Hao Wu<br>**Presenter:** Xuan Zhu, Wuhan University, China<br><br>**Abstract:** To enhance the detection ability of radar dim and small targets in challenging conditions such as low SNR and malicious jamming, thereby ensuring low-altitude security, this paper proposes an improved YOLOv8n visual detection method. Firstly, a radar dim and small target range-Doppler spectrum dataset is constructed based on signal model. Then, the YOLOv8n baseline model is improved by incorporating the quadruple-scale gated |

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| | aggregation network (QSGANet), which is designed based on the extra-large scale feature path and the Triplet attention mechanism, thereby enhancing the detection performance of small targets. Experimental results show that our method can reach a detection precision (mAP) of 95.84%, which is 4.14% higher than the baseline model. Moreover, it also possesses strong robustness, which significantly enhances the reliability of radar systems in anti-jamming and low-altitude monitoring tasks. |
| **QD907**<br><br>**13:51-13:58** | **Title:** Trajectory Segment Association Based on Multi-Motion Features of Maritime Targets<br>**Authors:** Yuqi Fan, Wei Zhang, Long Li, Bingdong Jiang<br>**Presenter:** Wei Zhang, Hefei University of Technology, China<br><br>**Abstract:** Maritime target tracking via radars is often interrupted due to the complex and dynamic maritime traffic environment, making trajectory segment association a fundamental problem. Deep learning has demonstrated strong capabilities in processing time series data and has been increasingly applied to trajectory segment association. Trajectory data exhibit rich motion features, which are reflected by the various temporal dependencies and motion element correlations. However, existing deep learning-based methods for trajectory segment association are inadequate to capture the latent temporal dependencies and motion element correlations. In this paper, we propose a trajectory segment association model based on Multi-Motion Features (MMF), which explores the intrinsic motion characteristics of trajectory data from four perspectives, i.e., local motion features, periodic features, trend features, and motion element correlation features. After embedding each trajectory point, the model performs multi-scale convolution on the embedding differentiation to extract local motion features, leverages multi-scale decomposition to obtain trend and periodic features, and exploits an edge-learnable graph convolutional neural network to capture the correlations among motion elements. The model finally determines trajectory segment association by evaluating the similarity between the multi-motion features of old and new trajectory segments. Experimental results demonstrate that the proposed model significantly improves the accuracy of trajectory segment association and reduces both false and missed associations. |
| **QD1012**<br><br>**13:58-14:05** | **Title:** Robust RF Fingerprint Identification via Transformer-Based Adaptive Feature Fusion<br>**Authors:** Xiaohong Liu, Fei Shi, Jiashuo He, Shuo Chang, Wanli Ni, Sai Huang<br>**Presenter:** Xiaohong Liu, Beijing University of Posts and Telecommunications, China<br><br>**Abstract:** Radio frequency fingerprint identification (RFFI) leverages intrinsic hardware imperfections for device authentication, yet its performance degrades significantly under multipath fading channels, especially at low-to-moderate SNRs. To overcome this limitation, we propose DP-RSAAF, a novel channel-robust RFFI framework featuring dual-path residual statistical attention with adaptive fusion. Our method introduces two complementary channel-resilient features: the Difference of Logarithmic Spectrum (DoloS) and the Logarithmic Difference of Adjacent Spectra (LDoAS), forming a dual-path heterogeneous feature set. An adaptive fusion mecha nism based on multi-head self-attention dynamically emphasizes the most discriminative components for device identification. Experimental evaluations using Wi-Fi signals across diverse multipath channel conditions reveal that our method achieves approximately 40% higher identification accuracy compared to the single-path DoloS approach, and surpasses the LDoAS method by around 30%. |

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| **QD893**<br><br>**14:05-14:12** | **Title:** A Review of Deep Learning-Based Cross-Domain Fusion Methods for Camouflaged Object Detection<br>**Authors:** Zhe Niu, Haoqi Gao, Haibing Wang<br>**Presenter:** Zhe Niu, College of Electronic Engineering, National University of Defense Technology, China<br><br>**Abstract:** Camouflage object detection, as a research hotspot in the field of computer vision, not only holds significant theoretical research value but also boasts broad practical application prospects. In complex scenarios, this task often encounters performance bottlenecks such as low detection accuracy and insufficient robustness. Cross-domain fusion technology, by integrating multi-source complementary information, has become a core and key approach to breaking through these bottlenecks and enhancing the model's perception capabilities. Therefore, this paper conducts a comprehensive and systematic review of cross-domain fusion technology for camouflage object detection based on deep learning. Firstly, a multi-dimensional classification framework is proposed, systematically categorizing existing research efforts into three core categories: cross-modal data fusion, cross-network architecture fusion, and cross-task fusion, clearly defining the technical boundaries and core positions of each category. Subsequently, the core ideas, mainstream implementation methods of each category are deeply analyzed, and the advantages and limitations of various methods are compared and analyzed. Finally, the core common challenges currently faced in this field are summarized, further indicating the overall trend and specific research directions of cross-domain fusion towards intelligence, engineering, and lightweight. This paper aims to provide a clear technical development context and comprehensive method reference for subsequent research in the field of cross-domain fusion for camouflage object detection, facilitating the efficient development and engineering application of the technology in this field. |
| **QD867**<br><br>**14:12-14:19** | **Title:** YLC-SLAM: YOLO-Ellipse Constraint Visual SLAM for Dynamic Environments<br>**Authors:** Zhike Chen, Yiying Yan, Zishi Li, Yizhi Mo, Jiajian Zhong, Kwok L. Chung,<br>**Presenter:** Zhike Chen, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Object detection algorithms can provide regional recognition of different target objects for visual SLAM systems, and effective integration of these algorithms enables the systems to intelligently perceive environmental changes and formulated ecisions. This paper proposes a dynamic visual SLAM system, YLC-SLAM, which is integrated with the latest YOLOv26 object detection algorithm. Common categories in the dataset are manually annotated, and training is subsequently conducted on the YOLOv26 model. Furthermore, on the basis of the ORB-SLAM3 framework, a multi-object feature point weight factor regulation mechanism is introduced by leveraging the different target regions identified by the model. This mechanism enhances the representational capability of effective feature points and suppresses both dynamic feature points and potential dynamic feature points with high confidence. |
| **QD879**<br><br>**14:19-14:26** | **Title:** WheatNet: A Domain-Aware Attention-Driven Framework for Robust Wheat Disease Detection in Real-World Field Conditions<br>**Authors:** Mandol Md Sharif, Jiangsheng Gui, Md Morshed Alam, Jubayer Ahmed<br>**Presenter:** Mandol Md Sharif, Zhejiang Sci-Tech University, China<br><br>**Abstract:** Wheat diseases pose a persistent threat to global food security, as their visual symptoms vary widely across growth stages, environmental conditions, and plant organs, making reliable field-level detection particularly challenging. To address these limitations, this paper proposes WheatNet, a domain-aware deep learning framework for accurate and robust wheat disease detection under real-world agricultural conditions. The framework |

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| | integrates leaf- and head-region imagery through an attention-enhanced DenseNet–FPN backbone to capture subtle lesion textures and spatial patterns. A disease-aware augmentation strategy models occlusions, illumination variability, and sensor noise, while an adaptive loss formulation mitigates severe class imbalance. Extensive experiments on enriched multi-source datasets show that WheatNet consistently outperforms classical CNNs and state-of-the-art detectors in mAP, F1-score, and robustness. Interpretability analyses further confirm that the model attends to biologically meaningful disease regions, supporting practical deployment in precision agriculture. Keywords—Wheat Disease Detection, Deep Learning, Image Classification, Attention Mechanisms, Domain-Specific Data Augmentation, Precision Agriculture. |
| **QD820**<br><br>**14:26-14:33** | **Title:** Receiver-Agnostic RFFI Based on Contrastive Learning and Feature Distribution Alignment<br>**Authors:** Heng Wang, Zhi Chai, Mingye Li, Liuming Zhang, Wei Chen, Xuelin Yang<br>**Presenter:** Heng Wang, Shanghai Jiao Tong University, China<br><br>**Abstract:** The Internet of Things (IoT) has been widely applied in various fields, and the free-space transmission of wireless links imposes security challenges for the identity authentication of IoT devices. Radio frequency fingerprint identification (RFFI) utilizes the subtle signal discrepancy caused by imperfections of wireless device hardware for identity authentication. However, the performance of RFFI is susceptible to variations in channels and receivers. To address this challenge, we adopt unsupervised contrastive learning and feature distribution alignment algorithms to tackle cross-domain feature shift. Experimental results show that the proposed scheme effectively leverages the feature distributions of unlabeled data from new receiver, achieving an average accuracy of 99.16%, which takes a step forward toward the practical application of RFFI. |
| **QD916**<br><br>**14:33-14:40** | **Title:** Adaptive Sparse Adversarial Attack via Orthogonal Matching Pursuit<br>**Authors:** Chaoran Li, Zhichao Lin, Zhaorui Gu, Xiaodong Wang<br>**Presenter:** Chaoran Li, Ocean University of China, China<br><br>**Abstract:** Deep Neural Networks have achieved remarkable progress in the field of computer vision. However, their vulnerability to adversarial examples has raised significant security concerns. Sparse adversarial examples can mislead classification models by modifying a very limited number of pixels, yet existing methods still face challenges in terms of sparsity and controllability. To address these challenges, we propose an adaptive sparse adversarial attack method based on orthogonal matching pursuit (Adaptive OMP SparseFool, AOSF). The proposed method iteratively selects the most discriminative coordinates using Orthogonal Matching Pursuit (OMP) and introduces an adaptive point selection restriction module to dynamically control the number of modified pixels per iteration. This ensures that the adversarial example crosses the decision boundary while suppressing redundant modifications. We evaluated our method on various models (CNN, InceptionV3, ResNet1 1, DenseNet161, VGG16) using the ImageNet and CIFAR-1 datasets. Experimental results demonstrate that, compared to baselines such as SparseFool, our method significantly reduces the average number of modified pixels (L norm) under the same perceptual budget while preserving attack effectiveness. Furthermore, visual analysis indicates that the perturbations generated by our method are sparser and are primarily concentrated in semantically critical regions of the image, exhibiting better imperceptibility and interpretability. |

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| **QD1008**<br><br>**14:40-14:47** | **Title:** An efficient system for field vehicle communication scenario simulation and verification in a highly controllable laboratory environment<br>**Authors:** SHIXIONG GAO<br>**Presenter:** Shixiong Gao, Chongqing University, China<br><br>**Abstract:** In-vehicle communication system field testing faces challenges including high costs, poor scenario control, limited reproducibility, and low efficiency. This paper proposes a systematic methodology to transform field testing into precise, repeatable verification through laboratory testing in the controllable "Vehicle Simulation Network Laboratory". The three-phase closed-loop system includes: 1) digital extraction of field scenarios using standardized "four-element" descriptors (geography, wireless, network, service); 2) high-fidelity reproduction via integrated laboratory platform with core network, program-controlled attenuators, and in-circuit vehicle systems; 3) performance evaluation. Validation shows lab-field consistency (handover success rate deviation <2%) and over 10-fold efficiency improvement. |
| **QD869**<br><br>**14:47-14:54** | **Title:** TL-Transformer: Tri-Level Exogenous Fusion Transformer for Microservice Time Series Anomaly Detection<br>**Authors:** Zeyu Guo, Yishuai Chen, Yuchun Guo, Zhong Cao<br>**Presenter:** Zeyu Guo, Beijing Jiaotong University, China<br><br>**Abstract:** With the widespread deployment of microservice architectures in cloud-native environments, systems produce massive multi-level time-series monitoring data spanning Pod, Node, and Service levels. Accurately detecting anomalies amidst high-dimensional redundant metrics and complex hierarchical dependencies poses a significant challenge. We propose Tri-Level Exogenous Fusion Transformer, which models Pod-level metrics as endogenous series and Node- and Service-level metrics as dual exogenous series, injecting them in parallel into the Pod encoding process. Our model employs dual cross-attention to capture macro- (Service) and meso- (Node) level influences on micro-level (Pod) behavior, followed by a gating mechanism to dynamically fuse the two exogenous information streams. Trained end-to-end with a reconstruction loss, anomalies are identified when input sequences cannot be faithfully reconstructed. Experiments on both simulated and real-world microservice logs demonstrate that our approach outperforms multiple baselines on F1 score. |
| **QD839**<br><br>**14:54-15:01** | **Title:** Adaptive Privacy-Preserving Federated Learning Algorithm Based on Gradient Sampling<br>**Authors:** Lu Wei, Chungui LI, Huan Wang, Junying Yang<br>**Presenter:** Lu Wei, Guangxi University of Science and Technology, China<br><br>**Abstract:** To prevent user data privacy leakage, Differential Privacy (DP) technology is widely applied in Federated Learning to facilitate joint modeling while keeping user private data local. However, balancing privacy utility with model prediction accuracy has become a critical research focus in this field. This paper proposes the Adapt ISDP_FL framework, an adaptive Privacy-Protecting Federated federated learning Approach based on gradient sampling. By evaluating the gradient variance of each iteration, the algorithm increases the sampling probability for low-variance scenarios, thereby accelerating model convergence. Experimental results demonstrate that, compared with several traditional differential privacy algorithms for federated learning, the proposed algorithm achieves improvements in both privacy utility and accuracy. |

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| **QD1011**<br><br>**15:01-15:08** | **Title:** An Incentive Mechanism for Task Offloading in Mobile Edge Computing Based on Multi-Dimensional Contract<br>**Authors:** Fuzi peng, Fanyu Qi<br>**Presenter:** Zipeng Hu, Hefei University of Technology, China<br><br>**Abstract:** The strategy of offloading users' computing tasks is crucial for the utilization of edge's resources in mobile edge computing (MEC) systems. Most existing research on computing offloading assumes complete information. That is, both the edge server and the users share all relevant information regarding the service provisioning and service requirements, which is not valid in real applications. The limited research based on information asymmetry overlooks user heterogeneity in terms of sensitivities to task offloading cost and latency, etc., resulting in the underutilization of edge's computing resources. In this paper, we propose a multi-dimensional contract based incentive mechanism to encourage heterogeneous users to offload tasks to the edge under information asymmetry. First, we formulate the contract design problem to maximize edge utility. Second, we transform the problem into an equivalent simplified form through theoretical analyses. Finally, we propose an iterative adjusted optimal contract algorithm (IAOC) to derive the optimal contract. Simulation results show that the proposed incentive mechanism effectively enhances edge utility and computing resource utilization in MEC systems. |

## Special Session 3: Distributed Large Language Model Training/Inference Systems over Edge Networks

**Time:** 16:00-18:00 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌屿厅---Lingyu Room ( 3 Floor )
**Chaired by:**
Assoc. Prof. Danyang Zheng, Southwest Jiaotong University, China
Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China

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| **Invited Speech**<br><br>**(QD864)**<br><br>**16:00-16:20** | **Speech Title:** Learning@Edge: Model-based Edge Learning through Prompt Engineering for Personalized Education<br>**Author**: Laxmisha Rai<br>**Invited Speaker:** Prof. Laxmisha Rai, Shandong University of Science and Technology, China<br><br>**Abstract:** The growth of Large Language Models (LLMs) and the influence of Generative Artificial Intelligence (GenAI) tools have given rise to novel learning paradigms for educators. In this paper, we propose Model-based Edge Learning (MbEL), a framework that shifts learning from centralized, human-centric institutions to the "edge" of the network, where individual users interact conversationally with a pre-trained foundational model to acquire knowledge and skills. Unlike traditional edge computing, which focuses on data processing, MbEL emphasizes cognitive offloading and personalized knowledge acquisition. This paper conceptualizes MbEL, illustrating its principles through case studies conducted with the DeepSeek model using prompt engineering methods such as zero-shot, few-shot, and chain-of-thought (CoT) prompting. As this study focuses exclusively on personalized learning through prompt engineering, to ensure response quality, we established a bench-marking system using LLM-as-a-Judge framework with structured prompt templates. This allows learners to systematically evaluate and verify the answers generated by the model. The proposed method is tested for generation, and evaluation of standard algorithms taught in the undergraduate Data Structures course serving as the evaluation domain. Furthermore, we discuss its profound implications for education, including the shift from knowledge retrieval to reasoning development, and challenges such as model bias and academic integrity. However, ethical considerations such as model hallucinations and trusting incorrect answers remain critical, underscoring the continued necessity of human oversight in guiding the student learning process. |
| **Invited Speech**<br><br>**(QD895)**<br><br>**16:20-16:40** | **Speech Title:** Design and Implementation of an LLM-Based Prompt Chain Framework for Automated Econometric Analysis: A Case Study in Corporate Sustainability<br>**Authors**: Xiaoyi Wang, Xi Wangb, Kexin Duan, Xinyu Chen, Danyang Zheng<br>**Invited Speaker:** Asst. Prof. Xiaoyi Wang, Sichuan University of Media and Communications, China<br><br>**Abstract:** Large language models (LLMs) improve access to complex data analytics, but their direct use in econometric analysis remains limited by computational inconsistency and unstable execution across multi-step tasks. This study proposes an automated econometric analysis framework based on Prompt Chain Engineering (PCE). Using corporate sustainability data (ESG and green innovation) as a high-dimensional testbed, we design a structured multi-stage prompt workflow that supports data preprocessing, statistical computation, and quantitative modeling without conventional econometric programming. The framework explicitly defines task pipelines, context-aware prompt templates, and reasoning constraints to improve execution stability, enforce process consistency, and reduce cross-stage error propagation. To evaluate computational reliability, LLM-generated outputs are systematically benchmarked against Stata results. Experimental results show |

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| | strong agreement in key econometric metrics, including coefficient estimates, significance levels, and robustness-check outcomes, thereby validating the computational accuracy of the proposed framework. In addition to numerical estimation, the framework incorporates an automated semantic generation module that converts statistical outputs into professional economic interpretations. Overall, the results demonstrate that structured prompt-chain design can enable LLMs to serve as reliable, accessible, and end-to-end analytical engines for complex domain-specific econometric analysis. |
| **Invited Speech**<br><br>**(QD889)**<br><br>**16:40-17:00** | **Title:** Cost-Efficient Multi-MoE Inference Models Deployment with Experts Sharing<br>**Authors:** Xiangning Lu, Xiaohui Liu, Chao Wang, Danyang Zheng, Chen Yang, Huanlai Xing, Fei Teng<br>**Presenter:** Assoc. Prof. Danyang Zheng, Southwest Jiaotong University, China<br><br>**Abstract:** With the growing need for ubiquitous inference at the network edge, Mixture-of-Experts (MoE) models are increasingly adopted to deliver Inference-as-a-Service (IFaaS), as they distribute expert models (EMs) across edge devices and thereby alleviate per-device resource pressure. In practice, supporting ubiquitous edge inference often leads to a setting where multiple MoE models co-exist at the edge and inevitably share a subset of EMs. In this setting, effectively leveraging shared EMs during multi-MoE deployment is essential: it can substantially reduce the effective resource footprint by reusing shared EMs rather than redundantly deploying duplicate copies for each MoE, thereby enabling feasible ubiquitous edge inference. In this paper, we take the first step toward cost-efficient deployment of multiple MoE inference models with shared experts. We first formulate the Multi-MoE Deployment with EM Sharing (MDES) problem with the objective of cost optimization. We then propose the Normalized Hosting Cost-based Multi-MoE Deployment with Sharing Set Identification (MNDS) algorithm that explicitly leverages ISRS and cross-model EM sharing (CMES) to reduce overall deployment cost. Extensive simulations demonstrate that our approach consistently outperforms representative benchmarks, reducing deployment cost by 9.8\% and 24.73\% on average. |
| **QD860**<br><br>**17:00-17:15** | **Title:** Location-Based Adaptive Grouping Algorithm for Federated Learning<br>**Authors:** JiaChen Wang, Donghang Duan, Qi Zhou, Xu Zheng<br>**Presenter:** Jiachen Wang, University of Electronic Science and Technology of China, China<br><br>**Abstract:** In wireless federated learning networks, high communication overhead remains a critical bottleneck. While existing location-based clustering methods mitigate long-distance transmission, they typically employ fixed grouping strategies that overlook the heterogeneity of data distributions among local clients, leading to suboptimal training accuracy. To address this issue, we propose a Location-Based Adaptive Grouping Algorithm (ADBR) to jointly optimize communication energy and model accuracy. Specifically, we design a sliding window mechanism on clients to detect real-time performance fluctuations and trigger regrouping requests. On the server side, a batched re-grouping strategy is introduced to process requests in parallel, thereby reducing system coordination overhead. Theoretical analysis and experimental results demonstrate that ADBR significantly improves model accuracy and reduces communication costs while ensuring convergence and security. |

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| **QD888**<br><br>**17:15-17:30** | **Title:** Steiner-based Federated Aggregation Chain Deployment for Distributed LLM Inference<br>**Authors:** Yuhang Zhao, Hailing Wu, Yufan Chen, Danyang Zheng, Xiaojun Cao, Chengzong Peng<br>**Presenter:** Yuhang Zhao, Chengdu University of Information Technology, China<br><br>**Abstract:** Large language models (LLMs) are increasingly deployed to support intelligent perception, decision-making, and autonomous reasoning across distributed edge and cloud environments. Due to the extreme computational cost and privacy sensitivity of LLM inference, a single node is often incapable of executing the entire inference process independently. Instead, modern LLM inference tasks are decomposed into multiple functional stages and collaboratively executed as distributed inference service chains. However, exposing intermediate inference representations and partial reasoning results across heterogeneous nodes introduces significant security and privacy risks, while suboptimal deployment decisions may lead to excessive communication overhead and latency degradation. To address these challenges, this paper investigates the problem of Federated Inference Chaining and Deployment (FICD) for large language model inference over resource-constrained networks. We model LLM inference as an ordered chain of inference services with heterogeneous computation, bandwidth, latency, and security requirements. To efficiently deploy such inference chains, we propose a heuristic algorithm termed Steiner-based Federated Aggregation Chain Deployment (SFACD). Extensive simulation results demonstrate that SFACD significantly outperforms representative baseline approaches. |
| **QD905**<br><br>**17:30-17:45** | **Title:** FedTCP: Token-Centric Control Plane for Federated Learning under Data Drift and Client Churn<br>**Authors:** Zhili Yang, Xiangyi Chen, Jiahui Wu, Zihao Wu, Xingyue Luo, and Li Feng<br>**Presenter:** Xiangyi Chen, Southwest Jiaotong University, China<br><br>**Abstract:** Federated learning (FL) enables collaborative model training without sharing raw data, but practical deployments often suffer from data drift, client churn, and unstable network conditions. Existing methods typically rely on parameter-level synchronization, which incurs communication costs proportional to model size and becomes increasingly unstable under dynamic participation. To address these challenges, we propose a Token-Centric Control Plane for Federated Learning under Data Drift and Client Churn (FedTCP) that replaces model parameter synchronization with compact class-level token exchange. The server maintains global semantic tokens as coordination states, while clients update local models independently and communicate token-level statistics. This design reduces communication complexity from model-scale transmission to lightweight token exchange that is primarily determined by the number of classes and embedding dimensions. Furthermore, we introduce a reliability-adaptive gating mechanism that adjusts cross-client regularization strength according to participation ratio and token drift, improving robustness under dynamic conditions. Experimental results on multiple datasets demonstrate that the proposed method achieves up to 3.65\% higher global test accuracy in dynamic environments than the strongest baseline, while significantly reducing communication overhead compared to conventional federated approaches. |

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| **QD880**<br><br>**17:45-18:00** | **Title:** Queueing Latency Aware Learning-based Online Computation Offloading for In-network Computing<br>**Authors:** Junyu Mai, Sheng Ouyang, Tian Yang, Quan Chen, and Yongchao Tao<br>**Presenter:** Junyu Mai, Guangdong University of Technology, China<br><br>**Abstract:** This paper investigates the online scheduling problem of path selection and workload allocation for in-network computing. We formulate the problem as a mixed-integer programming model that jointly minimizes server operating cost and end-to-end latency, and prove that it is NP-hard. To enable efficient online decision-making, we further transform the problem into a Markov decision process. Based on this formulation, we propose a reinforcement learning–based scheduling algorithm using proximal policy optimization (PPO), which incorporates a Long Short-Term Memory (LSTM)-based temporal encoder to capture historical deployment information and dynamically evolving network states. This design allows the algorithm to make adaptive, queueing-aware scheduling decisions in dynamic network environments. Extensive simulation results demonstrate that the proposed algorithm is robust and consistently outperforms state-of-the-art baseline methods in terms of the joint cost–latency performance metric. |

## Special Session 4: Smart Materials 360°: AI-Enabled Solutions from RF to Civil Structures

**Time:** 15:50-17:55 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌月厅---Lingyue Room ( 3 Floor )
**Chaired by:**
Prof. Kwok L. Chung, Guangzhou Institute of Science and Technology, China
Assoc. Prof. Xingye Chen, Guangzhou Institute of Science and Technology, China

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| **Invited Speech**<br><br>**QD833**<br><br>**15:50-16:10** | **Speech Title:** Optically Transparent Antenna-Thin Film PV Integration: Recent Advances, Core Bottlenecks, and Future Prospects<br>**Authors:** Kwok L. Chung, Xingye Chan, Siquan Wang,<br>**Invited Speaker:** Prof. Kwok L. Chung, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Optically transparent antenna and thin film photovoltaic (OTA-TFPV) integration technology addresses energy self-sufficiency and multi-functional integration in smart terminals, building-integrated photovoltaics (BIPVs), and satellite systems. This article synthesizes global research progress, focusing on transparent conducting oxides (TCOs)—including material diversification, deposition techniques, and the transparency-conductivity balance. It covers integrated design strategies: multiband electromagnetic adaptation, scenario-targeted applications (aerospace, BIPV, UAVs), and structural optimization, alongside TCO antenna performance limits via skin-depth predictions and loss characterization. Two core bottlenecks hinder commercialization: material performance tradeoffs (conductivity-thickness-frequency constraints, stability issues) and the integration paradox between photovoltaic harvesting and antenna radiation. Future directions include multi-functional material synergy, fabrication innovation, customized design, and standardized testing systems. This work supports OTA-TFPV research, technological iteration, and industrial application in green communication and renewable energy. |
| **QD1010**<br><br>**16:10-16:25** | **Title:** An Algorithm of Channel Computation and Compensation for Multi-RISs Communication Systems<br>**Authors:** Wengang Li, Qiong Ye, Xiaotong Zhai<br>**Presenter:** Wengang Li, Xidian University, China<br><br>**Abstract:** Reconfigurable Intelligent Surfaces(RIS) provide a promising ap-proach to construct programmable wireless transmission environ-ments. Most of the recent related work focuses on the modeling, design, performance analysis and optimization for RIS-assisted sys-tems. This paper studies performance optimization methods for multi-RISs communication systems. The complexity of channel es-timation for multi-RISs communication systems is high due to the coupling of different reflected signals and the presence of a large number of channel parameters. Because of the multi-path effect and the different spatial distributions of RISs, the signal arrival times at the receiver vary, resulting in delay spread, which causes inter-symbol interference, leading to signal fading and a decline in communication quality. To solve this problem, we propose a method to compute channel state information using position information and select the best reflection path based on capacity maximization. An optimized phase shift set is then designed to optimize the chan-nel characteristics and reduce the delay spread by adjusting the phase setting of RIS. The simulation results show that our proposed method of selecting the RIS after computing channels based on position information reduces the computational |

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| | complexity by a factor of $k$ compared to the greedy search algorithm (GS), where $k$ is the product of the number of reflection paths and the number of transmitted data streams. With the number of RIS set to 8, our optimized phase shift set can reduce the delay spread by $1 \times 10{-}8s$ and increase the spectral efficiency by 0.4 $bit/s/Hz$ compared to a random phase shift set. |
| **QD812**<br><br>**16:25-16:40** | **Title:** Low-Bias, High-Gain NIR Photodetectors Based on $Ag_2Se$-QD/Graphene Heterojunctions for Ultrasensitive RF Photonic Receivers<br>**Authors:** Lipeng Wu, Xin-Hua Zhao, Kwok L. Chung, Tao Ye, Zhilie Tang, Luxin Tang<br>**Presenter:** Lipeng Wu, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** To meet the urgent demand for non-toxic and environmentally friendly alternatives to heavy metal semiconductors in infrared photodetection, this study focuses on the potential of silver selenide ($Ag_2Se$) quantum dots (QDs) in the near-infrared (NIR) region. Leveraging the exceptional electron mobility of graphene and the efficient light absorption characteristics of $Ag_2Se$ QDs, constructing photodetectors (PDs) based on graphene/$Ag_2Se$ composite materials offers significant advantages. However, the presence of traditional long-chain organic ligands severely impedes the charge carrier transport efficiency. To address this limitation, we propose a liquid-phase inorganic ligand exchange strategy aimed at reconstructing the interface structure by introducing short-chain inorganic molecules. The device achieves maximum responsivity (R) of $2.88 \times 10^{-3}$ A / W, and the maximum transient Specific Detectivity (D*) reaches $2.35 \times 10^{13}$ at a bias of 0.1 V. |
| **QD885**<br><br>**16:40-16:55** | **Title:** Multi-Agent Deep Reinforcement Learning with Attention Mechanism for Energy-Efficient Power Control in RIS-Assisted 6G Heterogeneous Networks<br>**Author:** Jingwen Shen<br>**Presenter:** Jingwen Shen, Ocean University of China, China<br><br>**Abstract:** With the advent of the sixth-generation (6G) wireless era, ultra-high data rates and seamless connectivity impose unprecedented pressure on network energy consumption. Achieving a balance between spectral efficiency and green communication remains a critical challenge in dense heterogeneous networks (HetNets). This paper investigates energy efficiency (EE) optimization in Reconfigurable Intelligent Surface (RIS)-assisted 6G HetNets, and formulates the EE maximization as a non-convex joint optimization of base station (BS) active beamforming and RIS passive phase shifting, which is rigorously proven NP-hard due to coupled optimization variables and non-convex constraints. To address the high computational complexity and latency of traditional optimization methods in dynamic 6G environments, we propose a decentralized Multi-Agent Deep Reinforcement Learning framework with an attention mechanism (MADRL-Attention), where each BS acts as an autonomous agent to learn optimal power allocation via local observations while mitigating inter-cell interference. Simulation results show that the proposed algorithm outperforms WMMSE, random allocation, and centralized DDPG by up to 24.3% in energy efficiency in high-interference dense multi-cell scenarios, while guaranteeing 1 % user Quality of Service (QoS) satisfaction rate. |

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| **QD815**<br><br>**16:55-17:10** | **Title:** Computational Study on Defect and Interface Engineering for Kesterite Solar Cells<br>**Authors:** Xingye Chen, Yunhai Zhao, Kwok L. Chung,<br>**Presenter:** Xingye Chen, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Composed of earth-abundant and non-toxic elements, Kesterite \(Cu_{2} ZnSn(S, Se)_{4}\) (CZTSSe) is a compelling candidate for photovoltaic and energy harvesting in self-powered systems. However, device performance is fundamentally limited by a high density of deep-level bulk defects and non-ideal interface at the CZTSSe absorber/CdS buffer heterojunction. While experimental optimization is widely reported, a significant gap often exists between general theoretical models and the specific, complex parameters of practical devices used in IoT nodes. This study utilizes computational modeling to bridge this gap, developing a device model calibrated against realistic laboratory parameters to enable targeted performance simulation and predictive optimization. Using the SCAPS-1D software, we systematically investigate the influence of key physical parameters, including bulk defect, activation energy, conduction band offset (CBO) at the heterojunction, and the density of interface defects. We generate two-dimensional contour maps of photovoltaic performance metrics to identify optimal parameter windows for high-efficiency devices. The simulation predicts that a slightly positive CBO (-0.05 to +0.21 eV) and a low interface defect density \((<10^{16} ~cm^{-3})\) are critical for maximizing device performance. To validate the model, we correlate the simulation results with experimental data from a high-performance device over 14% power conversion efficiency (PCE). The findings provide a theoretical foundation for optimizing kesterite cells as stable energy harvesting modules for next-generation self-powered IoT nodes. |
| **QD924**<br><br>**17:10-17:25** | **Title:** Quantitative Evaluation of Amplitude and Phase Measurement Deviations Across Three Commercial VNAs for Common RF Components<br>**Authors:** Liwen L. Liang, Kwok L. Chung, Jialiang L. Ni, Zhilie Tang,<br>**Presenter:** Liwen L. Liang, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** As the core high-precision test instrument in RF and microwave engineering, the Vector Network Analyzer (VNA) provides full-vector S-parameter amplitude and phase measurements that directly determine the reliability of electromagnetic performance evaluation for RF devices such as antennas and microstrip lines. Most existing studies focus on measurement comparison between two VNAs using standard metrology devices, with insufficient research on multi-brand VNA measurement consistency for commonly used engineering RF devices. This paper selects three commercial VNAs (CEYEAR 3671D, KEYSIGHT E5063A, ROHDE & SCHWARZ ZNL20) to test the S-parameters of two patch antennas and one microstrip line under uniform SOLT calibration, and quantitatively evaluates measurement deviation of each instrument via the RMSE method. Results show that quantifiable amplitude and phase deviations exist across different VNAs, with phase deviation significantly larger than amplitude deviation; each VNA has unique performance strengths in different frequency bands. This study provides direct reference for instrument selection and measurement uncertainty analysis in RF testing. |

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| **QD870**<br><br>**17:25-17:40** | **Title:** Quantum Random Number Generator Based on Artificial Designed Quantum Dots in Low-Doped Silicon Nanowire Devices<br>**Authors:** Yinhan Zhao, Jingyan Nan, Keke Xu, Fayong Liu, Xiaoqing Zhang, Haiyong Zheng<br>**Presenter:** Fayong Liu, Ocean University of China, China<br><br>**Abstract:** Quantum random number generators (QRNGs) are crucial components for security applications, but the on-chip integration is often blocked by the incompatibility of mainstream optical schemes with standard Complementary Metal-Oxide-Semiconductor (CMOS) processes. In this study, artificially designed quantum dots are built in a low-doped silicon nanowire using local doping method. Which is fully CMOS-compatible. By manipulating the gate voltage (Vg) of the silicon nanowire device with a drain voltage (Vd) of 5 mV, a 5 :5 high/low ratio is almost achieved as the quantum-induced random telegraph signal (RTS) at Vg = -27 mV. The binary sequence generated through sampling exhibits near-ideal Shannon entropy (binary: .999998, quaternary: 1.999996) and passed 88.89% of the tests in the NIST statistical test suite. This work provides a feasible design and fabrication strategy for RTS devices used as QRNGs, facilitating the observation of RTS at room temperature and ensuring compatibility with CMOS fabrication processes. |
| **QD1016**<br><br>**17:40-17:55** | **Title:** Green Task Offloading for STAR-RIS-Assisted Fog Radio Access Networks<br>**Authors:** Hang Xu, Chao Fang, Hongwei Shi<br>**Presenter:** Chao Fang, Beijing University of Technology, China<br><br>**Abstract:** This paper investigates energy-efficient task offloading in a fog radio access system aided by simultaneously transmitting and re-flecting reconfigurable intelligent surfaces (STAR-RIS). A joint op-timization problem is established for total energy minimization, which simultaneously determines the offloading ratios of users and the beamforming coefficients of the STAR-RIS while respecting given latency limits. To solve this non-convex problem, we decou-ple it into two subproblems and develop an iterative framework employing Karush-Kuhn-Tucker (KKT) conditions and successive convex approximation (SCA) with dual decomposition. Simula-tion results verify rapid convergence and demonstrate up to 16.3%energy savings over benchmarks, highlighting the efficiency of STAR-RIS-assisted fog radio access networks. |

## Onsite Session 3: System Modeling, Network Performance Analysis, and Optimization Algorithms in Wireless Communication Systems and Networks

**Time:** 15:45-18:15 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌云厅---Lingyun Room ( 3 Floor )
**Chaired by:** Assoc. Prof. Hongwei Wang, University of Electronic Science and Technology of China, China

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| **Invited Speech**<br>**(QD901-A)**<br>**15:45-16:05** | **Speech Title:** Compressive Near-Field Wideband Channel Estimation for THz Extremely Large-scale MIMO Systems<br>**Invited Speaker:** Assoc. Prof. Hongwei Wang, University of Electronic Science and Technology of China, China<br><br>**Abstract:** We consider the channel acquisition problem for a wideband terahertz (THz) communication system, where an extremely large-scale array is deployed to mitigate severe path attenuation. In channel modeling, we account for both the spherical wavefront and beam-splitting phenomena of the wideband near-field channel. We propose a frequency-independent orthogonal dictionary that generalizes the standard discrete Fourier transform (DFT) matrix by introducing an additional parameter to capture near-field effects. This dictionary enables an efficient two-dimensional (2D) block-sparse representation of the wideband near-field channel. By leveraging this structured sparsity, the wideband near-field channel estimation problem can be effectively solved within a customized compressive sensing framework. Numerical results demonstrate the significant advantages of our proposed 2D block-sparsity-aware method over conventional polar-domain-based approaches for near-field wideband channel estimation. |
| **Invited Speech**<br>**(QD898-A)**<br>**16:05-16:25** | **Speech Title:** Environment-Aware Network-Level Design for Generalized Pinching-Antenna Systems<br>**Invited Speaker:** Dr. Yanqing Xu, The Chinese University of Hong Kong, Shenzhen, China<br><br>**Abstract:** Generalized pinching-antenna (GPA) systems enable a reconfigurable radiation point along a guided medium, offering a new degree of freedom beyond conventional fixed-aperture deployments. While most existing studies focus on link-level optimization for quasi-static users, such designs typically require frequent re-computation as users move or enter/leave the network, and they do not directly capture area-oriented objectives (e.g., region-wide coverage and hotspot service) that evolve on a longer time scale. This talk presents an environment-aware, network-level design framework for GPA systems that shifts the objective from serving specific instantaneous users to shaping area coverage and hotspot service over longer time scales. In particular, we consider two representative settings: traffic-aware and geometry-aware. In the traffic-aware case, we model spatial demand using slowly varying hotspot profiles and optimize the activation/positioning of pinching points to align the radiated energy with traffic intensity, together with resource allocation to balance hotspot performance across the service region. In the geometry-aware case, we incorporate site-map information such as obstacles and visibility constraints into the network metric, and optimize pinching-point deployment to mitigate blockage-induced coverage holes. For each setting, we formulate a network-level optimization problem, develop low-complexity structure-exploiting algorithms, and quantify the performance–overhead tradeoff associated with antenna reconfiguration. Simulation results demonstrate that environment-aware GPA design can substantially improve region-wide coverage and hotspot service quality compared to fixed-aperture baselines and user-driven link-level heuristics, especially in obstructed environments or highly non-uniform traffic scenarios. |

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| **Invited Speech**<br><br>**(QD931-A)**<br><br>**16:25-16:45** | **Speech Title:** Combinatorial Optimisation Meets Quantum Computing<br>**Invited Speaker:** Prof. Jingjing Cui, Southwest Jiaotong University, China<br><br>**Abstract:** Combinatorial optimisation problems lie at the core of mathematics, computer science, and engineering, yet many of them remain computationally intractable at realistic scales. Recent advances in quantum computing offer a promising — though still evolving — pathway to address such challenges. This report provides a mathematically grounded overview of how quantum algorithms interact with classical optimisation theory. We first review key models of combinatorial optimisation and their complexity characteristics. We then introduce fundamental quantum computing concepts and discuss representative quantum and hybrid quantum–classical approaches, including variational algorithms and the Quantum Approximate Optimization Algorithm (QAOA). Particular emphasis is placed on the mathematical structure underlying these methods, their approximation behavior, and the regimes in which quantum resources may provide an advantage. Through illustrative examples and comparative analysis, we highlight both the potential and current limitations of quantum approaches. The report concludes by outlining open problems and research directions at the interface of optimisation theory and quantum computation. |
| **QD851**<br><br>**16:45-17:00** | **Title:** Learning to Offload in UAV-Assisted MEC: A Temporal-Aware TD3 Framework with Hierarchical Attention<br>**Authors:** Li Ding, Jun Yang<br>**Presenter:** Li Ding, NingXia University, China<br><br>**Abstract:** In order to deal with the core challenges faced by the task offloading decision in the UAV assisted mobile edge computing system, such as multi-dimensional timing coupling, dynamic environment adaptation and insufficient strategy robustness, this paper innovatively proposes a dual delay depth deterministic strategy gradient algorithm (HTAN-TD3) that integrates hierarchical timing attention mechanism. The breakthrough contributions of this study are reflected in three aspects: firstly, a composite optimization objective that integrates total system latency, worst user experience, and multi-user fairness is constructed, which breaks through the limitations of traditional single objective modeling; Secondly, a hierarchical attention network (HTAN) with macro micro dual stream temporal analysis capability was designed. Through the heterogeneous collaboration and attention weighted fusion of LSTM and GRU, accurate perception and deep mining of dynamic features at multiple time scales in the system state were achieved; Furthermore, the Ornstein Uhlenbeck process with temporal correlation is introduced to explore the noise and dynamic adaptive Huber loss function, and the algorithm is systematically enhanced from two dimensions: policy exploration smoothness and training process robustness. In a complex edge scene simulating high load, strong occlusion and multi-user competition, HTAN-TD3 is significantly superior to mainstream baseline algorithms such as DDPG and TD3 and MATOPO in key indicators such as total system delay and user fairness, demonstrating excellent environmental adaptability and decision-making intelligence. This study provides a useful reference and reference for improving the autonomous decisionmaking ability of intelligent edge computing systems in dynamic and complex environments. |
| **QD1019-A**<br><br>**17:00-17:15** | **Title:** Reconstruction Mechanism and Strategy of Digital Supply Chain in Manufacturing Enterprises within TOE framewor<br>**Authors:** Bingfeng Bai, Tiantian Peng, Xinyu<br>**Presenter:** Bingfeng Bai, Shanghai University, China<br><br>**Abstract:** With the deepening of digital transformation, the digital supply chain has become a key area for manufacturing enterprises to optimize operational efficiency and |

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| | enhance competitiveness. This paper selects two enterprises, Xiaomi Technology and SAIC Motor, to conduct a horizontal comparative analysis of two cases based on grounded theory coding, exploring how technology, resources and environment affect the behavioral reconstruction of the digital supply chain, thereby greatly improving the agility, flexibility and innovation ability of the digital supply chain. This research not only enriches the theoretical system of the TOE framework and the relationship between digital supply chains, but also provides many operational guidelines for enterprises to improve their digital supply chain operations. |
| **QD882**<br><br>**17:15-17:30** | **Title:** A Comparative Review of Lightweight Python Web Frameworks for Undergraduate Beginners<br>**Authors:** Yongfei Song, Hongbo Qiao, Hao Zhang<br>**Presenter:** Yongfei Song, Henan Agricultural University, China<br><br>**Abstract:** With the rapid evolution of computing and communication technologies, lightweight web development frameworks have been widely and maturely applied in the development of small-scale software systems and the construction of lightweight internet services due to their characteristics of light weight, easy deployment and high development efficiency.For undergraduate students ma-joring in Software Engineering, mastering a lightweight web framework suitable for their learning stage is a prerequisite for successfully completing curriculum design, curriculum project development, as well as initial scientific research practice and innovative exploration. However, it is undeniable that undergraduate beginners often encounter problems such as vague selection criteria, low adaptability of learning curves and poor matching with hardware configurations when choosing frameworks. Accordingly, this paper selects three typical lightweight Python Web frameworks—Flask, FastAPI and Bottle—as research ob-jects, and conducts a systematic and hierarchical compar-ative analysis from four dimensions: learning difficulty, development efficiency, resource consumption and applica-tion scenarios. More importantly, based on the learning foundation, hardware environment and project require-ments of undergraduate beginners, this paper objectively and reasonably summarizes the technical characteristics, applicable scenarios and performance boundaries of the three frameworks, and puts forward targeted framework selection suggestions. The results of this paper not only help undergraduate beginners in Software Engineering and related majors quickly get started with Web development, but also enable them to efficiently and reliably build small-scale Web applications on personal computers, and lay a solid foundation for their future learning of heavyweight frameworks and engagement in industrial-grade develop-ment. |
| **QD906**<br><br>**17:30-17:45** | **Title:** Research on Wavelet Domain Signal Denoising Algorithm Based on Adaptive Continuously Differentiable Threshold Functions<br>**Authors:** Yiran Xue,Xingquan Wang, Yinmeng Bai, Yanling Dong, Siqi Wang, Na Zhang<br>**Presenter:** Yiran Xue, Gannan Normal University, China<br><br>**Abstract:** Rolling bearing fault diagnosis is severely affected by background noise in vibration signals, which masks faultrelated features and degrades diagnostic reliability. To solve this problem, an adaptive continuously differentiable threshold function in the wavelet domain is proposed for signal denoising. Unlike traditional hard/soft thresholding methods, the proposed function enables smooth, differentiable shrinkage and adaptively adjusts thresholds based on subband statistical characteristics, achieving effective noise suppression. Multi-domain features (time/frequency/envelope spectrum) were extracted from denoised signals to validate the method. Denoising performance was evaluated via Signal-to-Noise Ratio (SNR) and Root Mean Square Error (RMSE), while fault identification was tested using an SVM classifier. Experiments on the HUST bearing |

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| | dataset show the proposed approach outperforms median filtering and traditional wavelet thresholding in SNR improvement and RMSE reduction, and also enhances classification accuracy and recall rate. This confirms its effectiveness for practical rolling bearing fault diagnosis. |
| **QD843**<br><br>**17:45-18:00** | **Title:** Learning to Arbitrate: Uncertainty-Aware Inference for Scene Graph Generation<br>**Authors:** Na Tian, Jianfei Wang, and Wencang Zhao<br>**Presenter:** Na Tian, Qingdao University of Science and Technology, China<br><br>**Abstract:** Scene graph generation serves as a critical bridge connecting low-level visual perception with high-level semantic reasoning. However, the inherent ambiguity of visual features and biases arising from long-tail data distributions severely constrain a model's perceptual capabilities. Previous attempts either overfit high-frequency head categories or overly rely on static external knowledge. To address this, we propose a novel uncertainty-aware perception framework, UA-SGG, which achieves predicate reasoning through dual-flow knowledge modeling. Specifically, we design a coarse-grained physical layout process that filters geometrically impossible relationships based on spatial distribution to construct visual cues. Concurrently, a fine-grained semantic prototype process explicitly models logical consistency by learning structured co-occurrence distributions. To integrate these signals, we introduce an entropy-driven adaptive aggregation mechanism. This mechanism dynamically balances visual evidence and statistical priors by quantifying uncertainty, prioritizing visual cues in clear scenes while emphasizing semantic logic in ambiguous ones. Experiments on the Visual Genome dataset demonstrate that UA-SGG achieves a significant improvement in the PredCls task (mR@5 increases by 3.7%), not only outperforming on long-tail relations but also generating semantically richer scene graphs than other methods. |
| **QD1007**<br><br>**18:00-18:15** | **Title:** Modeling Fake News Adoption and Sharing Behavior in Social Media Communication Networks<br>**Authors:** Kieu Thien Kim Nguyen, Huu Loc Tran, Thi Thuy An Ngo<br>**Presenter:** KIEU THIEN KIM NGUYEN, FPT University, Vietnam<br><br>**Abstract:** The quick dissemination of false information on social media highlights how crucial it is to comprehend how youth evaluate and share digital content. Using the knowledge Acceptance Model (IACM), this study examines the factors influencing Vietnamese university students' intentions to adopt and share knowledge. PLS-SEM was used to evaluate survey data from 332 students. The findings show that while information credibility and the demand for information only affect information usefulness, users' attitudes and information quality both have significant positive effects on information adoption and usefulness. Information usefulness strongly predicts both adoption and sharing intention, while information adoption further increases users' willingness to share content. The model demonstrates solid explanatory and predictive capability. This study extends the application of IACM to the context of fake news and provides empirical insights into how cognitive and psychological factors shape students' online information behaviors. The results offer practical implications for educational institutions, and the government aiming to improve media literacy and reduce the spread of misleading content among young social media users. |

## Onsite Oral Session 4: Digital Signal Detection, Recognition, and Analysis

**Time:** 15:50-18:10 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌涛厅---Lingtao Room ( 3 Floor )
**Chaired by:** Prof. Botao Feng, Shenzhen University, China

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| **Invited Speech**<br><br>**(QD930-A)**<br><br>**15:50-16:10** | **Speech Title:** Mid-Infrared Photoacoustic Spectroscopy for $^{13}CO_2/^{12}CO_2$ Isotope Analysis in Breath-Based H. pylori Detection<br>**Invited Speaker:** Assoc. Prof. Guolin Li, China University of Petroleum (East China), China<br><br>**Abstract:** Helicobacter pylori infection is closely associated with chronic gastritis, peptic ulcers, and gastric cancer, rendering rapid and noninvasive diagnostic technologies clinically essential. Current breath tests, such as the 13C-urea breath test (13C-UBT), typically rely on breath collection bags followed by offline analysis, which limits real-time monitoring capabilities. To overcome this constraint, we presented a mid-infrared photoacoustic spectroscopy (MIR-PAS) system for real-time detection of CO2 isotopes and evaluation of 13C-UBT responses. A dual-channel differential resonant photoacoustic cell (DPAC) with a minimal sample volume of 10.3 mL was designed to enhance acoustic signal collection, achieving a resonance frequency of 3775.7 Hz and a Q-factor of 27. Target absorption lines of 12CO2 (2299.64 $cm^{-1}$) and 13CO2 (2299.80 $cm^{-1}$) were selected within the strong ν3 band to ensure high-resolution isotopic discrimination using a 4.35 μm quantum cascade laser. The sensor demonstrated excellent linear response ($R2 > 0.994$) across 500 - 2500 ppm and achieved detection limits of 8.98 ppb for 12CO2 and 2.81 ppb for 13CO2 with the optimal averaging. δ13C measurements exhibited a precision of 0.066 ‰ at 76 s averaging time. Breath-sampling tests further revealed distinct temporal release patterns of CO2 isotopes during exhalation. These results confirmed that the developed MIR-PAS system provides a compact, sensitive, and robust platform for isotopic CO2 analysis and demonstrates strong potential for point-of-care H. pylori diagnostics. |
| **QD861**<br><br>**16:10-16:25** | **Title:** Low-Rate Turbo Code-Aided Burst Signal Code Block Synchronization<br>**Authors:** Zejun Li, Shili Wang<br>**Presenter:** Zejun Li, Beijing Institute of Technology, China<br><br>**Abstract:** To address unknown code block boundaries in low- SNR burst communication system, this paper proposes a low-rate Turbo code–aided synchronization method without using attached synchronization markers. The method exploits distinct log-likelihood ratio (LLR) convergence behaviors during iterative decoding to identify and locate code block boundaries. To handle burst intermittency, a spectral entropy–based detector is used for signal detection. A hierarchical synchronization strategy is adopted in which coarse synchronization is first achieved with few iterations and precise boundary locking with full iterations effectively balancing performance and complexity. Simulation results show that the proposed method outperforms conventional ASM-based schemes in synchronization success rate and accuracy under low-SNR conditions, while remaining robust to frequency and phase offsets. |
| **QD858**<br><br>**16:25-16:40** | **Title:** Cross-Subject Cognitive Load Recognition via Meta-Learning<br>**Authors:** Shanshan Liang, Yueying Zhou, Shufeng Zhou, Lishan Qiao<br>**Presenter:** Hao Liu, Liaocheng University, China<br><br>**Abstract:** In cross-subject Electroencephalogram (EEG)-based cognitive workload |

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| | recognition tasks, the generalization capability of CNN is constrained under few-shot conditions. To address this issue, we propose a meta-learning-based enhanced model named Load-MetaCNN, and design an architecture specifically adapted to cognitive workload data. The model initialization is optimized using the fast adaptation mechanism in model-Agnostic Meta-Learning. Consequently, the model's ability to capture high-dimensional and strongly correlated features in cognitive workload data is enhanced. The proposed method quickly acquires transferable feature representations, thereby significantly improving adaptation to different cognitive workload distributions. We evaluate the effectiveness of the proposed model on a cognitive workload dataset. The proposed model is quantitatively compared with the original CNN and other similar deep learning methods. The results indicate that Load-MetaCNN achieves significant performance improvements in cognitive workload classification. |
| **QD819**<br><br>**16:40-16:55** | **Title:** Blind Separation Algorithm for Convolutive Frequency-Hopping Signals Based on Dynamic Step-size IVA<br>**Authors:** Le Sun, Juncheng Liu, Yu Guo, Yabo Wang, Songhu Ge, Lin Li<br>**Presenter:** Juncheng Liu, Xi'an University of Electronic Science and Technology, China<br><br>**Abstract:** To address the challenges of man-made interference and multipath propagation faced by ultra-short wave frequency-hopping communication systems in complex electromagnetic environments, this paper presents a Dynamic Step-size Independent Vector Analysis algorithm (DS-IVA), based on the dynamic regulation of the learning step-size using the time-frequency matrix of source signals. By incorporating the concept of the second-order Newton method into the optimization process, the algorithm adaptively adjusts the iterative step-size, thereby significantly accelerating the convergence speed while ensuring algorithm stability. Simulation results demonstrate that the separation performance of the presented algorithm for convolutive frequency-hopping signals is significantly superior to that of the traditional Blind Source Separation (BSS) algorithm. Compared with the traditional IVA algorithm, the presented method improves the output average Signal-to-Interference-plus-Noise Ratio (SINR) by 1.5 dB and the average correlation coefficient by 7.1%, while reducing the average computation time by 94.74%. |
| **QD837**<br><br>**16:55-17:10** | **Title:** Adaptive Step-Size LMS Mainlobe Interference Cancellation Method Based on Sum-Difference Four-Channel<br>**Authors:** Shiao Zhu, Xun Ni, Xuan Zhu, Yaxuan Zhao, Hao Wu<br>**Presenter:** Shiao Zhu, Huazhong University of Science and Technology, China<br><br>**Abstract:** Mainlobe suppressive jamming contaminates both the sum and difference channels of a monopulse radar, making the difference-to-sum ratio jammer-dominated and driving angle estimates to follow the jammer. This paper constructs planar- array sum/difference four-channel outputs and applies a unified symmetrization-normalization strategy to obtain robust channel weights. Two parallel cancellation links are then built for azimuth and elevation, where the difference channel assists the sum channel and the double-difference channel assists the difference channel. A power-normalized variable-step LMS with an exponential decay recursive estimation of reference power is proposed, which sets the stepsize upper bound via the auxiliary- channel power to ensure stable convergence under strong and non-stationary jamming. From a Wiener-solution viewpoint, the recovery of the difference-to-sum ratio after cancellation is also interpreted. Simulations demonstrate pronounced jammer suppression, target re-emergence in range-Doppler maps, and restored angle measurement accuracy. |

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| **QD856**<br><br>**17:10-17:25** | **Title:** SUDA: A Subject Selection-based Unsupervised Domain Adaptation Model for Cross-Subject Motor Imagery EEG Decoding<br>**Authors:** Lijun Wang, Yueying Zhou, Shufeng Zhou, Lishan Qiao<br>**Presenter:** Hao Liu, Liaocheng University, China<br><br>**Abstract:** To address domain shift in motor imagery electroencephalogram (MI-EEG) caused by individual differences and temporal variations, this paper proposes a Subject Selection-based Unsupervised Domain Adaptation model (SUDA). The method begins by applying K-Means clustering to group subjects in a balanced manner. It then incorporates a multi-scale feature extraction module to capture temporal discriminative features. Using the pseudo-label generation strategy, it generates target domain pseudo-labels for adaptive alignment. Finally, model optimization is performed through a hierarchical loss function. Using leave-one-subject-out cross-validation on the OpenBMI dataset, SUDA achieved accuracy of 81. % and 83.4% across two independent sessions. These results surpass both traditional CSP and various deep learning benchmarks, confirming the model's effectiveness and generalization capability in cross-subject motor imagery classification. |
| **QD886**<br><br>**17:25-17:40** | **Title:** Machine Learning-Based Information Processing for Smart Contact Lens Tear Glucose Sensing<br>**Author:** Zongkang Li<br>**Presenter:** Zongkang Li, Ocean University of China, China<br><br>**Abstract:** Recent advances in soft electronics and Internet of Things (IoT) have accelerated the development of wearable devices for noninvasive health monitoring. Capable of monitoring vital signs in eyes and tear fluids, smart contact lenses have been considered one of the most promising next-generation wearable technologies. However, previously reported smart contact lenses rely heavily on embedded system-on-chips (SoCs) and wireless modules for information processing and data transmission, which significantly complicate fabrication processes for space-constrained applications. Here, we reported an intelligent tear glucose sensing method based on electrochromic materials. Glucose information can be directly informed by visible color changes, and quantitative results are processed through image processing and machine learning. The detection range of the resulting smart contact lens covers both ordinary and high glucose levels, with a high correlation coefficient r = .99543 and a lower detection limitation of. 5 mM, while eliminating requirements for antennas, batteries, and complex integrated circuits. |
| **QD826**<br><br>**17:40-17:55** | **Title:** A Multilingual Intersectional Bias Framework For Detecting And Mitigating Demographic Bias In Sentiment Classification<br>**Authors:** Md Saiful Islam, Li Xiangdong, Jubayer Ahmes, Xia Bing<br>**Presenter:** Md Saiful Islam, School of Cyberspace Security Zhongyuan University of Technology, China<br><br>**Abstract:** Sentiment analysis models are increasingly deployed in real-world applications, but their fairness across intersectional demographic groups remains underexamined, particularly in low-resource languages. In this paper, we examined intersectional bias in sentiment classification across gender and racial subgroups in English and Bengali datasets. To utilize low-resource languages, we trained classical machine learning models, such as Logistic Regression, Naïve Bayes, Support Vector Machines, and Random Forest, using Word2Vec and FastText embeddings. This experiments, several substantial performance disparities across demographic intersection, particularly affecting the Female+Black subgroup. To mitigate these biases, we proposed a targeted T5-base data augmentation framework that generates synthetic samples for underrepresented subgroup. Our findings show that, this approach significantly reduce |

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| | performance gaps by up to 7 % while improves overall classification accuracy, particularly in low-resource language. These findings underscore the importance of intersectional evaluation in sentiment analysis and establish the effectiveness of demographic-aware data augmentation for reducing bias in multilingual NLP systems. |
| **QD845**<br><br>**17:55-18:10** | **Title:** RECVA: Real-time Edge-assisted Cross-camera Video Analytics via Spatial-Temporal Redundancy<br>**Authors:** Li Ni, Kangli Zhao, Penglin Dai, Xincao Xu<br>**Presenter:** Li Ni, Southwest Jiaotong University, China<br><br>**Abstract:** Edge computing holds great promise for supporting real-time video analytics. However, in multi-camera scenarios, multiple video streams can exceed the limited capacity of edge devices, leading to intolerable delays. Existing methods typically focus on either temporal or spatial redundancy reduction, which results in accuracy degradation and increased latency variance in dynamic scenes. To address these challenges, we propose the Real-time Edge-assisted Cross-camera Video Analytics (RECVA) system, which jointly leverages spatiotemporal redundancies to enable real-time cross-camera video analytics. Specifically, we design a Region of Interest (ROI) extraction and filtering module that selects a set of ROIs for inference by analyzing temporal correlations and identifying overlapping regions across cameras. Moreover, we introduce an inference sharing mechanism that maps the detection results from the head camera to non-head cameras at the pixel level, thus eliminating redundant inference over overlapping ROIs. To further optimize performance, a pipeline optimization mechanism is introduced to parallelize each stage of processing. Experimental results show that our approach achieves the lowest latency while maintaining competitive accuracy compared to state-of-the-art methods. Our empirical analysis reveals that spatiotemporal redundancy coupling accounts for 69.8% of computational waste in multi-camera systems. Our work addresses this inefficiency through coordinated suppression mechanisms that enhance both spatial and temporal adaptation. |

## Onsite Poster Session 2: AI-Driven Intelligent Communication and Signal Analysis Technologies

**Time:** 15:16-16:54 (GMT+8, Beijing Time)
**Date:** Saturday, April 11
**Venue**: 凌泉厅---Lingquan Room ( 3 Floor )
**Chaired by:** Prof. Liwei Yang, China Agricultural University, China

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| **QD809**<br><br>**15:16-15:23** | **Title:** Absorption-Scattering Characteristics in Underwater Optical Communication Links<br>**Authors:** Jiade Zhang, Liwei Yang, Yue Zhang, Xuyang Zhao, Xindi Yu, Bowen Hou<br>**Presenter:** Liwei Yang, China Agricultural University, China<br><br>**Abstract:** This paper analyzes the effects of water absorption and scattering characteristics on optical signal transmission. Considering the bi-directional transmission requirements of underwater optical communication links, the forward link of underwater visible light is studied and modeled, and factors affecting optical transmission are analyzed to help realize efficient and fast transmission of underwater optical communication. The effects of absorption and scattering characteristics on the system are also investigated, and the absorption and scattering characteristics of seawater as well as their influencing factors are analyzed. The attenuation coefficient of seawater is calculated based on the absorption and scattering coefficients of seawater. Summarize the influence of absorption and scattering effects on signal transmission under different water qualities and wavelengths, and analyze the influence of seawater absorption and scattering characteristics on the system. |
| **QD852**<br><br>**15:23-15:30** | **Title:** Prediction of Underwater Sound Speed Distribution Based on Liquid Neural Networks<br>**Authors:** Sitong Liu, Wei Huang, Hao Zhang<br>**Presenter:** Sitong Liu, Ocean University of China, China<br><br>**Abstract:** Underwater sound speed prediction is an important method of sound speed estimation, and its unique advantage lies in the fact that it does not require on-site underwater data measurement. Traditional sound speed prediction methods are primarily based on Long Short-Term Memory (LSTM) neural networks and Transformer neural networks. The parameter scale of these models is large, requiring ample training data, which is difficult to obtain for many ocean regions. To tackle this problem, we establish a lightweight liquid neural network model for predicting sound speed distribution (SSP-LNN). The parameter count of this model is only half of that of the LSTM model, making it less prone to overfitting when trained with a small number of samples, thus exhibiting better generalization ability. |
| **QD883**<br><br>**15:30-15:37** | **Title:** A Two-Stage U-Net-CNN Model for Ocean Sound Speed Profile Inversion<br>**Authors:** Sitong Liu, Wei Huang, Hao Zhang<br>**Presenter:** Ziyue Li, Ocean University of China, China<br><br>**Abstract:** The uneven distribution of ocean sound speed is a key factor degrading the performance of underwater positioning, navigation, timing and communication (PNTC) systems, while traditional instrumental measurements of sound speed profiles (SSPs) fail to meet real-time application demands. Existing data driven SSP inversion methods suffer from limitations such as high requirements for historical data continuity and low sensitivity to deep-sea sound speed changes, and acoustic field measurement errors further impair the inversion accuracy of artificial neural networks. To address these issues, we propose a two-stage U-net convolutional neural network (U-Net-CNN) for SSP inversion. We first use the compression reconstruction function of U-net to denoise the noisy measurement data of the |

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| | signal propagation time, extracting hidden features with stronger anti-interference ability, and then we adopt a CNN to map the relationship from the hidden features to SSPs. Experimental results show that U Net-CNN outperforms the standalone CNN, Compressed Sensing (CS), Multi-Layer Perceptron (MLP) and Empirical Orthogonal Function (EOF) methods by a significant margin. |
| **QD1006**<br><br>**15:37-15:44** | **Title:** OTFS Frame Design and DT-Domain Channel Estimation for Underwater Acoustic Communications<br>**Authors:** Gonghao Cui, Zhe Sun, Yongkang Wang, Hang Ruan, Xiandeng He, Yunhui Yi<br>**Presenter:** Gonghao Cui, Xidian University, China<br><br>**Abstract:** In high-mobility underwater acoustic (UWA) channels, fractional Doppler effects severely degrade the sparsity structure in the Delay-Doppler (DD) domain, causing severe energy leakage and grid mismatch in Orthogonal Time Frequency Space (OTFS) systems. To address this bottleneck, this paper proposes a Delay-Time (DT) domain channel estimation architecture. By exploiting the sparse invariant property of UWA channels in the DT domain, the proposed scheme recasts the complex fractional Doppler as trackable time-varying phase rotations, thereby circumventing the grid mismatch inherent in DD-domain methods. At the receiver, coarse synchronization is first achieved via Dual-chirp LFM preambles. Subsequently, a cascaded estimation mechanism combining Orthogonal Matching Pursuit (OMP) and Extended Kalman Filtering (EKF) is established, where OMP precisely localizes sparse multipath delays and EKF dynamically tracks the fast time-varying gains and residual Doppler shifts. To further mitigate error propagation, a Decision-directed Block-wise regularized Least squares (DBL) algorithm is designed to iteratively refine the channel state by reusing data symbols as virtual pilots. Simulation results demonstrate that the proposed method effectively mitigates inter-carrier interference (ICI) in strong Doppler scenarios, significantly improving system robustness and error performance. |
| **QD807**<br><br>**15:44-15:51** | **Title:** IoT-Enabled Internal Temperature Monitoring and Prophet-Based Forecasting for Outdoor Hydraulic Control Cabinets<br>**Authors:** Yuxin Wu, Wei Liu, Gang Du, Xiaojia Xu, Yingxin Shen, Luyue Chang<br>**Presenter:** Yuxin Wu, University of Science and Technology Beijing, China<br><br>**Abstract:** During the operation of outdoor hydraulic control cabinets, excessively high temperatures can easily cause equipment failure or malfunction, making temperature prediction essential. In recent years, severe fluctuations in ambient temperature and unstable climate conditions have increased thermal risks for outdoor equipment, making temperature management inside the cabinet even more critical. Therefore, this paper proposes a new IoT-based remote temperature prediction scheme for outdoor control cabinets. Using LTE Cat.1 wireless networking, the collected temperature data are transmitted quickly and reliably, addressing the traditional problems of weak field signals and difficult maintenance. The internal temperature of the cabinet is modeled using the Prophet time series model, which identifies the daily and seasonal variation patterns of temperature. Experimental results show that the proposed Prophet model achieves high prediction accuracy, with a mean absolute error (MAE) of about 3.17 and a mean absolute percentage error (MAPE) of about 16%. The model can help temperature control devices prevent overheating and avoid equipment failure caused by excessive temperature. Compared with traditional methods, this approach offers better accuracy and engineering applicability, providing reliable support for the intelligent operation and maintenance of outdoor hydraulic control cabinets. |

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| **QD876**<br>**15:51-15:58** | **Title:** Reliability Study on Low-Speed Impact Numerical Simulation of Carbon Fiber Composite Components in Communication Equipment<br>**Authors:** Jinshu Chen, Wei Zhang, Qian Zheng, Rui Wu<br>**Presenter:** Wei Zhang, Guangzhou Institute of Science and Technology Guangzhou, China<br><br>**Abstract:** Carbon fiber composite materials are widely used in communication equipment structural components and other fields due to their advantages such as light weight and high strength. Researchers have conducted extensive studies on their mechanical properties, but traditional research methods have disadvantages such as long research cycles and high costs. To overcome the limitations of experimental methods and improve research efficiency, it is necessary to develop reliable numerical simulation methods in the field of computing technology as supplementary and optimization means. Therefore, this paper studies the load-displacement-energy characteristics consistency under 45J energy impact through low-speed impact mechanical tests and corresponding numerical simulations of T8 carbon fiber composite material laminates, combined with the requirements of communication equipment for structural reliability and simulation verification in electromagnetic environments. The results show that after the composite laminate is impacted, there are slight dents on the front side and fiber fractures and matrix cracks occur at a 45° direction on the back side. The errors of load-displacement-energy characteristics between numerical simulation and experiments are 9%, 2%, and 6% respectively, further verifying the reliability of numerical simulation in structural performance prediction. This can provide a reference for the structural design and simulation analysis of related communication equipment in complex environments, and contribute to the construction of communication equipment structural health monitoring and intelligent operation and maintenance systems. |
| **QD868**<br><br>**15:58-16:05** | **Title:** Wi-Fi and TSN Fusion via OFDMA: Deadline-Aware RU Allocation and Scheduling<br>**Authors:** Chengbo Wei, Yuchun Guo, YongxiangZhao, Yishuai Chen<br>**Presenter:** Chengbo Wei, Beijing Jiaotong University, China<br><br>**Abstract:** Time-Sensitive Networking (TSN) provides bounded-latency communication for industrial applications, while Wi-Fi 6 (IEEE 8 2.11ax) introduces OFDMA to support multi-user transmissions. However, fusing TSN traffic over Wi-Fi remains challenging due to tight end-to-end deadlines, heterogeneous traffic demands, and time-varying link reliability. This paper proposes a deadline-aware OFDMA scheduling framework for Wi-Fi 6 and TSN fusion. We model each TXOP as a sequence of micro-slots and schedule non-overlapping resource-unit (RU) combinations. For each TSN instance, a wireless transmission budget is derived from its end-to-end delay bound by subtracting the deterministic TSN-side delay. In each micro-slot, the scheduler selects an RU combination that maximizes the total benefit computed from a slack-based urgency function and packet error rate, while enforcing one-RU-per-flow and choosing the minimum RU that satisfies the transmission demand. A best-effort guard is incorporated to mitigate starvation. Simulation results demonstrate that the proposed method reduces TSN deadline miss ratio under high load and increased deadline pressure, while maintaining stable best-effort throughput with practical runtime overhead. |
| **QD855**<br><br>**16:05-16:12** | **Title:** Research on Digital Modeling of the Impact of Ocean Environment for Shipborne TT&C Antennas<br>**Authors:** Ji Guo, Xing Li, Qian Sun, Tian Wang, Tianpeng Xu, Liang Chen<br>**Presenter:** Ji Guo, Beijing Institute of Tracking and Telecommunication Technology, China<br><br>**Abstract:** This paper focuses on the multi-dimensional impacts of complex marine environment on the performance of shipborne Tracking Telemetry and Command (TT&C) antennas. Key factors are introduced, such as wind, waves, swells, and electromagnetic, |

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| | with the action mechanisms of those factors presented. A novel simulation architecture of marine environment combined with TT&C antennas has been constructed, based on digital modelling. The research focuses on key technologies including the coupling of multiple factors in complex environments, and adaptive modeling and prediction. The effectiveness of the architecture is verified, through simulation and measured data. The degradation regularities of antenna performances, such as pointing accuracy, and gain attenuation, are analyzed, with providing the references for the anti-interference design, performance optimization, and operation and maintenance support of TT&C antennas. |
| **QD1005**<br><br>**16:12-16:19** | **Title:** Modulation Probability-Guided Joint Framework for Blind Source Separation and Deep Recognition<br>**Authors:** Zhe Sun, Gonghao Cui, Yunzhi Mao, Junyi Cheng, Xiandeng He, Yunhui Yi<br>**Presenter:** Yongkang Wang , Xi'an University of Electronic Science and Technology, China<br><br>**Abstract:** In scenarios including multi-user shared long-wave communication, maritime emergency long-wave communication, and military command long-wave communication, long-wave mixed signals formed by the superposition of different modulated signals are affected by the unique propagation characteristics of long-wave channels. They not only have strong coupling issues in the time, frequency, and modulation domains but also suffer from signal waveform distortion due to channel fading and noise superposition, making them difficult to directly adapt to the input format of deep learning. Meanwhile, traditional blind source separation algorithms (e.g., Independent Component Analysis, ICA) have severely limited separation and recognition performance in typical long-wave communication scenarios with low signal-to-noise ratio (SNR) and high signal correlation caused by multipath interference. To address this problem, this paper proposes a "Modulation Probability-Guided Joint Framework for Blind Source Separation and Deep Recognition": it first performs initial modulation recognition on mixed signals using a pre-trained deep neural network to output the probability distribution of each component, introduces this probability into the ICA iteration process, optimizes the separation effect by combining the characteristics of long-wave channels, then improves accuracy through secondary recognition and feeds back the results to form a closed-loop adaptive mechanism. This paper adopts a dataset composed of simulated data and measured data to verify the system, where the measured data is collected through a dedicated hardware platform to ensure the authenticity and reliability of the experiments. Experimental results show that the framework effectively solves the adaptation problem between signals and deep learning, exhibits excellent performance in dense long-wave communication and complex interference scenarios, and has significant engineering application value. |
| **QD859**<br>**16:19-16:26** | **Title:** MIGformer: A Multivariate Time Series Forecasting Model Based on Multi-scale Interaction and Gating Mechanism<br>**Authors:** Zeyu Hu, Yuan Jia, Zhenhong Jia and Wu Le<br>**Presenter:** Zeyu Hu, Xinjiang University, China<br><br>**Abstract:** Multivariate time series forecasting faces significant challenges due to non-stationarity, complex variable correlations, and multi-scale noise. Recently, the Inverted Transformer has achieved outstanding performance; however, it still exhibits limitations in multi-scale feature fusion and modeling local variable interactions. To address these issues, this paper proposes a novel model named MIGformer, which incorporates three core components. First, the Multi-scale Temporal Refinement Module utilizes a pyramid decomposition-fusion strategy and a temporal attention mechanism to refine multi-scale features while explicitly suppressing noise. Second, the Patch-level Channel Enhancement Module leverages Multilayer Perceptrons and channel attention to capture intra-patch interactions, thereby enhancing local contextual semantics. Finally, the Multi-View Gating |

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| | Mecha nism integrates linear, convolutional, and pooling perspectives to generate gating masks for dynamic feature calibration. Exper imental results on multiple standard datasets demonstrate that MIGformer achieves superior forecasting accuracy, reducing the Mean Squared Error by an average of 5.36% compared to the backbone model iTransformer, verifying its robustness in complex multivariate scenarios. |
| **QD917**<br>**16:26-16:33** | **Title:** SDAF: An Anti-Forgetting Federated Learning Framework for Anomaly Traffic Detection<br>**Authors:** Xiaotong Qu, Panpan Geng, and Xiaodong Wang<br>**Presenter:** Haolong Yuan, Ocean University of China, China<br><br>**Abstract:** With the advancement of informatization, network infrastructures in critical domains face escalating cyber threats, making anomaly detection pivotal for security. Deep learning-based anomaly traffic detection suffers from privacy leakage and data silos due to reliance on centralized datasets, limiting deployment in distributed environments. Federated learning (FL) offers a privacy-preserving alternative but is plagued by client data heterogeneity, unstable convergence, and catastrophic forgetting. To address these issues, this study proposes SDAF, a privacy-preserving FL-based anomaly detection framework. It integrates causal learning into an Enforced Causal Inference Variational Autoencoder (ECI-VAE) for causality-based feature modeling, enhancing interpretability and robustness. A local self-distillation module TGS mitigates knowledge forgetting via soft-label knowledge transfer. Experiments on NSL-KDD and UNSW-NB15 datasets show SDAF outperforms state-of-the-art methods, achieving 3.9% and 5.8% average accuracy improvements under IID and Non-IID settings, respectively. This validates its effectiveness and potential for real-world distributed deployments like smart manufacturing and IoT. |
| **QD1004**<br><br>**16:33-16:40** | **Title:** Signal Enhancement for Energy Efficient Wireless Communication in Edge Scenarios<br>**Authors:** Yongkang Wang, Zhe Sun, Yunzhi Mao, Zhenting Qiu, Xiandeng He, Yunhui Yi<br>**Presenter:** Yongkang Wang, Xidian University, China<br><br>**Abstract:** Signal enhancement in wide-area and long-range Internet of Things (IoT) communications is a challenging task when weak signals are corrupted by the superposition of impulsive atmospheric noise and Gaussian thermal noise. In such environments, the desired signal is often deeply buried in noise, leading to severe degradation in demodulation performance. This paper proposes a signal enhancement framework for Minimum Shift Keying (MSK) signals that integrates stochastic resonance (SR) and blind source separation (BSS). In the proposed framework, SR is employed as a nonlinear front-end mechanism to exploit the effect of noise, enabling weak MSK signals to be enhanced through noise-induced state transitions. Subsequently, BSS is applied to separate the desired signal from residual noise by exploiting the statistical contrast between MSK signal and noise components. The proposed method operates as a receiver front-end preprocessing module and remains compatible with conventional MSK demodulators. Simulation results indicate that, under the composite noise environment consisting of impulsive atmospheric noise and Gaussian thermal noise, the proposed approach consistently reduces the bit error rate, confirming its effectiveness for weak-signal enhancement in practical non-Gaussian noise scenarios. |
| **QD904**<br><br>**16:40-16:47** | **Title:** Multi-Targets Passive Localization via Dynamic Collaboration of Detector Array<br>**Authors:** Jian-Jun TU, Ding MA<br>**Presenter:** Ding MA, Shanghai Institute of Technical Physics of the Chinese Academy of Sciences, China<br><br>**Abstract:** To address the data association challenge in passive multi-target localization and |

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| | overcome the limitations of existing methods regarding prior information, operating frequency bands, and signal characteristics, a passive localization scheme for multiple radiation sources using dynamic detection arrays is proposed, which is based on the Generalized Cross-Correlation with Phase Trans-form (GCC-PHAT) algorithm and Inverse Delay-Interval Region (IDIR) theory. The core innovations include: (1) a method for generating dynamic partitions from dynamic arrays; (2) a dynamic sensitivity indicator for radiation sources crossing partition boundaries. Simulation localization of multiple radiation sources was conducted in a 2 km × 2 km two-dimensional space. The results show that when the cross-partition dynamic sensitivity indicator reaches its maximum value, credible localization results are obtained. This scheme is suitable for multi-target scenarios involving large-range and long-distance conditions, providing a new technical approach for long-distance target search and perception. |
| **QD926**<br><br>**16:47-16:54** | **Title:** AI-Enabled Wind Pressure Prediction for Smart Building Envelopes: A Bayesian Optimized LSTM Approach for Intelligent Cladding Design<br>**Authors:** Tao Ye, Kwok L. Chung, Xin-Hua Zhao<br>**Presenter:** Tao Ye, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Obtaining detailed building surface wind pressure data from limited wind tunnel tests is crucial for accurate cladding wind pressure and structural wind-induced response calculation while saving test costs. This paper proposes a Long Short-Term Memory (LSTM) neural network combined with Bayesian optimization (BO-LSTM) to predict building surface wind pressure coefficients and wind-induced pressure time series. A rigid high-rise building model was tested in a boundary layer wind tunnel for simultaneous pressure measurement, and partial test data were used to train the LSTM and BO-LSTM models. Comparison results show that the BO-LSTM method can accurately and efficiently predict the wind pressure time series of high-rise building surfaces using pressure data from a certain number of pressures taps in wind tunnel tests. |

## Online Oral Session 1 - AI-Driven Wireless Transmission and Intelligent Signal Processing for 6G and Beyond

**Time:** 9:30-11:55 (GMT+8, Beijing Time)
**Date: Sunday, April 12**
**Zoom Link:** https://us02web.zoom.us/j/84983204262
**Zoom ID:** 849 8320 4262
**Password:** 041012
**Chaired by:** Assoc. Prof. Xianbin Xie, West Anhui University, China

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| **Invited Speech**<br><br>**(QD928-A)**<br><br>**9:30-9:50** | **Speech Title:** Non-Terrestrial Networking: Evolution, Opportunities, and Future Directions<br>**Invited Speaker:** Lecturer Feng Wang, Singapore University of Technology and Design (SUTD), Singapore<br><br>**Abstract:** Non-terrestrial networks (NTNs), especially large-scale multi-layer satellite constellations, pose fundamental challenges for mobility management due to their dynamic multi-coverage and frequent handovers (HOs). Conventional snapshot-based mobility methods make slot-by-slot HO and link-switching decisions, which often results in locally optimal but globally suboptimal HO trajectories, leading to unstable satellite services and degraded user experience. To overcome these limitations, we propose a graph-based mobility learning framework that models all feasible HO opportunities as a graph, enabling global HO planning rather than repeated local decisions. To further enhance decision quality, we employ a modified graph attention network to assign adaptive edge weights in graph, prioritizing HO options with higher link capacity and longer service duration, facilitating globally optimal HO sequence planning. This talk will introduce the key characteristics of NTNs, mobility challenges, and research approaches integrating AI. |
| **Invited Speech**<br><br>**(QD902-A)**<br><br>**09:50-10:10** | **Speech Title:** Spaceborne Reconfigurable Intelligent Surface-Enabled Reflective Communications: Modeling and Performance<br>**Invited Speaker:** Lecturer Ruihong Jiang, Beijing University of Posts and Telecommunications, China<br><br>**Abstract:** As satellite networks evolve toward 6G integration, Reconfigurable Intelligent Surface (RIS)-enabled spaceborne reflective communication has emerged as a transformative paradigm to enhance coverage and energy efficiency through intelligent, passive signal reflection from orbit. This talk explores the theoretical foundations and performance benchmarks of such systems. We begin by establishing a robust channel model tailored to the unique orbital dynamics and atmospheric propagation constraints of space-to-ground links. Based on this, we derive closed-form outage probability expressions and characterize fundamental performance limits for multi-user scenarios under random channel realizations. Furthermore, we address practical implementation challenges, particularly performance degradation under imperfect channel state information, and discuss how AI-driven channel prediction can mitigate these effects. We also outline emerging opportunities in multi-satellite cooperative RIS networks as a key direction for future research. This session aims to provide a comprehensive roadmap for deploying RIS in next-generation satellite constellations. |
| **QD1015**<br><br>**10:10-10:25** | **Title:** DNS and DHCP Redesign for Reliability and Scalability<br>**Authors:** John Lenard Julio Bernal, William Penaflor Rey<br>**Presenter:** John Lenard Julio Bernal, Mapúa University, Philippines<br><br>**Abstract:** Reliable operation of Domain Name System (DNS) and Dynamic Host Configuration Protocol (DHCP) services are essential for maintaining connectivity in modern campus networks. As network usage intensifies and the number of mobile endpoints |

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| | continues to grow, traditional service deployments often struggle with operational reliability, scalability, and administrative overhead. This paper, titled "DNS and DHCP Redesign for Reliability and Scalability," presents a structured approach to improving core network services through coordinated redesign and established operational practices. The study reviews recent DNS and DHCP research to examine recurring issues related to service disruption, security exposure, and performance degradation in highly dynamic environments. To assess these challenges, a campus network scenario was simulated using Cisco Packet Tracer, focusing on redundancy design, IP address allocation behavior, and name resolution efficiency under varying traffic conditions. The simulation results show improved service continuity, fewer configuration-induced failures, and more consistent address management compared with conventional centralized deployments. These results indicate that an integrated redesign of DNS and DHCP can strengthen network stability while supporting long-term scalability. The proposed approach offers practical guidance for network administrators and academic institutions seeking resilient and manageable network service architecture. |
| **QD1003-A**<br><br>**10:25-10:40** | **Title:** Intelligent Hybrid Multipath Routing Protocol for Congestion and Black Hole Attack Mitigation in Mobile Ad-hoc Networks<br>**Authors:** Misgana Merga Iticha, Nega Firdissa Huluka, Soressa Beyene Lemu<br>**Presenter:** Misgana Merga Iticha, Wollega University, Nekemte, Ethiopia<br><br>**Abstract:** Mobile Ad-hoc Networks (MANETs) are decentralized, self-organizing wireless networks that operate without fixed infrastructure. Despite their flexibility, they are highly susceptible to congestion and black hole attacks, which significantly degrade throughput, packet delivery ratio (PDR), and overall Quality of Service (QoS). This paper introduces an enhanced hybrid routing protocol Black Hole and Congestion Overcome AOMDV (IH-AOMDV) as an optimized extension of the Ad-hoc On-Demand Multipath Distance Vector (AOMDV) protocol. The proposed approach integrates congestion awareness and security mechanisms by combining throughput-based congestion detection with sequence-number-based route validation to identify and isolate congested and malicious nodes in real time. Simulation experiments conducted in NS2.35 across a 1000×1000 m network with 15–35 nodes demonstrate that IH-AOMDV achieves up to 90–100% throughput, improves the packet delivery ratio by 35%, reduces end-to-end delay by 45%, and decreases packet loss by approximately 40% compared to standard AOMDV. The results confirm the robustness, scalability, and adaptability of IH-AOMDV, establishing it as a reliable routing framework for secure and congestion-free MANET communication in dynamic environments such as military, vehicular, and disaster response networks. |
| **QD802**<br><br>**10:40-10:55** | **Title:** An Edge-Assisted Real Time Localization Framework for Underground Pipeline Monitoring Based on GNSS-RFID Data Fusion<br>**Authors:** Zhihui Zhang, Da Li, Ling Huang, Yongtao Zhu, Fei Du, Huangyi Yan, Zhangqin Huang<br>**Presenter:** Zhihui Zhang, Beijing University of Technology, China<br><br>**Abstract:** Accurate and real-time localization of underground pipelines is becoming increasingly important for intelligent infrastructure systems in edge-enabled Internet-of-Things (IoT) contexts. Traditional methods such as ground-penetrating radar (GPR) and distributed fiber-optic sensing often incur complex deployment, high cost, and degraded performance in dynamic underground environments. To address these limitations, this paper introduces an edge-enabled Real-Time Localization Inversion (RTLI) model, which fuses mobile Global Navigation Satellite System (GNSS) positioning with low-frequency passive Radio Frequency Identification (RFID) sensing in a distributed sensor network framework. |

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| | The system integrates RFID tags and a handheld GNSS reader to perform in-site data acquisition, and then executes local processing and ellipsoidal boundary fitting on an edge terminal to minimize latency and support scalable deployment. A hybrid star-shaped scanning and three-stage vertical lifting sampling strategy is adopted to collect boundary point clouds; these are processed by Singular Value Decomposition(SVD) and iterative optimization to reconstruct a 3D sensing region. The fitted model enables localized displacement monitoring and visualization via an Android edge interface with sub-2-second response time, centimeter-level positioning accuracy, and RFID recognition rates above 95%. |
| **QD921**<br><br>**10:55-11:10** | **Title:** Transport Protocol Switching Mechanism for Throughput Optimization in Ad Hoc Networks<br>**Authors:** Yizhen Pan, Xin Xu, Liangdong Wei, Jun Cai<br>**Presenter:** Yizhen PAN, Army Engineering University, China<br><br>**Abstract:** Ad Hoc networks face significant challenges for reliable data transport due to limited spectral resources and dynamic channel conditions. This paper investigates the throughput performance of four reliable transport protocols—TCP, SCTP, UDT, and Mockets—under varying packet loss conditions in wireless environments. Experimental results demonstrate that while TCP and SCTP perform well under low-loss conditions (<2%), the middleware-based Mockets protocol significantly outperforms the other three protocols in high-loss environments (>3%). Based on these findings, we propose a protocol switching mechanism using a 2% packet loss threshold. Experimental evaluations show that this mechanism achieves 34MB total data transfer within a 6 -second window, outperforming standalone TCP (1 MB) and Mockets (24MB), thereby enhancing overall network throughput. |
| **QD1002**<br><br>**11:10-11:25** | **Title:** Modeling the Impact of Wi-Fi 6 Beamforming on User and Bystander EMF Exposure<br>**Authors:** Christos Apostolidis, Theodoros Samaras<br>**Presenter:** Christos Apostolidis, Aristotle University of Thessaloniki, Greece<br><br>**Abstract:** This study investigates the impact of beamforming on electromagnetic field (EMF) exposure generated by a Wi-Fi 6 (IEEE 802.11ax) Access Point (AP) operating in an indoor work environment. A detailed numerical model of a laboratory was developed, incorporating the geometry, materials, and antenna configuration of a real MIMO AP. The propagation channel was simulated in MATLAB using a deterministic ray-tracing approach based on the Shooting and Bouncing Rays (SBR) technique, including reflection and diffraction effects. Beamforming was modeled through the Maximum Ratio Transmission (MRT) precoding scheme to emulate the adaptive steering of the radiation pattern toward an active user. The incident electric field was computed for multiple receiver locations representing both users and bystanders under static and beam-steering conditions. Results show that beamforming increases user exposure by up to 12 dB (median) compared with the static radiation pattern, while bystander exposure exhibits mixed behavior depending on spatial position. The seemingly counter-intuitive increase in bystander exposure at certain locations arises from the AP's radiation pattern, which produces several beams of comparable gain rather than a single highly directive lobe, resulting in energy radiated toward off-axis directions. Overall, beamforming tends to smooth exposure variations across the workspace while improving transmission efficiency. |
| **QD1009**<br><br>**11:25-11:40** | **Title:** An Improved Network System Security Architecture Based on IoT<br>**Author:** Shiliang Luo<br>**Presenter:** Shiliang Luo, Huizhou University, China |

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| | **Abstract:** The object is to research the Internet of things safety system method. So it is designed to match the safety system. Firstly a multi-layer detection scheme is proposed. Then the Internet of Things risk system is designed in order to monitor the system reliably. And the sensor nodes with flexible structure and strong versatility are deployed. Finally a lot of simulation experiment is done to evaluate the performances. It is showed that the proposed system structure is effective and safe. And it meets the performance requirements. |
| **QD912**<br><br>**11:40-11:55** | **Title:** GAMING: A Green Computing Framework for Deploying LLM at the Edge.<br>**Authors:** Fatima Rani, Soham Saha, Pit Hofmann, Juan A. Cabrera, Frank H., P Fitzek,<br>**Presenter:** Fatima Rani, TUD Dresden University of Technology, Germany<br><br>**Abstract:** In the evolving Industry 5.0 revolution, combining Artificial Intelligence of Things (AIoT) with edge computing represents a significant step forward in innovation and communication efficiency. Conversely, Large Language Models (LLMs) have demonstrated strong capabilities by enabling diverse applications and improving human–AI interaction, thereby advancing Artificial Intelligence (AI) with broad societal impact. However, the current cloud-based LLM deployments are constrained by network latency, resource contention, throughput limits, and privacy constraints, while on-device LLM deployments are hindered by the limited capabilities of end devices, which often make local deployment impractical. To address these issues, this paper introduces GAMING : enerGy Aware LLMs Inference beNchmarkinG, a preliminary design of an energy-aware approach for constructing an edge AI framework utilizing the contemporary Large Language Models Operations (LLMOps) concept with edge intelligence. The proposed framework integrates a multi-stage pipeline architecture encompassing: 1) a data pipeline, 2) an LLMs inference pipeline, and 3) a deployment pipeline, enabling comprehensive and reproducible energy profiling across heterogeneous edge hardware configurations. Additionally, by consolidating energy consumption metrics across these interdependent pipeline stages, GAMING facilitates a structured benchmarking methodology that quantifies the computational and energy trade-offs of deploying state-of-the-art LLMs inference on edge devices. To evaluate inference efficiency under real-world deployment conditions, this work benchmarks nine quantized LLM variants across a comprehensive suite of energy-aware performance metrics such as latency statistics (mean, 50th percentile (P50), and 95th percentile (P95)), throughput, inference speed, and hardware resource utilization spanning CPU load, GPU utilization, and RAM consumption. Furthermore, the carbon footprint (CO2 emissions) is incorporated as an environmental sustainability metric, providing a holistic characterization of the energy-performance trade-offs associated with on-device LLMs inference. Thus, the findings of this work aim to establish a foundational reference for energy-aware LLMs deployment strategies, contributing to the broader pursuit of sustainable and efficient on-device AI inference in resource-constrained environments. |

## Online Oral Session 2 - Intelligent Image Processing and Multimedia Communication Technologies

**Time:** 14:00-15:45 (GMT+8, Beijing Time)
**Date: Sunday, April 12**
**Zoom Link:** https://us02web.zoom.us/j/84983204262
**Zoom ID:** 849 8320 4262
**Password:** 041012
**Chaired by:** TBA

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| **QD853**<br>**14:00-14:15** | **Title:** LCSA-DJSCC: Low-storage-complexity CR/SNR Adaptive DeepJSCC model for Wireless Image Transmission<br>**Authors:** Haoyu Wang, Sanya Liu, and Jiangli Zeng<br>**Presenter:** Haoyu Wang, Huaqiao University Xiamen, China<br><br>**Abstract:** Recent research has demonstrated that deep learning-based joint source-channel coding (DeepJSCC) exhibits excellent data compression and noise resilience. However, ex isting DeepJSCC models enabling dual-adaptive transmission for varying compression ratios (CR) and channel signal-to noise ratios (SNR) still fail to achieve an optimal balance between performance and complexity. This paper proposes a low storage complexity wireless image transmission scheme based on deep learning joint source-channel coding with both CR and SNR adaptability, termed the LCSA-DJSCC. Firstly, the scheme employs a deep neural network (DNN) model integrated with an attention mechanism to realize adaptive high-quality image feature extraction. Secondly, we treat CR and SNR as channel information shared by the encoder and decoder, feeding them into the attention module. The attention module calibrates channel features according to different CR and SNR values, thereby effectively learning rational channel bandwidth utilization strategies. Finally, the proposed model is trained with diverse CR and SNR configurations to achieve multi-target CR and multi-target SNR transmission. Experimental results indicate that the proposed model not only achieves peak signal-to-noise ratio (PSNR) performance comparable to that of state-of-the-art models specifically trained for single-target CR but also enables dual adaptability to both CR and SNR via a single network. Compared with other recent dual-adaptive models, its parameter count is reduced by 34.77% to 42.58%, which effectively lowers the model storage complexity and significantly reduces training and deployment costs. Additionally, the model supports a wide range of CR selections, demonstrating superior versatility and providing a feasible solution to alleviate the storage bottleneck of DeepJSCC models. |
| **QD854**<br>**14:15-14:30** | **Title:** Latency-Budgeted Terminal–Edge Collaborative Video Analytics with Adaptive Masking and Content-Aware Encoding<br>**Authors:** Lixin Jin, Kangli Zhao, Penglin Dai, Xincao Xu<br>**Presenter:** Lixin Jin, Southwest Jiaotong University, China<br><br>**Abstract:** Real-time edge video analytics is critical for latency-sensitive applications but remains challenging under dynamic video content and fluctuating wireless bandwidth. Existing terminal–edge collaborative systems often rely on static offloading, fragile Region of Interest (RoI) extraction, or coarse-grained compression, leading to unstable latency or inefficient bandwidth usage. This paper proposes SCORE, an adaptive terminal–edge collaborative framework built on a batch-based processing model. SCORE integrates three tightly coupled modules: a Latency-Aware Keyframe Scheduler that dynamically selects keyframes under strict latency budgets, a Adaptive Foreground Masker that adaptively refines RoI extraction based on detection feedback, and a Joint Resolution–Quality Optimizer that jointly optimizes spatial resolution and encoding quality for RoI transmission. Experiments on a real hardware testbed with traffic surveillance datasets show that SCORE achieves up to |

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| | 2.8× higher throughput than state-of-the-art methods while maintaining comparable detection accuracy and significantly reducing bandwidth consumption. |
| **QD923**<br>**14:30-14:45** | **Title:** Experimental Study on Public Warning Information Broadcast Based on BeiDou System<br>**Author:** Qiang Chai,<br>**Presenter:** Qiang Chai, Beijing Institute of Telemetry Technology, China<br><br>**Abstract:** For the people's livelihood demand of disseminating early warning information through BDS (BeiDou navigation satellite system) navigation messages, this paper proposes a scheme to broadcast early warning information by using B2b-PPP signal of Beidou Geo Satellite, without changing the design of the BDS satellites. Based on the ground test and verification bed for BeiDou navigation satellite system, we have completed multi-scene tests for the technical scheme, with using B2b-PPP to broadcast earthquake public early warning information. The technical parameters, such as the capacity and timeliness of broadcasting early warning information, are verified. Those provide a technical reference for the promotion and application of the BDS in the national earthquake prevention and disaster reduction. |
| **QD848**<br><br>**14:45-15:00** | **Title:** CrossDrone: Adaptive Cross-View Collaboration for Edge-Assisted Drone Video Analytics<br>**Authors:** Zilong Wu, Kangli Zhao, Penglin Dai<br>**Presenter:** ZilongWu, Southwest Jiaotong University, China<br><br>**Abstract:** The rapid proliferation of Unmanned Aerial Vehicles (UAVs), or drones, has enabled flexible and dynamic video analytics, yet processing video data on resource-constrained edge devices remains challenging. Existing approaches, including Detection-Based Tracking (DBT) and conventional multi-camera collaboration frameworks, are inadequate for multi-UAV scenarios. DBT performs server-side detection only at key frames and relies on lightweight on-device tracking for the remaining frames, but its accuracy degrades over time due to tracking drift. Meanwhile, traditional multi-camera collaboration depends on static cross-view geometric mappings that become invalid under continuous UAV motion. To address these limitations, we propose CrossDrone, an adaptive cross-view collaboration framework for edge-assisted drone video analytics built upon the DBT paradigm. CrossDrone introduces two key components: (1) a Cross-Drone Collaboration (CDC) module that leverages lightweight optical flow to maintain a Dynamic Mapping Model (DMM), enabling UAVs to exchange tracking cues and correct drift in real time without repeated feature extraction; and (2) an Adaptive Joint Offloading Policy that dynamically determines offloading strategies based on tracking stability, balancing detection accuracy and end-to-end latency. Experimental results show that CrossDrone reduces end-to-end latency by 71.5% compared with full-frame offloading and achieves over an order-of-magnitude improvement in accuracy over static multi-camera collaborative baselines. |
| **QD875**<br><br>**15:00-15:15** | **Title:** Human Pose Estimation and Skeleton-Based Action Recognition: A Systematic Review of 2D/3D Deep Learning Approaches<br>**Authors:** Kudratjon Zohirov, Feruz Ruziboev, Sardor Boykobilov, Mirjakhon Temirov, Kamoliddin Ablakulov, Elbek Jabborov<br>**Presenter:** Feruz Ruziboev, Department of Convergence of Digital Technologies Tashkent University of Information Technologies Tashkent, Uzbekistan<br><br>**Abstract:** This paper presents a systematic review of state-of-the-art 2D and 3D deep learning (DL) approaches used in the fields of Human Pose Estimation (HPE) and Skeleton-Based |

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| | Action Recognition (SBAR). The study is conducted following the SALSA methodology, analyzing works published in leading scientific databases. Within the scope of the review, approaches for detecting human joint keypoints from static images and video sequences, reconstructing skeletal structures, and modeling actions in spatial and spatiotemporal domains are comparatively analyzed. The paper examines the architectural characteristics of 2D and 3D HPE models, occlusion challenges in multi-person scenes, real-time performance requirements, and the feasibility of deploying models on embedded devices. In addition, the main spatial, spatiotemporal, and graph-based features used in SBAR systems are summarized, along with their impact on computational complexity and energy efficiency. Model performance is analyzed using evaluation metrics such as Mean Per Joint Position Error (MPJPE), Average Precision (AP), Root Mean Square Error (RMSE), Pearson correlation, and other evaluation criteria. The analysis indicates that skeleton-based approaches provide robust and adaptable solutions for real-time and resource-constrained systems; however, selecting optimal models and features requires balancing accuracy, computational complexity, and energy efficiency. This paper identifies promising architectures, feature representations, and hardware-aware optimization strategies for the practical deployment of HPE and SBAR systems in real-world environments. |
| **QD866**<br><br>**15:15-15:30** | **Title:** Color Beyond Vision: Multi-Color Dual-Domain Fusion for Robust Deepfake Detection<br>**Authors:** Lihui Wang, Xiaofen Wang, Ke Zhang<br>**Presenter:** Lihui Wang, University of Electronic Science and Technology of China, China<br><br>**Abstract:** With the rapid progress of generative models, realistic deepfakes are increasingly pervasive and pose growing risks to media trust and security. Deepfake detectors often excel in- domain yet fail to transfer under dataset and manipulation shifts, suggesting that the exploited forensic cues are brittle. We study frame-level deepfake detection on face-cropped frames and propose MCDDF-Net, a multi-color dual-domain fusion network that learns to adaptively prioritize the most reliable cues per input. MCDDF-Net first projects RGB into a six-channel perceptual representation by concatenating HCT and OKLAB, and derives compact DCT low-frequency features for frequency analysis. It then extracts complementary evidence with a gradient-enhanced spatial branch and a self-attention frequency branch, and fuses them via a gated unit that produces spatially varying weights between domains. Experiments on FaceForensics++, Celeb-DF v2, and DFDC-Preview show strong transfer without fine-tuning when trained on FF++, achieving 93.68% AUC on Celeb-DF v2 and 81.54% AUC on DFDC-Preview, while maintaining competitive in-domain performance. |
| **QD899**<br><br>**15:30-15:45** | **Title:** Markerless Craniofacial Repair Surgery Navigation Method Based on Depth Vision and Projection Mapping<br>**Authors:** Yuze She, Jingqi Li, Qiushi Dai, Guo Chen<br>**Presenter:** Yuze She, Beijing University of Posts and Telecommunications, China<br><br>**Abstract:** This paper presents a markerless navigation method for craniofacial repair surgery based on depth vision and projection mapping. The method acquires multi-view depth images of a skull phantom. These images are combined with static scanning and offline registration to generate a high-precision point cloud. A coarse-to-fine registration strategy is employed. It uses the Iterative Closest Point (ICP) algorithm to precisely align the point cloud with the preoperative CT-derived 3D model. A camera and a projector are jointly calibrated. Then, the surgical cutting boundaries are projected as a 2D image onto the physical skull surface. This creates an intuitive visual guide for the operative region. This technique offers a novel intraoperative guidance scheme for craniofacial repair surgery. It demonstrates significant advantages in intuitiveness and operational simplicity. Thus, it provides a reference for the advancement of precision in craniofacial surgery. |

## Online Oral Session 3 - Modern Electronics and Information Systems

**Time:** 16:00-18:20 (GMT+8, Beijing Time)
**Date: Sunday, April 12**
**Zoom Link:** https://us02web.zoom.us/j/84983204262
**Zoom ID:** 849 8320 4262
**Password:** 041012
**Chaired by: TBA**

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| **Invited Speech**<br><br>**(QD913-A)**<br><br>**16:00-16:20** | **Speech Title:** Computational Intelligence in Healthcare: Navigating hope vs hype in China<br>**Invited Speaker:** Assoc. Prof. Azhar Imran, Beijing University of Technology, China<br><br>**Abstract:** Computational Intelligence (CI) has emerged as a transformative force in healthcare, promising unprecedented advances in diagnosis, treatment, and personalized medicine. Techniques such as machine learning, deep learning, natural language processing, and evolutionary algorithms are redefining how clinicians interpret medical data and make decisions. However, alongside the optimism lies considerable hype exaggerated claims, ethical concerns, data biases, and limited clinical validation that often hinder real-world impact. This speech, Computational Intelligence in Healthcare: Hope vs. Hype, explores the fine balance between technological promise and practical limitations. It highlights success stories in predictive diagnostics, drug discovery, and medical imaging while critically addressing challenges related to data quality, model interpretability, regulatory compliance, and patient trust. The discussion aims to separate genuine innovation from inflated expectations, urging researchers and policymakers to adopt a responsible, evidence-driven approach to integrating CI into healthcare systems. Ultimately, the talk emphasizes that the true hope of computational intelligence lies not in replacing clinicians but in empowering them through transparent, ethical, and human-centered AI. |
| **QD829**<br><br>**16:20-16:35** | **Title:** High-Frequency SPWM Inverter: Real-Time 10 ms IGBT & DC-Link Fault Isolation<br>**Authors:** Xinzheng Jiang, Hekun Jiang,<br>**Presenter:** Xinzheng Jiang, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Conventional AC variable-frequency drives (VFDs) suffer from limited reliability and poor fault diagnosis under harsh operating conditions. We present a high-frequency sinusoidal PWM (SPWM) VFD that embeds real-time, self-diagnostic capability. A 20 kHz carrier, implemented on a high-performance digital signal processor, yields low-loss, low-noise output waveforms. Simultaneously, an on-board diagnostic engine continuously samples dc-link voltage, phase currents, IGBT temperature and gate-drive signals. Sliding-window filtering, FFT and wavelet-packet analysis extract fault-specific features; threshold and pattern-recognition algorithms then classify and locate overcurrent, over-/under-voltage, IGBT open/short circuits and dc-link capacitor ageing within 10 ms on average. False-alarm rates remain below 2 %. Simulations and experiments confirm wide speed range, fast dynamic response and accurate fault isolation, offering a practical route to highly reliable, maintainable VFDs. |
| **QD825**<br><br>**16:35-16:50** | **Title:** A Time-Aware Neural Collaborative Filtering Framework with Hybrid Feedback for Micro-Course Recommendation<br>**Author:** Xu Zhao<br>**Presenter:** Xu Zhao, Dalian Neusoft University of Information, China<br><br>**Abstract:** With the rapid development of online education, the explosive growth of micro-course resources has led to severe "information overload," which poses a significant challenge for intelligent information processing systems in online learning environments. Traditional collaborative filtering algorithms often rely on sparse explicit ratings or static user profiles, |

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| | failing to capture the non-linear dynamic evolution of user interests over time. To address these challenges, this paper proposes a Time-Aware Neural Collaborative Filtering framework with Hybrid Feedback (TNAR-HF). First, we construct a hybrid feedback mechanism based on a weighted fusion strategy, combining users' explicit ratings with implicit confidence derived from video completion rates. This effectively alleviates data sparsity and the subjectivity of single-source evaluation. Second, we introduce a time-aware attention network that explicitly encodes interaction time intervals into attention weights, enabling adaptive modeling of both short-term and long-term user interests. Finally, a Multilayer Perceptron (MLP) is utilized to model high-dimensional non-linear interactions between users and micro-courses. Experimental results on a real-world Uni-MicroRec dataset demonstrate that TNAR-HF significantly outperforms traditional methods, achieving superior performance in terms of HR@1 and NDCG@1, thereby validating its effectiveness in enhancing the precision of personalized recommendations. |
| **QD811**<br><br>**16:50-17:05** | **Title:** Research Status and Development Trends of Multi-Sensor Data Fusion Technology in Robotics<br>**Authors:** Zhenkang Ye, Xin Li<br>**Presenter:** Zhenkang Ye, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** Multi-sensor data fusion technology effectively addresses issues such as low perception accuracy and poor robustness of single sensors by integrating information from heterogeneous sensors mounted on robots. It has become a key enabler for enhancing core robotic capabilities including environmental perception, localization and navigation, and task execution. This paper systematically reviews its current research applications across diverse robotics domains—including hazardous chemical warehouse patrol robots, pipeline inspection robots, and firefighting robots—by examining three core implementation approaches: pixel-level fusion, feature-level fusion, and decision-level fusion. It provides an in-depth analysis of the technical characteristics and applicable scenarios for each fusion method. Building upon existing research, this paper projects future development trends across three dimensions-algorithm optimization, hardware adaptation, and cross-scenario adaptation-to provide insights for further innovative applications of multi-sensor data fusion technology in robotics. |
| **QD849**<br><br>**17:05-17:20** | **Title:** Time-Sensitive Target Group Intention Prediction Based on Lightweight Random Forest<br>**Authors:** Jiayu Luo, Fuming Li, Yifan Zhang, Bingyan Liu, Yuxiang Shen, Cheng Wang and Ke Zhang<br>**Presenter:** Jiayu Luo, University of Electronic Science and Technology of China, China<br><br>**Abstract:** In the field of group intention prediction, faced with increasingly complex, agile and adversarial battlefield envi- ronment, recognition methods based on manual experience and cognitive ability lack timeliness, accuracy and objectivity. In this paper, the Lightweight Random Forest (LWRF) model is used to realize the technical task autonomy of a battle group based on target state, target threat and group target components. Target clustering, group formation recognition, group threat calculation and the LWRF classification model are used to determine the tactical mission of the enemy battle group target. Through data simulation of the relevant parameters, the overall accuracy of intention prediction can reach 99.73%, demonstrating effective prediction performance. |

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| **QD890**<br><br>**17:20-17:35** | **Title:** Context-Aware Slot Refinement with Diffusion Language Models<br>**Authors:** Xinfang Wang, Qiuyun Wu, Siqi Yang, Jia Chen, Yili Li<br>**Presenter:** Siqi Yang, University of Electronic Science and Technology of China, China<br><br>**Abstract:** Task-oriented QA assistants rely on slot filling to convert an utterance into executable arguments such as time, location, and entity names. In practice, failures are often caused by small corruptions in a few fragile slot spans (e.g., dates/times, numbers, and proper names), where even a single character error can break execution. Robust slot correction is non-trivial: stronger taggers do not explicitly target these high-impact spans, while full-utterance rewriting risks semantic drift. We propose a context-aware slot refinement framework that performs targeted, controllable correction with a diffusion language model (DLM). Given coarse slot spans from a baseline tagger, the DLM iteratively denoises only the detected slot regions and preserves the remaining tokens; a lightweight gating module further narrows edits to truly error-prone positions. The refined output is then re-tagged or used for conservative value replacement, requiring no additional annotation. Experiments on SLURP under clean and slot-span perturbations show consistent gains in slot quality and strict frame correctness, improving executability without whole-sentence drift. |
| **QD920**<br><br>**17:35-17:50** | **Title:** ColdFusionX: Multi-Modal Fusion via Aligned Latent Manifolds and Stochastic Masking for Zero-Shot CTR<br>**Authors:** Sharm Fernando, Nethmi Wijesinghe<br>**Presenter:** Sharm Johan Ashley Fernando, Informatics Institute of Technology, Sri Lanka<br><br>**Abstract:** Click-Through Rate (CTR) prediction is a foundational pillar of modern recommender systems. While collaborative ID-based embeddings excel at modeling warm-item interactions, they catastrophically fail in zero-shot, cold-start scenarios. Existing multi-modal approaches attempt to fuse textual and visual content to bridge this gap, but routinely suffer from two structural flaws: gradient starvation, where dominant ID embeddings inhibit the learning of content networks, and disjoint latent manifolds, where collaborative and semantic features reside in fundamentally incompatible vector spaces. In this paper, we propose ColdFusionX, a novel multi-modal CTR architecture engineered to explicitly solve these representational bottlenecks. First, we introduce Stop-Gradient Cosine Alignment, which forces content-based meta-embeddings to map into the established collaborative space without corrupting the mature ID representations. Second, we implement Stochastic Alpha Masking (SAM), a targeted modality dropout mechanism that randomly severs the ID-embedding dependency during training, forcing the downstream network to become highly robust to zero-shot inference. Finally, we propose a Residual Temporal FiLM module to model item temporal drift as an additive residual dynamic. Evaluated on the large-scale AntM2C dataset, ColdFusionX establishes a new state-of-the-art for cold-start CTR prediction. By systematically outperforming modern generative and meta-learning baselines, it achieves a Cold AUC of 0.8500 and an Overall AUC of 0.9250. Latent space visualizations further confirm that our alignment strategy successfully fuses previously disjoint modalities into a single, cohesive topological manifold. |
| **QD806**<br><br>**17:50-18:05** | **Title:** Research on Centrifuge Fault Diagnosis Method Based on Improved GRU<br>**Authors:** Guo Pinshuo, Li Shouzheng, Jiang Dezhi, Yu Dichao, Wang Ruyi, Fu Jiaqi<br>**Presenter:** Pinshuo Guo, Guangzhou Institute of Science and Technology, China<br><br>**Abstract:** In response to the multi-sensor time-series data generated during centrifuge operation, this study employs five deep learning models—LSTM, GRU, improved GRU, CNN1D, and Transformer—for a comprehensive comparative analysis. A dataset |

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| | comprising 5, amples was generated through simulation, incorporating eight key sensor features, including rotational speed, tri-axial vibration, temperature, pressure, current, and voltage. The samples span three operational states: normal, minor anomaly, and major anomaly. Experimental results demonstrated that the improved GRU model achieved an accuracy of 98.5% on the test set, substantially outperforming the other baseline models. Furthermore, this paper provides an in-depth analysis of model performance, training efficiency, and robustness, highlighting the effectiveness of the proposed approach for intelligent fault diagnosis in industrial centrifuges. |
| **QD925**<br><br>**18:05-18:20** | **Title:** Multi-Agent Reinforcement Learning-based Dynamic Resource Allocation for Wireless Ad Hoc Networks<br>**Authors:** Shengchun Liu, and Xingyu Zhou<br>**Presenter:** Xingyu Zhou, National Key Laboratory of Electronic Science and Technology on Communication University of Electronic Science and Technology of China, Chengdu, China<br><br>**Abstract:** In this paper we investigate intelligent dynamic transmission resource scheduling in Ad Hoc networks with Multi-Frequency Time Division Multiple Access (MF-TDMA) transmission mechanism. We design a distributed signaling interaction and resource allocation scheduling strategy based on Multi-Agent Reinforcement Learning (MARL). Through reservation and contention among nodes, this strategy achieves distributed and dynamic on-demand allocation of transmission time slot resources. Furthermore, the dynamic contention process of time slot resources in the network is modeled as a Markov Decision Process (MDP), which is solved by using MARL. On this basis, we propose an intelligent time slot scheduling algorithm based on centralized training and distributed execution to realize intelligent on-demand allocation of transmission resources in the network. Simulation results demonstrate that compared with a number of baseline algorithms, our proposed algorithm can effectively improve the transmission performance of the network. |

# Qingdao City Introduction

Qingdao, a vibrant coastal city in eastern China, is renowned for its rich cultural heritage and breathtaking natural scenery. Located along the Yellow Sea, Qingdao seamlessly blends Eastern traditions with Western influences, a legacy of its historical connections with Europe. This unique cultural fusion can be seen in its architecture, from traditional Chinese temples to charming colonial-era buildings.

Culturally, Qingdao is famous for its lively festivals and strong maritime identity. The city is home to the internationally celebrated Qingdao International Beer Festival, which attracts visitors from around the world. In addition, its deep-rooted traditions in seafood cuisine and local customs offer a vivid glimpse into coastal Chinese life.

In terms of scenery, Qingdao boasts stunning landscapes that captivate visitors year-round. The iconic Laoshan Mountain, known for its Taoist heritage, offers magnificent views of the sea and lush greenery. Along the coastline, golden beaches, clear waters, and scenic promenades such as Zhanqiao Pier create a relaxing and picturesque atmosphere. With its harmonious blend of culture and nature, Qingdao stands out as a truly remarkable destination for both exploration and inspiration.

# Memo