Conference Program

The 8th World Conference on Computing and Communication Technologies (WCCCT 2025)

Workshop

2025 12th International Conference on Wireless Communication and Sensor Networks (icWCSN 2025)

April 11-13, 2025

Shenzhen, China

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Yunhui Yi, Xidian University, China

Long Zhang, Hebei University of Engineering, China

Danyang Zheng, Southwest Jiaotong University, China

Shichang Zhong, Nanjing Electronic Device Institute, China

Francesco Zirilli, Universita di Roma La Sapienza, Italy

Welcome Message

In the ever-evolving landscape of technological advancements, Computing and Communication Technologies have been at the forefront of innovation, shaping the way we connect, work, and live. As we navigate the digital era, this dynamic field continues to revolutionize industries, bridging gaps and unlocking transformative possibilities.

We are delighted to welcome you to the 2025 8th World Conference on Computing and Communication Technologies (WCCCT 2025) and its co-located event, the 2025 12th International Conference on Wireless Communication and Sensor Networks (icWCSN 2025)**,** which will take place from April 11th to 13th in Shenzhen, China. This prestigious conference is proudly sponsored by IEEE and Shenzhen University**,** with co-sponsorship from Sichuan Normal University, Xihua University, Warsaw University of Technology, Ocean University of China, and Gannan Normal University**.**

The primary goal of this conference is to provide an international platform that not only celebrates advancements in computing and communication technologies but also fosters interdisciplinary collaboration, knowledge exchange, and discussions on emerging paradigms. Building on the success of previous WCCCT events, this year has witnessed an overwhelming number of high-quality paper submissions from both academia and industry. After a rigorous peer-review process, only the most outstanding papers have been accepted for presentation.

This year, we are privileged to host an exceptional lineup of **world-class keynote speakers**, including:

- Prof. Jiangzhou Wang (Southeast University) – IEEE Fellow, IET Fellow, International Member of the Chinese Academy of Engineering (CAE), Fellow of the Royal Academy of Engineering (RAEng)
- Prof. Min Chen (South China University of Technology) – IEEE Fellow, IET Fellow, AAIA Fellow
- Prof. Chow-Yen-Desmond Sim (Feng Chia University) – IEEE Fellow, IET Fellow
- Prof. Qingsheng Zeng (Université du Québec à Outaouais, Canada) – IEEE Senior Member

Additionally, over 20 distinguished invited speakers will share their cutting-edge insights, ensuring that attendees benefit from a wealth of knowledge and expertise. We are confident that this conference will serve as a stimulating forum for researchers, industry experts, and practitioners to engage in meaningful discussions, exchange ideas, and address challenges in the field.

As part of the program, we have also arranged a visit to Shenzhen University and the National Key Laboratory of RF Heterogeneous and Heterostructure Integration, offering delegates the opportunity to explore the rich academic history and cutting-edge research facilities of our host institution.

On behalf of the conference committees, we extend our sincere gratitude to all authors for their valuable contributions, as well as to our keynote speakers, invited speakers, session chairs, committee members, reviewers, and staff for their dedication in making this event a resounding success.

We wish every delegate a fruitful and enjoyable experience in Shenzhen and look forward to an engaging and inspiring conference.

Best Regards,

Local Organizing Chair
Prof. Botao Feng
Shenzhen University, China

General Conference Chair
Prof. Peichang Zhang
Shenzhen University, China

Conference Venue

深圳圣淘沙酒店(翡翠店) | Sentosa Hotel (Feicui)

地址： 广东省 · 深圳 · 南山区 · 金鸡路 1 号(地铁罗宝线桃园站 B 出口)

Adress: 1 Jinji Road (Jinji Lu), Nanshan District, Shenzhen, Guangdong, China

Web/网站: http://www.sentosahotelfeicui.cn/

Time Zone:

UTC/GMT+8

Average Temperature of Shenzhen in April

Average daily minimum temperature: 21℃ Average daily maximum temperature: 28℃

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.

Shenzhen Metro Mini Program (Scan to Get Shenzhen Metro Map)

深圳地铁微信小程序

Online APP

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

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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: https://www.wccct.org/kits.rar

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

Poster Template: https://www.wccct.org/kits.rar

Duration of Each Presentation

- Keynote Speech: 40 Minutes of Presentation including Q&A.
- Invited Speech: 25 Minutes of Presentation including Q&A.
- Regular Oral Presentation: 15 Minutes of Presentation including Q&A.
- Poster Presentation: 6 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 12, Saturday, 09:10-09:50, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Meeting Room: Diamond Room (4 Floor)

Prof. Jiangzhou Wang

International Member of the Chinese Academy of Engineering (CAE)

Fellow of the Royal Academy of Engineering (RAEng), U.K.

Fellow of IEEE, Fellow of IET

Southeast University, China

Speech Title: Target Localization in Cooperative ISAC Systems

Abstract: The integration of sensing capabilities into communication systems, by sharing physical resources, has a significant potential for reducing spectrum, hardware, and energy costs while inspiring innovative applications. Cooperative networks, in particular, are expected to enhance sensing services by enlarging the coverage area and enriching sensing measurements, thus improving the service availability and accuracy. This talk presents and discusses a cooperative integrated sensing and communication (ISAC) framework by leveraging information-bearing orthogonal frequency division multiplexing (OFDM) signals transmitted by access points (APs).

Bio: Jiangzhou Wang is a Professor at Southeast University, China, and Emeritus Professor at the University of Kent, U.K. He has published more than 500 papers and five books. His research interest is in mobile communications. He was a recipient of the 2024 IEEE Communications Society Fred W. Ellersick Prize and the 2022 IEEE Communications Society Leonard G. Abraham Prize. He was the Technical Program Chair of the 2019 IEEE International Conference on Communications (ICC2019), Shanghai, Executive Chair of the IEEE ICC2015, London, and Technical Program Chair of the IEEE WCNC2013. Professor Wang is an International Member of the Chinese Academy of Engineering (CAE), a Fellow of the Royal Academy of Engineering (RAEng), U.K., Fellow of the IEEE, and Fellow of the IET.

Keynote Speaker II

April 12, Saturday, 10:20-11:00, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Meeting Room: Diamond Room (4 Floor)

Prof. Min Chen

Fellow of IEEE, Fellow of IET, Fellow of AAIA

Highly Cited Researcher (2018-2024)

South China University of Technology, China

Speech Title: Large Language Model (LLM) Fine Tuning: Concepts, Opportunities, and Challenges

Abstract: As a foundation of Large Language Models, fine-tuning drives rapid progress, broad applicability, and profound impacts on human-AI collaboration, surpassing earlier technological advancements. This talk examines the core principles, development, and applications of fine-tuning techniques, emphasizing its growing significance across diverse field and industries. By analyzing the latest round of LLM fine-tuning advancements, this talk explores potential future directions for the co-evolution of humans and AI, as well as emphasizing their potential to achieve higher levels of cognitive and operational intelligence. Specifically, this talk introduces Natural Language Fine-Tuning (NLFT). The pioneering work of NLFT is the first superior technique for paving the way to deploy various innovative LLM fine-tuning applications when resources are limited at network edges.

Bio: Min Chen is a tenured full professor in School of Computer Science and Engineering at South China University of Technology. He was the director of Embedded and Pervasive Computing (EPIC) Lab at Huazhong University of Science and Technology. He is the founding Chair of IEEE Computer Society Special Technical Communities on Big Data. He was an assistant professor in School of Computer Science and Engineering at Seoul National University. He worked as a Post-Doctoral Fellow in Department of Electrical and Computer Engineering at University of British Columbia from 2006 to 2009. He received Best Paper Award from IEEE ICC 2012 and IEEE IWCMC 2016, etc. He serves as associate editor for IEEE Transactions on Big Data, and ACM Transactions on Multimedia Computing, Communications, and Applications, etc. He was a Series Editor for IEEE Journal on Selected Areas in Communications. He was General Chair of CEI 2024, Symposium Chair of IEEE Globecom 2022 eHealth, Co-Chair of IEEE ICC 2012-Communications Theory Symposium, and Co-Chair of IEEE ICC 2013-Wireless Networks Symposium. He was General Co-Chair for IEEE CIT-2012, Tridentcom 2014, Mobimedia 2015, and Tridentcom 2017. He was keynote speaker for IEEE BHI-BSN 2022. He has 200+ SCI papers, including IEEE JSAC, IEEE TNNLS, IEEE TPDS, IEEE TWC, IEEE TSC, INFOCOM, AAAI, CVPR, Science, Advanced Materials, Nature Communications, etc. He has published 12 books, including Big Data Analytics for Cloud/IoT and Cognitive Computing (2017) with Wiley. His Google Scholar Citations reached 49,700+ with an H-index of 101. His

top paper was cited 5,170+ times. He was selected as ESI Highly Cited Researcher from 2018 to 2024. He got IEEE Communications Society Fred W. Ellersick Prize in 2017, the IEEE Jack Neubauer Memorial Award in 2019, and IEEE ComSoc APB Oustanding Paper Award in 2022. His research focuses on cognitive computing, 5G Networks, wearable computing, big data analytics, robotics, emotion detection, mobile edge computing, LLM and fabric computing etc. He is an IEEE Fellow since 2021.

Keynote Speaker III

April 12, Saturday, 11:00-11:40, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Meeting Room: Diamond Room (4 Floor)

Prof. Chow-Yen-Desmond Sim

IEEE Fellow, IEEE AP-S Distinguished Lecturer (2024-2026),
Fellow of IET

Feng Chia University, Taiwan, China

Speech Title: Antenna Solutions and Analysis for Commercial 5G mmWave Antenna-in-Package (AiP) Designs

Abstract: This presentation will explore the latest trends in 5G millimeter-wave (mmWave) antennas and address the challenges encountered by engineers in this field. To enhance the audience's understanding of mmWave array antenna design within the framework of commercial Antenna-in-Package (AiP) systems, we will examine a series of commercial mmWave AiP designs, starting with the QTM 052. The discussion will explore the design techniques adopted in these solutions and compare them with recent developments in academic research. Finally, the presentation will conclude with a brief outlook on future 5G mmWave (FR2) and 6G communication.

Bio: Prof. SIM Chow-Yen-Desmond, born in Singapore in February 1971, received his B.S. degree in Electrical and Electronic Engineering from the University of Leicester, UK, in 1998, and his Ph.D. in the Radio System Group from the same university in 2003. He joined Feng Chia University in July 2003, where he has served as a Distinguished Professor since August 2016. Prof. Sim's research interests focus on small antenna designs and RFID applications, particularly in 5G sub-6GHz/mmWave antennas, RFID antennas, antenna arrays, and laptop antennas. He has published over 200 SCI-indexed journal papers on these topics. Prof. Sim was elected a Fellow of the Institution of Engineering and Technology (FIET) in February 2013. He served as an Associate Editor (AE) for IEEE Access (2015–2022) and IEEE Antennas and Wireless Propagation Letters (AWPL) (2017–2023). Currently, he is an AE for the IEEE Journal of RFID, IEEE Open Journal of Antennas and Propagation, and the International Journal of RF and Microwave Computer-Aided Engineering. Prof. Sim has contributed to numerous conferences as a General Chair, Co-Chair, Technical Program Committee (TPC) Chair, or TPC member. He has also been invited as a Keynote, Workshop/Tutorial Speaker and Invited Speaker in many international conferences. He served as the Chapter Chair of the IEEE Antennas and Propagation Society (AP-S), Taipei Chapter (2016–2017), and was the founding Chapter Chair of the IEEE Council of RFID, Taipei Chapter (2017–2020). Prof. Sim received the IEEE AP-S Outstanding Reviewer Award (Transactions on Antennas and Propagation) for eight consecutive years (2014–2021) and the

Outstanding Associate Editor Award from IEEE AWPL in July 2018. He was appointed as a Distinguished Lecturer of the IEEE Antennas and Propagation Society for the term 2024–2026. In 2025, Prof. Sim was elevated to IEEE Fellow “for contributions to the practical design and application of high-isolation broadband antennas and arrays."

Keynote Speaker IV

April 12, Saturday, 11:40-12:20, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

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Meeting Room: Diamond Room (4 Floor)

Prof. Qingsheng Zeng
IEEE Senior Member

Université du Québec an Outaouais, Canada

Speech Title: Millimeter Wave Signal Propagation in Indoor Environment and Underground Mine

Abstract: With a huge spectrum of 5–7 GHz allocated as an unlicensed band worldwide, the 60-GHz millimeter wave frequency range has become attractive for future indoor networking. Very high data rates can be reached (on the order of several Gbps) because of the large available spectrum. With low interference with neighboring networks due to the oxygen resonance around 60 GHz, it becomes feasible to control mining machinery and implement underground communications by using wireless sensors. Modelling 60 GHz millimeter wave signal propagation in indoor environment and underground mine is of vital importance for realizing the above goals. Most of published channel modeling studies in the 60 GHz still make efforts to evaluate the heuristic diffraction coefficients around corners for relaying the signal while denying surrounding deflecting obstacles (DOs) and considering them as noise sources. Few measurements of radio propagation in underground mines have been carried out for the MIMO-mmW systems, including the effect of miners' activity. In this presentation, the importance of the presence of deflecting obstacles (DOs) for indoor wireless local area network (WLAN) applications in the 60 GHz band is evaluated, the propagation characteristics of a MIMO-mmW system within an underground mine environment is discussed, with the effect of miners' activity being considered.

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.

Invited Speaker I

April 13, Sunday, 14:00-14:25, GMT+8, Beijing Time
Zoom Link: https://us02web.zoom.us/j/86461997029
Zoom ID: 864 6199 7029
Password: 041113

Prof. Yonghua Li

Beijing University of Posts and Telecommunications, China

Speech Title: Improving Drilling Rate Prediction with Advanced Data Preprocessing and LSTM-Attention Mechanisms for Offshore Oil Drilling

Abstract: This study proposes a deep learning model combining Long Short-Term Memory (LSTM) and attention mechanisms for predicting drilling rate (ROP) in offshore oil drilling. The model processes time-series production data, extracts key features, and predicts future ROP with improved accuracy and real-time performance. Data preprocessing techniques, including outlier detection and duplicate removal, ensure high-quality data. The model outperforms traditional approaches such as LSTM, Temporal Convolutional Networks (TCN), and Gated Recurrent Units (GRU), achieving an RMSE of 0.154, MAE of 0.045, and an R^2 score of 0.908. This LSTM-Attention model offers strong support for real-time drilling optimization and can be further enhanced by integrating domain-specific knowledge and real-time data updates.

Bio: Yonghua Li is currently a professor, PHD supervisor with School of Information and Communication Engineering, Beijing University of Posts and Telecommunications. The main research interests are: Internet of Things, cloud computing and big data processing technology. He has 30 years of research and development experience in the key technical fields of Internet of Things, cloud computing and big data processing technology, undertaken more than 30 theoretical research and engineering projects, published more than 100 papers in academic journals and conferences and applied for 50 patents. More than 40 monographs and textbooks have been published.

Invited Speaker II

April 12, Saturday, 14:25-14:50, GMT+8, Beijing Time
Meeting Room: Agate Room (4 Floor)

Prof. Hao Zhang
Fellow of American Statistical Association, Elected Member of the International Statistical Institute

Michigan State University, USA

Speech Title: Kriging Through the Lens of Weighted Ridge Regression

Abstract: Kriging, the best linear unbiased prediction method, is widely applied in agriculture, geology, environmental and climate studies, and computer experiments. It shares deep connections with kernel learning methods in machine learning, where it is known as Gaussian process regression. Additionally, by the representer theorem, Kriging can be viewed as nonparametric smoothing in a functional space. In this talk, I will demonstrate how the Kriging solution can be obtained via weighted ridge regression, offering a new perspective that facilitates the use of existing ridge regression software. I will also discuss applications of this approach.

Bio: Hao Zhang is Professor and Chair at the Department of Statistics and Probability at Michigan State University. He is Fellow of American Statistical Association and an Elected Member of the International Statistical Institute. He has served editorial boards of Journal of the American Statistical Association, Statistica Sinica, Environmetrics, and Statistics & Probability Letters. His research interests are primarily in spatial and spatio-temporal statistics. His work includes both theoretical investigation into asymptotic properties of machine learning methods for spatial data and development of algorithms for the analysis of big spatial data. He collaborates with researchers in ecology, environmental sciences, climatology, and natural resources.

Invited Speaker III

April 13, Sunday, 09:00-09:25, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/87173579330

Zoom ID: 871 7357 9330

Password: 041113

Prof. Kwok L. Chung
IEEE Senior Member

Guangzhou Institute of Science and Technology, China

Speech Title: Harmonizing Tradition and Innovation: Advances in Chinese-Culture-Based Antennas and Sensors

Abstract: This paper presents the innovative application of Chinese-culture-based (CCB) design in the development of multiband patch antennas, integrating culturally resonant symbols such as traditional motifs and calligraphic elements like Lishu characters. We trace the evolution of CCB antennas, highlighting advancements from the pioneering WANG-shaped patch antennas to the recent multiband Guo- and Qing-shaped designs. These antennas not only celebrate China's rich cultural heritage but also enhance performance and aesthetic value in wireless communication. Employing methodologies such as Characteristic Mode Theory (CMT), our research demonstrates how tradition can blend seamlessly with modern technology. The findings highlight the potential of CCB antennas for smart cities, cultural heritage sites, and sustainable practices, illustrating the convergence of art and technology in the field of wireless communications.

Bio: Kwok L. Chung received his Ph.D. degree in Electrical Engineering from the University of Technology Sydney, NSW, Australia, in 2004. Following his graduation, he joined the Faculty of Engineering at the University of Technology Sydney as a Lecturer. In 2006, he transitioned to The Hong Kong Polytechnic University, and in 2012, he became a member of the Institute for Infrastructure Engineering at the University of Western Sydney, Sydney, NSW, Australia. In 2015, he joined Qingdao University of Technology (QUT) in Qingdao, China, as a Research Professor, where he supervises Ph.D. students and leads a cross-disciplinary research team at the Civionics Research Laboratory. From April 2021 to July 2024, he served as a Research Professor at Huizhou University. Currently, he is a Research Professor at the Guangzhou Institute of Science and Technology (GZIST), China. Prof. Chung has authored and co-authored approximately 100 articles in SCI journals and over 120 conference papers indexed by EI since 2000, covering various fields within electrical engineering, computer science, and civil engineering. He served as the Vice Chair and then Chairman of the IEEE AP/MTT Hong Kong Joint Chapter in 2010 and 2011, respectively, and is also the Founding Chair of the IEEE Qingdao AP/MTT/COM Joint Chapter (CN10879) under the Beijing Section. His editorial contributions include serving as an Associate Editor for IEEE Access from 2016 to 2022 and for the Alexandria Engineering Journal since 2020.

Recognized for his significant contributions to scientific research, Prof. Chung was selected for the World's Top 2% Scientists list published by Stanford University from 2019 to 2023. He was also the sole representative from GZIST included in the 2023 Career Long-Term Impact list, underscoring his remarkable position and influence in academia. His current research interests encompass wireless sensors, characterization of cement-based materials, WiFi-7, 5G/6G microwave and millimeter-wave antennas, artistic antennas, and MIMO antenna systems.

Invited Speaker IV

April 12, Saturday, 14:00-14:25, GMT+8, Beijing Time

Meeting Room: Diamond Room (4 Floor)

Prof. Botao Feng

IEEE Senior Member, Stanford University World's Top 2% Scientists, Head of Shenzhen University Key Laboratory of Wireless Communication, Antennas and Propagation

Shenzhen University, China

Speech Title: Multi-Function Multi-Beam Reflectarray Antenna for Sub-Terahertz Applications

Abstract: A single-layer-substrate dual-band multi-beam reflectarray antenna based on polarization selection technique for sub-terahertz (sub-THz) applications is proposed in this talk. The antenna element consists of two primary ring components (outer and inner) that are orthogonally nested to achieve dual-band characteristics. The outer component is a split ring structure aligned along the y-axis, designed to excite X-polarized radiation through a pair of arc-shaped phase shift lines extending from the sides of the ring. The inner component, located within the outer ring, comprises two small arc-shaped microstrip patches connected vertically by a straight-bar microstrip line, resulting in Y-polarized radiation. Furthermore, the digital coding metasurface together with the single- and multi-focus phase compensation techniques, enables the antenna array to achieve four-beam radiation and dual-beam scanning in the lower and upper frequency bands. Measured results show a very wide elevation angle of up to 104°and a high aperture efficiency of 49.2% at the lower frequency of 135 GHz. At the upper frequency of 170 GHz, a low scanning loss of 1.6 dB and a high aperture efficiency of 29% are realized. Additionally, high peak gains of 19.7 dBi and 26.3 dBi are obtained for the respective bands. Therefore, the proposed sub-THz reflectarray antenna presents itself as a promising candidate for future 6G point-to-multipoint communication systems, offering large capacity, wide coverage, and high-resolution scanning capabilities.

Bio: Botao Feng (Senior Member, IEEE) was born in Guangdong, China, in 1980. He received the B.S. and M.S. degrees from the Chongqing University of Posts and Telecommunications (CQUPT), Chongqing, China, in 2004 and 2009, respectively, and the Ph.D. degree from the Beijing University of Posts and Telecommunications (BUPT), Beijing, China, in 2015, all of which degrees are communication and information system majors. Dr. Feng joined Nokia Mobile Phones Ltd., Dongguan, China, as a Communication Engineer, in 2004. From 2009 to 2012, he served as a Senior Engineer and a Chief Executive in China United Network Communications Company Ltd., Guangzhou, China, where he won the Award of Breakout Star of the Year and the title of Technical Innovation Expert.

Dr. Feng currently acts as the Head, the Supervisors of graduate student and overseas doctoral student of the Shenzhen University Key Laboratory of Wireless Communication, Antennas and Propagation, which includes more than 70 research members and complete industry-university-research facilities in antenna and communication fields, and is a founding member of State Key Laboratory of Radio Frequency Heterogeneous Integration (Shenzhen University), and the President of Shenzhen Bodasheng/Taobida Technology Company Ltd., Shenzhen, China. In

addition, he has been a Distinguished Senior Research Fellow with Energy Materials Telecommunications Research Centre, Institut National De La Recherche Scientifique (INRS), Quebec City, QC, Canada, since 2020, and a Distinguished Visiting Professor of Huizhou University, Huizhou, China, since 2022. His research interests include antennas and mobile communications. He and his research team members are currently conducting multiple projects on antenna development for advanced mobile communications, which are supported by natural science research funds and industrial cooperation research and development funds. His several antenna designs for 5G/WiFi applications have been widely used by Chinese communication operators. It is estimated that the related total production value is around 2 billion Ren Min Bi (RMB). He has authored or co-authored nearly 200 technical articles, including approximately 60 science citation index (SCI) and 180 engineering index (EI) articles in which approximately a third of them are reported in top journals, and holds more than 80 technical patents. In the past few years, he has obtained the award of the Outstanding Instructor of the First Prize in the National Graduate Electronic Contest and the Tencent Outstanding Teacher Award. Since 2021, he has been a successive recipient of "Stanford University World's Top 2% Scientists".

Dr. Feng is a Senior Member of the IEEE Antennas and Propagation Society and the IEEE Vehicular Technology Society. He serves as a Regular Peer Reviewer, a Technical Program Committee Chair, a General Chair, and an Editor of IEEE/IET, Elsevier, Wiley, and Springer journals and conferences on microwave technique and antenna development. In addition, he concurrently also acts as a Senior Expert of Degree and Graduate Education Center of the Chinese Ministry of Education, Natural Science Foundation Committee of Guangdong Province/Zhejiang Province, Digital Government Expert Resource Pool of Guangdong Province, Information and Communication Technologies Senior Title Evaluation Committee of Guangdong Province, University Achievement Transformation Center of Guangdong Province, Electronic Communication Senior Title Evaluation Committee of Shenzhen City, Science and Technology Expert Database of Shenzhen City, Science and Technology Innovation Bureau of Shenzhen City, and Industry and Information Technology Bureau of Shenzhen City, etc..

Invited Speaker Ⅴ

April 12, Saturday, 16:45-17:10, GMT+8, Beijing Time

Meeting Room: Diamond Room (4 Floor)

Prof. Yindong Xiao

University of Electronic Science and Technology of China, China

Speech Title: Deep Learning-Based Device Twin Model and Its Testing Applications

Abstract: Currently, radio frequency integrated circuits (RFICs) are widely used in fields such as communication and radar, leading to an increased focus on efficient and accurate modeling methods. Despite the excellent device simulation capabilities provided by S-parameters and SPICE modeling methods, issues such as the difficulty of describing time-domain dynamic characteristics with S-parameters and the confidentiality risks associated with SPICE white-box models persist. This report proposes a novel RFIC modeling method based on deep learning to establish a fast RFIC twin model, characterizing device internals non-linearly. This aims to build a production testing system architecture from a new dimension, enhancing testing efficiency. The method involves using specially designed signal excitations to test the RF amplifier, with input-output signal pairs serving as training data for a deep neural network. This approach effectively captures the dynamic characteristics of the RF amplifier. The designed test signals better stimulate the broad frequency response and non-linear features of the RF amplifier, ensuring both time-domain and frequency-domain testing quality. Additionally, this method employs autoregressive modeling, where the model not only learns the current input-output signal relationships but also utilizes historical input-output data for learning, capable of capturing time-domain and frequency-domain characteristics of RF amplifiers. Experimental validation confirms that this deep learning-based RFIC modeling method, exemplified through RF amplifier testing, has distinct advantages. It can effectively characterize the characteristics of the tested RF device with just a few tests, offering a new approach and method for precise and efficient RF device modeling.

Bio: Xiao Yindong, a professor at the University of Electronic Science and Technology, has been at the forefront of integrated circuit (IC) testing system research, contributing innovative methods for test vector synthesis instruction design, optimization of complex vector synthesis scheduling, and enhancement of simulation and RF IC testing algorithms. These advancements have notably improved key performance indicators, including vector synthesis rate, test signal quality, and single-chip testing efficiency. As the principal investigator of 8 national projects, including 3 key initiatives and a National Natural Science Foundation grant, Professor Xiao has published over 20 academic papers, with more than 10 indexed in the SCI. He is a respected reviewer for the esteemed journal "ISA Transactions" and holds a US patent and 25 Chinese patents. His groundbreaking work has earned him the first prize from the Ministry of Education for Technical Invention. His development of a state-of-the-art, fully proprietary IC testing system has set a new benchmark in the industry, providing a comprehensive alternative to high-end testing instruments and meeting the urgent testing demands of chip development and production facilities. As a key

contributor to the SpinalHDL agile digital design development library, Professor Xiao is pioneering research into next-generation hardware-software integrated HDL languages and their applications, further advancing the field of IC testing and design.

Invited Speaker VI

April 12, Saturday, 14:00-14:25, GMT+8, Beijing Time

Meeting Room: Crystal Room (4 Floor)

Prof. Xingquan Wang

Gannan Normal University, China

Speech Title: A Half-Bridge IGBT Drive & Protection Circuit for Inverter Power Supply

Abstract: The common IGBT drive and protection circuits are complex and expensive. Moreover, the circuit's interfaces and the parameters are difficult to change. We designed a half-bridge IGBT drive and protection circuit with discrete components. It was easy to change the frequency, the duty cycle and the driving voltage and current of driving square wave signal which was then isolated into two outputs by using photoelectric coupler. The protection circuit was formed by using Hall sensor for direct detection of main circuit current with a minute amount of elements. Further, we build a high voltage power supply for DBD discharge whose output peak voltage can be changed continuously from 0 to 30 kV and frequency from 8 to 25 kHz with the output maximum power of 150 W.

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 and as the chairman of the Physics Society of Ganzhou City. He received his Ph.D. degree in optics from Changchun University of Science and Technology in 2010. Following his graduation, he worked as 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 fundamental research in low-temperature plasma discharge technology and electronic technology applications, publishing over 40 SCI/EI indexed papers and holding more than 30 authorized patents. He has led 8 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 12, Saturday, 16:55-17:20, GMT+8, Beijing Time

Meeting Room: Crystal Room (4 Floor)

Prof. George C. Polyzos

The Chinese University of Hong Kong, Shenzhen, China

Speech Title: SovereignEdge: A Context-Aware Cryptographic Architecture for Data Sovereignty in Mobile Edge-Fog-Cloud IoT Data Spaces

Abstract: Existing three-tier IoT systems focus on real-time analytics and context-aware processing across Edge, Fog, and Cloud layers but often overlook data sovereignty in cross-organizational Data Space scenarios. This paper introduces SovereignEdge, a context-aware cryptographic framework that extends ciphertext-embedded policies to a distributed multiauthority model, letting mobile Edge data owners define detailed access rules before data goes to Fog or Cloud layers. SovereignEdge features a multi-tier key management system with multiple Fog-based Attribute Authorities operating under a trust root, supporting dynamic policy updates, attribute revocation, and secret sharing without requiring re-encryption of historical data. To prevent forged contextual claims on constrained Edge devices, SovereignEdge uses a verifiable attribute mechanism that reduces unauthorized decryption. It merges robust cryptographic enforcement and data-space-based auditing. This approach supports cross-domain auditing, efficient attribute revocation, and regulatory compliance, and it follows Data Space principles. Experimental results show that SovereignEdge preserves data sovereignty and enables privacy-preserving collaboration across heterogeneous Edge–Fog–Cloud environments.

Bio: Professor George C. Polyzos is with the School of Data Science at The Chinese University of Hong Kong, Shenzhen, on leave from the Athens University of Economics and Business in Greece, where he founded and directed for many years the Mobile Multimedia Laboratory (MMlab). Previously, he was Professor of Computer Science and Engineering at the University of California, San Diego, where he was co-director of the Computer Systems Laboratory, member of the Steering Committee of the Center for Wireless Communications and Senior Fellow of the San Diego Supercomputer Center. He received his Diploma in Electrical Engineering from the National Technical University in Athens, Greece and his MASc in Electrical Engineering and PhD in Computer Science from the University of Toronto, Canada. Under his leadership the MMlab has participated in a series of research projects funded by the European Commission (EC), the European Space Agency, and Greece that co-developed Publish-Subscribe Internetworking, an Information-Centric Networking architecture, with project PURSUIT receiving the Future Internet Award in 2013. He also led MMlab's participation in EC-funded project SOFIE investigating Distributed Ledger and Interledger Technologies, including smart contracts, for Internet-of-Things (IoT) systems federation, focusing on openness, security, privacy, and business incentives, and more recently,

EC-funded project “InterConnect,” on smart homes and energy grid evolution. In 2022 he co-founded “Internet Identity Security and Privacy Solutions” P.C. (ExcID), an MMlab spin-off, to advance and commercialize digital identity technologies and software supply chain security. He was the founding chair of the Steering Committee of the ACM SIGCOMM conference on Information-Centric Networking and is now on the Steering Committee of the IFIP Wireless and Mobile Networking Conference. He has also been reviewer and panelist for the US NSF, the EC, and other research agencies. His current research interests focus on the IoT, security and privacy, energy informatics, and multi-agent AI systems.

Invited Speaker VIII

April 12, Saturday, 16:05-16:30, GMT+8, Beijing Time
Meeting Room: Crystal Room (4 Floor)

Prof. Wenzhe Gu

Huizhou University, China

Speech Title: A High-Gain Dual-Circularly Polarized Parabolic Antenna for Mobile Base Stations

Abstract: This paper presents a high-gain dual-circularly polarized parabolic antenna for mobile base stations, aiming to meet the point-to-point communication in emergency communication. The antenna operates 2.2-2.3 GHz and employs a circular-aperture parabolic reflector and a microstrip circular patch feed source. Dual circular polarization is achieved through an orthogonal coupler. Simulation and test results show that the antenna exhibits excellent performance. |S11| and |S22| are less than -16 dB, peak gain reaches 25dBi, and the axial ratio is less than 2. Additionally, half-power beamwidth of the antenna is approximately 71°-73°, and the front-to-back ratio is around 20 dB, demonstrating good radiation performance. This design excels in high gain, low reflection, and dual circular polarization, making it suitable for compact installation in mobile base stations and effectively improving signal transmission quality and coverage in emergency communication scenarios.

Bio: Prof. Wenzhe Gu is a faculty member at Huizhou University in China, specializing in the research of 5G/6G/mm-wave antenna design and intelligent control algorithms. At the State Key Laboratory of Networking and Switching at Beijing University of Posts and Telecommunications, his primary research focuses on wireless self-organized network routing algorithms and intelligent transportation, specifically group intelligent service computing. Prof. Gu is also a Distinguished Researcher and Graduate Tutor at Shenzhen University, where he concentrates on smart antenna algorithms and smart IoT AIoT applications within the Wireless Communication and Antenna Propagation Laboratory. In his previous roles, Prof. Gu was responsible for IT product development and management at ICBC (Head Office) and Ping An Bank (Head Office), where he handled the design of bank public business product systems, as well as major project planning, implementation, and operational commissioning. He has also led forward-looking technology research, focusing on the application of emerging technologies such as AI (machine learning, natural language processing), IoT, and cloud computing in the banking sector. His work includes conducting feasibility studies, prototype designs, and project pilots for these innovative technologies in the field of public banking services.

Invited Speaker IX

April 12, Saturday, 14:25-14:50, GMT+8, Beijing Time
Meeting Room: Crystal Room (4 Floor)

Assoc. Prof. Hongyan Fu
IEEE Senior Member, Tenured-Associate Professor, Deputy Director of Research Office, Director of Nano-fabrication Platform, Tsinghua Shenzhen International Graduate School (SIGS)

Tsinghua University, Shenzhen, China

Speech Title: Spectral-Scanning FMCW LiDAR Based on Tunable VCSEL and Nonlinearity Correction Methods

Abstract: In recent years, light detection and ranging (LiDAR) has found widespread applications in fields such as autonomous driving, drones, mapping, and consumer electronics. Frequency-modulated continuous-wave (FMCW) LiDAR has gained significant attention from both academia and industry due to its superior performance compared to traditional approaches such as time-of-flight (ToF). In FMCW LiDAR systems, high speed and wide field-of-view (FoV) play a crucial role in determining imaging performance. The linearity of the laser frequency sweep is another key performance metric significantly affecting imaging resolution and precision. This talk will briefly review existing beam-steering methods and related work for ultrafast LiDAR systems, with a focus on the technological advancements of tunable vertical-cavity surface-emitting laser (VCSEL), nonlinearity correction methods, and spectral-scanning methods for FMCW LiDAR.

Bio: Dr. Fu is currently a tenured-associate professor, deputy director of Research Office, and director of Nano-fabrication Platform, Tsinghua Shenzhen International Graduate School (SIGS), Tsinghua University, Shenzhen, China. From 2010 to April 2017, Dr. Fu was a founding member and leading the advanced optic communications research at Central Research Institute, Huawei. His research interest focuses on integrated photonics and its related applications for communications and sensing, including optical wireless communication, LiDAR and silicon photonics, etc. He is a senior member of IEEE, Optica and life member of SPIE. He is the founding advisors of Optica/IEEE Photonics Society/SPIE Student Chapters at Tsinghua SIGS, Tsinghua University. He has authored/coauthored over 360 journal or conference papers, 3 book chapters, over 80 granted/pending China / US patents.

Invited Speaker X

April 13, Sunday, 14:25-14:50, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Assoc. Prof. Qiang He

Northeastern University, China

Speech Title: UAV-assisted Microservice Mobile Edge Computing Architecture: Addressing Post-Disaster Emergency Medical Rescue

Abstract: In post-disaster emergency medical rescue operations, rapidly establishing an adaptive and flexible edge computing (EC) network, balancing data offloading with energy consumption, and ensuring the stable operation of the network have become urgent tasks. To address these challenges, we proposed a unmanned aerial vehicle (UAV)-assisted microservice mobile edge computing (MEC) architecture. The architecture can be rapidly deployed to provide temporary network coverage and EC services to disaster-stricken areas. A transformer-based resource management (TBRM) approach is utilized to optimize data offloading efficiency, and energy consumption, thereby maximizing the service time of the architecture. To ensure security and reliability, four microservices are designed to manage the full lifecycle of UAVs, utilizing dual digital signature certificates for identity authentication. Large-scale simulation experiments have demonstrated the effectiveness of the architecture in complex rescue environments, offering robust technical support for post-disaster medical rescue operations.

Bio: Qiang He received the Ph.D. degree in computer application technology from the Northeastern University, Shenyang, China in 2020. He also worked with School of Computer Science and Technology, Nanyang Technical University, Singapore as a visiting PhD researcher from 2018 to 2019. He is currently an Associated Professor at the College of Medicine and Biological Information Engineering, Northeastern University, Shenyang, China. His research interests include machine learning, social network analytic, data mining, health care, infectious diseases informatics, etc. He has published more than 70 journal articles and conference papers, including IEEE Transactions on Knowledge and Data Engineering, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Cybernetics, IEEE Transactions on Cloud Computing, IEEE Transactions on Computational Social Systems, IEEE Transactions on Cognitive and Developmental Systems.

Qiang He is with the School of Medicine and Biological Information Engineering, Northeastern University, Shenyang 110169, China, e-mail: heqiang@bmie.neu.edu.cn

Invited Speaker XI

April 12, Saturday, 16:20-16:45, GMT+8, Beijing Time
Meeting Room: Pearl Room (4 Floor)

Assoc. Prof. Chengzong Peng

Chengdu University of Information Technology, China

Speech Title: Distributed Pairwise Protection for Security-Aware Mission Chains in UAV Networks

Abstract: The unmanned aerial vehicles (UAVs) communication network exhibits significant potential in natural disaster management, with applications in flood relief and wildfire control. In these scenarios, UAVs can dynamically form mission chains (MCs) to collaboratively execute tasks such as real-time monitoring and post-disaster search and rescue. To address security challenges in these dynamic environments, we implement MCs as security-aware service function chains (SFCs). However, traditional SFC techniques are often inefficient and resource-intensive when applied to MCs in UAV networks, due to the networks' dynamic nature and resource constraints. In this paper, we introduce and mathematically formulate a novel problem, termed the security-aware SFC distributed pairwise protection (SSFC-DPP) problem in UAV networks, which optimizes SFC protection against failures while balancing security and resource demands, and prove its NP-hardness. To tackle SSFC-DPP, we propose an efficient heuristic approach, the distributed pairwise node protection (DPNP) algorithm, integrating a security-resource ratio (SRR) factor and pairwise backup selection (PBS) technique. Extensive simulations show that DPNP reduces overall backup costs by 8.05% and 51.39% compared to two benchmark algorithms, respectively.

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, 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 XII

April 12, Saturday, 17:05-17:30, GMT+8, Beijing Time
Meeting Room: V1 Room (4 Floor)

Assoc. Prof. Wei Yang

Shenzhen Technology University, China

Speech Title: Wi-Fi Signal Gesture Recognition Based on Multimodality

Abstract: With the development of technology, various gesture recognition devices and technologies have emerged to meet people's various needs. Traditional gesture recognition methods are relatively cumbersome and require wearing data gloves. At the same time, the technology based on computer vision needs to recognize that the target is always within sight. Therefore, we proposes a gesture recognition method based on multimodal Wi-Fi signals, and optimizes the gesture recognition methods from devices and technologies to overcome the problems in traditional recognition methods. Specifically, we first built a Wi-Fi signal data acquisition platform based on the Atheros network card, and the packet loss rate is less than 0.1%. Then, frame extraction is carried out for the video signal, and the T3D network based on DenseNet is used for video recognition. The video recognition rate reaches 95.0%. Finally, the above video data is extended to Wi-Fi signal, gesture recognition is performed jointly with CNN and GRU. The tests show that the gesture recognition rate of proposed scheme is 88.2%.

Bio: Wei Yang, Ph.D., Associate Professor of Engineering, IEEE Member. He received the Ph.D. degree in information and communication engineering from Beijing University of Posts and Telecommunications (BUPT), Beijing, China. He was also a Research Fellow with the State Key Laboratory of Networking and Switching Technology, BUPT, China. He has served as the TPC of ICCT (2021-2024), the Session Chair of WCCCT 2025, and also served as a reviewer for multiple well-known international academic journals and conferences. His research interests include wireless communication, cyber-physical system, information security and fusion.

Invited Speaker XIII

April 12, Saturday, 14:00-14:25, GMT+8, Beijing Time
Meeting Room: Pearl Room (4 Floor)

Assoc. Prof. Bo Li

Ningxia University, China

Speech Title: Dual Power Supply Strategies for Ground-Air Integrated Network

Abstract: To address the issues of how to maximize renewable power utilization and lower the charging cost, power supply strategy for green base station and UAV is proposed in this speech. For base station, the strategy consists of Grid Connection Depth (GCD) model and Battery Power Sharing (BPS) model, which reduce the dependence on the grid and take advantage of idle power. The optimal power transfer variables are obtained to facilitate the strategy for maximizing renewable power utilization. For UAV, a static charging station strategy that exploits inductive coupling and battery hotswapping techniques is proposed. The strategy consists of nearby battery swapping strategy and charging station selection strategy for UAVs without time constraints (CTC). For describing the mutual competition among UAV charging selections in CTC strategy, a non-cooperative game framework with pure strategy is developed. An iterative algorithm is designed to solve the Nash equilibrium and obtain the optimal charging selection scheme. The optimal ratio of weighting factors is obtained through simulation and numerical analysis. Finally, the comparison results with other strategies indicate that the proposed strategies have the characteristics of low cost and low latency. The simulation results demonstrate that the proposed strategies have higher practical value compared with other power supply strategies.

Bio: Dr. Li is an associate professor in the School of Electronics and Electrical Engineering, Ningxia University, China. He received his Ph.D. degree in Information and Communication Engineering from Beijing University of Posts and Telecommunications (BUPT) in 2012. And he did Postdocal research from 2015 to 2017 at EEC, the University of Florida, USA. His main research interests include B5G/6G, Space-Air-Ground Integrated Network Architecture, Network Function Virtualization and Software Definition, Green Communication and Energy Efficiency, Integration of Communication and Energy networks, and Resource management for future communication. In recent years, he has published more than 30 papers in journals and conferences. He serves in several reviewer boards for several international conferences and journals. Dr. Li has served as the Chair of IEEE ICCT and ICCC.

Invited Speaker XIV

April 12, Saturday, 16:30-16:55, GMT+8, Beijing Time
Meeting Room: Crystal Room (4 Floor)

Assoc. Prof. Dong Hou

University of Electronic Science and Technology of China, China

Speech Title: High-precision laser-based free space time and frequency transfer

Abstract: Laser-based free space time and frequency transfer is a new technique that involves transmitting time and frequency signals from one site to other site at a certain distance through free space, thereby achieving high-precision time-frequency synchronization between two or more sites. In the past few years, significant progress has been made in free space time and frequency transfer with the help of continuous laser and femtosecond laser. This presentation first introduces the basic principles of free space time and frequency transfer with laser, and then presents the latest research achievements in the field of free space time and frequency transfer, including free space time-frequency transfer based on continuous lasers, free space time-frequency transfer based on femtosecond optical frequency combs, and free space time-frequency transfer with weak signal based on single photon detection. Finally, some future development trends of free space time-frequency transfer are discussed.

Bio: Dong Hou was born in Sichuan, China, in 1982, and received the Ph.D. degree from Peking University, Beijing, in 2012. He was a Postdoctoral Fellow at Peking University, and University of Colorado Boulder, from 2012 to 2015. He was a Senior Visiting Scholar at Korea Advanced Institute of Science and Technology, South Korea, in 2015 and 2016. He is now an associate professor and doctoral supervisor of University of Electronic Science and Technology of China, Chengdu, China.
His current research interests include precise physical measurement, highly-stable time-frequency transfer over fiber and free-space link, timing jitter/phase noise measurement and stabilization of femtosecond laser. He participated in and completed a number of national 863, 973, and National Natural Science Foundation of China projects. He has been selected for municipal, provincial and ministerial talent programs, and published more than 60 journal papers. He has been invited to give oral presentations at international conferences for many times, and has applied for and authorized more than ten patents. Selected as an expert for the provincial and municipal overseas high-level talent program.

Invited Speaker XV

April 12, Saturday, 14:45-15:10, GMT+8, Beijing Time
Meeting Room: Pearl Room (4 Floor)

Associate Research Fellow Jie Tian

China Academy of Engineering Physics, Mianyang, China

Speech Title: Key Technologies for Secure Wireless Transmission Based on Covert Information Mapping and Spatial Direction Modulation

Abstract: We propose a comprehensive wireless secure transmission framework tailored for physical layer security communication, with a focus on key technologies integrating covert information mapping (CIM) and spatial direction modulation (SDM). First, to address the security degradation of traditional SDM systems when eavesdroppers are equipped with distributed receivers, we design the CIM-SDM structure, enhancing system robustness through covert information mapping. The detection performance of both legitimate users and eavesdroppers is theoretically derived, confirming the security advantages of this approach under extreme conditions. Second, we further introduce the CIM-GSDM system, which incorporates generalized spatial modulation (GSM), leveraging the indices of distributed receiver subsets and an interference matrix to modulate covert information. This effectively improves the bit error rate (BER) performance of legitimate users while significantly degrading the demodulation capability of eavesdroppers. Finally, we incorporate a joint precoding and artificial noise (AN) design to optimize system security, achieving dynamic optimization of multi-beam control and power allocation to maximize the secrecy rate. Simulation results demonstrate that the proposed framework significantly enhances the security of wireless transmission while maintaining the performance of legitimate users, making it well-suited for general physical layer secure wireless communication scenarios.

Bio: Jie Tian serves as the associate research fellow and master's supervisor in Institute of Electronic Engineering, China Academy of Engineering Physics, Mianyang, China. He received his B.S. and M.S. both from Chongqing University and Ph.D. from CAEP. He conducted advanced research at the University of Colorado Boulder as a visiting scholar (2014-2016). He serves as the Ph.D. engineering supervisor through joint key programs with the University of Electronic Science and Technology of China (UESTC) and Xidian University.

His current research interests mainly include robust telemetry system design and evaluation, precise channel measurement and estimation for wideband transmissions in combined space, physical-layer security, wireless network optimization and high-precision time-frequency synchronization. He has led and participated National-level and Provincial-level mandatory key projects and science foundations. His pioneering works in advanced communication systems design earned him the national military science and Technology Progress Awards (2nd Prize, 2014 and 3rd Prize, 2015) and Technological Innovation Awards (3rd Prize, 2018 and 2nd Prize, 2024) . He has

published more than 30 papers, with highlights being an Editor's Pick in Review of Scientific Instruments (2018) and a Top 5 Student Paper at IEEE Radar Conference 2016, and he has applied for and authorized 7 patents in secure transmission/novel communication waveform patterns. he serves as a expert reviewer for the National Natural Science Foundation, provincial-level major engineering/research projects and IEEE/OSA journals.

Invited Speaker XVI

April 12, Saturday, 16:45-17:10, GMT+8, Beijing Time

Meeting Room: Agate Room (4 Floor)

Assoc. Prof. Youzhi Xiong

Sichuan Normal University, China

Speech Title: Energy-Efficient Transmission Techniques for 6G Mobile Communications

Abstract: Energy efficiency (EE) is a crucial KPI of future 6G mobile communications. At this point, this presentation will explore two enablers that are promising to improve the EE, i.e., low-resolution quantization and reconfigurable intelligent surface (RIS). Specifically, in the context of cell-free massive MIMO, a promising technology for 6G, we show how low-resolution quantization and RIS can improve system EE. Moreover, by involving the two enablers, we introduce some challenges to be investigated, such as performance analysis, channel estimation, and RIS's configuration.

Bio: Youzhi Xiong received the B.E. degree in communication engineering from Henan University, Kaifeng, China, in 2011, and the M.E. and Ph.D. degrees in communication and information systems from the University of Electronic Science and Technology of China, Chengdu, China, in 2014 and 2019, respectively. He is currently an Associate Professor with the College of Physics and Electronic Engineering, Sichuan Normal University, Chengdu. His research interests include massive MIMO with low resolution ADCs and/or DACs, channel estimation, cell-free massive MIMO, machine learning, and reconfigurable intelligent surfaces. He has published over 20 SCI/EI papers, including IEEE TCOM, IEEE TVT, and IEEE IoTJ. He is currently leading/working on multiple national and provincial-level scientific research projects, including the National Natural Science Foundation of China and Sichuan Science and Technology Program. He has served as the Session Chair of WCCCT 2023& WCCCT 2024.

Invited Speaker XVII

April 13, Sunday, 09:00-09:25, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Assoc. Prof. Liwei Yang

China Agricultural University, China

Speech Title: Performance Analysis of Visible Light Communications (VLC)-WiFi Networks based on Dynamic Resource Allocation

Abstract: Visible Light Communications technology has become a potential solution for signal transmission in wireless optical network. In order to improve the fairness of the system, this study proposed an improved resource management algorithm for heterogeneous VLC-WiFi network. The simulation results show that the proposed algorithm has better fairness and throughput than the traditional algorithm.

Bio: 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 XVIII

April 12, Saturday, 14:00-14:25, GMT+8, Beijing Time

Meeting Room: Agate Room (4 Floor)

Assoc. Prof. Feibo Jiang

Hunan Normal University, China

Speech Title: Large Model-Empowered Multimodal Semantic Communication

Abstract: Multimodal signals, including text, audio, image, and video, can be integrated into semantic communication systems to provide a low-latency, high-quality immersive experience at the semantic level. However, multimodal semantic communication faces several challenges, such as data heterogeneity, semantic ambiguity, and signal distortion during transmission.

In recent years, large models, particularly large language models (LLMs), vision-language models (VLMs), and large multimodal models (LMMs), have offered potential solutions to address these challenges. We conduct a systematic study on the application of large models in semantic communication, including a cross-modal semantic communication system based on VLMs, a multimodal semantic communication system empowered by LMMs, a multi-agent system leveraging LLMs, and a VLM-based multimodal, multi-user, and multi-task semantic communication system.

Additionally, we explore knowledge base design schemes based on large models and propose a foundational large model for the communication domain, enhanced with the retrieval-augmented generation (RAG) and knowledge graph. These methods will further enhance the performance of semantic communication, eliminate semantic noise, and provide valuable insights for the advancement of semantic communication technology.

Bio: Feibo Jiang received his B.S. and M.S. degrees in School of Physics and Electronics from Hunan Normal University, China, in 2004 and 2007, respectively. He received his Ph.D. degree in School of Geosciences and Info-physics from the Central South University, China, in 2014. He is currently an associate professor at the Hunan Provincial Key Laboratory of Intelligent Computing and Language Information Processing, Hunan Normal University, China. His research interests include large AI model-assisted communications, machine learning, semantic communication, Internet of Things, and mobile edge computing.

Invited Speaker XIX

April 12, Saturday, 14:50-15:15, GMT+8, Beijing Time
Meeting Room: Diamond Room (4 Floor)

Asst. Prof. Luping Xiang
Xiaomi Young Scholar

Nanjing University, China

Speech Title: Foundation Models for Communication and Sensing: A Paradigm Shift from Traditional Models to AI-driven Intelligence

Abstract: Deep learning (DL) is transforming communication and sensing, enhancing the intelligence of future 6G networks. To address challenges in generalization and transferability, this work introduces foundation models—modular architectures seamlessly integrating into communication and sensing systems. These models improve communication efficiency, enable cross-task parameter sharing, and significantly reduce sensing errors. Additionally, a novel pre-equalization strategy dynamically adapts transmitted signals using sensing information, mitigating channel impairments without modifying pre-trained models. Simulation results validate the effectiveness and transferability of foundation models, highlighting their potential to bridge model-driven and data-driven approaches in communication and sensing.

Bio: Luping Xiang (Member, IEEE) is an Assistant Professor, Research Fellow, and Ph.D. supervisor at Nanjing University. He received the B.Eng. degree (Hons.) from Xiamen University, China, in 2015, and the Ph.D. degree from the University of Southampton, in 2020. From 2020 to 2021, he was a Research Fellow with the Next Generation Wireless Group, University of Southampton. In November 2021, he joined the University of Electronic Science and Technology of China (UESTC) as a faculty member, and in September 2024, he joined Nanjing University as an Assistant Professor.

In 2024, he was honored with the Xiaomi Young Scholar Award, he also co-founded the company Accelercomm. He is currently leading several projects, including the National Natural Science Foundation of China's Youth Project, Provincial Youth Science Foundation, and the Special Funding Project at the Postdoctoral research. He has also received funding from the Postdoctoral International Exchange Program and has participated in multiple national key projects. He currently serves as an associate editor for the journal IET Smart Cities and as Youth Editor of the Journal of Information and Intelligence.

His main research areas include native intelligence at wireless communication, end-to-end transmission technology, computer vision, and integrated sensing and communication transmission.

Invited Speaker XX

April 13, Sunday, 14:00-14:25, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/87173579330

Zoom ID: 871 7357 9330

Password: 041113

Dr. Ahmad Bazzi

Research Scientist
New York University Abu Ahabi, UAE

Speech Title: Trustworthy Image Semantic Communication with GenAI: Explainablity, Controllability, and Efficiency

Abstract: Image semantic communication (ISC) has garnered significant attention for its potential to achieve high efficiency in visual content transmission. However, existing ISC systems based on joint source-channel coding face challenges in interpretability, operability, and compatibility. To address these limitations, we propose a novel trustworthy ISC framework. This approach leverages text extraction and segmentation mapping techniques to convert images into explainable semantics, while employing Generative Artificial Intelligence (GenAI) for multiple downstream inference tasks. We also introduce a multi-rate ISC transmission protocol that dynamically adapts to both the received explainable semantic content and specific task requirements at the receiver. Simulation results based on a real-world demo demonstrate that our framework achieves explainable learning, decoupled training, and compatible transmission in various application scenarios. Finally, some intriguing research directions and application scenarios are identified.

Bio: Dr. Chenyuan Feng, Ph.D, Marie Skłodowska-Curie scholar. Dr. Feng earned her Ph.D. from SUTD, Singapore, and is currently a research fellow at EURECOM, France. Her research interests include edge intelligence and AI for communication. Dr. Feng has published over 30 papers, including one ESI Top 1% Highly Cited Paper, one IEEE ComComAp 2021 Best Paper, and one IEEE ICCT 2024 Best Paper. Additionally, she has obtained five Chinese national invention patents and edited three books. She has also been recognized with First Prize in the International Postdoctoral Innovation and Entrepreneurship Competition, as well as one Gold and one Silver Award in the Chinese Internet+ Innovation and Entrepreneurship Competition. Dr. Feng has led several projects, including an EU Horizon's MSCA project (PI), a National Natural Science Foundation of China project (PI), a National Key R&D sub-project (co-PI), and an Enterprise Start-up Grant (co-PI and co-founder). She has served as a TPC member and delivered tutorials at several international conferences, such as IEEE ICCT, IEEE PIMRC, IEEE VCC, IEEE VTC-Spring, IEEE WiOpt, and IEEE Globecom. Furthermore, Dr. Feng serves as an Associate Editor for the IEEE Internet of Things Journal (IoTJ) and the IEEE Open Journal of the Communications Society (OJ-COMS).

Invited Speaker XXI

April 12, Saturday, 17:30-17:55, GMT+8, Beijing Time
Meeting Room: V1 Room (4 Floor)

Dr. Shuliang Gui

Chongqing University of Posts and Telecommunications, China

Speech Title: ISAC ISAR Imaging for Non-cooperation Moving Targets Sensing Based on Minimum Entropy Technology

Abstract: Integrated Sensing and Communication (ISAC) is poised to become a key technology for next-generation communication systems, with promising applications in areas such as low-altitude operations, security surveillance, and smart cities. Inverse Synthetic Aperture Radar (ISAR) technology plays a critical role in detecting and imaging moving targets. Motivated by ISAR imaging principles and leveraging the ISAC echo signal model, we propose a far-field wavenumber domain ISAR imaging method based on the minimum image entropy criterion, which enables multi-frame imaging of non-cooperative moving targets. Furthermore, Finally, to demonstrate the performance and feasibility of the proposed method, the real imaging experiments are conducted with an 5G millimeter-wave ISAC system.

Bio: Shuliang Gui (1993-), received the Ph.D. degree in signal and information processing from the University of Electronic Science and Technology of China, Chengdu, China, in 2020. He is currently working at the school of Communications and Information Engineering, Chongqing University of Posts and Telecommunications, Chongqing, China. His main research interests include integrated communication and sensing technology, millimeter-wave and terahertz radar fine imaging technology, and low-altitude UAV sensing technology. He has led more than 10 research projects, including the National Natural Science Foundation of China (NSFC) Youth Program, the Chongqing Natural Science Foundation General Program, the Chongqing Doctoral Express Project, the Chongqing Municipal Education Commission Science and Technology Innovation Project, and enterprise-commissioned projects. He has published over 20 papers in journals and conferences, including IEEE TGRS, IEEE TMTT, and Acta Electronica Sinica.

Invited Speaker XXII

April 12, Saturday, 14:25-14:50, GMT+8, Beijing Time
Meeting Room: Diamond Room (4 Floor)

Dr. Jianchao Zheng

Huizhou University, China

Speech Title: FAS-RIS URLLC Communication Systems

Abstract: The ultra reliable low latency communications (URLLC) scheme enhances stringent latency and reliability requirements for Internet of Things (IoT) communication sys- tems. In this paper, we investigate a fluid antenna system (FAS)-reconfigurable intelligent surface (RIS) downlink URLLC communication systems, which consists of a base station (BS) equipped with a single fixed-position antenna, a RIS with M reflecting elements and a user equipped with a single fluid antenna (FA) for signal receiving. We derive the analytical expressions for the average block error rate (BLER). Numerical results illustrate that our theoretically derived analytical average BLERs are almost the same as the simulation results. Further- more, the results demonstrate that the FAS-RIS URLLC system significantly outperforms other configurations.

Bio: Jianchao Zheng is currently a Lecturer with the School of Computer Science and Engineering, Huizhou University, Huizhou, China. She received the Ph.D. degree in information and communication engineering from Sun Yat-sen University, Guangzhou, China, in 2022. Her research interests include finite blocklength transmissions, non-orthogonal multiple access, physical layer security, multiple-input multiple-output communications, fluid antenna system and reconfigurable intelligent surface.

Invited Speaker XXIII

April 13, Sunday, 14:50-15:15, GMT+8, Beijing Time

Zoom Link: https://us02web.zoom.us/j/86461997029

Zoom ID: 864 6199 7029

Password: 041113

Dr. Zehong Chen

Huizhou University, China

Speech Title: Exploring the Layer Style Keeping and Weight Reusing Strategy for Knowledge Distillation

Abstract: The method of knowledge distillation has recently gained significant interest for its potential to deploy models on low-resource devices. However, its success depends heavily on the learned feature representations of the source model. If the architecture and parameters of the source and target models differ significantly, the process of knowledge distillation may become challenging, and the growth of the target model may be restricted. To address these challenges, we propose a novel approach that includes a new style keeping loss function and a weight reusing strategy. The style keeping loss function is utilized to transfer knowledge in the intermediate layers to prevent overfitting and improve the student model's generalization ability. The weight reusing strategy is used for the classification layer, which facilitates pushing the last feature map closer to the classification boundary. Then we assess the effectiveness of our approach on multiple tasks, which include object detection, image classification, and salient object detection. The results show that the performance of the student model has a significant improvement by using the proposed approach.

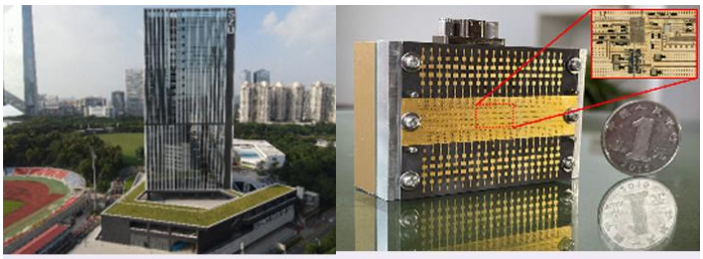
Bio: Zehong Chen is currently a Lecturer with the School of Computer Science and Engineering, Huizhou University, Huizhou, China. She received the Ph.D. degree in information and communication engineering from Shenzhen University, Shenzhen, China, in 2019. Her current research interests include information security, privacy preserving and deep learning. In the field of deep learning, her work primarily involves the design and optimization of neural network models to enhance computational efficiency and practical applicability in resource-constrained environments.

Academic Visits

Shenzhen University History Museum

The Shenzhen University History Museum is located on the first floor of the archives building. It was completed and officially opened to the public in October 2020, covering a total area of 1,279 square meters. The museum features a color scheme of blue, white, and lychee red, complemented by similar hues, which convey a sense of technology while highlighting Shenzhen University's "Lychee Garden" cultural identity.

The museum is structured around a timeline, with its main theme centered on the university's educational spirit. It consists of 11 exhibition areas, beginning with "Development History," which comprehensively presents the founding and development of Shenzhen University. The museum further explores ten thematic areas, including talent cultivation, scientific research, discipline construction, faculty team, party building, campus culture, exchange and cooperation, educational conditions, alumni achievements, and future development prospects. Additionally, it includes a video theater.



State Key Laboratory of Radio Frequency Heterogeneous Integration

The State Key Laboratory of Radio Frequency Heterogeneous Integration was established in 2022 with national approval. Led by Shenzhen University, it is co-constructed with Shanghai Jiao Tong University and ZTE Corporation. The laboratory focuses on key challenges in radio frequency heterogeneous integration, including multi-physics coupling, cooperative mechanisms, and heterogeneous interface generation. It conducts in-depth research to understand fundamental principles and develop core technologies, aiming to establish capabilities and standards for radio frequency heterogeneous integration. The research will drive advancements in integrated circuits and information systems, contributing significantly to China's integrated circuit industry. The laboratory's main research directions include coupling multi-physics fields theory, RF heterogeneous integration processes, measurability and test characterization, and applications of RF heterogeneous integration technology.

Day 1- April 11, 2025 (Fri., GMT+8, Beijing Time)

Onsite Sign-in		
Time	**Event**	**Venue**
10:00-17:00	Onsite Sign-in	Sentosa Hotel (Feicui) Lobby
15:00-17:00	Visit Shenzhen University History Museum& State Key Laboratory of Radio Frequency Heterogeneous Integration	Gather at Sentosa Hotel (Feicui) Lobby at 14:50

Online Pretest		
Time	**Presenters**	**ZOOM Information**
09:00-12:00	Keynote Speaker (Online), Invited Speakers (Online), Session Chairs (Online), Committee Members (Online)	Zoom Link: https://us02web.zoom.us/j/86461997029 Zoom ID: 864 6199 7029 Password: 041113
09:00-15:00	**Online Oral Session 1 -Ubiquitous communication system and wireless communication** SZ692, SZ684, SZ617, SZ7008, SZ7007, SZ7001, SZ7017, SZ7012, SZ623	
	Online Oral Session 2 -Intelligent communication network collaboration and optimization SZ646, SZ7005, SZ630, SZ655, SZ616, SZ7006, SZ7011, SZ7030, SZ7013	
	Online Oral Session 3 -Cross-modal machine learning and system model design SZ654, SZ696, SZ705, SZ700, SZ651, SZ672	
	Online Oral Session 4 -Adaptive network security defense and threat perception SZ648, SZ604, SZ636, SZ649, SZ688, SZ7024, SZ647	

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 12, 2025 (Sat., GMT+8, Beijing Time)

Opening Ceremony and Keynote Speeches

Onsite Meeting Room –Diamond Room (4 Floor)
Zoom ID: 864 6199 7029
Zoom Link: https://us02web.zoom.us/j/86461997029
Password: 041113

09:00-09:05	**Welcome Message** **Prof. Peichang Zhang** Vice Dean of College of Electronics and Information Engineering Shenzhen University, China
09:05-09:10	**Opening Remarks** **Prof. Krzysztof Szczypiorski** Warsaw University of Technology, Poland
09:10-09:50	**Keynote Speech I** **Prof. Jiangzhou Wang** International Member of the Chinese Academy of Engineering (CAE) Fellow of the Royal Academy of Engineering (RAEng), U.K. Fellow of IEEE, Fellow of IET Southeast University, China **Speech Title: Target Localization in Cooperative ISAC Systems**
09:50-10:20	**Group Photo & Coffee Break**
10:20-11:00	**Keynote Speech II** **Prof. Min Chen** Fellow of IEEE, Fellow of IET, Fellow of AAIA Highly Cited Researcher (2018-2024) South China University of Technology, China **Speech Title: Large Language Model (LLM) Fine Tuning: Concepts, Opportunities, and Challenges**
11:00-11:40	**Keynote Speech III** **Prof. Chow-Yen-Desmond Sim** IEEE Fellow, IEEE AP-S Distinguished Lecturer (2024-2026), Fellow of IET Feng Chia University, Taiwan, China **Speech Title: Antenna Solutions and Analysis for Commercial 5G mmWave Antenna-in-Package (AiP) Designs**
11:40-12:20	**Keynote Speech IV** **Prof. Qingsheng Zeng** IEEE Senior Member Université du Québec an Outaouais, Canada **Speech Title: Millimeter Wave Signal Propagation in Indoor Environment and Underground Mine**
12:20-14:00	**Break & Lunch (Sentosa Hotel (Feicui) Restaurant 1 Floor)**

14:00-16:30	Diamond Room (4 Floor)	**Onsite Oral Session 1 -Electromagnetic theory and intelligent fusion antenna design** **Session Chair:** Prof. Yindong Xiao, University of Electronic Science and Technology of China, China **Invited Speakers:** Prof. Botao Feng, Shenzhen University, China Dr. Jianchao Zheng, Huizhou University, China Asst. Prof. Luping Xiang, Nanjing University, China SZ619-A, SZ708, SZ709, SZ711, SZ712
14:00-15:50	Crystal Room (4 Floor)	**Onsite Oral Session 2 -Intelligent measurement technology and system based on high-precision sensing** **Session Chair:** Prof. Xing-Quan Wang, Gannan Normal University, China **Invited Speakers:** Prof. XingQuan Wang, Gannan Normal University, China Assoc. Prof. Hongyan Fu, Tsinghua University, China SZ7021, SZ627, SZ679, SZ632
14:00-15:55	Pearl Room (4 Floor)	**Onsite Oral Session 3 -Integration of renewable energy network and air-space-ground-sea integrated network** **Session Chair:** Assoc. Prof. Bo Li, Ningxia University, China **Invited Speaker:** Assoc. Prof. Bo Li, Ningxia University, China SZ7009, SZ650, SZ653, SZ659, SZ7002, SZ7010
14:00-16:05	Agate Room (4 Floor)	**Onsite Oral Session 4 -Intelligent optimization algorithm and model design** **Session Chair:** Assoc. Prof. Chaoyang Li, Guangdong University of Science & Technology, China **Invited Speakers:** Assoc. Prof. Feibo Jiang, Hunan Normal University Prof. Hao Zhang, Purdue University, USA SZ637, SZ640, SZ641, SZ644, SZ674
14:00-15:12	V1 Room (4 Floor)	**Onsite Poster Session 1 -Digital communication and network collaborative optimization** **Session Chair:** Assoc. Prof. Wei Yang, Shenzhen Technology University, China SZ603, SZ638, SZ626, SZ639, SZ642, SZ715, SZ601, SZ699, SZ690, SZ7022, SZ7003, SZ612
15:30-16:48	V1 Room (4 Floor)	**Onsite Poster Session 2 -Cross-modal intelligent perception system and engineering application** **Session Chair:** Prof. Sanshan Sun, Sichuan Normal Univeristy, China SZ606, SZ609, SZ615, SZ608, SZ625, SZ631, SZ680, SZ682, SZ656, SZ694, SZ714, SZ718, SZ719
15:50-17:05		**Coffee Break**

16:45-18:10	Diamond Room (4 Floor)	**Onsite Oral Session 5 -Resource scheduling and adaptive optimization model in federated edge learning** **Session Chair:** Prof. Hao Zhang, Purdue University, USA **Invited Speaker:** Prof. Yindong Xiao, University of Electronic Science and Technology of China, China SZ691, SZ660, SZ720, SZ663
16:05-18:35	Crystal Room (4 Floor)	**Onsite Oral Session 6 -Modern communication system and signal processing** **Session Chair:** Prof. Wenzhe Gu, Huizhou University, China **Invited Speakers:** Prof. Wenzhe Gu, Huizhou University, China Assoc. Prof. Dong Hou, University of Electronic Science and Technology of China, China Prof. George C. Polyzos, The Chinese University of Hong Kong, China SZ645, SZ634, SZ681, SZ624-A, SZ721
16:20-18:10	Pearl Room (4 Floor)	**Onsite Oral Session 7 -New network security defense and privacy enhancement** **Session Chair:** Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China **Invited Speakers:** Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China Associate Research Fellow Jie Tian, China Academy of Engineering Physics, Mianyang, China SZ607, SZ613, SZ662, SZ695
16:20-18:15	Agate Room (4 Floor)	**Onsite Oral Session 8 -Green communication and energy collaborative management** **Session Chair:** Assoc. Prof. Min Fu, Ocean University of China, China **Invited Speakers:** Assoc. Prof. Min Fu, Ocean University of China, China Assoc. Prof. Youzhi Xiong, Sichuan Normal University, China SZ710, SZ677, SZ707, SZ687
17:05-18:40	V1 Room (4 Floor)	**Onsite Oral Session 9 -Digital image processing and application** **Session Chair:** Prof. Xiao Ding, Macau University of Science and Technology, China **Invited Speakers:** Assoc. Prof. Wei Yang, Shenzhen Technology University, China Dr. Shuliang Gui, Chongqing University of Posts and Telecommunications, China SZ643, SZ7026, SZ698
19:00-20:30		**Banquet (Jade Room 3 - 4 Floor)**

Day 3 –April 13, 2025 (Sun., GMT+8, Beijing Time)

Online Sessions		
9:00-11:40	**Zoom ID:** 864 6199 7029 https://us02web.zoom.us/j/86461997029 Password: 041113	**Online Oral Session 1 -Ubiquitous communication system and wireless communication** **Session Chair:** Prof. Jiehan Zhou, Shandong University of Science and Technology, China **Invited Speaker:** Assoc. Prof. Liwei Yang, China Agricultural University, China SZ692, SZ684, SZ617, SZ7008, SZ7007, SZ7001, SZ7017, SZ7012, SZ623
9:00-11:40	**Zoom ID:** 871 7357 9330 https://us02web.zoom.us/j/87173579330 **Password**: 041113	**Online Oral Session 2 -Intelligent communication network collaboration and optimization** **Session Chair:** Prof. Yonghua Li, Information and Communication Engineering Beijing University of Posts and Telecommunications, China **Invited Speaker:** Prof. Kwok L. Chung, Guangzhou Institute of Science and Technology, China SZ646, SZ7005, SZ630, SZ655, SZ616, SZ7006, SZ7011, SZ7030, SZ7013
11:40-14:00	**Break Time**	
14:00-16:45	**Zoom ID:** 864 6199 7029 https://us02web.zoom.us/j/86461997029 **Password:** 041113	**Online Oral Session 3 -Cross-modal machine learning and system model design** **Session Chair:** Assoc. Prof. Qiang He, Northeastern University, China **Invited Speakers:** Prof. Yonghua Li, Information and Communication Engineering Beijing University of Posts and Telecommunications, China Assoc. Prof. Qiang He, Northeastern University, China; Dr. Zehong Chen, Huizhou University, China SZ654, SZ696, SZ705, SZ700, SZ651, SZ672
14:00-16:10	**Zoom ID:** 871 7357 9330 https://us02web.zoom.us/j/87173579330 **Password:** 041113	**Online Oral Session 4 -Adaptive network security defense and threat perception** **Session Chair:** TBA **Invited Speaker:** Dr. Ahmad Bazzi, New York University Abu Ahabi, UAE SZ648, SZ604, SZ636, SZ649, SZ688, SZ7024, SZ647

Onsite Oral Session 1

Time: 14:00-16:30 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Diamond Room (4 Floor)
Topic: Electromagnetic theory and intelligent fusion antenna design
Chaired by: Prof. Yindong Xiao, University of Electronic Science and Technology of China, China

Invited Speech SZ666-A **14:00-14:25**	**Title:** Multi-Function Multi-Beam Reflectarray Antenna for Sub-Terahertz Applications **Author:** Botao Feng **Invited Speaker:** Botao Feng, Shenzhen University, China **Abstract:** This paper presents a single-layer dual-band multi-beam reflectarray antenna based on a polarization selection technique for sub-terahertz (sub-THz) applications. The antenna element consists of two orthogonally nested ring structures that enable dual-band operation. The outer split-ring component, aligned along the y-axis, generates X-polarized radiation through arc-shaped phase-shifting lines extending from its sides. The inner component, embedded within the outer ring, comprises two small arc-shaped microstrip patches connected vertically by a straight-bar microstrip line, producing Y-polarized radiation. To enhance performance, a digital coding metasurface, combined with single- and multi-focus phase compensation techniques, enables four-beam radiation at the lower frequency band and dual-beam scanning at the upper band. Experimental results demonstrate a wide elevation angle of up to 104° and a high aperture efficiency of 49.2% at 135 GHz. At 170 GHz, the antenna achieves a low scanning loss of 1.6 dB and an aperture efficiency of 29%. Additionally, the antenna attains high peak gains of 19.7 dBi and 26.3 dBi in the lower and upper frequency bands, respectively. With its high gain, broad coverage, and multi-beam scanning capability, the proposed sub-THz reflectarray antenna serves as a promising solution for future 6G point-to-multipoint communication systems, addressing the demands for large capacity, wide-area coverage, and high-resolution beamforming.
Invited Speech SZ7027 **14:25-14:50**	**Title:** FAS-RIS URLLC Communication Systems **Authors:** Jianchao Zheng, Yulan Zhang, Xiaoye Wang, Dongxiong Li, Hui Li, Shanshan Chen **Invited Speaker:** Jianchao Zheng, Huizhou University, China **Abstract:** The ultra reliable low latency communications (URLLC) scheme enhances stringent latency and reliability requirements for Internet of Things (IoT) communication sys- tems. In this paper, we investigate a fluid antenna system (FAS)-reconfigurable intelligent surface (RIS) downlink URLLC communication systems, which consists of a base station (BS) equipped with a single fixed-position antenna, a RIS with M reflecting elements and a user equipped with a single fluid antenna (FA) for signal receiving. We derive the analytical expressions for the average block error rate (BLER). Numerical results illustrate that our theoretically derived analytical average BLERs are almost the same as the simulation results. Further- more, the results demonstrate that the FAS-RIS URLLC system significantly outperforms other configurations.
Invited Speech SZ703 **14:50-15:15**	**Title:** Foundation Models for Communication and Sensing: A Paradigm Shift from Traditional Models to AI-driven Intelligence **Author:** Luping Xiang **Invited Speaker:** Luping Xiang, Nanjing University, China **Abstract:** Deep learning (DL) is transforming communication and sensing, enhancing the intelligence of future 6G networks. To address challenges in generalization and transferability, this work introduces foundation models—modular architectures seamlessly integrating into communication and sensing systems. These models improve communication efficiency, enable cross-task parameter sharing, and significantly reduce sensing errors. Additionally, a novel pre-equalization strategy dynamically adapts transmitted signals using sensing information, mitigating channel impairments without modifying pre-trained models. Simulation results validate the effectiveness and transferability of foundation models, highlighting their potential to bridge model-

	driven and data-driven approaches in communication and sensing.
SZ619-A **15:15-15:30**	**Title:** Wideband Circularly Polarized Archimedean Spiral Antenna with Heat Dissipation Function **Authors:** Liudan Chen, Yu-Xiang Sun **Presenter:** Liudan Chen, Shenzhen University, China **Abstract:** A wideband circularly polarized antenna with heat dissipation function is presented in this paper. This antenna consists of two metal heat-dissipating fins shaped like Archimedean spiral arms. To achieve better impedance matching, the heatsink is designed with a height gradient. An exponential gradient microstrip balun is employed for matching the port and antenna. The results of the antenna show that the overlapping-10-dB impedance bandwidth and axial ratio bandwidth are 127.5% (5-22.56 GHz). Under the heat source power of 0.5 W and 293 K environment temperature, the rising temperature of the proposed antenna is 12.3 K lower than the microstrip spiral antenna.
SZ708 **15:30-15:45**	**Title:** Multi-Band Low-Profile Non-Uniform Metasurface Antenna For Sub-6-GHz Applications **Authors:** Naveed Hamid Nawaz Khan, Botao Feng, Xiao Ding, Li Deng, Wei Yang, Qingsheng Zeng **Presenter:** Naveed Hamid Nawaz Khan, Shenzhen University, China **Abstract:** This paper presents the design of a compact nonuniform metasurface antenna with dimensions of 70×70 mm². The antenna basically comprises a 1.6 mm-thick metasurface patch and a 1 mm-thick substrate, separated by a 5-mm air gap to enhance performance. The proposed design is analyzed using CST Microwave Studio, evaluating key parameters such as Voltage Standing Wave Ratio (VSWR), |S11|, and radiation efficiency. Simulation results indicate excellent impedance matching, with |S11| below −10 dB across 2.35 GHz to 6 GHz, reaching a minimum of −36.647 dB at 5.16 GHz. The VSWR remains below 2.5, with a minimum of 1.5 at 5.16 GHz. Additionally, the antenna demonstrates high radiation efficiency, ranging 74% to 80.7%, indicating effective energy radiation. The experiment results highlight the potential of the proposed non-uniform metasurface antenna for next-generation wireless communication systems, especially for 5G and beyond, where compact size, broad bandwidth, and high efficiency are essential. Notably, the integration of a non-uniform metasurface geometry and strategically placed air gap enhances overall performance, making it a promising candidate for future wireless technologies.
SZ709 **15:45-16:00**	**Title:** An Ultra-Wideband Coplanar Waveguide Antenna Covering Multiple Frequency Bands **Authors:** Gengbo Xiao, Botao Feng, Xiao Ding, Li Deng, Wei Yang, Qingsheng Zeng **Presenter**: Gengbo Xiao, Shenzhen University, China **Abstract:** This paper proposes a miniaturized ultra-wideband antenna with multi-mode operation, designed with a coplanar waveguide (CPW) feed to achieve compact dimensions. The antenna's bandwidth is significantly enhanced by using the integration of stubs and strategic cutouts, while circular polarization is introduced to improve transmission and reception performance. Notably, the antenna supports GPS positioning, with its right-hand circular polarization meeting satellite positioning requirements. The proposed design achieves an impedance bandwidth of 1.08 GHz to 2.62 GHz (|S11|≤-6 dB, 84.86%) and an axial ratio (AR) bandwidth (VSWR<3 dB) from 1.5 GHz to 2.27 GHz (40.84%). With the characteristics of a low profile, high gain, wide bandwidth, and high radiation efficiency, this antenna is well-suited for applications in GPS positioning, satellite communication, LTE, and WiFi frequency bands.
SZ711 **16:00-16:15**	**Title:** A Low-Profile Circularly Polarized Directional Antenna with Wide Beamwidth and Wide Bandwidth **Authors:** Xuhang Zhou, Botao Feng, Xiao Ding, Li Deng, Wei Yang, Qingsheng Zeng **Presenter:** Xuhang Zhou, Shenzhen University, China **Abstract:** This paper presents a low-profile broadband wide-beam directional circularly polarized (CP) antenna based on crossed dipoles. The design consists of two sets of crossed dipoles, each

	connected to the inner and outer conductors of a coaxial line. Each dipole set features two bowtie-shaped patches linked by a vacant-quarter ring, whose circumference equals a quarter of the center wavelength. This ring introduces a 90-degree phase shift, enabling circularly polarized radiation. To enhance performance, four parasitic elements are strategically placed at the corners. The parasitic patches contribute to bandwidth expansion, while the vertical parasitic plates improve beamwidth coverage. Simulation results demonstrate that the antenna achieves good |S11| and axial ratio performance within the 1.2-2.1 GHz range. Additionally, the half-power beamwidth (HPBW) is significantly improved compared to designs without vertical parasitic plates, highlighting its strong potential for future wireless communication applications.
SZ712 **16:15-16:30**	**Title:** A Low-profile Broadband Dual-polarized Magneto-electric dipole Antenna for 5G applications **Authors:** Yihuang Yang, Botao Feng, Ding Xiao, Li Deng, Wenzhe Gu, Kwok L. Chung **Presenter:** Yihuang Yang, Shenzhen University, China **Abstract:** This study proposes a compact wideband dual-polarized (DP) magneto-electric (ME) dipole antenna with cross-differential feeding, designed for 5G/6G millimeter-wave (mm-Wave) systems. The antenna features a geometrically symmetric configuration, integrating radiating elements and feeding networks into a single metallic layer, achieving a low-profile structure. By leveraging ME coupling mechanisms, the antenna supports dual-orthogonal polarization operation, offering a broad impedance bandwidth of 39.4% (26.3-39.1 GHz) under differential port excitation. Experimental results demonstrate excellent radiation performance, including highly symmetric radiation patterns, cross-polarization suppression below -30 dB, a gain range of 2.6-6.2 dBi, and an axial ratio (AR) below 2 dB across the operational band. The unified feed-radiator co-design effectively mitigates mm-Wave challenges such as narrow bandwidth and integration constraints commonly found in conventional dual-polarized antennas, which makes the proposed design a promising solution for compact MIMO arrays in the 28/39 GHz 5G NR bands.

Onsite Oral Session 2

Time: 14:00-15:50 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Crystal Room (4 Floor)
Topic: Intelligent measurement technology and system based on high-precision sensing
Chaired by: Prof. Xing-Quan Wang, Gannan Normal University, China

Invited Speech SZ635-A **14:00-14:25**	**Title:** A Half-Bridge IGBT Drive & Protection Circuit for Inverter Power Supply **Author:** Xingquan Wang **Invited Speaker:** Xingquan Wang, Gannan Normal University, China **Abstract:** The common IGBT drive and protection circuits are complex and expensive. Moreover, the circuit's interfaces and the parameters are difficult to change. We designed a half-bridge IGBT drive and protection circuit with discrete components. It was easy to change the frequency, the duty cycle and the driving voltage and current of driving square wave signal which was then isolated into two outputs by using photoelectric coupler. The protection circuit was formed by using Hall sensor for direct detection of main circuit current with a minute amount of elements. Further, we build a high voltage power supply for DBD discharge whose output peak voltage can be changed continuously from 0 to 30 kV and frequency from 8 to 25 kHz with the output maximum power of 150 W.
Invited Speech SZ675-A **14:25-14:50**	**Title:** Spectral-Scanning FMCW LiDAR Based on Tunable VCSEL and Nonlinearity Correction Methods **Authors**: Hongyan Fu and Yi Hao **Invited Speaker:** Hongyan Fu, Tsinghua University, China **Abstract:** In recent years, light detection and ranging (LiDAR) has found widespread applications in fields such as autonomous driving, drones, mapping, and consumer electronics. Frequency-modulated continuous-wave (FMCW) LiDAR has gained significant attention from both academia and industry due to its superior performance compared to traditional approaches such as time-of-flight (ToF). In FMCW LiDAR systems, high speed and wide field-of-view (FoV) play a crucial role in determining imaging performance. The linearity of the laser frequency sweep is another key performance metric significantly affecting imaging resolution and precision. This talk will briefly review existing beam-steering methods and related work for ultrafast LiDAR systems, with a focus on the technological advancements of tunable vertical-cavity surface-emitting laser (VCSEL), nonlinearity correction methods, and spectral-scanning methods for FMCW LiDAR.
SZ7021 **14:50-15:05**	**Title:** A study on the application of intelligent algorithms in ultrasonic measurement technology **Authors:** Huang Yu-Che, Huang Ping-Hsien **Presenter:** Huamg,Yu-Che, Chaoyang University of Science and Technology, Taiwan, China **Abstract:** Smart algorithms have significant advantages in many fields, especially in the application of ultrasonic sensing technology. First, smart algorithms can effectively process and analyze large amounts of data, which is crucial for the large number of signals generated by ultrasonic sensors. Through technologies such as machine learning and neural networks, algorithms can accurately identify different types of sound wave reflection signals to achieve accurate measurement of the environment or objects. These technologies are particularly effective in dealing with noise interference in complex environments and can improve signal stability and accuracy. In recent years, due to the habit of car drivers not using car seat belts, people are thrown out of the car in car accidents, causing casualties and family losses. This research combines ultrasound with smart technology and applies it to smart devices to optimize energy. usage and environmental awareness. Therefore, the combination of smart algorithms and ultrasonic sensing technology has broad application potential and will provide strong support for future technological development.

SZ627 **15:05-15:20**	**Title:** Simplified Dielectric Property Determination for Wearable Applications Using Dual CPW Lines **Authors:** Jialiang Ni, Kwok L. Chung, Liwen Liang, Jingshu Sun, Wenbiao Li, Xiaotian Liu, Tongtong Ouyang, Zhibin Chen, **Presenter:** Jialiang Ni, Guangzhou Institute of Science and Technology, China **Abstract:** This paper presents an enhanced dual transmission-line method for evaluating the dielectric properties of known and unknown materials, significantly improving upon traditional techniques. The proposed method simplifies the experimental setup by eliminating the need for constructing transmission lines or additional processing on unknown materials, utilizing a straightforward simulation model created with the EM simulator CST and requiring only low-cost experimental equipment. It operates independently of prior knowledge concerning the substrate dielectric constant, streamlining data processing and saving time. Furthermore, the method demonstrates high accuracy in comparison to reference values. Applied in this study, it verified the dielectric properties of unknown cowhide leather and two commercial substrates, RO3010 and RT5880. The computed root-mean-square errors (RMSEs) were 24.1% for RT5880 and 3% for RO3010, confirming the method's effectiveness. Overall, this improved approach provides a reliable and efficient alternative for material characterization in dielectric property determination.
SZ679 **15:20-15:35**	**Title:** Multi-Frequency Filter Based Denoising Diffusion Model for Knowledge-Aware Recommendation **Authors:** Yiran Shi, Bangzuo Zhang, and Dongbing Pu **Presenter:** Yiran Shi, Northeast Normal University, China **Abstract:** Knowledge Graph (KG) introduces fruitful domain information of structure and semantic to solve data sparsity. However, the presence of irrelevant entities as noise results in the inability to predict user true preference. Recently, diffusion models have been broadly applied to remove noise. In addition, filtering algorithms are current effective methods for filtering out noise signals. To fundamentally eliminate noise in KG, we propose a remarkable multi-frequency filter based denoising diffusion model (FDiff) for knowledge-aware recommendation. In our framework, we devise a diffusion with multi-frequency filter to generate a denoised KG. Specifically, the reverse process incorporates a multi-frequency filter, which divides frequencies with different weights to eliminate irrelevant signals. Meanwhile, the top k optimal values are returned to represent the knowledge data. For prediction results, the aggregation strategy consists of knowledge aggregation and collaborative knowledge graph aggregation to obtain user personalized preferences. Furthermore, we utilize a contrastive learning method to optimize the recommendation task. Extensive experiments are performed on three realistic datasets. The results consistently prove that our FDiff surpasses other competitive baselines.
SZ632 **15:35-15:50**	**Title:** High-Performance Vibration Sensor Design **Authors:** He Quan、Xing-Quan Wang、Qiao-sheng Guo、Kai-Xiang Ouyang、Bai-Rui Yin、Wen-Hao Wen **Presenter:** He Quan, Gannan Normal University, China **Abstract:** This paper proposes a high-performance vibration sensor design to address sensitivity and stability issues in existing sensors under wide frequency (0-1 kHz) and high-amplitude (>10 g) conditions. The ADXL317 accelerometer provides high-sensitivity three-axis acceleration measurement, while the AD2428W signal processing chip handles signal processing and data transmission. This combination ensures excellent sensitivity and stability across a wide frequency range and under large amplitude vibrations. Experimental results show that the sensor achieves a sensitivity of 80 mV/g to 85 mV/g in the 0-1 kHz range, with a maximum linearity deviation of 0.997% in the 1 g to 16 g acceleration range. This design offers an effective solution for precise measurements in challenging environments, suitable for industrial monitoring, equipment diagnostics, and applications in automotive and aerospace industries.

Onsite Oral Session 3

Time: 14:00-15:55 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Pearl Room (4 Floor)
Topic: Integration of renewable energy network and air-space-ground-sea integrated network
Chaired by: Assoc. Prof. Bo Li, Ningxia University, China

Invited Speech **SZ670-A** **14:00-14:25**	**Title:** Dual Power Supply Strategies for Ground-Air Integrated Network **Authors:** Assoc. Prof. Bo Li, Ningxia University, China **Invited Speaker:** Bo Li, Ningxia University, China **Abstract:** To address the issues of how to maximize renewable power utilization and lower the charging cost, power supply strategy for green base station and UAV is proposed in this speech. For base station, the strategy consists of Grid Connection Depth (GCD) model and Battery Power Sharing (BPS) model, which reduce the dependence on the grid and take advantage of idle power. The optimal power transfer variables are obtained to facilitate the strategy for maximizing renewable power utilization. For UAV, a static charging station strategy that exploits inductive coupling and battery hotswapping techniques is proposed. The strategy consists of nearby battery swapping strategy and charging station selection strategy for UAVs without time constraints (CTC). For describing the mutual competition among UAV charging selections in CTC strategy, a non-cooperative game framework with pure strategy is developed. An iterative algorithm is designed to solve the Nash equilibrium and obtain the optimal charging selection scheme. The optimal ratio of weighting factors is obtained through simulation and numerical analysis. Finally, the comparison results with other strategies indicate that the proposed strategies have the characteristics of low cost and low latency. The simulation results demonstrate that the proposed strategies have higher practical value compared with other power supply strategies.
SZ7009 **14:25-14:40**	**Title:** An Energy Efficient Dual Sink Protocol for Wireless Body Area Networks **Authors:** AHMAD ALI ALZUBI, FAHAD ALBLEHAI, OSAMA ALFARRAJ, SALEM ALKHALAF **Presenter:** SALEM ALKHALAF, Qassim University, Saudi Arabia **Abstract:** The growing demand for energy-efficient solutions in Wireless Body Area Networks (WBANs) calls for innovative protocols that can optimize energy consumption while ensuring high network performance. This paper introduces the energy-efficient dual sink protocol (EEDSP) designed to enhance the performance of WBANs through a combination of advanced energy management and reliable communication techniques. EEDSP operates with a dual-sink architecture, utilizing any-casting to ensure optimal data routing while minimizing packet loss and communication delays. The protocol also integrates energy-aware routing mechanisms, which dynamically select paths based on residual energy and distance, extending the network's lifetime. Extensive simulation results demonstrate that EEDSP outperforms existing protocols, such as CRPBA and EEDLABA, in key performance metrics, including PDR, network lifetime, residual energy, end-to-end delay, path loss, and CCR. These results confirm EEDSP as a promising solution for energy-efficient WBANs, making it well-suited for applications in healthcare and other energy-constrained environments.
SZ650 **14:40-14:55**	**Title:** Robustness Analysis of Mega-constellation Networks Against Node Attacks **Authors:** Xianyang Liu, Siyue Lu, Shiqing Peng, Weifeng Zeng, Mingze Li, Xin Xu **Presenter:** Siyue Lu, Army Engineering University of PLA, Chnia **Abstract:** Mega-constellation networks have received increasing attention in recent years. Network robustness is important for mega-constellation networks, but it is also difficult because satellites are expensive to maintain and reconfigure in outer space. This paper presents some network robustness evaluations on mega-constellation networks. Firstly, a

	definition of the importance metric of satellites is proposed based on traffic due to the difference between constellation networks and terrestrial networks. Based on this, three node attack strategies are defined to mimic actual attack behavior against mega-constellation networks. Simulations are implemented in three typical mega-constellation network models and the robustness is evaluated using a newly presented metric. The results show that the random attack strategy has a wider impact on mega-constellation networks, and the selective attacks may have a stronger impact on the network, which results in a greater packet loss ratio in mega-constellations.
SZ653 **14:55-15:10**	**Title:** A Study on 100Gbs+ Transceiver adopting OTFS signaling for space communication **Authors:** Ping Ji, Tong Yang, Jianglei Gong, Xiang Li, Baiyan Wang **Presenter:** Ping Ji, Institute of telecommunication and navigation satellite, China Academy of Space Technology (CAST), China **Abstract:** In the future space communication scenarios, high- speed communication with high mobility will face many challenges, including the ultra-reliable communication issue. Orthogonal Time Frequency Space (OTFS) signaling scheme, as an emerging technology, can overcome the multi-path and Doppler effects and offers significant performance compared to orthogonal frequency division multiplexing (OFDM) technology in space communication. In this paper, an introduction of general principle to the OTFS system was presented. A 100Gb/s+ W-band transceiver adopting OTFS signaling was studied and proposed. It combines the OTFS and MIMO technology, fully utilizes broadband frequency spectrum resources, and takes the advantage of the polarization isolation. The system design can overcome severe Doppler shift effect under environmental conditions of space communication with high mobility. In the simulation study, both the system BER level and the system throughput capability are taken into consideration. The experimental results show that the transceiver can effectively operate at BER levels around 10-4 when SNR is over 20dB.
SZ659 **15:10-15:25**	**Title:** Downlink SE Analysis and Optimization for Cell-free Massive MIMO Network With Limited-Capacity Fronthauls **Authors:** Tang Liu, Zhuang Pan, Ding Shifei, Xiong Youzhi, Sun Shansan, Liu Li, **Presenter:** Tang Liu, Sichuan Normal University, China **Abstract:** This paper derives an asymptotic expression of downlink spectral efficiency (SE) for fronthaul-constrained cell free massive multiple-input multiple-output (MIMO) network with minimum mean-square error (MMSE) precoding. Based on the closed-form downlink SE, we then formulate an optimization problem to maximize downlink sum SE under the constraints of fronthaul capacity and transmit power. By exploiting the Lagrangian dual transform and fractional programming (FP) techniques, we further propose an alternating maximization (AM) algorithm to achieve bit allocation scheme among all access points (APs) and downlink power control strategy for all users. Finally, simulation results validate the accuracy of the analytical SE and demonstrate that the proposed algorithm is preferable to other counterparts.
SZ7002 **15:25-15:40**	**Title:** Performance of Optical Wireless Communications with Spatial Diversity over Fisher-Snedecor Turbelence Channels **Authors:** Wenhui Zeng, Theodoros A. Tsiftsis **Presenter:** Wenhui Zeng, Jinan University, China **Abstract:** Atmospheric turbulence and misalignment fading due to pointing errors severely degrade the performance of free-space optics (FSO) communications. To mitigate these issues and leverage the benefits of spatial diversity, multiple antennas can be employed at the transmitter and/or receiver of the optical communication link. Spatial diversity serves as critical technology to enhance communication performance of optical wireless systems, especially in strong turbulence channels. In this research, we study the average bit error ratio (ABER) performance of FSO systems considering the Fisher-Snedecor F-modeled turbulence fading channels and pointing errors, and explore the potential benefits of spatial

	diversity at both ends of the optical link. Additionally, we provide an efficient approximate closed-form expression for the ABER of single input multiple output FSO systems.
SZ7010 **15:40-15:55**	**Title:** Channel Characteristics Analysis of RIS-Assisted Wireless Communication in Mountainous City Scenarios **Authors:** Xiyuan Ren, Xiaorong Jing and Qianbin Chen **Presenter:** Xiyuan Ren, School of Communications and Information Engineering, Chongqing University of Posts and Telecommunications, China **Abstract:** The space-time-frequency (STF) characteristics of Reconfigurable Intelligent Surface (RIS)-assisted communication channels significantly influence the performance of integrated sensing and communication systems. This paper classifies three distinct communication scenarios in the complex mountainous city environment of Chongqing: mountainous urban, mountainous tunnel/bridge, and mountainous riverside scenarios. Different channel models are developed by accounting for the variations in path propagation across the three scenarios. Theoretical analyses of fading characteristics are conducted for the different scenarios, with a focus on the path loss model incorporating the water surface effect in the riverside scenario and the dual-slope path loss model refined for the tunnel scenario to account for the waveguide effect. Numerical simulations are employed to investigate the STF correlation characteristics of the channels in these three scenarios. The results indicate slightly higher temporal autocorrelation in the urban and tunnel scenarios compared to the riverside scenario, due to the line-of-sight path and RIS assistance. Additionally, the double RIS reconfiguration of the electromagnetic wave propagation path in the riverside scenario leads to smoother, reduced spatial correlation compared to the other scenarios, and causes the scatterers to be more dispersed, resulting in greater delay spread. It is shown that RIS-assisted communication channel models in complex mountainous environments exhibit distinct statistical characteristics across different communication scenarios.

Onsite Oral Session 4

Time: 14:00-16:05 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Agate Room (4 Floor)
Topic: Intelligent optimization algorithm and model design
Chaired by: Assoc. Prof. Chaoyang Li, Guangdong University of Science & Technology, China

Invited Speech **SZ716-A** **14:00-14:25**	**Title:** Large Model-Empowered Multimodal Semantic Communication **Author:** Feibo Jiang **Invited Speaker:** Feibo Jiang, Hunan Normal University **Abstract:** Multimodal signals, including text, audio, image, and video, can be integrated into semantic communication systems to provide a low-latency, high-quality immersive experience at the semantic level. However, multimodal semantic communication faces several challenges, such as data heterogeneity, semantic ambiguity, and signal distortion during transmission. In recent years, large models, particularly large language models (LLMs), vision-language models (VLMs), and large multimodal models (LMMs), have offered potential solutions to address these challenges. We conduct a systematic study on the application of large models in semantic communication, including a cross-modal semantic communication system based on VLMs, a multimodal semantic communication system empowered by LMMs, a multi-agent system leveraging LLMs, and a VLM-based multimodal, multi-user, and multi-task semantic communication system. In recent years, large models, particularly large language models (LLMs), vision-language models (VLMs), and large multimodal models (LMMs), have offered potential solutions to address these challenges. We conduct a systematic study on the application of large models in semantic communication, including a cross-modal semantic communication system based on VLMs, a multimodal semantic communication system empowered by LMMs, a multi-agent system leveraging LLMs, and a VLM-based multimodal, multi-user, and multi-task semantic communication system. Additionally, we explore knowledge base design schemes based on large models and propose a foundational large model for the communication domain, enhanced with the retrieval-augmented generation (RAG) and knowledge graph. These methods will further enhance the performance of semantic communication, eliminate semantic noise, and provide valuable insights for the advancement of semantic communication technology.
Invited Speech **SZ669-A** **14:25-14:50**	**Title:** Kriging Through the Lens of Weighted Ridge Regression **Author:** Hao Zhang **Invited Speaker:** Hao Zhang, Purdue University, USA **Abstract:** Kriging, the best linear unbiased prediction method, is widely applied in agriculture, geology, environmental and climate studies, and computer experiments. It shares deep connections with kernel learning methods in machine learning, where it is known as Gaussian process regression. Additionally, by the representer theorem, Kriging can be viewed as nonparametric smoothing in a functional space. In this talk, I will demonstrate how the Kriging solution can be obtained via weighted ridge regression, offering a new perspective that facilitates the use of existing ridge regression software. I will also discuss applications of this approach.
SZ637 **14:50-15:05**	**Title:** Application of hybrid optimization algorithm considering yard priority to port vehicle scheduling **Authors:** Fu Jia, Sishi Pan, Jinsong Liao, Shuangyu Zhang **Presenter:** Sishi Pan, Chongqing University of Posts and Telecommunications, China **Abstract:** With the increasing scale and complexity of port logistics, the Vehicle Routing Problem (VRP) has become a key challenge to improve the efficiency of port logistics with multiple ships and multiple yards. In this paper, a hybrid method based on ant colony optimization algorithm and genetic algorithm is proposed for optimizing the vehicle scheduling problem in port cargo

	transportation. The study is designed to construct the fitness function by considering the transportation time, fuel consumption, yard priority and the number of vehicle turns, aiming to minimize the transportation time and fuel consumption, while giving priority to meet the cargo demand of yards with higher inventory. The algorithm improves the global optimization capability of path search by introducing the pheromone matrix updating mechanism combined with the crossover and mutation operations of the genetic algorithm.
SZ640 **15:05-15:20**	**Title:** Yard Stacking Strategy for General Cargo Terminals: Integrating Cargo Classification Adaptation and Berth Scheduling Optimization **Authors:** Fu Jia, Zhang Shuangyu, Liao Jinsong, Pan Sishi, **Presenter:** Zhang Shuangyu, Chongqing University of Posts and Telecommunications., China **Abstract:** In response to the escalating cargo throughput at ports, the demand for stacking at breakbulk cargo terminals has surged, leading to increasingly strained yard space. The existing yard stacking strategies are no longer sufficient to meet the efficiency demands of modern port operations. This paper introduces a stacking strategy that comprehensively considers berth scheduling, yard resource constraints, cargo turnover, and cargo type fitness. By integrating discrete berth scheduling, cargo turnover, diverse cargo characteristics, and fitness conditions into a unified model, we develop algorithms to solve this complex problem. The findings indicate that: (1) the proposed stacking strategy optimizes the overall distance from the berth to the yard and minimizes the number of trailer transports, reducing the transported miles by over 35% compared to other strategies. (2) The average number of trailer transports is decreased, shortening cargo transportation time, lowering transportation costs, enhancing the overall transportation efficiency of the terminal, and reducing logistics time. (3) The overall space utilization rate of the terminal yard is elevated to 8.7%, expanding the cargo capacity of the yard and consequently lowering the storage cost per unit of cargo due to improved space utilization and increased cargo capacity.
SZ641 **15:20-15:35**	**Title:** ALMM: Analytic Learning and Model Merging for Class Incremental Learning **Authors:** He Han, Huiping Zhuang **Presenter:** He Han, South China University of Technology, China **Abstract:** In rapidly changing environments, traditional static deep learning models are unable to adapt to the evolving demands of new tasks. These models lack the adaptability required to address dynamic scenarios. While fine-tuning these models can be a solution to some extent, it frequently leads to a phenomenon known as catastrophic forgetting, which involves the loss of knowledge acquired from previous tasks. Existing class-incremental learning methods predominantly prioritize the mitigation of catastrophic forgetting, often at the cost of compromising plasticity and adaptability. To address these challenges, we draw inspiration from model merging techniques and propose the Analytic Learning and Model Merging (ALMM) method. ALMM integrates the strengths of model fine-tuning, analytic learning and model merging into a cohesive framework. This approach enables ALMM to achieve a balance between robustness and plasticity in class-incremental learning tasks, while also safeguarding data privacy—a critical consideration in real-world applications. Experimental results demonstrate that ALMM excels in class-incremental learning scenarios, effectively addressing the dual challenges of catastrophic forgetting and adaptability, and showcasing superior performance in balancing robustness and plasticity.
SZ644 **15:35-15:50**	**Title:** A Deep Reinforcement Learning Based Optimization Scheme for Three-dimensional Lumber Crating **Authors:** Fu Jia, Hu Wenhao, Liao Jinsong, Chen Anliang, Pan Sishi **Presenter:** Hu Wenhao, Chongqing University of Posts and Telecommunications., China **Abstract:** Currently, the loading and unloading process of lumber in the dock mostly relies on adding cables artificially to realize the function similar to that of a “container”, but it often suffers from the problems of poor integrality, insufficient science, and weak safety. To address these problems, this scheme builds a three-dimensional grid environment to simulate the spatial structure

	of a container, and combines the Q-network structure based on the graph attention mechanism and the greedy algorithm to optimize the placement strategy of the lumber based on the real-time lumber length, diameter, and container state. This research provides new solutions for containerized cargo loading and new ideas for future terminal crating processes.
SZ674 **15:50-16:05**	**Title:** Prompt Chain Engineering for Customer Satisfaction Analysis via Large Language Models **Authors:** Xi Wang, Xiaoyi Wang, Danyang Zheng **Presenter:** Xiaoyi Wang, Sichuan University of Media and Communications, China **Abstract:** In the contemporary era of technological evolution, the swift progress of large language models (LLMs) has democratized the realm of data analysis, rendering it more accessible to a broader audience. This work delves into the innovative application of LLMs within the sphere of satisfaction analysis, with a primary objective of empowering non-specialists to harness the potential of these advanced models for their analytical endeavors. The core of this study lies the concept of prompt chain and prompt engineering, which serves as a strategic approach to guide the interaction between users and LLM. By meticulously delineating the operational procedures, parameter configurations, and nuanced use cases of LLMs in satisfaction analysis, this paper establishes a comprehensive prompt framework. This framework is designed to be user-friendly, enabling non-experts to navigate the complexities of LLMs with relative ease. To further validate the efficacy of this approach, we integrate SPSS statistical analysis as a benchmark for comparison. The performance and outcomes of satisfaction analysis conducted via the designed prompt chain are rigorously compared with those obtained through traditional SPSS methods.

Onsite Poster Session 1

Time: 14:00-15:12 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: V1 Room (4 Floor)
Topic: Digital communication and network collaborative optimization
Chaired by: Assoc. Prof. Wei Yang, Shenzhen Technology University, China

SZ603 **14:00-14:06**	**Title:** Research on Calculation Design of Navigation Chip for Precise Point Positioning **Authors:** Ji Guo, Xing Li, Yuanliang Wang, Qian Sun, Wei Zhou, Yinan Meng **Presenter:** Ji GUO, Beijing Institute of Tracking and Telecommunication Technology & Key Laboratory of Smart Earth, China **Abstract:** The Beidou Navigation Satellite System (BDS) provides the precise point positioning (PPP) service in China and surrounding areas, with broadcasting PPP correction data through B2b signal of BDS. By receiving signals and demodulating correction message, user receivers can carry out real-time precise point positioning calculation, and obtain high-precision position information. This paper introduces the PPP model and parameter estimation. The calculation of the navigation chip is designed for PPP, with applying two independent CPU cores. The application of the chip in agricultural machinery is indicated in this paper.
SZ638 **14:06-14:12**	**Title:** A Linearly Polarized Holographic Metasurface Antenna Loaded with SIW and Its Gain Enhancement Analysis **Authors:** Chunyu Liu, Chen Zhang, Xuwen Guo, Yahui Liu, Xiaokai Jiang, Xinyi Li, Huayong Zou **Presenter:** Chunyu Liu, Tianjin University of Technology and Education, China **Abstract:** In this paper, a design method for a linearly polarized antenna is proposed by combining the principle of optical holography and the structure of a center-fed parallel-plate waveguide. By loading the slit cell at a specific location in the top layer of the parallel plate, the slit cell can generate a beam by coupling a reference wave excited by a feed. And by adjusting the slit orientations, linearly polarized light beams can be generated in different directions. The antenna offers the advantages of a low profile, small size, and eliminates the need for a separate feed network. Also, to enhance the gain of this antenna, we propose a method to load the substrate integrated waveguide (SIW) around the antenna. The gain of the metasurface is further enhanced by reducing the reference wave energy leakage, and finally the correctness of the method is verified by electromagnetic simulation results.
SZ626 **14:12-14:18**	**Title:** Fast Startup LC Oscillator Used in OOK Modulated Wireless Body Communication System with Reconfigurable Output Buffer **Authors:** Qing He Li, Sio Hang Pun, Mang I. Vai, Peng Un Mak, Yiwen Wang , Hung-Chun Li **Presenter:** Qing He Li, University of Macau, China **Abstract:** We present a fast startup LC oscillator used in on off keying modulation mode, whose carrier frequency is 4.2GHz. To increase the transmission data rate, we reduce the turn-on time of the oscillator by adding a logic structure to provide a significant injection current. This part will be cut off when the oscillator usually works. So, the power can be kept as low as possible with this structure. For the output buffer, we choose a buffer with three levels output power, featuring different load-carrying capabilities. This enables it to meet the readability requirements of the received signal at the receiving end under various channel attenuation conditions. This circuit is implemented using 65nm CMOS technology, and the tuning range is from 3.5GHz to 4.4GHz. The simulation results show that the startup cycles were reduced by 55% compared to conventional LC oscillator. The system consumes only 8mW under a 1.2V supply, and the maximum data rate is up to 100Mbps.

SZ639 **14:18-14:24**	**Title:** Contribution Emulation Approach for Improved Latency in Mobile Edge Computing Environments **Authors:** Liu Yang, Kwok L. Chung, Xiaoyong Lin, Huijie Hong **Presenter:** Liu Yang, Guangzhou Institute of Science and Technology, China **Abstract:** —The rise of mobile edge computing enhances computing capabilities and reduces latency for numerous terminal devices, relying on robust base station communication. However, failures or damage to base stations can diminish their communication abilities, hindering terminal nodes' task processing. To address this, we propose the Contribution Emulated Terminal Computation Pooling (CE-TCP) solution, which leverages Mobile Ad Hoc Networks to provide computing power to base stations. CE-TCP employs an incentive strategy based on historical contribution levels and communication willingness to expand the computation pool. Simulation results demonstrate that our approach achieves a maximal computation pool and completes tasks with minimal latency, outperforming existing solutions and ensuring efficient resource utilization in mobile terminal computing.
SZ642 **14:24-14:30**	**Title:** Dynamic UAV Relay-Assisted MEC-NOMA for Optimal Power Distribution in Multiuser Vehicular Networks **Authors:** Junpeng Li, Zepeng Liu, Jingshu Sun, Wenjie Dai, Kwok L. Chung, Zhenqiang Yuan, Jianxing Zhu, Irina Hou **Presenter:** Wenjie Dai, Guangzhou Institute of Science and Technology, China **Abstract:** To enhance the performance of vehicular networking systems and reduce power consumption, this paper utilizes Mobile Edge Computing (MEC) to achieve optimal power allocation in a multiuser cluster for the downlink of Non-Orthogonal Multiple Access (NOMA) systems. We propose a MEC-NOMA system supported by a dynamic UAV relay cooperative vehicular network. This research first investigates the globally optimal power allocation policy for downlink users within the MEC-NOMA system by examining the spatial dynamics of UAV relay planning for collaborative vehicular networking deployments, and further validates our findings through Monte Carlo simulations. The simulation results demonstrate a significant improvement in the system's performance for multiuser clustering under the dynamic UAV relay cooperative vehicular networking setup, specifically in terms of energy consumption and total user rate, when compared to traditional Frequency Division Multiple Access (FDMA) schemes.
SZ715 **14:30-14:36**	**Title:** GAN-Based Fractional Doppler Channel Estimation for OTFS Modulation **Authors:** Yebin Bai, Xiaohan Jia, Kaichuang Jiang, Shifu Yang **Presenter:** Yebin Bai, Xidian University, China **Abstract:** Orthogonal Time Frequency Space (OTFS) modulation is a novel technique that enables efficient and robust communication in time-varying wireless channels, demonstrating unique properties such as resistance to inter-symbol interference and effective exploitation of multipath diversity. This paper proposes a fractional Doppler channel estimation scheme based on Generative Adversarial Networks (GAN) for OTFS modulation in high-mobility air-ground communication scenarios. Specifically, we improve the structure of the Conditional GAN (cGAN) generator by using the initial channel response matrix obtained through the least squares (LS) algorithm as the initial input, while the received signal serves as the conditional input. This structure compensates for missing channel features during training and enhances model accuracy. Simulation results demonstrate that the proposed scheme outperforms conventional LMMSE and OMP algorithms in channel estimation performance.
SZ601 **14:36-14:42**	**Title:** Design and Application of Navigation Chip Based on RISC-V Architecture **Authors:** Guo, Ji and Xue, Renkui and Gao, Weiguang and Jiang, kun and Zhang, Xiangyi and Chen, Zhengkun **Presenter:** Ji Guo, Beijing Institute of Tracking and Telecommunication Technology & Key Laboratory of Smart Earth, China **Abstract:** With the widespread application of satellite navigation technology in various fields,

	higher requirements have been put forward for the performance and functionality of navigation chips. This article focuses on this requirement and conducts in-depth research and design of a baseband RF integrated navigation chip based on RISC-V architecture. Through careful planning and optimization of the dual processor architecture, efficient collaboration between baseband and RF processing has been achieved. Performance testing and practical application verification were conducted on the designed navigation chip, and the results showed that the chip has significant advantages in positioning accuracy, low power consumption, and can meet the needs of various complex application scenarios, providing strong support for the development of satellite navigation technology.
SZ699 **14:42-14:48**	**Title:** Wideband Beamspace Channel Estimation Based on Improved VAMP Algorithm **Author:** Yang Nie **Presenter:** Yang Nie, Jining Normal University, China **Abstract:** Massive multiple-input multiple-output (Massive MIMO) equipped with lens antenna arrays (LAAs), known as beamspace Massive MIMO, can focus signals into specific beams to enhance the performance and efficiency of millimeter wave (mmWave) wireless communication systems. However, the channel estimation is extremely challenging, since the number of radio frequency (RF) chains is considerably smaller than the number of antennas. Furthermore, due to the beam squint effect in wideband mmWave systems, the channel estimation is further complicated. To tackle these challenges, we propose an improved vector approximate message passing (VAMP) scheme for the wideband beamspace channel estimation. Specifically, the channel estimation is firstly formulated as a sparse signal recovery problem, where the sparse signals can be recovered from a limited number of noisy measurements. Then, a novel shrinkage function is derived for the VAMP algorithm to enhance estimation accuracy. Finally, by replacing the original shrinkage function of VAMP with the proposed function, the improved VAMP algorithm can estimate the wideband beamspace channel with greater accuracy. Simulation results confirm the effectiveness of the proposed scheme and demonstrate its superior performance in channel estimation.
SZ690 **14:48-14:54**	**Title:** Optimization Algorithm for Maximizing Secrecy Rate in RIS-Assisted ISAC Systems **Authors**: Jianing Wang, Mian Qin, Jiazhang Yuan, Ankang liu, Ruina Lian, Jinglong Zhang **Presenter:** Jianing Wang, Henan University, China **Abstract:** This study introduces an innovative joint waveform design and precoding strategy leveraging a Reconfigurable Intelligent Surfaces (RIS) and artificial noise (AN) covariance matrix to strengthen physical layer security (PLS) in Integrated Sensing and Communication (ISAC) systems. Considering a realistic communication scenario where the eavesdropper is located closer to the base station and RIS compared to the legitimate user, we formulate a Secrecy Rate (SR) maximization problem under the constraints of ISAC-BS power limits, point target detection threshold, and the unit modulus limitation at RIS. Finally, an efficient alternating optimization (AO) algorithm based on Semidefinite Relaxation (SDR) is employed to resolve the issue of high coupling among variables in the formulated problem.
SZ7022 **14:54-15:00**	**Title:** Inter cluster routing algorithm for air sea cross domain clustering network based on improved grey wolf optimization algorithm **Authors:** Zhigang Shang, Han Yu, Mo Li and He Li **Presenter:** Han Yu, Harbin Engineering University, China **Abstract:** Traditional clustering routing algorithms do not consider factors such as network hierarchy, node types, and inter node channel types, and are not suitable for air sea cross domain networks. This article is based on the DEEC algorithm for improvement, introducing an improved grey wolf optimization algorithm for routing scheme planning in the inter cluster routing stage of air sea cross domain networks. A cluster routing algorithm based on the improved grey wolf algorithm (CRGA) is proposed for inter cluster routing. The improved strategy of grey wolf optimization algorithm includes differential evolution and survival of the fittest, and the fitness function includes distance factor, remaining energy of the next hop, and balance of node energy. After simulation verification, CRGA has the advantages of longer network lifespan, slower total node energy consumption, better network energy balance, and higher average packet delivery

	success rate compared to LEACH and DEEC.
SZ7003 **15:00-15:06**	**Title:** A Simplified Fast Fourier Transform Algorithm **Authors:** FAPING LU, ZHILIN Zhang, QI AN, ZHONGYANG MAO, JIAHUAN GENG, YAOZONG PAN, YIHAO SHU, XIGUO LIU, YANG YOU, XIAO LIU **Presenter:** JiaHuan Geng, Naval Aviation University **Abstract:** As a Fast algorithm of Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT) can quickly analyze discrete signal spectrum and is widely used in communication, radar, medical imaging and other systems. However, as the increase of signal points, the signal processing time and hardware resources occupation also increase, which limits the signal processing rate and the overall performance of the system to a certain extent. In this paper, a simplified fast Fourier transform algorithm is proposed to reduce the complexity of FFT system. By using the idea of "separating odd-even symmetric signal and splitting odd-even symmetric branch processing", the parallel branch of odd-even symmetric signal is adopted for FFT processing. Then the number of points participating in FFT processing is reduced from N to N/2 and the multiplication complexity can be reduced from (N/2)log2N to (N/2)log2(N/2). By this method, the FFT signal processing rate can be improved effectively.
SZ612 **15:06-15:12**	**Title:** AI-Powered Identification of Corn Leaf Diseases and Pests: A Flask-Based Web Application for Enhanced Agricultural Decision-Making **Authors:** Zhipan Wu, Xinyi Li, Kwok L. Chung, Jinxiong Chen **Presenter:** Liwen Liang, Guangzhou Institute of Science and Technology, China **Abstract:** As the global population continues to grow, the demand for food escalates, placing corn—a vital staple crop—at risk from diseases and pests. To address this challenge, we have developed a corn leaf disease and pest identification system that leverages artificial intelligence and big data analytics. Built using the Flask framework, this user-friendly web application employs the YOLOv9 model for accurate target detection and identification. The system features key functionalities such as image upload and recognition, user registration and login, and detailed reports on diseases and pests, allowing users to easily access and query relevant information for timely action against identified threats. Experimental results demonstrate that the system achieves high accuracy and stability in identifying corn leaf diseases and pests, providing farmers with a crucial tool to protect their crops. By facilitating informed decision-making, this system significantly contributes to enhancing corn production efficiency and supporting sustainable agricultural practices.

Onsite Poster Session 2

Time: 15:30-16:48 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: V1 Room (4 Floor)
Topic: Cross-modal intelligent perception system and engineering application
Chaired by: Prof. Sanshan Sun, Sichuan Normal Univeristy, China

SZ606 **15:30-15:36**	**Title:** A Large-Class K-shot Manchu Recognition Method for Based on N-ary ECOC **Authors:** Shouyu Xin，Chen Wen，Zitong Wang **Presenter:** Shouyu Xin, Qingdao Huanghai University, China **Abstract:** Manchu recognition is regarded as a K-shot learning problem due to the difficulty in obtaining training data. However, in practical applications, the number of categories that Manchu recognition is required to confront is extremely large, rendering the traditional K-shot learning algorithm inadequate. In this paper, a K-shot learning algorithm for large-category recognition is constructed. The fundamental strategy involves decomposing the original large-category classification problem into a series of smaller-category classification ones through N-ary ECOC (error correcting output coding, ECOC) technology before further processing. The algorithm consists of two stages: encoding and decoding. In the encoding stage, the large-category support set is decomposed into a series of smaller-category sub support sets by the N-ary ECOC coding matrix, and subsequently, multiple K-shot learning base classifiers are generated based on the sub support sets. In the decoding stage, the test sample is classified by the aforementioned base classifiers to form a prediction code. Eventually, the prediction code is compared with the coding matrix for error correction to determine the final class. The proposed algorithm attains a recognition accuracy of 87.8% on a 500-category Manchu dataset.
SZ609 **15:36-15:42**	**Title:** Stock Price Forecasting Model Based on ARIMA-TCN **Authors:** Xiangliang Chen, Xiaoyan Zheng, Bo-Xiang Liu **Presenter:** Xiangliang Chen, Tianjin University of Technology and Education, China **Abstract:** In response to the limitations of traditional stock prediction methods such as ARIMA in stock price forecasting, a hybrid ARIMA-TCN model has been proposed. The model aims to leverage the strengths of ARIMA in processing linear data and TCN in capturing nonlinear characteristics and long-term dependencies to enhance the accuracy and stability of stock price predictions. Using data from Baidu and Coca-Cola stocks from January 4, 2016, to December 30, 2022, and January 4, 2021, to December 29, 2023, as samples, the model first uses ARIMA and TCN with optimized hyperparameters through Bayesian optimization for forecasting, then determines the weights of the two models' predictions through Bayes optimization, ultimately obtaining a weighted average final prediction result. Empirical research has found that the hybrid model performs better on small datasets than on large ones, and compared to benchmark models such as ARIMA, TCN, and LSTM, the hybrid model shows a significant decrease in RMSE values on the aforementioned datasets. The experimental results verify that the proposed stock price prediction model not only improves accuracy and stability but also increases the model's flexibility. However, the process of Bayesian optimization for TCN model hyperparameters and weight determination makes the computational cost of the hybrid model high on large-scale datasets.
SZ615 **15:42-15:48**	**Title:** Lightweight Detection Method for Tomato Maturity in Complex Environments Based on PCIA-YOLO **Authors:** Lunman Deng, Zhipan Wu, LiYao, Minxuan Mai, Junwei Huang **Presenter:** Junwei Huang, School of Computer Science and Engineering Huizhou University, China **Abstract:** In order to solve the problem of low detection accuracy of tomatoes of different ripeness in the occlusion environment of traditional methods, an improved YOLOv8n model was introduced, which was called PCIA-YOLO. In this study, the PCIA-YOLO model was established to improve feature extraction through partial convolution and self-attention mechanism, and the

	IoU loss function and adaptive sample selection mechanism were used to enhance the accuracy and performance of tomato ripeness detection. The PCIA-YOLO model performs well in the task of tomato ripeness detection, with higher accuracy and faster convergence speed, and at the same time optimizes the model resources, providing an effective technical solution for agricultural automated harvesting.
SZ608 **15:48-15:54**	**Title:** Multimodal Text and Image Social Emotion Analysis **Authors:** Boxiang liu, Xiaoyan Zheng, Xiangliang Chen **Presenter:** Boxiang Liu, Tianjin University of Technology and Education, China **Abstract:** With the rise of social media, multimodal emotion analysis has become a research hotspot. Despite the progress made in the fusion of multimodal data by existing studies, challenges remain: current models often overlook the similarities between text and vision, fail to effectively handle noise in multimodal data, and do not sufficiently consider the contributions of different modalities, which limits the generalization and accuracy of the models. To address these issues, this study proposes an innovative multimodal emotion analysis model (EMHA-MMEA). The model combines an emotion dictionary with a cross-modal multi-head attention mechanism to enhance the model's understanding of the complex relationships between multimodal data. Compared to traditional models, EMHA-MMEA can more effectively integrate textual and visual features, focusing on emotional features between modalities, thereby more accurately capturing emotional tendencies. Experimental results on the MVSA-Single dataset show that EMHA-MMEA's accuracy in predicting emotional labels on the test set has increased by 4% compared to the baseline model, proving its effectiveness and practicality. This achievement provides technical support for the fields of social media emotion analysis and public opinion monitoring, and offers new ideas for future research.
SZ625 **15:54-16:00**	**Title:** Development of a Neuromodulation System with Micro-LED Drive: Reducing Channel Mismatch and Enhancing Input Impedance **Authors:** Yiwen Wang, Shunning Tian, Liyang Wang, Qinghe Li, Hung-Chun Li, and Sio Hang Pun **Presenter:** Yiwen Wang, University of Macau, China **Abstract:** This paper introduces an optogenetic neuromodulation system consisting of a neural signal acquisition module, a three-channel optogenetic stimulation module, and a three-channel micro-LED monitoring module. The micro-LED driver module facilitates continuous, real-time tracking of the micro-LEDs' long-term performance, offering direct feedback on their operational status for user convenience. The neural signal acquisition module employs a GCIA (Group-Chopping Instrumentation Amplifier) structure to achieve multi-channel gating, minimizing inter-channel mismatch. Multi-stage chopping reduces the equivalent input impedance, with the first stage utilizing a DDA (Differential Difference Amplifier) structure to enhance input impedance. The amplifier employs an open-loop structure to improve area efficiency and utilizes switched capacitor filters for signal filtering. Fabricated using the TSMC 65nm process, the improved GCIA achieves a gain of 43 dB, a bandwidth of 0.5–5 kHz, and an inter-channel mismatch of less than 0.0428%. The equivalent input-referred noise is 3.3 μVrm, the input impedance reaches 535 MΩ, and the static power consumption is 1.05 μW.
SZ631 **16:00-16:06**	**Title:** Optimizing Trapezoidal Gratings for Enhanced Surface Plasmon Resonance Sensor Performance **Authors:** Hui Wang, Kwok L. Chung, Shiquan Wang, Jianxing Zhu, **Presenter:** Hui Wang, Guangzhou Institute of Science and Technology, China **Abstract:** This study investigates the design and optimization of a trapezoidal grating-coupled surface plasmon resonance (GCSPR) sensor to enhance its sensitivity and overall performance. By varying the trapezoidal coefficient from 0.77 to 0.92, the analysis revealed a maximum sensitivity of 405.5°/RIU at an optimal coefficient of 0.89, accompanied by an impressive figure of merit (FOM+) of 409.8/RIU. Notably, the full width at half maximum (FWHM) of the absorption peaks decreased from 3.13 nm to 0.71 nm, indicating improved resolution. Additionally, the absorption peak depth increased from 0.87 to 0.96, reflecting a 10% enhancement. These findings demonstrate

	the critical impact of geometrical parameters on the performance of GCSPR sensors for biosensing applications.
SZ680 **16:06-16:12**	**Title:** Periodic Subgraph Matching on Temporal Graphs **Authors:** Min Lu, Yuechao Zang, Qianzhen Zhang, Xianqiang Zhu **Presenter:** Min Lu, National University of Defense Technology, China **Abstract:** Periodicity is a frequent phenomenon on temporal graphs. Seeking periodic subgraph patterns is essential to understand the insights into the structure and behavior of the graph. Unfortunately, most previous studies for subgraph matching ignore the periodic feature of query patterns. In this paper, we study a new problem of periodic subgraph matching on temporal graphs, which finds all subgraphs in the temporal graph that not only match the given query graph but also appear periodically. To solve this problem, we propose a two-phase subgraph matching approach. In the offline phase, we develop an effective graph reduction technique to significantly prune the temporal graph. In the online phase, we propose a novel auxiliary data structure to further prune the search space and support periodic subgraph matching. We conduct extensive experiments on several real-life datasets and the results demonstrate the efficiency and effectiveness of our approach.
SZ682 **16:12-16:18**	**Title:** Research on engineering application of deep learning model based on UNet structure in infrared weak target detection **Authors:** Xinyue Du, Yuanyu Wang, Zan Jia, Jing Li, Zhaoyang Guan, Yu Lin **Presenter:** Xinyue Du, Kunming Institute of Physics, China **Abstract:** Infrared weak target detection has an important application value in the fields of early warning, traffic management and security. However, limited by the weak characteristics and complex background of the target, the traditional detection methods are insufficient in terms of accuracy and real-time performance. In this paper, we propose a deep learning algorithm based on the Transformer structure with an improved Unet model for efficient detection of infrared weak targets. In order to realize engineering deployment, we deploy the model on two embedded platforms, RK3588 and Nvidia Orin Nano, and conduct performance comparison experiments. The experimental results show that the proposed method outperforms the traditional method in terms of detection accuracy and real-time performance, and exhibits good adaptability and high efficiency on different hardware platforms.
SZ656 **16:18-16:24**	**Title:** Optimizing Attention for Efficient LLM Inference: A Review **Authors:** Siyuan Sun, Jinling Yu, Hanshuo Liu, Hanyun Guo, Yang Cao, Shouhua Zhang, Jiehan Zhou **Presenter:** Siyaun Sun, Shandong University of Science and Technology, Qingdao, China **Abstract:** The rapid advancement of deep learning has led to significant progress in large language models (LLMs), with the Attention mechanism serving as a core component of their success. However, the computational and memory demands of Attention mechanisms pose bottlenecks for efficient inference, especially in long-sequence and real-time tasks. This paper systematically reviews optimization strategies for Attention mechanisms, including sparse attention, low-rank decomposition, quantization techniques, block based parallel computation, and memory management. These approaches have demonstrated notable improvements in reducing computational complexity, optimizing memory usage, and enhancing inference performance. This review highlights the key challenges of computational efficiency, long-sequence modeling, and cross-task generalization through an in-depth analysis of existing methods, their advantages, and limitations. Future research directions, including dynamic precision, hardware-aware optimization, and lightweight architectures offer insights for advancing LLM inference theory and practice.

SZ694 **16:24-16:30**	**Title:** Advanced Anti-Lost System for Indoor Environments using Smart Devices **Authors:** Sheng Guo, Minmin Li, and You Li **Presenter:** Sheng Guo, Guangdong Laboratory of Artificial Intelligence and Digital Economy (SZ), China **Abstract:** Cases of child loss are unfortunately common, particularly in large indoor areas such as shopping malls where incidents of separation occur frequently. However, with the advent of smart devices, new opportunities have emerged to mitigate such incidents. Our research focuses on real-time monitoring and early warning systems for children in indoor environments, utilizing common smart devices such as smartphones, smartwatches, and smart bracelets. Specifically, we have developed an anti-lost system in which parents utilize their smartphones as the central platform, while their children carry smart devices connected to the smartphone platform via WiFi hotspots. By continuously monitoring the real-time signal strength of the WiFi connection, the system can determine if a child has wandered away from their parent and send an alert if necessary. Furthermore, if a child engages in abnormal activities, the parent's smartphone platform receives a warning message. The system performs position estimation and activity recognition directly from the raw data collected by inertial sensors. Position estimation is predicted using Resnet network, while the activity recognition is determined using the CNN-LSTM network. The location calculation and activity recognition are performed independently on the respective smart devices.
SZ714 **16:30-16:36**	**Title:** A Study on the Protection of Basic Buildings of Chinese Township Schools Through Wind-Field CFD Migration Algorithm **Authors:** Yuchen Shao, Xiao Ding, Botao Feng **Presenter:** Yuchen Shao, Macau University of Science and Technology, China **Abstract:** This study investigates strategies to optimize wind environments around rural school buildings in China through computational fluid dynamics (CFD), using a school complex in Xingren City, Guizhou Province, as a case study. A CFD-based transfer algorithm was applied to simulate and analyze wind patterns, aiming to establish a framework for assessing and enhancing aerodynamic performance to safeguard structural integrity. The methodology encompassed meteorological data collection, geometric model simplification, fluid domain parameterization, high-resolution meshing, turbulence model selection, and boundary condition configuration. Comparative analysis of pre- and post- retrofit scenarios demonstrated the algorithm's efficacy in accurately mapping wind fields, enabling data-driven retrofitting strategies such as vegetation buffers and façade modifications. These interventions not only enhanced occupant comfort and safety by mitigating wind-induced stress, but also advanced sustainable preservation practices for rural educational infrastructure. By integrating site-specific environmental data with aerodynamic simulations, this work bridges theoretical innovation and practical applications, offering scalable solutions for climate-resilient architectural design in resource-constrained regions.
SZ718 **16:36-16:42**	**Title:** Supercontinuum Generation in Suspended Core Fibers Based on Intelligent Algorithms **Authors:** Jing Meiqian, Ning Tigang, Wang Wensheng, Zhai Yuanbo **Presenter:** Wang Wensheng, Beijing Jiaotong University, China **Abstract:** In this study, a suspended-core fiber structure, combined with neural networks and optimization algorithms, is utilized to design a supercontinuum (SC) generation method that balances the target spectral range with optimal flatness. The design also enables the reverse calculation of key physical parameters of the fiber structure and the initial pulse. Under a -20 dB intensity calibration, the spectral coverage can reach up to 16 μm. Additionally, the proposed method can reverse-engineer structural parameters such as the fiber core diameter, suspended width, and fiber length, as well as physical parameters such as the peak power, full width at half maximum (FWHM), and chirp of the initial pulse to meet specific supercontinuum targets. The supercontinuum spectral bandwidth achieved in this study is among the highest reported in similar research. Furthermore, the initial pulse required to generate a supercontinuum with a spectral range exceeding 20 μm requires a lower peak power compared to the power levels required in previous studies to achieve the same coverage. By integrating optimization algorithms with a neural network model, the proposed intelligent algorithm significantly reduces computational costs. The reliability of the fiber structure is validated through an analysis of spectral coherence and manufacturing

	tolerance performance, providing an important theoretical foundation for supercontinuum design and fiber parameter optimization.
SZ719 **16:42-16:48**	**Title:** An Exploration of University Campus Entrance Architecture Design from the Perspective of "Red Gene" Urban Context Inheritance **Authors:** Yujing Zhang, Bin Chen, Botao Feng, Xiao Ding **Presenter:** Yujing Zhang, Macau University of Science and Technology, China. **Abstract:** In modern architectural design for university campuses, preserving urban cultural continuity holds critical significance, particularly for cities characterized by “red genes.” Such campuses can serve as dynamic platforms for sustaining and disseminating “red memories” through their architectural and landscape features. Focusing on the entrance design of Shanwei Institute of Technology as a case study, this paper establishes a methodological framework integrating the categorization of revolutionary heritage sites in Haifeng County’s urban core, classifications of protected cultural relics, architectural chronology, and educational infrastructure requirements to derive design parameters. By synthesizing historical data and contextual conditions, the study identifies a prototype for campus entrance design. The investigation subsequently explores spatial and symbolic strategies for the Shanwei Institute’s entrance, demonstrating how architectural interventions can embed revolutionary narratives into educational environments while aligning with functional and commemorative objectives.

Onsite Oral Session 5

Time: 16:45-18:10 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Diamond Room (4 Floor)
Topic: Resource scheduling and adaptive optimization model in federated edge learning
Chaired by: Prof. Hao Zhang, Purdue University, USA

Invited Speech SZ676 **16:45-17:10**	**Title:** Deep Learning-Based Device Twin Model and Its Testing Applications **Authors:** Jiayong Yu, Houjun Wang, Yindong Xiao, Zihang Gao, Zihang Gao, Zhaokun Hu, Rui Jing **Invited Speaker:** Yindong Xiao, University of Electronic Science and Technology of China, China **Abstract:** Currently, radio frequency integrated circuits (RFICs) are widely used in fields such as communication and radar, leading to an increased focus on efficient and accurate modeling methods. Despite the excellent device simulation capabilities provided by S-parameters and SPICE modeling methods, issues such as the difficulty of describing time-domain dynamic characteristics with S-parameters and the confidentiality risks associated with SPICE white-box models persist. This report proposes a novel RFIC modeling method based on deep learning to establish a fast RFIC twin model, characterizing device internals non-linearly. This aims to build a production testing system architecture from a new dimension, enhancing testing efficiency. The method involves using specially designed signal excitations to test the RF amplifier, with input-output signal pairs serving as training data for a deep neural network. This approach effectively captures the dynamic characteristics of the RF amplifier. The designed test signals better stimulate the broad frequency response and non-linear features of the RF amplifier, ensuring both time-domain and frequency-domain testing quality. Additionally, this method employs autoregressive modeling, where the model not only learns the current input-output signal relationships but also utilizes historical input-output data for learning, capable of capturing time-domain and frequency-domain characteristics of RF amplifiers. Experimental validation confirms that this deep learning-based RFIC modeling method, exemplified through RF amplifier testing, has distinct advantages. It can effectively characterize the characteristics of the tested RF device with just a few tests, offering a new approach and method for precise and efficient RF device modeling.
SZ691 **17:10-17:25**	**Title:** Federated Learning Optimization Model Update Difference Minimization and Functional Based Adaptive Learning Rate Adjustment **Authors:** Zijing Rong, Yaowen Liu, Mingjun Dai, Stefano Savazzi, Sanaz Kianoush. **Presenter:** Zijing Rong, College of Electronic and Information Engineering (Shenzhen University), China **Abstract:** The FedAdamPID algorithm resolves the overshoot problem suffered by the FedAdam algorithm under the framework of PID control. The research on FedAdamPID explores the connection between PID controllers and the process of federated learning algorithms, particularly applying it to the update rules on the server side. This study draws on the previous research of the research group, first establishing a connection between the local update process of the client and the PID controller, and then viewing the entire FL process involving both the client and the server as a multi-PID coupled system. On this basis, the minimum update difference and the dynamic adjustment strategy of the local learning rate are introduced, and an optimized algorithm, FedAdamPID-op, is proposed. Experiments on multiple standard datasets have verified that this optimized algorithm slightly outperforms FedAdamPID in terms of accuracy and the number of convergence rounds.
SZ660 **17:25-17:40**	**Title:** A Cost-and-Time-Efficient Approach of Deploying Mixture of Expert Models **Authors:** Yuqian Wu, Danyang Zheng, Jiaqi Ren, Jianli Wang, Chao Wang, Chengzong Peng, Xiaojun Cao **Presenter:** Yuqian Wu, Southwest Jiaotong University, China **Abstract:** The emerging large language models (LLMs) such as ChatGPT and DeepSeek have

	shown great potential in almost all fields. However, the current centralized cloud deployment fashion makes it barely possible to jointly serve tremendous user requests due to shortcomings like insufficient resources and high response delays. In response to relieving the above shortcomings, one approach is to deploy the LLM model in edge networks, which shortens the responding delay and lowers the volume pressure. This work shows the very pioneering efforts in deploying the mixture of expert models (MoE) LLM over edge networks. To begin, we formally formulate the MoE deployment problem. Next, we propose a novel cost-closeness centrality (CCC) measure and design the novel CCC-based router and aggregator deployment (3C-RAD) algorithm. Through extensive simulations, we have found that the 3C-RAD algorithm can significantly improve the runtime efficiency while keeping the cost efficiency in deploying MoE compared to brutal force.
SZ720 **17:40-17:55**	**Title:** Edge Association and Trajectory Planning of UAVs in Federated Edge Learning Architecture **Authors:** Qian Zhang, Zhenglin Feng, Yingzhe Li, Sanshan Sun, Youzhi Xiong, Li Liu **Presenter:** Yingzhe Li, Sichuan Normal University, China **Abstract:** Federated learning, due to its technical characteris tic of distributed training, is widely integrated into collaborative unmanned aerial vehicle (UAV) swarms for executing various intelligent tasks such as target tracking and disaster monitoring. However, the traditional federated learning architecture, which relies on a single central server for global model aggregation, suffers from deteriorating communication delay due to the drastic changes in UAV mobility, thereby degrading the convergence performance of the model. To address this issue, a federated edge learning architecture is introduced into UAV swarms, utilizing multiple edge servers deployed in the network for local model parameter collection from neighboring UAVs to perform global model aggregation. To ensure rapid convergence of the learning model under this architecture, the association strategy between edge servers and UAVs and the trajectory planning of UAVs are jointly considered. We formulate an optimization problem to minimize the convergence delay of federated learning model and solve the problem by utilizing a deep reinforcement learning algorithm. Simulation results show that our proposed algorithm can effectively reduce the convergence delay and keep the energy consumption of model training in an acceptable range as well.
SZ663 **17:55-18:10**	**Title:** A Cost-Optimization Approach of Placing Student Models in Edge Networks **Authors:** Weiqing Zeng, Danyang Zheng, Huanlai Xing, Xiangyi Chen, Jiaqi Ren, Yuqi Zhang, Chengzong Peng and Xiaojun Cao **Presenter:** Jiaqi Ren, Southwest Jiaotong University, China **Abstract:** The remarkable success of large language models (LLMs) like ChatGPT and Deepseek has spurred significant demand for their widespread placement. However, placing full parameter LLMs in resource-constrained networks is often infeasible, prompting the adoption of knowledge distillation techniques that enable the compression of LLMs into smaller, domain-specific student models while preserving their perfor mance efficiency. In edge networks, where clients are geograph ically distributed, multiple student models are placed to serve local requests, while a centralized teacher model handles more complex tasks. Here, a critical challenge arises in determining the optimal placement of these student models to minimize client access costs. Targeting this challenge, this work formulates the problem of student model placement in edge networks (SMP-EN) with the objective of cost optimization and demonstrates its NP hardness. To solve SMP-EN, we propose an efficient algorithm called average-cost-first student model placement (ACF-SMP). Extensive simulation experiments demonstrate that our ACF SMP algorithm significantly reduces the average expected client access cost compared to the benchmarks.

Onsite Oral Session 6

Time: 16:05-18:35 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Crystal Room (4 Floor)
Topic: Modern communication system and signal processing
Chaired by: Prof. Wenzhe Gu, Huizhou University, China

Invited Speech SZ7023 **16:05-16:30**	**Title:** A High-Gain Dual-Circularly Polarized Parabolic Antenna for Mobile Base Stations **Authors:** Wenzhe Gu, Fan Li, Xiong Yang, Xuexin Zhu, Yiyuan Luo, Botao Feng **Invited Speaker:** Wenzhe Gu, Huizhou University, China **Abstract:** This paper presents a high-gain dual-circularly polarized parabolic antenna for mobile base stations, aiming to meet the point-to-point communication in emergency communication. The antenna operates 2.2-2.3 GHz and employs a circular-aperture parabolic reflector and a microstrip circular patch feed source. Dual circular polarization is achieved through an orthogonal coupler. Simulation and test results show that the antenna exhibits excellent performance. |S11| and |S22| are less than -16 dB, peak gain reaches 25dBi, and the axial ratio is less than 2. Additionally, half-power beamwidth of the antenna is approximately 71°-73°, and the front-to-back ratio is around 20 dB, demonstrating good radiation performance. This design excels in high gain, low reflection, and dual circular polarization, making it suitable for compact installation in mobile base stations and effectively improving signal transmission quality and coverage in emergency communication scenarios.
Invited Speech SZ702 **16:30-16:55**	**Title:** High-precision laser-based free space time and frequency transfer **Author:** Dong Hou **Invited Speaker**: Dong Hou, University of Electronic Science and Technology of China, China **Abstract:** Laser-based free space time and frequency transfer is a new technique that involves transmitting time and frequency signals from one site to other site at a certain distance through free space, thereby achieving high-precision time-frequency synchronization between two or more sites. In the past few years, significant progress has been made in free space time and frequency transfer with the help of continuous laser and femtosecond laser. This presentation first introduces the basic principles of free space time and frequency transfer with laser, and then presents the latest research achievements in the field of free space time and frequency transfer, including free space time-frequency transfer based on continuous lasers, free space time-frequency transfer based on femtosecond optical frequency combs, and free space time-frequency transfer with weak signal based on single photon detection. Finally, some future development trends of free space time-frequency transfer are discussed.
Invited Speech SZ7018 **16:55-17:20**	**Title:** SovereignEdge: A Context-Aware Cryptographic Architecture for Data Sovereignty in Mobile Edge-Fog-Cloud IoT Data Spaces **Authors:** Shuwen Liu, George C. Polyzos **Invited Speaker:** George C. Polyzos, The Chinese University of Hong Kong, Shenzhen **Abstract:** Existing three-tier IoT systems focus on real-time analytics and context-aware processing across Edge, Fog, and Cloud layers but often overlook data sovereignty in cross-organizational Data Space scenarios. This paper introduces SovereignEdge, a context-aware cryptographic framework that extends ciphertext-embedded policies to a distributed multiauthority model, letting mobile Edge data owners define detailed access rules before data goes to Fog or Cloud layers. SovereignEdge features a multi-tier key management system with multiple Fog-based Attribute Authorities operating under a trust root, supporting dynamic policy updates, attribute revocation, and secret sharing without

	requiring re-encryption of historical data. To prevent forged contextual claims on constrained Edge devices, SovereignEdge uses a verifiable attribute mechanism that reduces unauthorized decryption. It merges robust cryptographic enforcement and data-space-based auditing. This approach supports cross-domain auditing, efficient attribute revocation, and regulatory compliance, and it follows Data Space principles. Experimental results show that SovereignEdge preserves data sovereignty and enables privacy-preserving collaboration across heterogeneous Edge–Fog–Cloud environments.
SZ645 **17:20-17:35**	**Title:** Network-on-Chip Research Project Report **Author:** Peng Zhou **Presenter:** Pengzhou, Nang Fang College·Guangzhou, China **Abstract:** In order to break through the bandwidth and delay of data transmission, people have turned their attention to the on-chip network. Because it can meet the performance requirements of modern applications. This paper makes a new contribution to network on chip. For example, the router, routing algorithm, virtual channel allocation, input unit and state module are fully introduced and analyzed. The introduction content is explained in a combination of text and pictures in order to better understand the status and role of each module. The analysis includes a detailed explanation of the verilog language in key parts to help understand the signal flow direction and the system regulation role played by the control signal, as well as the tracking of the signal flow, studying how it carries information between multiple modules, and what signals will be in each shuttle to ensure the correctness of the signal flow direction. Then, the signal is simulated by software and the correctness and reliability of NoC-Verilog-master is verified successfully. The fact proves that this is a correct and reliable NoC system. Finally, the paper boldly proposes the challenges that NoC may face in the future, and makes a summary.
SZ634 **17:35-17:50**	**Title:** Design and Implementation of a High-Precision Audio Signal Acquisition Circuit **Authors:** Kai-Xiang Ouyang, Xing-Quan Wang, Qiao-Sheng Guo, He Quan, Wen-Hao Wen, Na Wang **Presenter:** Kai-Xiang Ouyang, Gannan Normal University, China **Abstract:** With the rapid development of audio technology, the demand for high-precision audio signal acquisition circuits is steadily increasing. This study successfully designs a high-precision audio signal acquisition circuit by optimizing the microphone sensor, amplification circuit, and filtering design. The circuit incorporates power filtering, electromagnetic shielding, and signal isolation techniques, achieving clear long-range audio capture and high stability in complex electromagnetic environments. The performance metrics of this circuit are excellent, with a sensitivity of -19.6dB, a frequency response range of 100Hz to 10kHz, a pickup range of 5 to 6 meters, a signal-to-noise ratio of 65.3dB, a distortion rate of 0.2%, and a working current of 5.23mA. It supports both analog and differential signal outputs with low power consumption. Furthermore, through the use of an audio conversion circuit and a well-designed PCB layout, the circuit enhances anti-interference capability. This circuit has broad applications in fields such as audio recording and speech recognition, providing a high-quality signal source for subsequent audio signal processing.
SZ681 **17:50-18:05**	**Title:** A Hybrid Analysis-Based Construction Method for Tainted Control Flow Graphs of Binary Programs **Authors:** Honggang Xie, Xiangdong Li, Zenghui Shen **Presenter:** Honggang Xie, Zhongyuan University of Technology, China **Abstract:** In recent years, control flow graphs (CFGs) have gained increasing prominence in binary vulnerability detection due to their comprehensive representation of a program's execution paths. However, traditional methods for constructing CFGs often encounter significant challenges, such as limited precision in static analysis and high runtime overhead in dynamic analysis. To address these limitations, this paper proposes a novel hybrid approach that combines static taint analysis with dynamic symbolic execution to

	construct precise and efficient taint control flow graphs. The proposed methodology begins with static taint analysis to propagate tainted data across the program, offering details of potential taint paths. Dynamic Symbol Execution refines the analysis by combining the results of static taint analysis with setting response times, parsing runtime behavior, and exploring possible execution paths in more detail. By integrating the strengths of both techniques, our approach effectively reduces false positives and captures complex runtime behaviors that static analysis alone cannot handle. Experimental evaluations on real-world binaries demonstrate the efficacy of the proposed approach, showcasing significant improvements in CFG precision, runtime efficiency, and vulnerability detection capabilities. This work contributes to advancing binary analysis techniques and provides a robust tool for enhancing program security.
SZ624-A **18:05-18:20**	**Title:** IP-YOLO: Progressive Fusion and Deep Vision Transformer for Accurate Insect Pest Detection **Authors:** Wenhao Wen, Xingquan Wang, Qiusheng Zhu, Kaixiang Ouyang, he Quan **Presenter:** Wenhao Wen, Gannan Normal University, China **Abstract:** Insect pests pose a significant threat to agricultural productivity, necessitating accurate and timely identification to minimize economic losses. This paper presents IP-YOLO, an enhanced insect pest detection algorithm that leverages the YOLOv8 framework. IP-YOLO introduces several key enhancements to address the challenges of traditional algorithms, particularly in recognition accuracy and response speed. First, EfficientViT is utilized as the backbone network to efficiently extract deep image features and capture global information. Second, an Asymptotic Feature Pyramid Network (AFPN) is introduced to reduce feature loss during multi-scale fusion, thereby improving detection accuracy. Furthermore, the C2fSE module is proposed to enhance the algorithm's image-capturing ability while minimizing noise and redundancy. Extensive experiments on the IP50 dataset demonstrate that IP-YOLO outperforms several popular baselines, improving P by 5%, R by 6%, and mAP50 by 4.1% compared to the original YOLOv8 algorithm. These results indicate that IP-YOLO is a promising candidate for real-time monitoring and control of insect pests, offering a practical solution for high-quality pest detection with reduced computational cost.
SZ721 **18:20-18:35**	**Title:** Design of Ultra-Wideband Antenna Based on Semi-Conformal Annular Parasitic Structure **Authors:** Shenxu Wang, Qingsheng Zeng, Jiarui Chen, Yichi Zhang,Yuan He, Xuefei Chang, Botao Feng **Presenter:** Shenxu Wang, Nanjing University of Aeronautics and Astronautics, China **Abstract:** This paper proposes a novel ultra-wideband (UWB) antenna featuring a pentagonal patch and a semi-conformal annular parasitic structure. By integrating two halved pentagonal rings with the central patch and optimizing the ground slot design, the bandwidth and impedance matching performance are significantly enhanced. The antenna is printed on a 40 mm × 40 mm × 1.6 mm FR4 substrate. Simulation results indicate that the reflection coefficient (S11) is below -10 dB within the 4.67–12 GHz frequency band, achieving a relative bandwidth of 87.3% and covering scenarios such as Sub-6G (5–6 GHz), C-band (4–8 GHz), WLAN 5 GHz (5.15–5.85 GHz), and X-band (8–12 GHz). Specifically, at 5.4 GHz, S11 reaches a peak matching of -42.6 dB, and at 7.1 GHz, it also exhibits excellent impedance characteristics of -31.8 dB. The antenna structure is compact and suitable for multi-band wireless communication systems.This design, through the current regulation of the semi-conformal ring and the coupling optimization of the ground slot, provides new insights for the engineering applications of ultra-wideband antennas.

Onsite Oral Session 7

Time: 16:20-18:10 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Pearl Room (4 Floor)
Topic: New network security defense and privacy enhancement
Chaired by: Assoc. Prof. Chengzong Peng, Chengdu University of Information Technology, China

Invited Speech **SZ697** **16:20-16:45**	**Title:** Distributed Pairwise Protection for Security-Aware Mission Chains in UAV Networks **Authors:** Yuhang Zhao, Guangmming Duan, Danyang Zheng, Xiaojun Cao, Chengzong Peng **Invited Speaker:** Chengzong Peng, Chengdu University of Information Technology, China **Abstract:** The unmanned aerial vehicles (UAVs) communication network exhibits significant potential in natural disaster management, with applications in flood relief and wildfire control. In these scenarios, UAVs can dynamically form mission chains (MCs) to collaboratively execute tasks such as real-time monitoring and post-disaster search and rescue. To address security challenges in these dynamic environments, we implement MCs as security-aware service function chains (SFCs). However, traditional SFC techniques are often inefficient and resource-intensive when applied to MCs in UAV networks, due to the networks' dynamic nature and resource constraints. In this paper, we introduce and mathematically formulate a novel problem, termed the security-aware SFC distributed pairwise protection (SSFC-DPP) problem in UAV networks, which optimizes SFC protection against failures while balancing security and resource demands, and prove its NP-hardness. To tackle SSFC-DPP, we propose an efficient heuristic approach, the distributed pairwise node protection (DPNP) algorithm, integrating a security-resource ratio (SRR) factor and pairwise backup selection (PBS) technique. Extensive simulations show that DPNP reduces overall backup costs by 8.05% and 51.39% compared to two benchmark algorithms, respectively.
Invited Speech **SZ704-A** **16:45-17:10**	**Title:** Key Technologies for Secure Wireless Transmission Based on Covert Information Mapping and Spatial Direction Modulation **Author:** Jie Tia **Invited Speaker:** Jie Tian, China Academy of Engineering Physics, Mianyang, China **Abstract:** We propose a comprehensive wireless secure transmission framework tailored for physical layer security communication, with a focus on key technologies integrating covert information mapping (CIM) and spatial direction modulation (SDM). First, to address the security degradation of traditional SDM systems when eavesdroppers are equipped with distributed receivers, we design the CIM-SDM structure, enhancing system robustness through covert information mapping. The detection performance of both legitimate users and eavesdroppers is theoretically derived, confirming the security advantages of this approach under extreme conditions. Second, we further introduce the CIM-GSDM system, which incorporates generalized spatial modulation (GSM), leveraging the indices of distributed receiver subsets and an interference matrix to modulate covert information. This effectively improves the bit error rate (BER) performance of legitimate users while significantly degrading the demodulation capability of eavesdroppers. Finally, we incorporate a joint precoding and artificial noise (AN) design to optimize system security, achieving dynamic optimization of multi-beam control and power allocation to maximize the secrecy rate. Simulation results demonstrate that the proposed framework significantly enhances the security of wireless transmission while maintaining the performance of legitimate users, making it well-suited for general physical layer secure wireless communication scenarios.

SZ607 **17:10-17:25**	**Title:** Fair Data Trading Protocol based on Passive Proxy Re-encryption with Smart Contracts **Authors:** Peng Zhang, Jianzhou Ruan and Jiaquan Wei **Presenter:** Jianzhou Ruan, Shenzhen University, China **Abstract:** With the diversity of data generated in daily life and the high economic benefits of effective use of data in various aspects, data trading has become a trend, and the fairness of data trading has also received increasing attention in recent years. Fairness means that the buyer and seller either get what they want or neither, which is one of the most basic requirements of transactions. Studies have shown that it is difficult to design a fair agreement based on buyers and sellers alone. Therefore, existing fair agreements generally rely on Trusted Third Parties (TTP) for transactions, and their fairness is based on the behavior of TTP and the trust of both parties in TTP. After the emergence of blockchain and smart contracts, their decentralization and transparency make them excellent candidates for replacing TTP. Therefore, this paper attempts to design a secure and fair data transaction protocol based on smart contracts. In order to ensure the security of data, we use an advanced Passive Proxy Re-Encryption (PPRE) scheme to enable the smart contract to transfer the decryption right to the buyer after receiving the buyer's payment. In addition, based on smart contracts and PPRE, a fair protocol for data trading is proposed, and the fairness of the protocol is guaranteed by an arbitration protocol. The protocol supports ciphertext publicity and repeatable sale, thereby reducing the number of interactions. Comprehensive experimental results verify the feasibility and effectiveness of the proposed protocol.
SZ613 **17:25-17:40**	**Title:** Detection of Phishing Attacks Based on Improved Convolution Neural Networks with Attention Mechanism **Authors:** Chaoyang Li, Xiaohan Li, Lei Yang **Presenter:** Chaoyang Li, Guangdong University of Science & Technology, China Abstract: Phishing attacks, a significant threat to cybersecurity, have been rapidly increasing in recent years. To mitigate this risk, more effective phishing detection techniques are urgently needed. However, current defense technologies remain inadequate. This paper proposes a novel approach that combines an attention mechanism with modified residual blocks within a conventional residual neural network. This modification addresses the vanishing gradient problem, enhancing the network's performance. Experimental results demonstrate that the improved model achieves superior classification accuracy compared to other state-of-the-art models.
SZ662 **17:40-17:55**	**Title:** A DDoS Attack Detection Method Based on Spiking Neural Networks **Authors:** Tianhuai Yin, and Aiqun Hu **Presenter:** Tianhuai yin, South East University, China **Abstract:** With the annual advancement of computers, network threats have become increasingly severe. Among these, distributed denial of service (DDoS) attacks pose a significant threat. In recent years, DDoS attack detection methods have predominantly relied on machine learning approaches, which suffer from high computational and memory overhead and poor noise robustness. Additionally, traditional firewall-based defenses are inadequate to address the increasingly complex network environments. In recent years, the concept of bio-inspired security has emerged, drawing inspiration from the way biological neurons process external stimuli. This paper leverages this concept and proposes a DDoS attack detection method based on spiking neural networks (SNNs) within a bio-inspired security framework. Building upon the foundation of SNNs, the method uses a reused encoding scheme for spiking encoding and incorporates neural correlation to further reduce computational and memory overhead. To leverage existing labeled DDoS data, this paper introduces a semi-supervised model by adding the final layer on the SNNs. Experimental results demonstrate that the proposed SNNs-based DDoS attack detection method significantly reduces the computational and memory overhead required for training compared to several existing algorithms. Additionally, the noise robustness of the method has been notably enhanced.

SZ695 **17:55-18:10**	**Title:** A Privacy-Preserving Data Query Framework for Blockchain-based Information Systems: Integrating CP-ABE and PIR **Authors:** Li Meipeng, Zhang Peng, Li Yanming **Presenter:** Guo Zhaozhong, Beijing Information Science and Technology University **Abstract:** Current information systems face significant limitations across multiple dimensions, including challenges in ensuring data authenticity, inadequate security in resource-sharing mechanisms, and persistent difficulties in safeguarding data privacy. When blockchain technology is employed in information systems for data storage and querying, its inherent transparency and decentralization introduce risks of privacy breaches. To address this issue, we propose a novel privacy-preserving data query framework that integrates on-chain/off-chain storage architecture and ciphertext-policy attribute-based encryption (CP-ABE) for fine-grained access control, and private information retrieval (PIR) for data querying. This framework ensures the confidentiality of queried data, anonymizes querying entities, and safeguards the privacy of raw datasets. Theoretical analysis confirms the system's correctness while rigorously validating the privacy preservation of both querying parties and original data.

Onsite Oral Session 8

Time: 16:20-18:15 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: Agate Room (4 Floor)
Topic: Green communication and energy collaborative management
Chaired by: Assoc. Prof. Min Fu, Ocean University of China, China

Invited Speech **SZ618/SZ620** **16:20-16:45**	**Title:** Research on the Performance and Optimization Strategies of Underwater Wireless Optical Communication System under Microbubble Channel **Authors:** Jiaheng Zhang, Min Fu, Bing Zheng, XinHui Wang **Invited Speaker:** Min Fu, Ocean University of China, China **Abstract:** This research addresses critical challenges in Underwater Wireless Optical Communication (UWOC) systems within complex marine environments, focusing on two key aspects. Firstly, to mitigate the interference of micron-sized bubble swarms on communication performance, 10-250 μm bubble groups conforming to oceanic distributions were simulated via electrolysis, and their impact on Orthogonal Frequency Division Multiplexing (OFDM) links was quantitatively analyzed using an image acquisition platform. The results show that as bubble density increases, the bit error rate exceeds the Forward Error Correction (FEC) threshold. A 50mm large-aperture receiver improves the communication threshold by 136%, and combining Space-Time Block Coding (STBC) Multiple Input Multiple Output (MIMO) technology further enhances it by 50%. Secondly, to overcome the limited generalization capability of traditional channel modeling methods, a UWOC channel emulator based on Model-Agnostic Meta-Learning (MAML) and Deep Convolutional Conditional Generative Adversarial Network (DCGAN) is proposed. This emulator outperforms traditional methods in both time and frequency domains (time-domain correlation coefficient of 0.902, frequency-domain error reduced by 38%), demonstrating rapid adaptation to new water environments with varying attenuation coefficients. These findings provide effective solutions for performance optimization and channel modeling of UWOC systems in complex marine environments.
Invited Speech **SZ665-A** **16:45-17:10**	**Title:** Energy-Efficient Transmission Techniques for 6G Mobile Communications **Author:** Youzhi Xiong **Invited Speaker:** Youzhi Xiong, Sichuan Normal University, China **Abstract:** Energy efficiency (EE) is a crucial KPI of future 6G mobile communications. At this point, this presentation will explore two enablers that are promising to improve the EE, i.e., low-resolution quantization and reconfigurable intelligent surface (RIS). Specifically, in the context of cell-free massive MIMO, a promising technology for 6G, we show how low-resolution quantization and RIS can improve system EE. Moreover, by involving the two enablers, we introduce some challenges to be investigated, such as performance analysis, channel estimation, and RIS's configuration.
SZ710 **17:10-17:25**	**Title:** A Dual-Band Frequency Selective Surface with Angular Stability at X-band **Authors:** Lin Du, Botao Feng, Xiao Ding, Li Deng, Wenzhe Gu, Qingsheng Zeng **Presenter:** Lin Du, Shenzhen University, China **Abstract**: This paper proposes a dual-band frequency selective surface (FSS) design. To achieve dual-band functionality, two similarly shaped elements with different sizes are staggered on the substrate. The filtering response is created through strategically designed slots on the middle layer. Three different FSS configurations are designed and analyzed. The inclusion of arms and stubs enhances isolation between the staggered elements, reducing magnetic coupling and strengthening electric coupling, which improves angular stability. The proposed design shows transmission zeros at 7.75 GHz, 9.6 GHz, and 11.75 GHz, with a suppression level of -20 dB, demonstrating its effectiveness in frequency-selective applications.

SZ677 **17:25-17:40**	**Title:** State-Based Potential Game Approach for Anti-Jamming Channel Access via Reinforcement Learning **Authors:** Jiangtu deng, Xueqiang Zheng, Songyi Liu, Hao Han, Jihao Cai, Yifan Xu, Zhibin Feng and Haoming Li **Presenter:** Jiangtu Deng, College of Communication Engineering, Army Engineering University of PLA, China **Abstract:** This paper investigates the distributed anti-jamming channel access in multi-user communication networks. In antijamming wireless communication networks, the dynamic characteristics of external jamming, the absence of centralized network control, and the localized impact of interference on network nodes create significant hurdles for anti-jamming strategies. To address these challenges, we model the anti-jamming problem using a state-based potential game framework, theoretically guaranteeing convergence. We then propose a Neighborhood-Aware Cooperative Multi-Agent Reinforcement Learning (NAC-MARL) algorithm. This algorithm effectively mitigates external malicious jamming while minimizing mutual interference among users by facilitating local information exchange, enhancing decisionmaking, and enabling adaptive responses to dynamic jamming conditions. Experimental results demonstrate that the proposed NAC-MARL algorithm achieves a 13.1% increase in network throughput compared to independent Q-learning and a 43.1% improvement over the SAP method under dynamic sweeping jamming conditions. Additionally, the algorithm reduces the average congestion level across various user scenarios, ensuring stable communication in dynamic spectrum environments.
SZ707 **17:40-17:55**	**Title:** Ergodic capacity performance analysis of NOMA combined with AF relay downlink transmission **Authors:** Xianbin Xie and Quan zhou **Presenter:** Xianbin Xie, West Anhui Uiniversity, China **Abstract:** In this paper, we consider a typical downlink two-user transmission mode, in which the base station cannot transmit information directly to two users, mainly due to obstacles or shadow effects between links. Therefore, it is necessary to use relay node. In order to improve spectral efficiency by reducing transmission time slots, we use non-orthogonal superposition coding technology to construct superimposed signal at the base station. The base station sends superimposed information to the relay node, and in the next time slot, the relay node transmits the superimposed signal to the downlink two users through the amplify-and-forward protocol (AF) in a broadcast manner. In order to verify the advantages of the proposed transmission mode in ergodic capacity performance, we compare with the traditional orthogonal relay transmission modes, such as time division multiple access (TDMA) combined with AF transmission mode and TDMA combined with decode-and-forward (DF) transmission mode. Monte Carlo simulation confirm the advantages of the proposed transmission mode.
SZ687 **17:55-18:10**	**Title:** A Dual-polarized Antenna with Solar Cell Array for Low-carbon Communication **Authors:** Chenxi Liu, Wenxing An, Xiaoqing Tian, Yi Wu, Yu Luo, Min Li **Presenter**: Wenxing An, Tianjin University, China **Abstract:** A 5×5 solar cell array is integrated with an antenna radiation aperture for 5G low-carbon communication. To leverage the distinct properties of the inductor in DC and RF bands, surface-mounted inductors are incorporated into the circuit of the solar cell array, ensuring both DC connectivity and optimal antenna dual-polarization performance. This dual-function design achieves a dual-polarized broadband antenna with DC power generation. The antenna demonstrates a high port isolation of more than 30 dB, with simulated -10 dB bandwidth covering 5G target bands from 3.3 GHz to 5 GHz. The simulated gain is more than 8.6 dBi for two polarizations. This design utilizes a solar cell array as the radiating structure for 5G broadband antennas, reducing the cost and complexity of the dual-function device, and offering an attractive solution for future low-carbon communications.

Onsite Oral Session 9

Time: 17:05-18:40 (GMT+8, Beijing Time)
Date: Saturday, April 12
Venue: V1 Room (4 Floor)
Topic: Digital image processing and application
Chaired by: Prof. Xiao Ding, Macau University of Science and Technology, China

Invited Speech SZ614 **17:05-17:30**	**Title:** Wi-Fi Signal Gesture Recognition Based on Multimodality **Authors:** Wei Yang, Botao Feng, Yi Pan, Yong Chen, Wang Chai, Xiaojun Jing **Invited Speaker:** Wei Yang, Shenzhen Technology University, China **Abstract:** With the development of technology, various gesture recognition devices and technologies have emerged to meet people's various needs. Traditional gesture recognition methods are relatively cumbersome and require wearing data gloves. At the same time, the technology based on computer vision needs to recognize that the target is always within sight. Therefore, this paper proposes a gesture recognition method based on multimodal Wi-Fi signals, and optimizes the gesture recognition methods from devices and technologies to overcome the problems in traditional recognition methods. Specifically, we first built a Wi-Fi signal data acquisition platform based on the Atheros network card, and the packet loss rate is less than 0.1%. Then, frame extraction is carried out for the video signal, and the T3D network based on DenseNet is used for video recognition. The video recognition rate reaches 95.0%. Finally, the above video data is extended to the Wi-Fi signal, and gesture recognition is performed jointly with CNN and GRU. The test data shows that the gesture recognition rate of the system platform is 88.2%, which is the leading level.
Invited Speech SZ693-A **17:30-17:55**	**Title:** ISAC ISAR Imaging for Non-cooperation Moving Targets Sensing Based on Minimum Entropy Technology **Author:** Shuliang Gui **Invited Speaker:** Shuliang Gui, Chongqing University of Posts and Telecommunications, China **Abstract:** Integrated Sensing and Communication (ISAC) is poised to become a key technology for next-generation communication systems, with promising applications in areas such as low-altitude operations, security surveillance, and smart cities. Inverse Synthetic Aperture Radar (ISAR) technology plays a critical role in detecting and imaging moving targets. Motivated by ISAR imaging principles and leveraging the ISAC echo signal model, we propose a far-field wavenumber domain ISAR imaging method based on the minimum image entropy criterion, which enables multi-frame imaging of non-cooperative moving targets. Furthermore, Finally, to demonstrate the performance and feasibility of the proposed method, the real imaging experiments are conducted with an 5G millimeter-wave ISAC system.
SZ643 **17:55-18:10**	**Title:** Moving Scenes Detection Based on DeblurGAN-v2 And YOLOv5 **Authors:** Jia Fu, Anliang Chen, Jinsong Liao, Wenhao Hu, Sishi Pan **Presenter:** Anliang Chen, Chongqing University of Posts and Telecommunications, China **Abstract:** With the rapid growth in wood demand, the need for accurate and efficient counting during wood transportation has become increasingly prominent, especially in mobile scenarios such as transport vehicles and docks. Traditional manual counting methods are inefficient, prone to errors, and pose safety risks. To address the issues of low counting accuracy and efficiency caused by motion blur in images, this study proposes a wood counting method based on DeblurGAN-v2 and YOLOv5. First, industrial cameras are used to capture motion-blurred images of wood in mobile scenarios, and the images are labeled using the Labelimg tool to construct the original dataset. Next, DeblurGAN-v2 is utilized to deblur the original images, generating a clear deblurred dataset. Then, this

	deblurred dataset is used to train the YOLOv5 model for wood object detection and counting. Experimental results show that this method significantly improves the accuracy and efficiency of wood counting in mobile scenarios and can effectively tackle the challenges posed by motion blur, demonstrating good practical application potential.
SZ7026 **18:10-18:25**	**Title:** Deep Learning Models in Underwater Image Enhancement **Authors:** Dong Su, Jie Dong, Haoye Jiang, Zhonghua Xie **Presenter:** Zhonghua Xie, Huizhou University, China **Abstract:** Underwater images are of great significance in marine related fields, but the complex underwater environment causes problems such as color distortion and low contrast, which seriously affect information extraction. This study focuses on underwater image enhancement methods based on deep learning, and conducts in-depth analysis and comparative experiments on various models such as FusionEnhance and CycleGAN. Train the model using the EUVP dataset and test it using the UFO-120 dataset, and evaluate its performance using PSNR, SSIM, and UIQMS metrics. The experimental results show that UWCNN performs the best in PSNR and SSIM metrics, with outstanding abilities in denoising and preserving image structure; UGAN performs excellently in the UIQMS metric, with a significant overall improvement in image quality. The study also found that different models have their own advantages and disadvantages in quantitative and qualitative analysis, such as WF Diff, which has excellent quantitative indicators but less detail retention than Pix2pix. This study provides important references for the development of underwater image enhancement technology, while pointing out the limitations of current research in model selection, dataset representativeness, and evaluation indicators.
SZ698 **18:25-18:40**	**Title:** Research on the Optimization of an Edge-side System for Fatigue Detection Based on an Adaptive Threshold Tuning Algorithm **Authors:** Liukun He, Ying Chen, Manyi Lu, Yi Pan **Presenter:** Liukun He, Guangdong Tobacco Heyuan Co., Ltd, China **Abstract:** To address the challenges of poor environmental adaptability, sensitivity to individual physiological differences, and high computational demands on edge devices in traditional computer vision-based fatigue detection systems during practical implementation, this study proposes a systematic optimization approach through architectural improvements. Firstly, the replacement of Dlib framework with MediaPipe Face Mesh keypoint detection model achieves a significant reduction in model footprint while maintaining detection accuracy, doubling processing speed while enhancing robustness against illumination variations, head rotations, and occlusions. Secondly, the establishment of a driver physiological characteristics database and adaptive threshold tuning algorithm effectively mitigates false detection caused by individual differences. By integrating MobileNet lightweight architecture with hybrid quantization techniques, combined with spatiotemporal optimization of detection logic, the system reduces GPU memory usage by two-thirds on edge devices and significantly decreases latency. Experimental results demonstrate that the optimized system achieves high detection accuracy with ultra-low latency on automotive-grade embedded platforms, while maintaining adaptability across diverse driving scenarios. This research provides an engineering paradigm for low-cost, high-reliability active safety solutions.

Online Oral Session 1

Time: 9:00-11:40 (GMT+8, Beijing Time)
Date: Sunday, April 13
Zoom Link: https://us02web.zoom.us/j/86461997029
Zoom ID: 864 6199 7029
Password: 041113
Topic: Ubiquitous communication system and wireless communication
Chaired by: Prof. Jiehan Zhou, Shandong University of Science and Technology, China

Invited Speech **SZ701-A** **9:00-9:25**	**Title: Performance Analysis of Visible Light Communications (VLC)-WiFi Networks based on Dynamic Resource Allocation** **Authors:** Liwei Yang **Invited Speaker:** Liwei Yang, China Agricultural University, China **Abstract:** Visible Light Communications technology has become a potential solution for signal transmission in wireless optical network. In order to improve the fairness of the system, this study proposed an improved resource management algorithm for heterogeneous VLC-WiFi network. The simulation results show that the proposed algorithm has better fairness and throughput than the traditional algorithm.
SZ692 **9:25-9:40**	**Title: Predicting Available Bandwidth in Ad Hoc Networks Using Neural Networks** **Authors:** Yizhen Pan, Xin Xu, Liangdong Wei, Rongjin Wang, Jingqiu Yang, Rongwei Hu **Presenter:** Yizhen Pan, Army Engineering University, China **Abstract:** Ad hoc networks are self-organizing wireless networks that do not rely on fixed infrastructure. They are easy and fast to set up, unrestricted by time and space, and can be widely used in battlefields, emergency rescue operations, hazardous environments, and other scenarios. The available bandwidth of links in Ad hoc networks changes with the channel conditions. If the available bandwidth can be predicted and the transmission rate adjusted accordingly, the channel utilization can be significantly improved. In this paper, neural network models such as CNN, LSTM, Transformer, TCN, and KAN are applied to predict the available channel bandwidth based on measured data. The experimental results indicate that among those models, the CNN model converges more rapidly, while the TCN and TCN-GRU models exhibit superior fitting performance.
SZ684 **9:40-9:55**	**Title: Efficient Correlated Sources Scheduling in Vehicular Networks via Deep Reinforcement Learning** **Authors:** Ke Li, Sai Ma, Xinbang Zhang, Jiaqi Fan **Presenter:** Sai Ma, Southwest Jiaotong University, China **Abstract:** Selecting the optimal vehicle for communication in cooperative sensing scenarios of vehicular networks is crucial for minimizing costs and ensuring timely information updates, especially when multiple vehicles are monitoring the same event. This paper proposes a Proximal Policy Optimization with Atten tion (PPO-A) algorithm to address the vehicle selection problem, taking into account the correlation of information among vehicles. Acomprehensive network resource model is developed to analyze the relationship between information correlation and the Age of Information (AoI). Compared to baseline algorithms, the AoI is reduced by 12% to 25%, the transmission delay is reduced by 10% to 25%, and the overall communication efficiency is enhanced through the application of the proposed PPO-A algorithm. These improvements demonstrate its effectiveness in enhancing communication efficiency within vehicular networks.

SZ617 **9:55-10:10**	**Title: Research on Underwater OLSR Routing Protocol Based on Optimized MPR Nodes** **Authors:** Jiaqi Cui, Tingting Lv, Jiyuan Wang, Qizheng Tian, Yuhan Yao, Zhang yan **Presenter:** Jiaqi Cui, Ocean University of China, China **Abstract:** With the development of underwater acoustic communication technology, underwater acoustic communication (UAC) networks have emerged accordingly. However, the instability of underwater acoustic communication and the mobility of underwater nodes lead to frequent changes in the topology and disorder of communication links. Solving this problem is of great significance for underwater acoustic communication networks. The Optimized Link State Routing (OLSR) is a well-known routing protocol for mobile ad hoc networks. Although it can be applied to underwater scenarios and has the advantages of rapid network convergence and effective reduction of broadcast storms, due to the complexity of the underwater environment, it has numerous drawbacks when applied. For example, the routing overhead for link maintenance among nodes is too high, its adaptability to the frequently changing underwater topological structures is poor, and it fails to meet the requirements for the efficient and stable operation of underwater communication networks. In this paper, by defining and optimizing the Multi-Point Relay (MPR) node selection algorithm, a new MPR node selection algorithm that comprehensively considers key indicators such as data throughput rate, end-to-end delay, and packet loss rate is constructed. Based on the dynamic changes of the underwater environment, this algorithm dynamically adjusts the MPR node set and accurately selects high-quality MPR nodes, and further determines the optimal transmission path, effectively alleviating problems such as frequent topology changes and disordered communication links caused by the complexity of the underwater environment. Through a large number of experiments using the OPNET network simulation simulator, the results show that compared with the traditional OLSR, Vector-Based Forwarding (VBF), and Depth-Based Routing (DBR) routing protocols, the underwater OLSR routing protocol based on the optimized MPR nodes has an increase in the data throughput rate of approximately 9% - 14%, a reduction in the end-to-end delay of approximately 15% - 21%, and an increase in the network lifetime of approximately 17% - 25%.
SZ7008 **10:10-10:25**	**Title: Research on Application of Cat.1 Module into IoT Smart Water Meter** **Author:** Chunliang Yang, Yuan Ding, Chao Fan, Han Zhang, Peng Zhuang **Presenter:** Chunliang Yang, China Mobile Internet of Things Co., Ltd., China **Abstract:** The development of cellular Internet of Things (IoT) technology is fast and its applications into vertical industry are flourishing. As the entrance of cellular Internet of Things, communication module is the key to the development and application of the Internet of Things. Public utilities are the earliest and most mature areas of Internet of Things in using communication modules, in which smart electricity meters have reached 90% penetration rate, while smart water meters are relatively lagging behind, only reaching 40% penetration rate, so there is a large space for the development of smart water meters. At present, NB-IoT module is the main communication component of smart water meters, and its development is relatively mature, but NB-IoT network has certain coverage limitations in rural and some urban areas, resulting in the application of NB-IoT smart water meters into those areas is limited. Therefore, the Cat.1 technology and module, which has been developed rapidly in the past two years and is based on a wider coverage of 4G LTE network, has become a potential alternative or complementary technology of NB-IoT in the smart water meter industry. However, the application of Cat.1 technology and modules into smart water meters needs to solve and evaluate the power consumption problem in order to meet the extremely low power consumption requirements of smart water meters. The research carries out a pioneering study in evaluating the power consumption of Cat.1 smart water meter in a practical view, and results show that the power consumption of Cat.1 smart water meter is relatively lower than that of NB-IoT smart water meter due to shorter working time. Thus it is feasible to apply Cat. 1 module into smart water meter through carefully low-power design. The research gives an innovative technical solution to solve the limitation of present NB-IoT smart water meter in certain areas.

SZ7007 **10:25-10:40**	**Title: A System for Network Asset Discovery and Localization Using Edge Computing Drones** **Authors:** Zhe Zhang, Yingjie Wang, Guoliang Hu, Hongjie Fan, Songtao Ye **Presenter:** Songtao Ye, Xiangtan University, China **Abstract:** As network technologies rapidly advance, complexity in network asset management have become increasingly evident. Traditional methods protect network assets by segregating external and internal networks. However, this approach increases management complexity and brings potential security risks. Additionally, existing network mapping tools often lack the ability to accurately locate network assets. This limitation prevents administrators from easily identifying the geographic location of network assets. As a result, effective network asset management is hindered. To address these challenges, this study introduces an automated network mapping solution. The solution combines drone with edge computing devices. Drones with edge computing devices use active routers as access points for nighttime mapping. This approach overcomes the limitations of traditional methods and provides a novel idea for managing network assets.
SZ7001 **10:40-10:55**	**Title: Automatic Verification of Camera, Radar, LIDAR Sensors Synchronization and Calibration for Automotive Applications** **Authors:** Chunhui Xiang, Yongming Li, Shaochen Jiang **Presenter:** Chunhui Xiang, Xinjiang University, China **Abstract:** Wireless Sensor Networks (WSNs) consist of a large number of low-power sensor nodes capable of self-organizing to perform real-time monitoring and data collection of the environment. However, the energy constraints and limited battery life of these sensor nodes have long been a key challenge in this field. To address this issue, many solutions have been proposed, with clustering-based routing protocols being widely adopted as an effective method for reducing energy consumption. Additionally, the heterogeneity of the network plays a critical role in extending network lifetime. In this paper, we propose an Energy and Distance Aware Distributed Dynamic Clustering protocol (EDAD) for heterogeneous WSNs to management the network and reduce the energy consumption involved in data transmission, thereby extending the network's lifespan. The protocol considers both the residual energy of nodes and their distance to the base station (BS) in the cluster head (CH) selection process. Moreover, EDAD adjusts the frequency of nodes serving as CHs to prevent certain nodes from exhausting their energy prematurely due to frequent CH responsibilities. Simulation results show that EDAD significantly outperforms existing clustering protocols in terms of node energy consumption, network lifetime, and throughput.
SZ7017 **10:55-11:10**	**Title: On the Ergodic Rate of CR-Aided Multi-User Uplink RSMA and NOMA** **Authors:** Tianzhi He, Theodoros A. Tsiftsis **Presenter:** Tianzhi He, School of Intelligent Systems Science and Engineering, Jinan University, China **Abstract:** Sixth-generation (6G) wireless networks require a range of technologies and possible designs to meet high throughput, huge connectivity, and different quality of service (QoS) needs due to the rapid growth of wireless devices. In this study, we created a three-user uplink cognitive radio system with two secondary users ($SU1$ and $SU2$), one close to the base station and the other farther away. We examined the ergodic rate performance of two decoding order protocols: CR-Fix-DO, which is based on Rate-Splitting Multiple Access (RSMA), and CR-Flex-DO, which is based on Non-Orthogonal Multiple Access (NOMA). Within a resource block allotted to the primary user (PU), both protocols are made to support secondary users without sacrificing the PU's quality of service (QoS). The suggested protocols exceed benchmark schemes, as shown by numerical findings that confirmed the theoretical analysis. Under the given conditions, CR-Flex-DO achieved up to 1.7 bps/Hz greater ergodic rates than CR-Fix-DO.

SZ7012 **11:10-11:25**	**Title: Non-coherent Signal Detection Algorithm Based on Molecular Communication and Its Experimental Verification** **Authors:** Leifu Ren **Presenter:** Leifu Ren, Beijing University of Posts and Telecommunications, China **Abstract:** Demodulation at the receiver is a pivotal process in molecular communication (MC), involving the identification and transformation of transmitted signals to retrieve the original information from the sender. Due to the unique properties of MC, traditional demodulation techniques from electromagnetic communication cannot be directly applied. The demodulation process in MC must account for complex factors such as molecular diffusion, reaction kinetics, and environmental influences, which can affect the receiver's ability to recognize and process signals. Most existing signal detection methods rely on an unbounded model, which does not align with real-world communication scenarios, and are unsuitable for bounded environments. Addressing these issues, this paper proposes a non-coherent signal detection method suitable for bounded models, using pre-smoothing of data to set thresholds for current time slots. Through experimental simulations of the communication process using the molecular communication simulator developed by China Mobile, we analyze the channel capacity and bit error rate (BER). The results demonstrate that our approach significantly reduces the BER and enhances the reliability of MC in bounded environments.
SZ623 **11:25-11:40**	**Title: Research on Markov Channel Model Based on Beidou B1 Signal** **Authors:** Zeyu Ni, Hao Zhang, Tingting Lv, Longyu Xia, Jiaqi Cui and Yinghui Zhao **Presenter:** Jiaqi Cui, Ocean University of China, China **Abstract:** In this paper, the research on satellite channel modeling of the B1 signal within the Beidou Global Navigation System (BDS) is carried out. Considering the crucial influence of satellite channel characteristics on the performance of the Beidou system, a satellite channel model for the BDS is established with respect to three typical geographical scenarios, namely open regions, rural areas, and urban areas. Specifically, the generalized Rice model, the improved C.Loo model, and the extended Suzuki model are applied correspondingly. Meanwhile, a three-state Markov model is incorporated to depict the time-varying features of the channel induced by the movement of the receiver. Through comparison with measured data and analysis of statistical characteristic functions, the usability of the constructed model is verified. The simulation outcomes indicate that this model can more accurately represent the channel characteristics of the Beidou satellite. The simulation results indicate that this model is capable of precisely representing the channel characteristics of the Beidou satellites. This will offer research methodologies for constructing an accurate satellite model for the Beidou signal, enhancing the positioning accuracy of the BDS, strengthening the anti-interference capacity of the signal, and expanding the application domains.

Online Oral Session 2

Time: 9:00-11:40(GMT+8, Beijing Time)
Date: Sunday, April 13, 2025
Zoom Link: https://us02web.zoom.us/j/87173579330
Zoom ID: 871 7357 9330
Password: 041113
Topic: Intelligent communication network collaboration and optimization
Chaired by: Prof. Yonghua Li, Information and Communication Engineering Beijing University of Posts and Telecommunications, China

Invited Speech **SZ673** **09:00-09:25**	**Title:** Harmonizing Tradition and Innovation: Advances in Chinese-Culture-Based Antennas and Sensors **Author:** Kwok L. Chung **Invited Speaker:** Kwok L. Chung, Guangzhou Institute of Science and Technology, China **Abstract:** This paper presents the innovative application of Chinese-culture-based (CCB) design in the development of multiband patch antennas, integrating culturally resonant symbols such as traditional motifs and calligraphic elements like Lishu characters. We trace the evolution of CCB antennas, highlighting advancements from the pioneering WANG-shaped patch antennas to the recent multiband Guo- and Qing-shaped designs. These antennas not only celebrate China's rich cultural heritage but also enhance performance and aesthetic value in wireless communication. Employing methodologies such as Characteristic Mode Theory (CMT), our research demonstrates how tradition can blend seamlessly with modern technology. The findings highlight the potential of CCB antennas for smart cities, cultural heritage sites, and sustainable practices, illustrating the convergence of art and technology in the field of wireless communications.
SZ646 **9:25-9:40**	**Title: Modeling of Wideband Non-Stationary MIMO Channels for Low-Altitude UAV Based on GBSM** **Authors:** Jingjing Du, Lei Xiong **Presenter:** Jingjing Du, Beijing Jiaotong University, China **Abstract:** In recent years, unmanned aerial vehicle (UAV), particularly low-altitude UAVs, have gained significant importance. This paper proposes a three-dimensional geometry-based wide band non-stationary stochastic channel model for such scenarios. Differing from existing models, it unifies air-to-air (A2A) and air-to-ground (A2G) scenarios into a general model, accounting for local, remote, and moving scatter clusters. A two-state continuous-time Markov process is utilized to simulate scatter clusters birth-death dynamics, and key statistical properties are derived. A simulation model is developed to reduce computational complexity. The results indicate that the proposed model can accurately reflect UAV channel characteristics across various frequencies..
SZ7005 **9:40-9:55**	**Title: STAR-RIS Aided Secure Integrated Sensing and Communication** **Authors: Xuerong Zhao, Jiahui Hao, Gonghao Cui, Yongkang Wang, Zhe Sun and Yunhui Yi** **Presenter: Xuerong Zhao, Xidian University, China** **Abstract:** Integrated sensing and communication (ISAC) has attracted considerable interest owing to its capacity to mitigate spectrum congestion and hardware efficiency. Nevertheless, there is a certain risk of leaking communication information, if sensing waveform includes communication data. In this paper, we integrate a secure transmission problem in an ISAC network with simultaneously transmitting and reflecting intelligent surface (STAR-RIS), which divides the whole space into two regions: the reflection space R and the transmission space T. The reflection space contains a radar sensing target, which we consider as a possible eavesdropper that attempts to intercept the communication transmission. The transmission space has a single communication user. The base

	station (BS) simultaneously sends messages to the single-antenna user and performs target detection with the help of STAR-RIS. In addition, to further increase the secrecy capacity, BS simultaneously generates artificial noise (AN) to interfere with the eavesdropper. We jointly optimize the transmission and reflected beam formation of BS and STAR-RIS, and consider the communication and perceptual power ratio to maximize the user secrecy capacity, On the basis of satisfying the minimum level of perception. The reference points-based evolutionary algorithm (RPEA) genetic algorithm is used to solve the non-convex problem. The simulation results demonstrate the effectiveness of the proposed scheme and AN can increase the user's capacity for confidentiality.
SZ630 **9:55-10:10**	**Title: Design of Quantized Weight Concentric Ring Sparse Arrays in LEO Satellites** **Authors:** Xianmeng Zhang, Wei Zhang, Bin Zhou, Wei Yu, Yu Zhao, Zhiyong Bu **Presenter:** Zhang Xianmeng, Shanghai Institute of Microsystem and Information Technology, Chinese Academy of Sciences, Shanghai, China **Abstract:** The low-earth orbit (LEO) satellite system has been one of the most promising technologies in 6G communications, where phased array antennas play an important role in compensating for the huge path loss between LEOs and ground-based terminals. To enhance the energy efficiency and steering precision of conventional phased array, this paper proposes an improved genetic algorithm to design a sparse phased array with quantized amplitude weights based on concentric ring arrangements, where the antenna array design problem is formulated into a sparse optimization problem. Simulation results demonstrate that, compared with the standalone use of concentric ring arrangements or traditional genetic algorithms, the proposed method significantly reduces the number of elements while effectively lowering the peak sidelobe level (PSLL) and maintaining a stable main lobe width, making it suitable for LEO satellite antenna array design requirements.
SZ655 **10:10-10:25**	**Title: Joint Computation Offloading, Mode Selection and Resource Allocation for D2D-Assisted Mobile Edge Computing** **Authors:** Jieping Liu, Yu Li, Ziyan Wang, Qi Jiang, Ting Yang, Junchao Yang **Presenter:** Jieping Liu, Chongqing Technology and Business University, China **Abstract:** The emergence of 6G technologies has accelerated the development of advanced intelligent applications, leading to an increased demand for mobile edge computing (MEC) systems. However, limited computational resources at mobile devices and edge servers hinder the efficient processing of the rapidly growing data requests. This limitation results in a reduced quality of service (QoS) and inefficient resource utilization. To address these challenges, we propose a device-to-device-assisted MEC (D2D-MEC) architecture that optimizes the joint allocation of communication and computational resources. The objective is to minimize the average task offloading cost, which is defined as a weighted sum of delay and energy consumption. This goal involves the joint optimization of computation offloading, communication mode selection, and resource allocation. To tackle the modeled mixed-integer nonlinear programming (MINLP) problem, we introduce a multi-agent deep reinforcement learning (MADRL) framework. By framing the problem as a Markov decision process (MDP), the algorithm implements a centralized training and decentralized execution approach. This approach enables agents to dynamically adjust their offloading strategies, communication modes, and resource allocations based on real
SZ616 **10:25-10:40**	**Title: Multi-Time-Scale Shortwave Channel Model Based on Ionospheric Characteristics** **Authors:** Yu Li, Tingting Lv, Chen Shen, Tianqi Lin **Presenter:** Yu Li, Ocean University of China, China

	Abstract: This thesis proposes a multi-time-scale ionospheric shortwave channel model based on the Watterson model to address the issue of channel changes under different time scales. The paper elaborates in detail on the parameter estimation algorithm of the ionospheric channel model obtained through electron density calculation. Meanwhile, a control experiment is set up with the LTV (Long Time Varying) and ITV (Instantaneous Time Varying) channel models whose Alpha filter performance has been verified based on observed data. Simulations of various time scales for both models are carried out, and the signals passing through the two channels demonstrate consistency in terms of time-frequency domain and key signal parameters. The simulation results show that the multi-time-scale ionospheric shortwave channel model can accurately simulate the real transmission conditions of the shortwave transmission system under different time scales.
SZ7006 **10:40-10:55**	**Title: Joint Beamforming Optimization for RIS-Aided ISAC Security Systems** **Authors: Jiahui Hao, Xuerong Zhao, Zhe Sun, Yongkang Wang, Gonghao Cui, Yunhui Yi** **Presenter:** Jiahui Hao, Xidian University, China **Abstract:** In Integrated Sensing and Communication (ISAC) systems, there is a significant risk of information leakage to eavesdroppers when ISAC waveforms are used for communication. In this paper, we address the physical layer security (PLS) issue in ISAC systems by deploying reconfigurable intelligent surfaces (RIS). Specifically, under the scenario where the base station employs dual-functional radar-communication (DFRC) waveforms, we formulate a complex multi-objective optimization problem. This problem involves jointly optimizing the passive beamforming of the RIS and the active beamforming of the base station, aiming to maximize the secrecy capacity of the communication system while enhancing target detection power. Given the inherently multi-objective and non-convex nature of this optimization problem, we propose to use an improved multi-objective evolutionary algorithm based on adaptive geometric estimation (IAGEMOEA) to find a solution. Through extensive numerical simulations, we validate the effectiveness of the RIS deployment and the proposed algorithm in improving the secrecy capacity and target tracking performance of ISAC systems.
SZ7011 **10:55-11:10**	**Title: Research on the Method of Enhancing the User Capacity of Dense User Asynchronous Frequency Hopping Networks Based on NOMA Technology** **Authors: Jinjie Wang, Shaofu Zhang, Yuan Zhao** **Presenter:** Jinjie Wang, Space Star Technology Co., Ltd., China **Abstract:** This paper proposes a scheme based on NOMA (Non-Orthogonal Multiple Access) to enhance user capacity in asynchronous frequency hopping networks, which is limited by available frequency resources. By reusing frequency resources among multiple nodes, NOMA technology can effectively reduce the number of frequency resources required by users in accessing network, thereby improving spectrum utilization and significantly increasing user capacity. This article proves by simulation that the asynchronous frequency hopping network based on NOMA has higher user capacity in intensive multi-user scenarios.
SZ7030 **11:10-11:25**	**Title: A Vehicle-Road Cooperative Positioning Method for Intelligent and Connected Vehicles Based on Wolf Pack Algorithm Optimized Neural Network** **Authors:** Shimin Cai, Shangyan Wang, Qi Liu, Chi Liu, Junliang You, Luyao Du **Presenter:** Shimin Cai, Wuhan University of Technology, China **Abstract:** Vehicle-road cooperative positioning is an effective method for intelligent and connected vehicles to improve positioning accuracy. In the process of vehicle-road cooperative positioning, the height difference of roadside cooperative units can lead to the amplification of Z-axis positioning errors. In this paper, a back propagation (BP) neural network optimized by an improved wolf pack

	algorithm (WPA) is proposed to improve Z-axis and overall positioning accuracy. By analyzing the nonlinear propagation of vertical ranging noise, the improved WPA integrates logistic chaotic mapping for global parameter initialization, adaptive dynamic step size adjustment to balance exploration and exploitation, and t- distribution mutation to escape local optima. Simulation experiments are conducted in MATLAB environment. The experimental results show that the proposed vehicle-road cooperative positioning method can effectively reduce Z-axis and overall positioning errors, improving vehicle positioning accuracy.
SZ7013 **11:25-11:40**	**Title: Sum Rate Maximization for IRS-Assisted Energy Harvesting Cognitive Radio Networks** **Authors:** Lilian Chiru Kawala, Guoquan Li, Liu Ting, Amayika Kakati **Presenter:** LILIAN CHIRU KAWALA, Chongqing University of Posts and Telecommunications, China **Abstract:** Cognitive Radio (CR) technology allows secondary users (SUs) to utilize the spectrum resources of primary users (PUs) without affecting PUs' quality of service (QoS), addressing spectrum scarcity in future wireless communication systems. Energy Harvesting (EH)-powered Cognitive Radio Networks (EH-CRNs) equip secondary base stations with EH capabili-ties to address spectrum scarcity and RF energy harvesting simultaneously but face challenges in optimizing spectrum and EH efficiency. In this paper, we establish an EH-CRN system model assisted by Intelligent Reflecting Surface (IRS) for better transmission QoS and formulate an optimization problem to maximize secondary networks' achievable throughput subject to constraints on the lowest false alarm probability, SU QoS, and IRS phase shift. To solve the non-convex problem, we propose a resource allocation algorithm based on alternating optimization and divide it into three subproblems to respectively optimize the detection probability, the energy harvesting, and the achievable rate of secondary users by using semidefinite relaxation (SDR), successive convex approximation (SCA), first-order Taylor expansion, and Gaussian randomization with se-quential rank-one constraint relaxation (SROCR). Simulation results demonstrate the algorithm's convergence and improved performance compared to benchmark schemes under consistent constraints.

Online Oral Session 3

Time: 14:00-16:45(GMT+8, Beijing Time)
Date: Sunday, April 13, 2025
Zoom Link: https://us02web.zoom.us/j/86461997029
Zoom ID: 864 6199 7029
Password: 041113
Topic: Cross-modal machine learning and system model design
Chaired by: Prof. Qiang He, Northeastern University, China

Invited Speech SZ689 **14:00-14:25**	**Title:** Improving Drilling Rate Prediction with Advanced Data Preprocessing and LSTM-Attention Mechanisms for Offshore Oil Drilling **Authors:** Yi Wu, Bingxuan Li, Jingang Jiao, Anhao Yang, Yonghua Li **Invited Speaker:** Yonghua Li, Information and Communication Engineering Beijing University of Posts and Telecommunications, China **Abstract:** This study proposes a deep learning model combining Long Short-Term Memory (LSTM) and attention mechanisms for predicting drilling rate (ROP) in offshore oil drilling. The model processes time-series production data, extracts key features, and predicts future ROP with improved accuracy and real-time performance. Data preprocessing techniques, including outlier detection and duplicate removal, ensure high-quality data. The model outperforms traditional approaches such as LSTM, Temporal Convolutional Networks (TCN), and Gated Recurrent Units (GRU), achieving an RMSE of 0.154, MAE of 0.045, and an R^2 score of 0.908. This LSTM-Attention model offers strong support for real-time drilling optimization and can be further enhanced by integrating domain-specific knowledge and real-time data updates.
Invited Speech SZ661-A **14:25-14:50**	**Title: UAV-assisted Microservice Mobile Edge Computing Architecture: Addressing Post-Disaster Emergency Medical Rescue** **Authors:** Ji Li, Qiang He, Xingwei Wang, Ammar Hawbani, Keping Yu, Yuanguo Bi, Liang Zhao **Invited Speaker:** Qiang He, Northeastern University, China **Abstract:** In post-disaster emergency medical rescue operations, rapidly establishing an adaptive and flexible edge computing (EC) network, balancing data offloading with energy consumption, and ensuring the stable operation of the network have become urgent tasks. To address these challenges, we proposed a unmanned aerial vehicle (UAV)-assisted microservice mobile edge computing (MEC) architecture. The architecture can be rapidly deployed to provide temporary network coverage and EC services to disaster-stricken areas. A transformer-based resource management (TBRM) approach is utilized to optimize data offloading efficiency, and energy consumption, thereby maximizing the service time of the architecture. To ensure security and reliability, four microservices are designed to manage the full lifecycle of UAVs, utilizing dual digital signature certificates for identity authentication. Large-scale simulation experiments have demonstrated the effectiveness of the architecture in complex rescue environments, offering robust technical support for post-disaster medical rescue operations.
Invited Speech SZ7025 **14:50-15:15**	**Title: Exploring the Layer Style Keeping and Weight Reusing Strategy for Knowledge Distillation** **Authors:** Zehong Chen, Zhonghua Xie, Huabin Wang, Yiyuan Luo, Wenzhe Gu, Zhengrui Zhang **Invited Speaker:** Zehong Chen, Huizhou University, China **Abstract:** The method of knowledge distillation has recently gained significant interest for its potential to deploy models on low-resource devices. However, its success depends heavily on the learned feature representations of the source model. If the architecture and parameters of the source and target models differ significantly, the process of knowledge distillation may become challenging,

	and the growth of the target model may be restricted. To address these challenges, we propose a novel approach that includes a new style keeping loss function and a weight reusing strategy. The style keeping loss function is utilized to transfer knowledge in the intermediate layers to prevent overfitting and improve the student model's generalization ability. The weight reusing strategy is used for the classification layer, which facilitates pushing the last feature map closer to the classification boundary. Then we assess the effectiveness of our approach on multiple tasks, which include object detection, image classification, and salient object detection. The results show that the performance of the student model has a significant improvement by using the proposed approach.
SZ654 **15:15-15:30**	**Title: Improving Processing-In-Memory Chip Inferencing Accuracy Through Noise-Aware Training** **Authors:** YOUNGSEO KIM, CIMANG LU, XIANG QIU, YI ZHAO **Presenter:** YOUNGSEO KIM, East China Normal University, REPUBLIC OF KOREA **Abstract:** The increasing demand for high-performance and energy-efficient neural network (NN) deployments has led to the adoption of Processing-In-Memory (PIM) architectures. While PIM offers significant advantages in speed, power consumption, and cost, its inherent analog noise introduces accuracy loss, limiting its application in accuracy-sensitive tasks. In this study, we propose a noise-aware training (NAT) method to address this challenge. By incorporating uniformly distributed noise, modeled from real PIM chip behavior, into the training process, NAT adapts neural networks to the error characteristics of PIM chips. Experimental results on a keyword recognition task demonstrate that NAT significantly reduces accuracy loss during PIM chip inference without degrading the model's intrinsic FP32 accuracy. Compared to both baseline training and quantization-aware training (QAT), NAT exhibits superior robustness to noise and achieves higher inference accuracy on PIM chips. These findings highlight the potential of NAT to enhance the reliability of PIM architectures, paving the way for their broader adoption in real-world applications.
SZ696 **15:30-15:45**	**Title: DBformer: A Dual-Branch Temporal Prediction Network Based on Transformer** **Authors:** Xiaoshuai Zhang, Shujuan Zheng, Ying Zang **Presenter:** Xiaoshuai Zhang, Huzhou University, China **Abstract:** Multivariate time series forecasting plays a crucial role in various domains, including energy, transportation, and climate science. However, such data often exhibit complex inter-dependencies that traditional modeling approaches struggle to capture effectively. While Transformer-based time series forecasting models have shown promising performance, they primarily focus on temporal dependencies and rely on point-wise self-attention mechanisms to capture inter-variable relationships. This approach is insufficient for modeling the intricate cross-correlations among variables. To address this issue, we propose DBformer, a dual-branch Transformer-based network for time series forecasting. After preprocessing, the input sequence is fed into two parallel branches: a global branch, where multiple variables are stacked together and processed through global attention to capture inter-variable relationships, and a local branch, where channel-independent and patch-based mechanisms are employed to focus on local sequence details. The extracted sequence features from both branches are then adaptively fused through a spatiotemporal feature fusion module. This design effectively captures and models both inter-variable dependencies and temporal correlations, thereby enhancing forecasting accuracy. Extensive experiments on multiple real-world datasets demonstrate that DBformer outperforms advanced Transformer models, achieving a 1.3% improvement in Mean Squared Error (MSE) and a 3.4% improvement in Mean Absolute Error (MAE). Additionally, compared to the best-performing Convolutional Neural Network-based (CNN-based) model, our method achieves a relative reduction of 11.5% in MSE and 7.7% in MAE.

SZ705 **15:45-16:00**	**Title: HSNN: A Hybrid Sampling With Neural Network Method for Imbalanced Communication Services Classification** **Authors:** Wenbo Xiao, Caihong Kai, Tian Chen, Zhengyu Zhang **Presenter:** Caihong Kai, Hefei University of Technology, China **Abstract:** Unlike traditional network traffic classification, communication service classification encompasses a broader spectrum of applications. Variations in individual user behavior over time lead to significant differences in the network traffic generated by various services. Consequently, in real-world scenarios, communication service datasets often exhibit severe class imbalance, with some categories containing substantially more data than others. To address these challenges, this paper proposes a novel hybrid sampling with neural network method (HSNN). The proposed approach integrates advanced sampling techniques, neural network architectures, and machine learning classifiers. Specifically, we preprocess the data using a time windowing strategy, employ the Synthetic Minority Over sampling Technique (SMOTE) to mitigate data imbalance, and apply the Edited Nearest Neighbor (ENN) method to eliminate noisy samples. For classification, we combine an enhanced convolutional neural network with a random forest classifier. Experimental evaluations on our communication service dataset demonstrate that the HSNN framework achieves superior performance, highlighting its effectiveness in tackling the challenges inherent in imbalanced communication service data.
SZ700 **16:00-16:15**	**Title: Langevin Monte Carlo-based Offloading for Edge-Assisted Real-Time Video Analytics** **Author:** Wei Xu, Penglin Dai, and Kangli Zhao **Presenter:** Wei Xu, Southwest Jiaotong University, China **Abstract:** Leveraging edge computing and efficient video inference algorithms facilitates the implementation of various real-time video analytics applications on edge devices. However, existing methods for selecting regions of interest to offload typically only consider the entire video frame, detection bounding boxes on the device, or their aggregated blocks. They offload redundant information or lose critical features of offloaded targets. Furthermore, most current offloading mechanisms either assume the availability of ground-truth prior results or rely on empirical heuristic algorithms, which limits their applicability in real-world scenarios. To address these challenges, this paper proposes an edge-assisted video analysis framework that effectively coordinates detection models of diverse scales between the device and edge server. Additionally, considering the complex dynamics of the system environment, we formulate an offloading problem based on encoding quality and mixed confidence, which aims to maximize the weighted utility of accuracy and end-to-end latency. We propose a Langevin Monte Carlo-based Offloading (LMCO) algorithm, which directly samples from the posterior distribution of historical decision data to accurately model the reward function and select the optimal system parameter configuration. Finally, we evaluate the algorithm's performance on the real-world video dataset. The experimental results demonstrate that the LMCO outperforms existing baselines across various application scenarios and can quickly provide near-optimal solutions with sublinear regret.
SZ651 **16:15-16:30**	**Title: GNN-based Inspection UAV-assisted Computing Task Scheduling Method for Power Networks** **Authors:** Hanyu Li, Kun Xie, Xiaohong Huang and Jialu Zhao **Presenter:** Hanyu Li, Beijing University of Posts and Telecommunications, China **Abstract:** Modern power systems impose dual challenges on data networks: increasing computational tasks and stringent low-latency requirements. Traditional cloud computing struggles to meet these real-time demands in power IoT, whereas edge computing and UAV-assisted offloading offer promising alternatives. This paper proposes an inspection UAV-assisted task scheduling method to enhance grid terminal throughput and fairness while reducing system energy consumption via optimized resource allocation and path selection. We develop a scheduling architecture integrating

	multiple UAVs and grid terminals, and formulate a joint optimization problem balancing energy consumption, throughput, and fairness. To solve this, we introduce DGDCMM—a multi-agent reinforcement learning algorithm that combines a Double-layer Graph Attention Network with a Discrete Communication Model. UAVs process local observations through a Feature Extraction Network (FEN) and share information via a Discrete Communication Network (DCN) under centralized training with distributed execution. Simulation results show that DGDCMM outperforms baseline methods in overall throughput, resource uniformity, and energy efficiency.
SZ672 **16:30-16:45**	**Title: Dual-Class Prompt Generation: Enhancing Indonesian Gender-Based Hate Speech Detection through Data Augmentation** **Authors:** Muhammad Amien Ibrahim, Faisal, Tora Sangputra Yopie Winarto, Zefanya Delvin Sulistiya **Presenter:** Muhammad Amien Ibrahim, Bina Nusantara University, Indonesia **Abstract:** Detecting gender-based hate speech in Indonesian social media remains challenging due to limited labeled datasets. While binary hate speech classification has advanced, a more granular category like gender-targeted hate speech is understudied because of class imbalance issues. This paper addresses this gap by comparing three data augmentation techniques for Indonesian gender-based hate speech detection. We evaluate backtranslation, single-class prompt generation (using only hate speech examples), and our proposed dual-class prompt generation (using both hate speech and non-hate speech examples). Experiments show all augmentation methods improve classification performance, with our dual-class approach achieving the best results (88.5% accuracy, 88.1% F1-score using Random Forest). Semantic similarity analysis reveals dual-class prompt generation produces the most novel content, while T-SNE visualizations confirm these samples occupy distinct feature space regions while maintaining class characteristics. Our findings suggest that incorporating examples from both classes helps language models generate more diverse yet representative samples, effectively addressing limited data challenges in specialized hate speech detection.

Online Oral Session 4

Time: 14:00-16:10 (GMT+8, Beijing Time)
Date: Sunday, April 13, 2025
Zoom Link: https://us02web.zoom.us/j/87173579330
Zoom ID: 871 7357 9330
Password: 041113
Topic: Adaptive network security defense and threat perception
Chaired by: TBA

Invited Speaker **14:00-14:25**	**Title: Outage-Based Beamforming Design for Integrated Sensing and Communications 6G Systems** **Author:** Ahmad Bazzi **Presenter:** Ahmad Bazzi, New York University Abu Ahabi, UAE **Abstract:** Integrated Sensing and Communication (ISAC) is emerging as a cornerstone technology for future 6G networks, enabling wireless environments that can support advanced communication and sensing. In this talk, we characterize SAC performance in by jointly optimizing the tradeoffs between sensing from a Bartlett perspective, and communication from outage SINR perspective. In particular, we formulate a framework that allows to achieve the aforementioned sensing and communication joint capabilities through beamforming. Our main results include the explicit dependencies of outage parameters on the SAC tradeoff. In particular, the correlation level between the steering vector towards the target and the channel between the dual functional radar-communication base station and the communication user directly impacts the ISAC trade-off.
SZ648 **14:25-14:40**	**Title: Self-Supervised Spatio-Temporal Representation Learning for Microservice Anomaly Detection** **Authors:** Yiming Li, Yuchun Guo, Yishuai Chen, Zhong Cao, Shuowen Liang **Presenter:** Yiming Li, Beijing Jiaotong University, China **Abstract:** Microservice architecture is widely adopted in massive Internet applications due to its advantages such as agility and scalability. It is important to accurately detect anomalies to ensure the reliability of microservice systems. Unsupervised methods based on prediction or reconstruction have been proposed to monitor the time series of metrics for each virtual component (named pod). However, such methods have only used normal data for training representation of time series therefore the difference between normal and anomaly data is not fully represented. Moreover, the 2D spatial-temporal dependency among metric time series have been considered in literature but the interdependency among metric data implied by the physical co-deployment of components in the microservice system has not been considered. In this paper, we propose a self-supervised spatio-temporal representation learning model, named 3DCNN-VAE, for microservice anomaly detection. We customized VAE to learn comparative representations between normal and anomaly to construct discriminative features for multivariate time series representations. 3DCNN is introduced as an encoder in VAE to extract 3D spatio-temporal dependencies between multivariate metric data. Meanwhile, we use GNN to reduce the influence of metric indexing on feature extraction. The latent space representation in the VAE structure is used as the pre-trained time series representation, and the VAE decoder is transformed into MLP to complete downstream classification tasks for anomaly detection. Results on realistic dataset show that 3DCNN-VAE outperforms the best baseline by 9.8% on recall and 4.2% on F1-score.
SZ604 **14:40-14:55**	**Title: A Malicious Cluster Entry Method for Clustered Federated Learning** **Authors:** Hao Xu, Lei Shi, Huaili Liu, Junyu Ye, Hao Xu **Presenter:** Hao Xu, Hefei University of Technology, China **Abstract:** Clustered Federated Learning (CFL) represents a pioneering advancement in federated learning, addressing the issue of suboptimal model performance caused by heterogeneous data.

	However, the clustering process introduced by CFL can be exploited by potential attackers, leading to serious consequences such as the leakage of private information from clients within the cluster. In this paper, we propose an in-cluster attack against CFL to explore its potential security vulnerabilities. First, we define a threat model to better characterize the training process of CFL and outline the relevant assumptions of our approach. We then investigate a datasets filtering method that constructs a victim-isomorphic datasets using the attacker's auxiliary datasets and some of the victim's model parameters. Finally, the attacker uses the constructed victim-isomorphic datasets to train the model parameters and uploads them to the server, misleading the server's clustering algorithm and generating incorrect clustering results. Through experimental evaluation using four clustering algorithms on three datasets, our results demonstrate the effectiveness of our proposed in-cluster attack algorithms, while comparing them with two existing inference attack methods, proving that our approach possesses a higher precision rate.
SZ636 **14:55-15:10**	**Title: System Architecture Design for Spoofing Detection Based on Baseband Information** **Author:** Zhen Peng, Ao Peng, Jianghong Shi **Presenter:** Zhen Peng, Xiamen University, China **Abstract:** This paper evaluates the performance of two anti-spoofing algorithms, studies the performance boundary of anti-spoofing technology under multiple parameters, verifies its reliability and effectiveness in the face of multiple spoofing attack ways, and provides a judgment basis for scheme selection. Moreover, combining the complementarity of advantages of different spoofing detection technologies, the detection probability in joint detection scenarios is calculated, it provides effective support for various spoofing scenarios. This paper then proposes an anti-spoofing system architecture based on baseband information. The architecture utilizes multi-dimensional and multi-feature signal analysis, and combines various spoofing parameters using specific group strategies, so as to obtain a more comprehensive reference for detection effects.
SZ649 **15:10-15:25**	**Title: HiGraph: Learning Hierarchical Graph for Multivariate Time Series Anomaly Detection in Microservice Systems** **Authors:** Shuowen Liang, Yuchun Guo, Yishuai Chen, Zhong Cao, Yiming Li, Ruoyao Zhang **Presenter:** Shuowen Liang, Beijing Jiaotong University, China **Abstract:** Microservices enable flexible, scalable, and efficient application development in cloud environments. A service instance is a chain of microservices running in virtual pods. The service invocation trace and the pod performance metrics are recorded and analyzed to detect anomalies and ensure system stability. Spatiotemporal graph neural network models are popular for time-series representation as they can capture intra- and inter-correlation of time series. However, we find that the performance of anomaly detection depends on the dynamic correlation between containers in microservice system greatly, but has not been considered in existing work. To capture the correlation both on pod level and metric level, we propose a hierachcical graph neural network model, HiGraph, cascading of MetricLayer and PodLayer modules. MetricLayer is used to compute the correlation between metrics through mutual information. PodLayer is used to learn the dynamical correlation of the pods from trace data. It is important to note that trace data continuously records calls, while metric data has a sampling interval, making temporal alignment difficult. To address this, we innovatively use the edge weights of the graph to align them. We count the call frequency between different pods in the trace data over a specific period to update the weights of the spatial correlation graph. Extensive experiments on real data demonstrate that HiGraph improves RMSE by 4.9%, MAE by 4.8%, F1-score by 4.2% and recall by 9.2% compared to the best baseline.

SZ688 **15:25-15:40**	**Title: Dynamic Malware Detection Method Based on Graph Neural Networks** **Authors:** Nan Lin, Lijin Wu, Yuxin Liu, Lihong Xu, Zhiqin Lin, Tao Huang, Huijian Liu **Presenter:** Nan Lin,State Grid Fujian Electric Power Co., Ltd., Putian Power Supply Company , Putian, China **Abstract:** In recent years, the rapid evolution of malware has posed severe challenges to cybersecurity. Traditional machine learning (ML)-based methods exhibit limitations in malware classification due to their difficulty in modeling complex real-world malware characteristics and propagation networks. With the application of graph mining techniques, researchers have begun leveraging graph structures to capture correlations within malware propagation networks for more efficient classification tasks. Summarizing existing graph-based solutions for malware classification holds significant guidance value for future research. As a key contribution of this study, this paper provides a comprehensive survey on graph-based malware classification, including an overview of malware classification tasks, typical graph mining techniques and their application processes, and diverse solutions tailored to different classification objectives. For each task, we delve into relevant methodologies, emphasizing their employed graph types, graph mining approaches, and task-level impacts. Furthermore, we organize open datasets and toolkits for graph-based malware classification and propose future research directions in this field.
SZ7024 **15:40-15:55**	**Title: An Improved Network Security Monitoring System Architecture Based on IoT** **Authors:** Shiliang Luo **Presenter:** Shiliang Luo, Huizhou University, China **Abstract:** The object is to research the Internet of things safety monitoring method. So it is developed to match the safety monitoring system. Firstly the block diagram of the network security is proposed. Then the network security layers of the 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 saf . And it meets the performance requirements.
SZ647 **15:55-16:10**	**Title: HR-RCA: Hierarchical Localization of Root Causes with False Causality Removal** **Authors:** Ziwei Yang,Yuchun Guo,Yishuai Chen **Presenter:** Ziwei Yang,Beijing Jiaotong University,China **Abstract:** Microservice architectures have been widely adopted for large-scale applications. The proliferation of interactions between services within applications has made it difficult to detect faults and identify root causes. Some existing root cause localization algorithms using component dependency graphs reduce spurious causal relations between unrelated metrics to some extent. However, component dependency graphs lack information on the causal directions of fault propagation between services and cannot eliminate false causality due to confounding variables, both of which can help improve the accuracy of root cause localization. Therefore, this paper proposes a hierarchical root cause localization model, HR-RCA, which can eliminate false causality. It first constructs a fault propagation framework by combining the causal directions of fault propagation between services, the real-time call relationships, and the component deployment relationships. Then, based on the fault propagation framework, causal discovery is performed on the underlying metric data to identify causal relationships layer by layer from top to bottom. Finally, a second causality test is performed on Fork structures that may cause false causality to further improve accuracy. Experimental results on an open dataset demonstrate that, compared to the baseline model MicroDiag, the top 3 accuracy of the HR-RCA root cause localization model is improved by 28\% on average.

Shenzhen City Introduction

Shenzhen, often referred to as "Shumchun," is a major city in Guangdong Province, China. It is one of the country's four first-tier cities and a central hub within the Guangdong-Hong Kong-Macao Greater Bay Area. Known as "Pengcheng" or "the City of Peng," Shenzhen is renowned for its rapid transformation from a small agricultural town to a global economic powerhouse following its designation as China's first Special Economic Zone (SEZ) in 1980.

Located on the eastern bank of the Pearl River Delta, Shenzhen borders Hong Kong to the south and is adjacent to Huizhou and Dongguan to the north and east. The city's strategic position has facilitated its growth into a significant financial, technological, and manufacturing center. Shenzhen is often called "China's Silicon Valley" due to its thriving high-tech industry, which includes companies like Huawei and Tencent.

The city's economic achievements are impressive, with a GDP that surpassed Hong Kong's in 2018, making it the largest in the Guangdong-Hong Kong-Macao Greater Bay Area. Shenzhen is home to the Shenzhen Stock Exchange, one of China's three major stock exchanges, and its Bao'an International Airport is among the busiest in China. The city's container port is the third busiest globally, underscoring its role in international trade.

Shenzhen's urban planning emphasizes innovation and sustainability, with a focus on green spaces and modern infrastructure. The city has received numerous awards for its urban development, including the "UN Habitat Award." Shenzhen's cultural landscape is diverse, with a mix of traditional Cantonese and modern influences. The city's motto, "Dare to Try, Be Open and Inclusive, Practical and Law-abiding, and Pursue Excellence," reflects its entrepreneurial spirit and commitment to innovation. As a hub for technology and finance, Shenzhen continues to attract talent from around the world, solidifying its position as a leading global city.

Memo