Conference Program

2024 5th Information Communication Technologies Conference (ICTC 2024, www.ictc.net)

With its Workshop

2024 4th International Conference on Engineering Education and Information Technology (EEIT 2024, www.eeit.net)

May 10-12, 2024
Nanjing, China

Co-sponsors

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江苏省大数据区块链与智能信息专委会
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Mischelle Asi Esguerra, Lyceum of the Philippines University, Philippines

Thitima Srivatanakul, University of New York, USA

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Wen-Chung Kao, National Taiwan Normal University, China

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Olarik Surinta, Mahasarakham University, Thailand

Haruna Abdu, Federal Unversity Lokoja, Nigeria

Paulo Batista, Uiversity of Évora, Portugal

Welcome Message

Dear Distinguished Delegates,

It is our great pleasure to welcome you to 2024 5th Information Communication Technologies Conference (ICTC 2024) and its workshop 2024 4th International Conference on Engineering Education and Information Technology (EEIT 2024), which will be held during May 10-12 of 2024 in Nanjing, China. This event will be an excellent opportunity for international experts in various areas to gather together to discuss cutting edge issues and find solutions. Welcome all of you to attend!

ICTC 2024 is co-sponsored by Nanjing University, Southeast University, IEEE and hosted by Southeast University, technically supported by Jiangsu Information Technology Application Society. Patrons are SIR Forum, University of Leeds, Jiangsu BigData-Blockchain and Smart Information Special Committee. The conference aims to promote interaction and exchange of various disciplines among professionals in academia and industry at home and abroad. In addition, it also serves to turn technologies into industrial applications. ICTC 2024 promises to be an exciting and innovative event, with keynote speeches, invited speeches, oral and poster sessions, and Purple Mountain Laboratories visit.

During conference period, we have 5 keynote & 12 invited speeches, and 1 poster session, 10 parallel sessions covering various topics such as: Network and Information Security, Network System Model and Satellite Communication Network, Network System Model and Satellite Communication Network, Communication Theory and Information Technology, Computer model and calculation in information engineering, etc.

To put a successful conference together could have only been achieved through a team effort. In this regard, we thank all the committee members who have made every effort to promote the conference. The appreciation goes to all the authors who submit their papers and cooperate with organizing committee to complete conference affairs. We also would like to express the deepest appreciation to the technical program committee members and session chairs for sacrificing their precious time in supporting paper review and evaluation work.

In the end, we wish to thank all authors and attendees for participating in the conference. Hope you have a fruitful and memorable experience. We look forward to meeting you again next year!

Yours sincerely,
Conference Committees Chair
Wanyang Dai, Nanjing University, China

Conference Executive Chair
Chuan Zhang, Southeast University, China

Useful Information

Conference Venue

Holiday Inn Nanjing Qinhuai South

南京上秦淮假日酒店

Website:

https://www.ihg.com.cn/holidayinn/hotels/cn/zh/nanjing/nkgnq/hoteldetail

Address: NO.21 Mozhou East Road, Jiangning District, Nanjing, JS, 211111, China

地址: 中国江苏省南京市江宁区秣周东路 21 号

Tel: +86-25-84908888

Email: rsvn@holidayinnjn.com

Time Zone:
UTC/GMT+8

Average Temperature of Nanjing in May

Average daily minimum temperature
16℃

Average daily maximum temperature
26℃

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.

Virtual Meeting Software

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

ZOOM Using & Presentation Instruction: www.ictc.net/kits.rar

Rename Screen Name Before Entering the Room	Examples
Authors: Paper ID-Name	ET1001-San Zhang
Delegate: Delegate- Name	Delegate-San Zhang
Keynote Speaker: Keynote-Name	Keynote-San Zhang
Committee Member: Committee-Name	Committee-San Zhang

Materials Prepared by the Presenters

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

PPT Template: www.ictc.net/kits.rar

✧ **Poster Presentation: Poster 80cm*180cm (height>width), Portrait Format, Dig holes at each corner**

Poster Template: www.ictc.net/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: 7 Minutes of Presentation including Q&A

Note

✧ The regular oral presentation time arrangement is for reference only. In case any absence or some presentations are less than 15 minutes, please join your session before it starts.

✧ An excellent presentation will be selected from each session which will be announced and awarded an excellent presentation certificate.

Keynote Speaker I

Prof. Kin K. Leung

Tananka Chair Professor of Imperial College, UK

Fellow of the Royal Academy of Engineering

Member of Academia European, IEEE Fellow, IET Fellow

Imperial College, UK

Speech Title: Optimization by Learning and Federated Learning for Communication Networks

Abstract: Allocation of network resources to competing demands is an important problem for efficient design and management of future communication networks. The complexity of the issue is compounded by system dynamics in terms of fluctuation of resource demands and availability. On the future communication networks, users do not expect them to support only conventional multi-media services, but also future artificial intelligence (AI) and machine-learning (ML) applications for sensing and communications.

In the first part of this speech, the speaker will discuss the issue of network resource allocation. Specifically, he will present a new machine-learning method by using two Coupled Long Short-Term Memory (CLSTM) networks to quickly and robustly produce the optimal or near-optimal resource allocation, which is modeled as constrained optimization problem, over a range of system parameters. Numerical examples for allocation of network resources will be presented to confirm the validity of the proposed method.

In the second part, the speaker will present new approaches to supporting federated learning (FL) and improving the learning process by model pruning in communication networks with resource constraints. The FL technique learns the model parameters from data collected at distributed nodes and adapts according to the limited availability of resources. The key idea of model pruning is to remove unimportant model parameters to reduce computation and communication burden and speed up the learning convergence, while maintaining the model accuracy. Using real datasets, the experimentation results show that the proposed approaches perform near to the optimum or offer significant performance improvement over other methods.

Bio: Kin K. Leung received his B.S. degree from the Chinese University of Hong Kong, and his M.S. and Ph.D. degrees from University of California, Los Angeles. He worked at AT&T Bell Labs and its successor companies in New Jersey from 1986 to 2004. Since then, he has been the Tanaka Chair Professor in the Electrical and Electronic Engineering (EEE), and Computing Departments at Imperial College in London. He also served as the Head of Communications and Signal Processing Group in the EEE Department at Imperial from 2009 to 2024. His current research focuses on optimization and machine learning for system design and control of large-

scale communications, computer and quantum networks. He also works on multi-antenna and cross-layer designs for wireless networks.

He is a Fellow of the Royal Academy of Engineering, IEEE Fellow, IET Fellow, and member of Academia Europaea. He received the Distinguished Member of Technical Staff Award from AT&T Bell Labs (1994) and the Royal Society Wolfson Research Merits Award (2004-09). Jointly with his collaborators, he received the IEEE Communications Society (ComSoc) Leonard G. Abraham Prize (2021), the IEEE ComSoc Best Survey Paper Award (2022), the U.S.–UK Science and Technology Stocktake Award (2021), the Lanchester Prize Honorable Mention Award (1997), and several best conference paper awards. He was an IEEE ComSoc Distinguished Lecturer (2022-23). He was a member (2009-11) and the chairman (2012-15) of the IEEE Fellow Evaluation Committee for the ComSoc. He has served as an editor for 10 IEEE and ACM journals and chaired the Steering Committee for the IEEE Transactions on Mobile Computing. Currently, he is an editor for the ACM Computing Survey and International Journal of Sensor Networks.

Keynote Speaker II

09:50-10:30, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 悠谷厅/UPark Room, 5th Floor
ZOOM Link: https://us02web.zoom.us/j/86848077879, Password: 51012

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

University of Kent, UK

Speech Title: mmWave Integrated Communications and Sensing

Abstract: Integrated communications and sensing (ISAC) has become very popular for the next generation mobile communications. This seminar will introduce the concept and challenges of using milimeter wave (mmWave) for ISAC. The latest research results in mmWave ISAC will be presented in conjunction with hybrid beamforming and rate splitting multiple access technologies.

Bio: Jiangzhou Wang is a Professor with 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 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. He is/was the editor of multiple international journals, including IEEE Transactions on Communications from 1998 to 2013. 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 III

11:00-11:40, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 悠谷厅/UPark Room, 5th Floor
ZOOM Link: https://us02web.zoom.us/j/86848077879, Password: 51012

Prof. Xiang-Gen Xia

IEEE Fellow

Chang Jiang Chair Professorship (visiting), China

Charles Black Evans Professor

University of Delaware, USA

Speech Title: Some Thoughts on 6G Modulation

Abstract: I will talk about some of my own thoughts on 6G modulation. I think that 6G modulation should be a trade-off between complexity and performance. Two extremes are OFDM and single carrier frequency domain equalizer (SC-FDE). I will briefly introduce vector OFDM (VOFDM) that is in the middle of the two, and is a natural trade-off of complexity and performance, in particular for time-varying channels (delay Doppler channels).

Bio: Xiang-Gen Xia is the Charles Black Evans Professor, Department of Electrical and Computer Engineering, University of Delaware, Newark, Delaware, USA. Dr. Xia was the Kumar's Chair Professor Group Professor (guest) in Wireless Communications, Tsinghua University, during 2009-2011, the Chang Jiang Chair Professor (visiting), Xidian University, during 2010-2012, and the World Class University (WCU) Chair Professor (visiting), Chonbuk National University, South Korea, during 2009-2013. He received the National Science Foundation (NSF) Faculty Early Career Development (CAREER) Program Award in 1997, the Office of Naval Research (ONR) Young Investigator Award in 1998, the Outstanding Overseas Young Investigator Award from the National Nature Science Foundation of China in 2001, and the Information Theory Outstanding Overseas Chinese Scientist Award from the Chinese Information Theory Society of Chinese Institute of Electronics in 2019. Dr. Xia was the General Co-Chair of ICASSP 2005 in Philadelphia. He is a Fellow of IEEE. His current research interests include space-time coding, MIMO and OFDM systems, digital signal processing, and SAR and ISAR imaging. He is the author of the book Modulated Coding for Intersymbol Interference Channels (New York, Marcel Dekker, 2000) and a co-author of the book Array Beamforming Enabled Wireless Communications (New York, CRC Press, 2023).

Keynote Speaker IV

11:40-12:20, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 悠谷厅/ UPark Room, 5th Floor
ZOOM Link: https://us02web.zoom.us/j/86848077879, Password: 51012

Prof. Guan Gui

IEEE Fellow, IET Fellow

AAIA Fellow, IEEE VTS Distinguished Lecturer

Nanjing University of Posts and Telecommunications, China

Speech Title: Intelligent Signal Sensing and Recognition Techniques Towards 6G

Abstract: The dawn of 6G wireless communication introduces a transformative era characterized by pervasive sensing and advanced intelligent identification, essential for ensuring physical security. This keynote speech highlights the integration of Artificial Intelligence (AI) and Deep Learning (DL) as pivotal in addressing the dynamic and complex challenges of 6G networks. We emphasize the role of AI in revolutionizing signal sensing and recognition. Our discussion centers on the application of these neural networks in enhancing signal detection, classification, and Specific Emitter Identification (SEI). By leveraging gradient-based optimization techniques, we demonstrate how ANNs can improve model and algorithm parameterization, leading to a data-driven approach that surpasses traditional rule-based systems. This advancement is crucial in the physical layer of wireless communications, where intelligent signal recognition plays a key role in maintaining security and efficiency. We also explore the challenges faced by conventional model-based methods in the evolving landscape of 6G communication systems, which are marked by complex interference and uncertain channel conditions. DL emerges as a solution, offering innovative strategies for redesigning baseband module functionalities, including coding/decoding and detection processes. In conclusion, this keynote underscores the significance of integrating intelligent signal sensing and recognition with DL technologies in 6G networks. This approach not only enhances physical security but also paves the way for a more robust, efficient, and intelligent wireless communication ecosystem, capable of meeting the security demands of the future.

Bio: Guan Gui received the Ph.D. degree from the University of Electronic Science and Technology of China, Chengdu, China, in 2012. From 2009 to 2014, he joined Tohoku University as a Research Assistant and a Post-Doctoral Research Fellow. From 2014 to 2015, he was an Assistant Professor with Akita Prefectural University, Akita, Japan. Since 2015, he has been a Professor with the Nanjing University of Posts and Telecommunications, Nanjing, China. He has published more than 200 IEEE journals/conference papers. His recent research interests include intelligence sensing and recognition, intelligent signal processing, and physical layer security. Dr. Gui contributions to intelligent signal analysis and wireless resource optimization have earned him the title of fellow of the IEEE, IET, and AAIA. He was a recipient of several Best Paper Awards, such as ICC 2017, ICC 2014,

and VTC 2014-Spring. He received the IEEE Communications Society Heinrich Hertz Award in 2021, top 2% scientists of the world by Stanford University from 2021 to 2023, the Clarivate Analytics Highly Cited Researcher in Cross-Field from 2021 to 2023, the Highly Cited Chinese Researchers by Elsevier from 2020 to 2023, a member and Global Activities Contributions Award in 2018, the Top Editor Award of IEEE Transactions on Vehicular Technology in 2019, the Outstanding Journal Service Award of KSII Transactions on Internet and Information System in 2020, the Exemplary Reviewer Award of IEEE Communications Letters in 2017, the 2012 Japan Society for Promotion of Science (JSPS) Postdoctoral Fellowships for Foreign Researchers, and the 2018 Japan Society for Promotion of Science (JSPS) International Fellowships for Overseas Researchers. He was also selected as the Jiangsu Specially-Appointed Professor in 2016, the Jiangsu High-Level Innovation and Entrepreneurial Talent in 2016, and the Jiangsu Six Top Talent in 2018.

Keynote Speaker V

13:45-14:25, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 悠谷厅/UPark Room, 5th Floor
ZOOM Link: https://us02web.zoom.us/j/86848077879, Password: 51012

Prof. O. Bonnaud

Guest Professor at Southeast University, China

Executive Director of National Coordination for Higher Education in Microelectronics and Nanotechnologies, GIP-P-CNFM, France

Emeritus Professor at University of Rennes, France

Speech Title: The Strategy of Microelectronics Education to Face the Future Challenges of The New Digital World

Abstract: The global development of digital technology has invaded our 21st-century world, and applies equally to industry, finance and government. This field has experienced exponential growth since 2005, accelerating with digital payments, and with the arrival of crypto-currencies, 5G-6G, and above all artificial intelligence (AI). Transparency on the user side of this digital world masks the fact that the associated consumption of energy and natural resources (rare elements) is also growing exponentially. In fact, we risk reaching a global energy impasse over the next decade, with digital energy consumption outstripping current global electricity production. The hardware part of the digital world is physically based on electronics and microelectronics. Today's challenge is to reduce the energy consumption of all electronics and minimize the use of rare elements in advanced technologies. The development of new technologies involving new component and circuit architectures and new materials should go some way towards meeting these needs. After presenting the context and challenges, various proposals for improving electronics, both technologically and architecturally, are detailed. But all these improvements can only be achieved if future employees in the sector are capable of innovation. Indeed, on a global scale, the microelectronics profession is experiencing a growing skills deficit, corresponding to a serious recruitment shortage. There is an urgent need to attract and train new specialists in this field. The final part of the presentation is devoted to the actions taken by the French national network for higher education in microelectronics to meet these challenges.

Bio: Olivier Bonnaud, born in 1950 in France, is a student of the Ecole Normale Supérieure de Paris-Saclay and holds a PhD in microelectronics. In 1984, he became a full professor at the University of Rennes 1 and at Supelec (engineer school), where he created a microelectronics research laboratory that he directed until 2010, as well as several international masters and PhD programs in microelectronics engineering. He supervised 43 PhDs, worked in cooperation with microelectronics companies, on integrated and thin film technologies. He has

published or presented more than 500 papers and written 7 books. He was member of more than 300 PhD defense juries, and chairman/co-chairman of more than thirty international conferences.

Founder in 1985 of a regional inter-university joint center for microelectronics education (CCMO), he directed it until 2010, when he was appointed by the French Ministry of Higher Education as Executive Director of the National Coordination for Higher Education to Microelectronics and nanotechnologies (GIP-CNFM), a network of 12 French inter-university training centers that hosts about 20,000 students per year for practical training on technological platforms, including 7 cleanrooms. President of several scientific associations in electrical engineering, evaluator and expert for several research and higher education international agencies, he is professor emeritus since 2013.

As part of his many international cooperation's, he was selected for the "1000 global talents" program by the Chinese government in 2013. In 2018, he was awarded of the Jiangsu Province Friendship Medal for his 14 years scientific cooperation with SEU (Nanjing). Since 2019, he has been heavily involved in the French Strategic Committee of the Electronic Industry sector and is presently piloting a 5 years national project on "Skills and Jobs of the Future" in the field, in the frame of France 2030 governmental program.

Invited Speaker I

Prof. Pascal Lorenz

University of Haute-Alsace, France

Speech Title: Advanced Architectures of Next Generation Wireless Networks

Abstract: Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services. New standards and new communication architectures allowing guaranteed QoS services are now developed. We will cover the issues of QoS provisioning in heterogeneous networks, Internet access over 5G networks and discusses most emerging technologies in the area of networks and telecommunications such as IoT, SDN, Edge Computing and MEC networking. We will also present routing, security, baseline architectures of the inter-networking protocols and end-to-end traffic management issues.

Bio: Pascal Lorenz (lorenz@ieee.org) received his M.Sc. (1990) and Ph.D. (1994) from the University of Nancy, France. Between 1990 and 1995 he was a research engineer at WorldFIP Europe and at Alcatel-Alsthom. He is a professor at the University of Haute-Alsace, France, since 1995. His research interests include QoS, wireless networks and high-speed networks. He is the author/co-author of 3 books, 3 patents and 200 international publications in refereed journals and conferences. He was Technical Editor of the IEEE Communications Magazine Editorial Board (2000-2006), IEEE Networks Magazine since 2015, IEEE Transactions on Vehicular Technology since 2017, Chair of IEEE ComSoc France (2014-2020), Financial chair of IEEE France (2017-2022), Chair of Vertical Issues in Communication Systems Technical Committee Cluster (2008-2009), Chair of the Communications Systems Integration and Modeling Technical Committee (2003-2009), Chair of the Communications Software Technical Committee (2008-2010) and Chair of the Technical Committee on Information Infrastructure and Networking (2016-2017), Chair of IEEE/ComSoc Satellite and Space Communications Technical (2022-2023), IEEE R8 Finance Committee (2022-2023), IEEE R8 Conference Coordination Committee (2023). He has served as Co-Program Chair of IEEE WCNC'2012 and ICC'2004, Executive Vice-Chair of ICC'2017, TPC Vice Chair of Globecom'2018, Panel sessions co-chair for Globecom'16, tutorial chair of VTC'2013 Spring and WCNC'2010, track chair of PIMRC'2012 and WCNC'2014, symposium Co-Chair at Globecom 2007-2011, Globecom'2019, ICC 2008-2010, ICC'2014 and '2016. He has served as Co-Guest Editor for special issues of IEEE Communications Magazine, Networks Magazine, Wireless Communications Magazine, Telecommunications Systems and LNCS. He is associate Editor for International Journal of Communication Systems (IJCS-Wiley), Journal on Security and Communication Networks (SCN-

Wiley) and International Journal of Business Data Communications and Networking, Journal of Network and Computer Applications (JNCA-Elsevier). He is senior member of the IEEE, IARIA fellow and member of many international program committees. He has organized many conferences, chaired several technical sessions and gave tutorials at major international conferences. He was IEEE ComSoc Distinguished Lecturer Tour during 2013-2014.

Invited Speaker II

Prof. Ravinder Koul

Fulbright Senior Specialist

The Pennsylvania State University, USA

Speech Title: Gendered Patterns in Engineering Identities, Participation, and Persistence in Engineering Fields

Abstract: In 2022, the percentages of women enrolled in undergraduate engineering degree programs in the top 11 universities in Thailand were 25% for computer engineering, 22% for electrical engineering, 19% for civil engineering, and 13% for mechanical engineering (Thai Office of the Higher Education Commission, 2022). This data is indicative of the underrepresentation of women in engineering programs in universities across the world and the gender gap that continues to persist in some of the STEM fields. There have been education policy and research efforts undertaken globally to enhance gender equity in engineering education (Ong et al., 2020). This paper begins with an overview of research literature from different motivational perspectives on gender differences in engineering identities, participation, and persistence in engineering fields. The paper presents results of a comparative analysis of gender differences in academic identities and occupational interests and goals of public high school students in central Thailand and undergraduate students enrolled in engineering programs at a public institution of higher education in the same geographical region. The paper concludes with proposing theoretical and practical implications of findings for gender-based equity in engineering fields.

Bio: Dr. Koul is a Professor of Education (Science Education) at The Pennsylvania State University, USA. Dr. Koul's research and teaching have developed with three learner-centered themes: 1) Cultural aspects in motivation and learning, 2) Mastery goals and motivation for teaching and learning, and 3) Equity issues in teaching and learning. His recent research has focused on gender equity in the participation and persistence of students in STEM fields across national cultures and cultural factors that promote or hinder curriculum reform efforts and the effectiveness of professional development for teachers. Dr. Koul was a recipient of Fulbright Senior Specialist Awards in 2010 and 2013 and has been recognized by Pennsylvania State University for his international work. Dr. Koul is the Lead Faculty for the STEM education graduate program offered through Penn State's World Campus.

Invited Speaker III

14:40-15:05, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 智慧厅A/ Knowledge Room A, 5th Floor

Prof. Shuo Zhao

Fellow of New York Academy of Sciences

Communication University of China, China

Speech Title: On Digital Education of European Universities in Post-pandemic Era

Abstract: After COVID-19 epidemic in 2020, online education has been basically started in all education stages around the world. From a global perspective, the model of using digital media for education and teaching has become an irreversible education trend. The digitization degree of British universities is in the leading position in the world. Taking the digital teaching practice of three British universities as case study the research analyzes the digital teaching achievements of British universities in post-pandemic era and compares current situation of digital education in China and UK, so as to provide reference and enlightenment for applying digital teaching in more universities of the world.

Bio: Dr. Shuo Zhao is Professor in Communication University of China (CUC) and Fellow of New York Academy of Sciences while he is guest professor/PhD Superviser in University of Malaya(UM), Krirk University of Thailand and visiting professor in Universidad Nacional de Rosario(UNR) in Argentina.
He received his two Ph.D in Shanghai International Studies University and Northwestern Polytechnical University. He did his Postdoctoral Research both in Fudan University, Shanghai of China and Universitat of Barcelona, Barcelona of Spain. He is majored in higher education, digital education and applied linguistics.
Professor Shuo Zhao ever presides over National Social Science Fund in China, China Postdoctoral Science Fund, Humanities and Social Science Fund of Chinese Ministry of Education, National Education Science Program. He publishes more than 100 papers and articles approximately.
He is awarded as International Humanity Scholar by American Common Ground Publishing and CEU of Spain in 2014. In addition he is awarded as Emerging Humanity Scholar by American Common Ground Publishing and Imperial College London in 2017. Recently he is awarded as Emerging Scholar by Universidad Complutense of Spain in 2021, Emerging Scholar by University of Aegean of Greece in 2022, Emerging Scholar by University of Sorbonne of France in 2023.

Invited Speaker IV

Prof. Kelum A.A. Gamage

Fellow of the Institution of Engineering and Technology (FIET)

Fellow of the Royal Society of Arts (FRSA)

Principal Fellow of the Higher Education Academy (PFHEA)

University of Glasgow, UK

Speech Title: Transnational Education Sector: Emerging Opportunities, Challenges and Trends

Abstract: Demand for transnational education programmes has remained relatively steady over the years, but with the current pandemic circumstances, significant changes in student numbers can be seen in the transnational education sector. This paper explores the past, present and future direction of the transnational education sector and investigates and identifies the impacts of the pandemic on the transnational education sector. We identify the challenges of a post-pandemic era, which has resulted in long-term changes to the global higher education landscape. Transnational Education engagement can benefit students, overseas partners, and UK universities, and it is critical to investigate trends and challenges to ensure that transnational academic program partners can adapt to the environment and reap the benefits. It highlights students pursuing a transnational education programme as a more sustainable approach to obtaining an international degree compared to leaving their home country for a period of higher education abroad.

Bio: Prof. Kelum Gamage (BSc, PhD, PgCAP, CEng, PFHEA, FIET, FRSA, SMIEEE) is a Full Professor in the James Watt School of Engineering at the University of Glasgow and a winner of the University of Glasgow Teaching Excellence Individual Award (2020/21). He is the Learning & Teaching Enhancement Officer of the College of Science and Engineering and the Co-Director of the Centre for Educational Development and Innovation. He is an academic accreditor and Professional Registration Advisor (PRA) of the IET. Prof. Gamage is the Scotland member of the Advisory Group for the Engineering Subject Benchmark Statement (lead by the Quality Assurance Agency (QAA) for Higher Education) and also an assessor of the Designated Quality Body in England (DQB). He is the lead editor of "The Wiley Handbook of Sustainability in Higher Education Learning and Teaching" (ISBN: 978-1-119-85283-4). Prof. Gamage is the Editor-in-Chief for the STEM Education Section of the Education Sciences Journal (Publisher: MDPI, Switzerland, ISSN 2227-7102).

Prof. Gamage has gained the highest level of professional recognition for teaching and supporting learning in higher education, becoming a Principal Fellow of the Higher Education Academy (PFHEA). He is also a Chartered Engineer (CEng) of the Engineering Council (UK), a Fellow of the Institution of Engineering and Technology (FIET), a Fellow of the Royal Society of Arts (FRSA) and a Senior Member of the Institute of Electrical and Electronics Engineers (SMIEEE).

Invited Speaker V

14:40-15:05, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 智慧厅B/Knowledge Room B, 5th Floor

Assoc. Prof. Chao Fang

Beijing University of Technology, China

Speech Title: Intelligent Task Offloading for Caching-Assisted UAV Networks

Abstract: To satisfy the differentiated service requirements of delay-sensitive and computing-intensive tasks in unmanned aerial vehicle (UAV) networks, it is urgent to efficiently allocate limited network resources to improve network performance. In this paper, we propose an intelligent task offloading scheme to optimize resource allocation in UAV networks with content caching. Specifically, we formulate the joint optimization of task offloading and resource allocation as a latency minimization model for the caching-assisted UAV system. Then, a new deep reinforcement learning (DRL) algorithm is designed to make offloading and resource allocation decisions based on current network state information, significantly improving resource utilization. Numerical results indicate that the model significantly reduces network latency in comparison to its existing benchmarks in caching-assisted UAV networks.

Bio: Chao Fang received his B.S degree in Information Engineering from Wuhan University of Technology, Wuhan, China, in 2009, and the Ph.D. degree with the State Key Laboratory of Networking and Switching Technology in Information and Communication Engineering from Beijing University of Posts and Te4lecommunications, Beijing, China, in 2015. He joined the Beijing University of Technology in 2016 and now is an associate professor. From August 2013 to August 2014, he had been funded by China Scholarship Council to visit Carleton University, Ottawa, ON, Canada, as a joint doctorate. Moreover, he is the visiting scholar of University of Technology Sydney, Commonwealth Scientific and Industrial Research Organization, Hong Kong Polytechnic University, Kyoto University, Muroran Institute of Technology, and Queen Mary University of London.

Dr. Fang is the senior member of IEEE, and the vice chair of technical affairs committee in IEEE ComSoc Asia/Pacific Region (2022-2023). Moreover, he is the leading editors of Electronics and Symmetry special issues. He also served as the Session Chairs of ICC NGN'2015 and ICCC NMNRM'2021, and Poster Co-Chair of HotICN'2018. He won the Best Paper Award of IEEE ICFEICT'2022. His current research interests include future networks, information-centric networking (ICN), cloud-edge-terminal cooperation networks, intelligent network control, resource management and content delivery.

Invited Speaker VI

16:40-17:05, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 智慧厅B/Knowledge Room B, 5th Floor

Assoc. Prof. Yan Lin

Nanjing University of Science and Technology, China

Speech Title: Improving Age of Information (AoI) in Vehicular Edge Computing Based on Multi-Agent Deep Reinforcement Learning With Attention Mechanism

Abstract: In the face of increasingly computing-intensive and delay-sensitive vehicular applications, vehicular edge computing (VEC) has emerged as a promising paradigm by deploying computing resources at the edge. This speech introduces the age of information (AoI) challenge in VEC, and presents the vehicular edge offloading problem formulation and solutions by dynamically adjusting the edge offloading ratio and the VEC server selection. Aiming for improving both AoI and computing energy efficiency (CEE), a novel cooperative edge offloading solution based on multi-agent deep reinforcement learning is proposed. To better adapt to the time-varying network topology, the actor-attention-critic framework is employed, where the importance of different levels of attention to other vehicular agents is considered in decision-making for each vehicular agent. The simulation results show that the proposed solution can achieve a more compelling trade-off between AoI and CEE compared to the baseline solutions.

Bio: Yan Lin received the M.S. and Ph.D. degree from Southeast University, China, in 2013 and 2018, respectively. She visited Southampton Wireless Group in Southampton University, U.K. from Oct. 2016 to Oct. 2017. Since 2018, she has been working at Nanjing University of Science and Technology, China, in 2018, where she is currently an associate professor with the School of Electronic and Optical Engineering. She has co-authored more than 50 journals and conferences, such as IEEE JSAC/TWC/TCOM/TVT/IOT, and holds 10 Chinese patents. She has presided over and participated in several projects funded by National Natural Science Foundation of China and Natural Science Foundation of Jiangsu Province. She also has served as TPC members for several IEEE conferences, and as reviewers for many IEEE journals and conferences. Her current research interests include mobile edge computing and resource allocation in vehicular networks, and anti-jamming communication in UAV networks.

Invited Speaker VII

16:40-17:05, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 协同厅/Alliance Room, 5th Floor

Dr. Huaiyu Tang

China Research Institute of Radiowave Propagation, China

Speech Title: Cross-System Collaboration Design of Communications, Computing, and Caching in Virtualized

Abstract: With the proliferation of smart devices, the traffic volume has been growing exponentially. In this context, traditional cellular networks fall short of accommodating these explosive service demands with ever-changing requirements. Thus, the future network, such as beyond 5G, 6G, etc., is expected to make great efforts to achieve a convergence of communications, computing, and caching (3C), where intermediate nodes within access networks should be endowed with sufficient storage and computation capabilities. To further support massive simultaneous information exchange, a novel paradigm shift to virtualized multicast also becomes a promising enabler to enhance the network capacity.

Bio: Huaiyu Tang received his Ph.D. degree in telecommunication from Xidian University, Xi'an, China. He is currently a researcher at China Research Institute of Radiowave Propagation, Qingdao, China. His research interests include regional electromagnetic frequency spectrum safe management and Electromagnetic space perception. He is an expert on Electromagnetic spectrum management and electromagnetic environment monitoring. He has led five national key research projects. He has published more than 20 papers in SCI and EI. He is the author/co-author of over 40 patents. He won twice the first prize of Provincial Science and Technology Progress Award.

Invited Speaker VIII

14:40-15:05, May 11, 2024, [Sunday]-- GMT+8, Beijing Time
Meeting Room: 协同厅/Alliance Room, 5th Floor

Dr. Dan Michael A. Cortez

University of the City of Manila, Philippines

Speech Title: An Enhancement of SMOTE Algorithm Using Heron- Centroid Approach and Noise Mitigation

Abstract: The performance of any classification algorithm is determined not only by the quality of the classifier itself, but also the quality of data to be used. Most data are imbalanced, meaning the different class instances have varying ratios which poses a challenge for classification performance. Synthetic Minority Oversampling Technique (SMOTE) algorithm is an oversampling technique that deals with data imbalance by generating synthetic data instances by linearly interpolating between the minority class instances. However, the SMOTE Algorithm has certain limitations as it has a potential to overfit the classification model. The proposed method utilizes a triangle centroid method for the synthesis of new minority class instances. Heron's formula will also be used for the proposed method to be able to determine the distribution density of the data instances, as well as use a triangular noise mitigation technique to reduce the propagation of noisy data instances. Results of simulation on publicly available medical datasets show that Heron-Centroid SMOTE improved SMOTE across all performance metrics and beating both 'Imbalanced' tests and SMOTE on most datasets, with mean F- score of 0.5792, and an average G-mean of 0.6398.

Bio: DR. DAN MICHAEL A. CORTEZ is currently the Assistant Vice President for University Priorities at PAMANTASAN NG LUNGSOD NG MAYNILA. He is also the Chairperson of the Computer Science Department. He has ten (10) years of teaching experience.

He graduated with the degree of Bachelor of Science in Information Technology from the Pamantasan ng Lungsod ng Maynila. He also obtained his Master of Science in Information and Communications Technology degree from the same university. He finished his Doctor in Information Technology from Technological Institute of the Philippines-Quezon City Campus.

He is a member of the Philippine Society of Information Technology Educators (PSITE-NCR) and the Computing Society of the Philippines. He is also an author of various books and has already published his research in the field of Information Technology, both locally and internationally. His research interest is more on cryptography and Data Mining.

Invited Speaker IX

17:05-17:30, May 11, 2024, [Saturday]-- GMT+8, Beijing Time
Meeting Room: 协同厅/ Alliance Room, 5th Floor

Dr. Xiaosi Tan

Southeast University, China

Speech Title: Expectation Propagation for Massive MIMO Detection: Algorithms and Implementations

Abstract: With the escalating demands for high-speed, low-latency, and wide-coverage communications, massive multiple-input multiple-output (MIMO) has emerged as a key technology for B5G and 6G wireless communication systems. However, the MIMO detection problem still poses substantial computational challenges due to the large number of antennas and users involved. Expectation Propagation (EP), a powerful inference technique rooted in Bayesian probability theory, offers an elegant solution for MIMO detection by iteratively refining approximate posterior distributions. This talk will provide a comprehensive overview of EP-based detection algorithms tailored for massive MIMO scenarios, highlighting their theoretical foundations and performance-complexity trade-offs. In addition, various EP-based joint detection and decoding techniques will be covered. Furthermore, we will discuss efficient hardware architectures and implementations of EP-based detectors.

Bio: Xiaosi Tan received her B.S. degree from Beijing University of Technology, Beijing, China, in 2009, and her Ph.D. degree from Texas A&M University, College Station, TX, USA, in 2015. She was a Post-Doctoral Research Associate with Texas A&M University from 2015 to 2017. She joined the National Mobile Communications Research Laboratory, School of Information Science and Engineering, Southeast University, Nanjing, China as a Post-Doctoral Researcher in 2017, where she is currently a lecturer. Her current research interests include efficient algorithms and VLSI architectures for B5G/6G baseband signal processing, and machine learning for wireless communications. She has co-authored more than 30 papers in journals and conferences on these subjects, and has led and participated in several projects funded by National Natural Science Foundation of China.

Invited Speaker X

14:40-15:05, May 11, 2024 [Saturday]--GMT+8, Beijing Time
Meeting Room: 独特厅/ Unique Room, 5th Floor

Dr. Suwen Song

Sun Yat-Sen University, China

Speech Title: Efficient Decoder Design for Soft-Assisted Product Decoder

Abstract: Product code has been proven as an efficient choice for achieving high net coding gain (NCG) at extremely low bit error rates (BER) in fiber communication systems. Compared to the hard-decision product decoders, it has been demonstrated that decoders based on soft-assisted decoding algorithms can achieve excellent decoding performance with only a slight increase in area. This speech introduce some efficient designs for product code and its typical component codes.

Bio: Suwen Song received her B.S. degree in electronic information science and technology and her Ph.D. degree in electronic science and technology from Nanjing University, Nanjing, China, in 2017 and 2022, respectively. She is currently an assistant professor at Sun Yat-Sen University, Shenzhen, China. Previously she worked for Nanjing University from 2022 to 2023 as an associate researcher. Her research interests include channel coding algorithms, massive MIMO, and low-power, high-throughput VLSI systems for digital signal processing. She has published over 25 papers in mainstream journals and conferences of the IEEE, and has applied for or been granted more than 10 national invention patents. She has led and participated in several projects funded by National Natural Science Foundation of China, as well as collaborations with large enterprises and research institutes.

Invited Speaker XI

13:55-14:20, May 12, 2024 [Sunday]--GMT+8, Beijing Time
ZOOM Link: https://us02web.zoom.us/j/81073456804, Password: 51012

Dr. Amjad Ali Amjad

Donghai Laboratory/Zhejiang University, China

Speech Title: Laser Diode-Based high speed optical wireless communication and high CRI Solid State Lighting

Abstract: Gallium nitride (GaN) phosphor-converted white light-emitting diodes (Pc-WLEDs) are emerging as an indispensable solid-state lighting (SSL) source for next-generation display systems and the lighting industry. Together with the function of lighting, visible light communication (VLC) using Pc-WLEDs has gained increasing attention to fulfill the growing demand for wireless data communication. Over the past few years, white-light-emitting diodes have been used for both high-speed visible light communication and solid-state lighting simultaneously. Practically, the low modulation response and low emitting intensity of light-emitting diodes (LED) are the drawbacks to the development of ultrahigh-speed VLC and a high-quality SSL system. Blue GaN laser diode (LD) and color convertor quantum dots-based white light can simultaneously be used for both high-speed VLC and SSL.

Bio: Amjad Ali Amjad received his B.S. degree (Hons.) in Computer Systems Engineering from the University of Engineering and Technology (UET), Peshawar, Pakistan, in 2014, his M.S. degree in Electrical Engineering from the University of Lahore, Islamabad, Pakistan, in 2017, and his Ph.D. from Zhejiang University in 2021. He recently completed his first postdoctoral research at the School of Electronic and Computer Engineering at Peking University. He is currently engaged in his second postdoctoral research at the Donghai Laboratory in collaboration with Zhejiang University. His research interests include wireless optical communications, underwater wireless optical communication, solidstate lighting, and visible light communication. He has co-authored one book chapter and several papers on these subjects, published in refereed journals and conference proceedings.

Invited Speaker XII

09:30-09:55, May 12, 2024 [Sunday]--GMT+8, Beijing Time
ZOOM Link: https://us02web.zoom.us/j/81073456804, Password: 51012

Dr. Abhimanyu Mukerji

Amazon, USA

Speech Title: Causal Inference, Machine Learning and Deep Learning

Abstract: This talk will provide an overview of the problem of causal inference in the technology industry and current approaches to address it. We will discuss the applications of machine learning and deep learning to this problem space, with inspiration from our own work. We will also touch upon the challenges involved in validating solutions and some tests that can be performed to build confidence in causal results.

Bio: Abhimanyu is an Economist at Amazon working on dynamic causal models and causal machine learning. His prior research has used methods from machine learning, deep learning and natural language processing combined with econometric approaches to study problems in applied microeconomics and empirical corporate finance. He holds a PhD in financial economics from Stanford University.

Day 1- May 10, 2024

Friday, GMT+8, Beijing Time

Onsite Sign-in

Time	Event	Venue
10:00-17:00	Onsite Sign-in	Holiday Inn Nanjing Qinhuai South, Ground Floor
14:00-16:00	Visit to Purple Mountain Laboratories	Gather at Hotel Lobby at 14:00 and then Set out

Online Pretest Session

Time	Presenters	ZOOM Information
10:00-17:30	Keynote Speakers (Online), Session Chairs (Online), Committee Members (Online), Invited Speakers (Online)	Zoom ID: 828 4075 3018
13:30-17:30	**Session 8: AI Based Intelligent System Design and Information Management** ET1061, ET1083, ET1070, ET1064, ET1072, ET1082, ET1069, ET1040 **Session 9: Wireless Transmission and Data Communication** ET1051, ET1038, ET1009, ET1042, ET1004, ET1091 **Session 10: Modern Teaching Models and Innovative Mechanisms** ET1089, ET3008, ET3054, ET3055, ET3058	Zoom Link: https://us02web. zoom.us/j/8284 0753018 Password: 51012

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- May 11, 2024

Saturday, GMT+8, Beijing Time

> **Opening Ceremony, Keynote Speeches**
>
> 1. **Onsite Meeting Room –悠谷厅/UPark Room, 5th Floor**
> 2. **Zoom link**: https://us02web.zoom.us/j/86848077879　Password: 51012

Host: Prof. Chuan Zhang, Southeast University, China

09:00-09:05 **Welcome Message**	**Prof. Zaichen Zhang** Chair Professor of Southeast University **Southeast University, China**
09:05-09:10 **Opening Remarks**	**Prof. Wanyang Dai** **Nanjing University, China**
09:10-09:50 **Keynote Speech I**	*Speech Title: Optimization by Learning and Federated Learning for Communication Networks* **Prof. Kin K. Leung** Tananka Chair Professor of Imperial College, U.K. Fellow of the Royal Academy of Engineering Member of Academia European, IEEE Fellow, IET Fellow **Imperial College, UK**
09:50-10:30 **Keynote Speech II**	*Speech Title: mmWave Integrated Communications and Sensing* **Prof. Jiangzhou Wang** International Member of the Chinese Academy of Engineering (CAE) Fellow of the Royal Academy of Engineering(RAEng), UK Fellow of IEEE, Fellow of IET **University of Kent, UK**
10:30-11:00	**Group Photo & Coffee Break**
11:00-11:40 **Keynote Speech III**	*Speech Title: Some Thoughts on 6G Modulation* **Prof. Xiang-Gen Xia** IEEE Fellow Chang Jiang Chair Professorship (visiting), China Charles Black Evans Professor **University of Delaware, USA**

11:40-12:20 **Keynote Speech IV**		*Speech Title: Intelligent Signal Sensing and Recognition Techniques Towards 6G* **Prof. Guan Gui** IEEE Fellow, IET Fellow AAIA Fellow, IEEE VTS Distinguished Lecturer **Nanjing University of Posts and Telecommunications, China**
12:20-13:45		**Break & Lunch(百香西餐厅 1 楼/Peppers All Day Dinning Restaurant, Ground Floor)**
13:45-14:25 **Keynote Speech V**		*Speech Title: The Strategy of Microelectronics Education to Face the Future Challenges of The New Digital World* **Prof. O. Bonnaud** Guest Professor at Southeast University, China Executive Director of National Coordination for Higher Education in Microelectronics and Nanotechnologies, GIP-P-CNFM, France **Emeritus Professor at University of Rennes, France**

Onsite Session

14:40-16:05	智慧厅 A **Knowledge Room A** **5th Floor**	*Session 1: Digital Teaching and Development Models* **Session Chair:** Prof. O. Bonnaud, University of Rennes, France **Invited Speaker:** Prof. Shuo Zhao, Communication University of China, China ET3020, ET3031, ET3057, ET3053
14:40-16:20	智慧厅 B **Knowledge Room B** **5th Floor**	*Session 2: Wireless Communication and Transmission* **Session Chair:** Assoc. Prof. Yan Lin, Nanjing University of Science and Technology, China **Invited Speakers:** Assoc. Prof. Chao Fang, Beijing University of Technology, China ET1025, ET1058, ET1033, ET1068, ET1032
14:40-16:20	协同厅 **Alliance Room** **5th Floor**	*Session 3: Digital Signal Detection and Analysis* **Session Chair:** Prof. He Li, Southeast University, China **Invited Speakers:** Dr. Dan Michael A. Cortez, Pamantasan ng Lungsod ng Maynila, Philippines ET1059, ET1050, ET1002, ET1019, ET1044
14:40-16:20	独特厅 **Unique Room** **5th Floor**	*Session 4: Modern Communication Theory and Technology* **Session Chair:** Prof. Qiang Wu, Nanjing University of Aeronautics and Astronautics, China

		Invited Speakers: Dr. Suwen Song, Sun Yat-sen University, China ET1074, ET1034, ET1073, ET1076, ET1048
16:20-16:40		**Coffee Break**
16:40-18:32	智慧厅 A **Knowledge Room A** **5th Floor**	*Poster Session 1: Security Management and Network Performance Analysis in Wireless Communication Systems* **Session Chair:** Assoc. Prof. You You, Purple Mountain Laboratories, China ET1039, ET1036, ET1027, ET1024, ET1045, ET1028, ET1046, ET1055, ET1065-A, ET1007, ET1054, ET1008, ET1079, ET1088, ET1016, ET1035
16:40-18:35	智慧厅 B **Knowledge Room B** **5th Floor**	*Session 5: Network and Information Security* **Session Chair:** Assoc. Prof. Liangliang Lou, Taizhou University, China **Invited Speaker:** Assoc. Prof. Yan Lin, Nanjing University of Science and Technology, China ET1020, ET1049, ET1037, ET1071, ET1090, ET1081
16:40-18:45	协同厅 **Alliance Room** **5th Floor**	*Session 6: Massive MIMO Systems and Key Technologies* **Session Chair:** Assoc. Prof. Tianming Ma, Shanghai University of Engineering Science, China **Invited Speaker:** Dr. Huaiyu Tang, China Research Institute of Radiowave Propagation, China; Dr. Xiaosi Tan, Southeast University, China ET1053, ET1077, ET1078, ET1043, ET1075
16:40-18:20	独特厅 **Unique Room** **5th Floor**	*Session 7: Intelligent Algorithms and Calculations Based on Data* **Session Chair:** Prof. Wanyang Dai, Nanjing University, China **Invited Speaker:** Prof. Ravinder Koul, The Pennsylvania State University, USA ET1018, ET1005, ET1022, ET1057, ET1080
18:50-20:00		**Dinner (天韵中餐厅 2 楼/ Tian Yun Chinese Restaurant, 2nd Floor)**

Day 3 - May 12, 2024

Sunday, GMT+8, Beijing Time

Online Session		
09:30-11:55	ZOOM ID 810 7345 6804 https://us02web.zoom.us/j/81073456804 Password: 51012	**Session 8: AI Based Intelligent System Design and Information Management** **Session Chair:** Prof. Yan Yang, Beijing Jiaotong University, China **Invited Speaker**: Dr. Abhimanyu Mukerji, Amazon, USA ET1061, ET1083, ET1070, ET1064, ET1072, ET1082, ET1069, ET1040
11:55-13:30	**Break Time**	
13:30-15:50	ZOOM ID 810 7345 6804 https://us02web.zoom.us/j/81073456804 Password: 51012	**Session 9: Wireless Transmission and Data Communication** **Session Chair:** Assoc. Prof. Jie Zhang, Xi'an Jiaotong-Liverpool University, China **Invited Speaker** : Prof. Pascal Lorenz, University of Haute-Alsace, France Dr. Amjad Ali Amjad, Donghai Laboratory/Zhejiang University, China ET1051, ET1038, ET1009, ET1042, ET1004, ET1091
15:50-16:05	**Break Time**	
16:05-17:45	ZOOM ID 810 7345 6804 https://us02web.zoom.us/j/81073456804 Password: 51012	**Session 10: Modern Teaching Models and Innovative Mechanisms** **Session Chair:** Prof. Kelum A.A. Gamage, University of Glasgow, UK **Invited speaker:** Prof. Kelum A.A. Gamage, University of Glasgow, UK ET1089, ET3008, ET3054, ET3055, ET3058

Session 1 : Digital Teaching and Development Models

Session Time Period: 14:40-16:05 (GMT+8, Beijing Time), Saturday, May 11, 2024

Conference Room: 智慧厅A/Knowledge Room A, 5th Floor

Session Chair: Prof. O. Bonnaud, University of Rennes, France

Invited Speech	Title: On Developing Model of Online Education in European Universities
	Invited Speaker: Prof. Shuo Zhao, Communication University of China, China
14:40-15:05	

Abstract: With development of European higher education digital education in European universities has received more and more attention since the outbreak of COVID-19 has brought severe challenges to European higher education. European universities have adopted various means and measures to ensure online teaching quality in the face of challenge of COVID-19. On the basis of combing the current situation and characteristics of development of online education in European universities, the study explores its development characteristics through case analysis, proposes cluster analysis of ICT digital shared learning and finally puts forward enlightenment and reference of digital education in European universities.

ET3020	Title: The Application of Multisim14.0 in Analog Circuit Teaching
	Authors: Maoqun Yao, Yize Song, Xiaole Zhang
15:05-15:20	Presenter: Xiaole Zhang, Hangzhou Normal University, China

Abstract: Analog circuit is an important compulsory basic course for electronic information majors, which has complex theories, abstract concepts, strong logic, and a single experimental project and form that leads to certain limitations for students to have a deep understanding of circuits. By improving the degree of freedom of experimental exploration, students can further deepen their understanding and knowledge of theoretical knowledge and the actual working situation of circuits, improve students' enthusiasm for learning, enhance students' independent thinking and practical ability, and improve the teaching effect.

ET3031	Title: Investigating Hybrid Teaching Approaches for Data analytics in Higher Education
	Authors: Wasinee Noonpakdee
15:20-15:35	Presenter: Wasinee Noonpakdee, Thammasat University, Thailand

Abstract: With the increasing demand for data science professionals, several universities have introduced data science and data analytics programs to prepare students with the necessary knowledge and skills. This study aims to investigate the implementation of hybrid teaching approaches for data analytics courses in higher education. The research process includes literature review, survey, observation, analysis, and conclusion. The results indicate several key aspects, including course content development, hybrid teaching activities and engagement, student feedback, and the challenges and strategies associated with hybrid teaching. Practical recommendations are provided to gain insights into the effective implementation of hybrid teaching in data analytics through appropriate teaching methods and delivery modes. The results of this study will contribute to a better understanding of the post-pandemic era, ultimately enhancing the quality of education.

ET3057 15:35-15:50	**Title: Research on the Transformation of Music Education Model under the Background of Generative Artificial Intelligence** **Authors:** Zhifang Li, Shuo Zhao, Yachen Zhang **Presenter:** Zhifang Li, Communication University of China Beijing, China

Abstract: Since 2022, the rapid development of generative artificial intelligence systems represented by Chat-GPT has profoundly influenced various fields. This article briefly introduces the development process of generative artificial intelligence models in recent years, explains the benefits of applying generative artificial intelligence in music education, and discusses the direction of transformation for music education models in the context of the development of generative artificial intelligence. It also reflects and summarizes the challenges faced by the current application of generative artificial intelligence in the field of music education.

ET3053 15:50-16:05	**Title: Design thinking and service learning: Fostering innovation with a purpose** **Authors:** Eduardo Bastida-Escamilla, Froylan Franco-Herrera, Victor Manuel Rayas-Carbajal, Rodolfo Medoza-Gomez, and Milton Carlos Elias-Espinosa **Presenter:** Eduardo Bastida-Escamilla, Tecnologico de Monterrey, Mexico

Abstract: The present work explores the pressing need to provide higher education students with meaningful learning strategies that help them understand the application of theory in practice. Service learning, a teaching methodology in which the application of theory to a real-life problem is explored, along with design thinking. Together these methodologies intend to better develop engineering competences while providing innovative solutions to the community. Assessment of the implementation of this methodology indicates that students following service learning understand better the implications of theory for practical settings than those involved in traditional teaching settings, like case studies. Moreover, interesting insights are found towards students' attitude to future engage in civic commitment that will require further investigation.

Session 2: Wireless Communication and Transmission

Session Time Period: 14:40-16:20 (GMT+8, Beijing Time), Saturday, May 11, 2024
Conference Room: 智慧厅B/Knowledge B, 5th Floor
Session Chair: Assoc. Prof. Yan Lin, Nanjing University of Science and Technology, China

Invited Speech 14:40-15:05	**Title: Intelligent Task Offloading for Caching-Assisted UAV Networks** **Invited Speaker:** Assoc. Prof. Chao Fang, Beijing University of Technology, China

Abstract: To satisfy the differentiated service requirements of delay-sensitive and computing-intensive tasks in unmanned aerial vehicle (UAV) networks, it is urgent to efficiently allocate limited network resources to improve network performance. In this paper, we propose an intelligent task offloading scheme to optimize resource allocation in UAV networks with content caching. Specifically, we formulate the joint optimization of task offloading and resource allocation as a latency minimization model for the caching-assisted UAV system. Then, a new deep reinforcement learning (DRL) algorithm is designed to make offloading and resource allocation decisions based on current network state information, significantly improving resource utilization. Numerical results indicate that the model significantly reduces network latency in comparison to its existing benchmarks in caching-assisted UAV networks.

ET1025 15:05-15:20	**Title: Relay Based Asymmetric Communication Resource Allocation Scheme for Urban Operations** **Authors:** Kecheng Zhang, Xiaobin Mao, Long Sheng, Zhaochen Zhang, Yu Sun, Dali Gao **Presenter:** Kecheng Zhang, Science and Technology on Information Systems Engineering Laboratory, China

Abstract: Relay based communication is essential for urban operations because two communication nodes far from each other are hard to connect due to the harsh wireless environment. A relay based asymmetric commuication resource allocation scheme for OFDM-Based relay system in downlink is proposede in this paper. Unlike previous work, the time slots for the two hops via each relay are designed to be asymmetric, which enhances the degree of freedom. Besides, destinations which connect directly to the source are considered, which is different from previous work. Simulation results demonstrate that the proposed scheme can successfully give the optimal results and when the distance between source and relay or the distance between relay and destination varies, the optimal solution changes.

ET1058 15:20-15:35	**Title: Optimized Layered FAIDs of 5G LDPC Codes With RQNN** **Authors:** Qiushi Xu, Yanchen Lyu, Yangming Li, Ming Jiang **Presenter:** Qiushi Xu, Southeast University, China

Abstract: In this paper, a recurrent quantized neural network with a layered structure is designed to optimize the look-up table (LUT) in the layered finite alphabet iterative decoders (FAIDs). By using straight-through estimators to soften the backward gradient propagation of some low-precision activation functions, the quantization thresholds and quantization levels in the LUTs are optimized as parameters in the network. Performance evaluations on decoding codewords encoded with quasi-cyclic low-density parity-check codes show significant advantages compared to the conventional optimized FAIDs using a generalized flooding structure network. The proposed approach achieves notable performance improvements without increasing the complexity of the decoding algorithm. We also classify the check nodes by row weights of the parity-check matrix, and train different LUTs for different categories of nodes for each iteration. This approach achieves further

performance improvements in online decoding and significant complexity reduction compared to the exhaustive search method.

ET1033 15:35-15:50	**Title: An Anti-electromagnetic Interference Parking Detection Method Based on Wireless Sensing Technology** **Authors:** Jian Wang, Xiyuan Wang, Ruyin Cai, Liangliang Lou, Boyu Xu, Gaojie Cheng **Presenter:** Liangliang Lou, Taizhou University, China

Abstract: The management level of Smart Parking System (SPS) can be guaranteed by the accurate parking information, so that the low cost and high precision magnetometer-based wireless parking sensors (WPS) powered by batteries have been widely used in outdoor parking lots. However, the magnetic field around existing magnetometer-based WPS is easily interfered from the electromagnetic emission generated by underground high-voltage cables and subways in city. To address the above problems, an Anti-electromagnetic Interference Parking Detection (AeIPD) method is proposed in the paper, the band-pass filter of wireless transceiver is fully exploited. In AeIPD, the channel attenuation of wireless signals filtered by the bandpass filter assembled in the wireless transceiver is used to achieve parking detection. Namely, a channel attenuation measurement mechanism based on wireless transceivers is proposed in the paper, and the Receiving Signal Strength (RSS) unit assembled in wireless transceiver is used to collect the data required by AeIPD. Finally, the AeIPD performance is evaluated in a real testbed. The experimental results show that AeIPD achieves 99.17% accuracy in detecting 599 vehicles interfered by electromagnetic emission, which can provide a valuable reference for the development of wireless parking detector industry.

ET1068 15:50-16:05	**Title: Deep Reinforcement Learning based OFDMA Scheduling for WiFi Networks with Coexisting Latency-Sensitive and High-Throughput Services** **Authors:** Qingyu Tan, Junjie He, Yayu Gao **Presenter:** Qingyu Tan, Huazhong University of Science and Technology, China

Abstract: In this paper, we focus on how to meet the diverse quality-of-service requirements of different types of STAs in WiFi networks where latency-sensitive (LS) STAs with strict end-toend delay constraints coexist with high-throughput (HT) STAs demanding high data rates, which remains largely unexplored. To tackle this issue, we propose a novel deep reinforcement learning based resource scheduling algorithm for uplink Orthogonal Frequency Division Multiple Access (OFDMA) IEEE 802.11ax WiFi networks, aiming at guaranteeing the delay constraints for LS STAs while simultaneously maximizing the throughput of HT STAs. Extensive simulation results show that the proposed algorithm 1) exhibits substantial performance improvement compared to the traditional Round Robin algorithm under various traffic conditions, particularly for services with tighter delay constraints; 2) enables flexible resource allocation between LS and HT STAs by fine-tuning a predefined factor; and 3) achieves satisfactory reliability for LS STAs while good throughput for HT STAs under highly congested network conditions.

ET1032 16:05-16:20	**Title: End-to-End Delay Analysis of K-Repetition Grant-Free Access in Cell-Free Massive MIMO Systems** **Authors:** Dongyi Jiang, Feng Ye, Jiamin Li, Pengcheng Zhu **Presenter:** Feng Ye, Southeast University, China

Abstract: In order to meet the massive ultra-reliable and low-latency communication (mURLLC) demands of vertical industries in the Internet of Things (IoT), the research for end-to-end (E2E) delay has become a key direction of the sixth generation (6G) mobile communication. Cell-free massive multiple-input-multiple-output (CF-mMIMO) systems can provide enhanced anti-interference performance and reliability. Existing research is not comprehensive enough to analyze the E2E

delay and are mostly limited to traditional cellular systems. In this paper, we propose the E2E delay model based on K-repetition grant-free (GF) access scheme in CF-mMIMO systems. Taking the finite blocklength regime into consideration, we present the process of packet queuing, random access, collisions and transmission errors. In particular, we analyze three significant components of the E2E delay, namely access delay, queuing delay and transmission delay. On this basis, we formulate the average E2E delay. Simulation results reveal the tradeoff relationship among access delay, queuing delay and transmission delay with the change of finite blocklength.

Session 3: Digital Signal Detection and Analysis

Session Time Period: 14:40-16:20 (GMT+8, Beijing Time), Saturday, May 11, 2024
Conference Room: 协同厅/Alliance Room, 5th Floor
Session Chair: Prof. He Li, Southeast University, China

Invited Speech 14:40-15:05	**Title: An Enhancement of SMOTE Algorithm Using Heron- Centroid Approach and Noise Mitigation** **Authors:** Dan Michael Cortez, Roi John Belmonte, Lexter Aquino, Crisel Salva, Jonathan Morano, Leisyl Mahusay, Bernard Letrero, Khatalyn Mata, Florencio Contreras Jr. **Invited Speaker:** Dr. Dan Michael A. Cortez, Pamantasan ng Lungsod ng Maynila, Philippines

Abstract: The performance of any classification algorithm is determined not only by the quality of the classifier itself, but also the quality of data to be used. Most data are imbalanced, meaning the different class instances have varying ratios which poses a challenge for classification performance. Synthetic Minority Oversampling Technique (SMOTE) algorithm is an oversampling technique that deals with data imbalance by generating synthetic data instances by linearly interpolating between the minority class instances. However, the SMOTE Algorithm has certain limitations as it has a potential to overfit the classification model. The proposed method utilizes a triangle centroid method for the synthesis of new minority class instances. Heron's formula will also be used for the proposed method to be able to determine the distribution density of the data instances, as well as use a triangular noise mitigation technique to reduce the propagation of noisy data instances. Results of simulation on publicly available medical datasets show that Heron-Centroid SMOTE improved SMOTE across all performance metrics and beating both 'Imbalanced' tests and SMOTE on most datasets, with mean F- score of 0.5792, and an average G-mean of 0.6398.

ET1059 15:05-15:20	**Title: Adaptive Interference Cancellation Scheme for OFDM-based ISAC System** **Authors:** Zhigang Cong, Liang Wu, Zaichen Zhang **Presenter:** Zhigang Cong, Southeast University, China

Abstract: Interference cancellation between the echo of the sensing signal and the communication signal is an challenging issue in integrated sensing and communication (ISAC) systems, especially when the directions of arrival (DoAs) of the echo signal and the communication signal are the same. In this paper, an echo cancellation scheme based on adaptive filtering is proposed for the ISAC system, and the smoothed rank profile (SRP) algorithm and spatial smoothing algorithm are jointly employed. After the echo signal and the uplink communication signal are separated, the motion state of the sensing target is estimated. Simulation results show that the proposed adaptive filtering scheme can improve both the communication performance and the sensing performance.

ET1050 15:20-15:35	**Title: A RIS-assisted Interference Cancellation Scheme for Dynamic TDD Systems** **Authors:** Yuanhao Chen, Ziyang Cai, Liang Wu, Zaichen Zhang, Jian Dang, Bingcheng Zhu, Lei Wang **Presenter:** Ziyang Cai, Southeast University, China

Abstract: This paper proposes a reconfigurable intelligent surface (RIS) assisted scheme to mitigate cross-link interference (CLI) in the dynamic time division duplex (TDD) wireless communication system. The proposed scheme designs the weights of RIS elements by reconstructing the equivalent channel matrix. Besides, we efficiently reduce the overhead by predicting the channel state information (CSI) between the user equipment (UE) and the RIS. Simulation results show that the proposed RIS-assisted scheme can effectively mitigate the CLI, and it can achieve a better bit error rate (BER) performance than the

benchmark schemes. By employing the predicted CSI, the proposed RIS-assisted scheme can also maintain a good BER performance.

ET1002	Title: Rolling bearing fault diagnosis based on CWT and two-stream convolutional neural network
	Authors: Yanping Wang, Longsheng Cheng, Ting Mao, Mengdie Wu
15:35-15:50	**Presenter:** Yanping Wang, Nanjing University of Science and Technology, China

Abstract: In the era of industrial big data, data-driven rolling bearing fault diagnosis has received widespread attention. However, most of the current methods only extract features from a single dimension such as time domain, frequency domain or time-frequency domain, and this extraction method often leads to the inability to comprehensively extract the information features. Therefore, this paper considers multi-dimensional feature extraction of information, and thus proposes a fault diagnosis model based on two-branch convolutional neural network to improve the comprehensiveness of feature extraction and the accuracy of the classifier. The experimental validation results on the Case Western Reserve University bearing dataset show that the method can effectively improve the fault diagnosis performance, with an average accuracy of 99% on four datasets.

ET1019	Title: An Efficient Demodulation Approach for Sidetone Distance Measurement
	Authors: Jikai Cheng, Chao Li, Liming Yin, Qingsheng Hu
15:50-16:05	**Presenter:** Jikai Cheng, Southeast University, China

Abstract: This paper presents an efficient demodulation method based on sidetone ranging. To measure the distance between two terminals precisely, the carrier and sidetone should be tracked and recovered efficiently. A multi-rate filter has been proposed, which completes the functions of data extraction and anti-aliasing. A phase-locked loop based on orthogonal two channel signals is proposed, which is more suitable for carrier tracking. A complex multiplier is applied in a phase-locked loop, achieving the purpose of structural simplification. Some of the structures are verified and the key parameters are obtained by MATLAB. Finally, the functions are realized in Vivado by using Verilog language and IP cores.

ET1044	Title: Air-Induced Passive Intermodulation Modeling Method Based on CNN-LSTM-FIR Neural Network
	Authors: Huawen Lin, Hongjun Ma, Jun Yang, Jinxiang Liu
16:05-16:20	**Presenter:** Huawen Lin, South China University of Technology, China

Abstract: In this article, we analyzed the principle of the air-induced passive intermodulation (PIM) signals generated by passive devices in communication systems and modeled the air-induced PIM. Air-induced PIM is the interference caused by nonlinear transformations of the transmitted signals and can severely degrade the quality of the received signals. Therefore, in this article, we designed a neural network model, CNN-LSTM-FIR, to model and compensate for the air-induced PIM signals generated by the system.

Firstly, we follow the actual physics process generated by air-induced PIM, and add the leading and lagging terms of the signal as inputs. The memory of the signal is extracted by using the CNN layer, and the nonlinearity of the signal is extracted by the nonlinear activation function. In addition, the fully connected layer is used to distribute the weight of the signal, and then the deeper memory of the signal is extracted through the LSTM layer, and finally the signal is effectively sorted out and output through the FIR filter layer.

Experiments show that the above model has excellent modeling and cancellation capabilities, and achieves a cancellation performance of more than 18dB.

Session 4: Modern Communication Theory and Technology

Session Time Period: 14:40-16:20 (GMT+8, Beijing Time), Saturday, May 11, 2024
Conference Room: 独特厅/Unique Room, 5th Floor
Session Chair: Prof. Qiang Wu, Nanjing University of Aeronautics and Astronautics, China

Invited Speech	Title: Efficient Decoder Design for Soft-Assisted Product Decoder
	Invited Speaker: Dr. Suwen Song, Sun Yat-sen University, China
14:40-15:05	

Abstract: Product code has been proven as an efficient choice for achieving high net coding gain (NCG) at extremely low bit error rates (BER) in fiber communication systems. Compared to the hard-decision product decoders, it has been demonstrated that decoders based on soft-assisted decoding algorithms can achieve excellent decoding performance with only a slight increase in area. However, existing decoders tend to have high power dissipation and large component decoder area due to the fully-parallel architecture. Therefore, further efforts are needed to achieve efficient hardware implementation. In this paper, a low-area and low-power product decoder based on Improved Soft-Assisted Iterative Bounded Distance Decoding algorithm (ISA-iBDD) algorithm is presented. The ASIC synthesis results show that the proposed design leads to an $8.5\times$ improvement in area efficiency (AE) and a reduction of 62% in energy dissipation compared with the state of-the-art design.

ET1074	Title: Modifying Belief Propagation MIMO Detector with Multi-Objective Evolutionary Algorithm
	Authors: Zihe Wang, Xiaosi Tan, Wenyue Zhou, Yongming Huang, Chuan Zhang
15:05-15:20	**Presenter:** Zihe Wang, Southeast University/ Purple Mountain Laboratories, China

Abstract: This paper proposes modified-BP (mBP), a novel approach that leverages a multi-objective evolutionary algorithm (MOEA) to enhance belief propagation (BP) for massive multipleinput multiple-output (MIMO) detection. mBP optimizes the BP algorithm by determining the optimal search space size and number of iterations for improved computational efficiency. Numerical results demonstrate the significant reduction in computational complexity of mBP compared to the state-of-the-art belief-selective propagation (BsP) algorithm. Additionally, mBP shows negligible performance degradation in most scenarios, with some configurations even exhibiting slight performance enhancement, which highlights mBP's potential as an efficient and effective detector for MIMO systems.

ET1034	Title: The Shortest Path Algorithm Based on Geometric Symmetry for Low Earth Orbit Satellite Network
	Authors: Benchu Zhang, Zaiyue Yang
15:20-15:35	**Presenter:** Benchu Zhang, Southern University of Science and Technology, China

Abstract: Since the Low Earth Orbit (LEO) satellite communication system has the advantages of low latency, global coverage, and rapid reconstruction, it has become the main networking method of satellite networks. Routing is the basis for realizing satellite communications. Because the complexity of the shortest path algorithm basically determines the computational complexity of the routing algorithm, the shortest path algorithm is the core of the routing problem. This paper attempts to use the laws of LEO satellite network topology to calculate the shortest path between the source satellite and the destination satellite. First, we derive the function of inter-satellite link (ISL) length with time and establish the geometric model of the satellite network. Then, on the basis of this model, we establish the shortest path algorithm between source and destination pairs - the symmetric geometry algorithm (SGA). In addition, in order to ensure the optimality of the path, we extend the applicable scene of the model from the two-dimensional plane to the three-dimensional sphere. The simulation test

results show that compared with the traditional Dijkstra's algorithm, SGA can greatly improve the calculation speed of the shortest path while ensuring the optimality of the path.

ET1073	Title: Local Subdivisional Channel Estimation in RIS-Assisted THz MIMO-OFDM Systems
	Authors: Yifang Dai, Wuqiong Zhao, You You, Yongming Huang, Chuan Zhang
15:35-15:50	**Presenter:** Yifang Dai, Southeast University/Purple Mountain Laboratories, China

Abstract: Reconfigurable intelligent surfaces (RIS) offer significant performance gains for terahertz (THz) multiple-input and multiple-output (MIMO)-orthogonal frequency division multiplexing (OFDM) systems. However, channel estimation (CE) in high-dimensional RIS channels remains challenging. This paper proposes a compressed sensing (CS)-based CE method that separates angle and gain estimation, reducing pilot overhead and computational complexity. We leverage spatial path selection enabled by designed beam and reflection patterns to reduce dimensionality. Our method achieves over 35% pilot overhead reduction and significantly improves computational efficiency, while maintaining accuracy comparable to existing methods.

ET1076	Title: DRL-based IRS-assisted Mobile Edge Computing for Energy Efficiency Maximisation
	Authors: Tiantian Gong, Junxuan Wang, Yanyan Zhang
15:50-16:05	**Presenter:** Tiantian Gong, Xi'an University of Posts and Telecommunications, China

Abstract: Intelligent Reflective Surfaces (IRSs) are densely deployed in edge computing (MEC) in a low-cost, low-energy manner to help users offload computational tasks to edge servers via reflective links, thus supporting widely used MECs. In this paper, we consider an IRS-assisted MEC system, which consists of an edge-server-equipped access point (AP), multiple users, and reflective elements with multiple IRS components. Based on this system model, the joint optimisation calculates the task offload rate, user local central processing unit (CPU) frequency, user transmit power and IRS phase shift to maximise the system energy efficiency. For the non-convex optimisation problem, a deep reinforcement learning (DRL)-based approach is proposed. To achieve higher returns, the agent adjusts the optimisation variables according to dynamically changing link conditions and randomly arriving task volumes. Numerical results show that the energy efficiency of the system with the assistance of IRS is better than the case without IRS, proving the effectiveness of IRS and that the proposed algorithm outperforms other benchmark schemes.

ET1048	Title: CSI Fingerprint Positioning Algorithm Based on Data Preprocessing and SVM
	Authors: Qianqian Sun, Zhentian Zhang, Jian Dang, Zaichen Zhang, Bingcheng Zhu, Liang Wu
16:05-16:20	**Presenter:** Qianqian Sun, Southeast University, China

Abstract: In today's mobile Internet era, location service occupies a pivotal position, and is also a vital part of important fields such as emergency rescue and traffic navigation. Outdoor positioning has become more and more mature, but accurate positioning in indoor environment is facing completely different challenges from outdoor environment. The indoor environment is highly complicated and it is challenging to achieve high-precision. The presence of personnel seriously affects the accuracy of indoor positioning. Although channel state information (CSI) fingerprint recognition technology allows for relatively accurate indoor positioning, the presence of people can seriously affect its accuracy relative to other indoor environmental factors. Exploiting the property that people in different positions with different gestures will have different degrees of impact on CSI data, CSI fingerprint localization algorithm based on principal component analysis (PCA) and support vector machine (SVM) is proposed. The positioning accuracy is improved by 9.6%, and positioning delay is improved by 2.9%.

Poster Session 1: Security Management and Network Performance Analysis in Wireless Communication Systems

Session Time Period: 16:40-18:32 (GMT+8, Beijing Time), Saturday, May 11, 2024
Conference Room: 智慧厅A/Knowledge Room A, 5th Floor
Session Chair: Assoc. Prof. You You, Purple Mountain Laboratories, China

ET1039 16:40-16:47	**Title: A High-Efficiency Framework Combining Sparse Feature Representation and Sparse Interpretation of High Spatial Resolution Remote Sensing Imagery** **Authors:** Xiaopeng Han, Zhibo He, Zhigang Cao, Ding Zhou **Presenter:** Xiaopeng Han, Purple Mountain Laboratories, China

Abstract: For desirable interpretation of high resolution remote imagery, special attention has been given to the extraction of spatial information, related to textural, structural, and morphological features. However, in most cases, spatial features, subject to different parameters such as sizes, scales, and directions, always lead to high-dimensional feature space. Under this circumstance, some state-of-the-art classification methods, e.g., tree bagger (TB), support vector machine (SVM), generalized composite kernel-based multinomial logistic regression (GCK-MLR), and multiple feature learning (MFL), are proposed to interpret high-dimensional feature accurately. The emphases of current studies lie on the feature extraction or classification separately, and few studies concern their collaborative capabilities. In addition, most of the current classification methods focus only on the accuracy, but ignore the computational cost when considering the high-dimensional feature interpretation. In this context, we propose a sparse feature representation and sparse interpretation (SRSI) framework, which combine sparse feature extraction and interpretation in an efficient manner, for the classification of high-resolution imagery. Meanwhile, in order to measure the classification efficiency, a novel efficiency index is defined, considering the trade-off between accuracy and computational complexity. In order to validate the proposed SRSI framework, a recently developed generalized differential morphological profiles (GDMPs) were adopted as the high-dimensional feature, and a sparse multinomial logistic regression (SMLR) via variable splitting and augmented Lagrangian algorithm (LORSAL), was used to interpret the GDMPs. Experiments were conducted on a number of high-resolution remote sensing images e.g., QuickBird, WorldView-2, GeoEye-1, ZY-3. The experimental results demonstrate the superiority of SRSI framework, in terms of both classification accuracy and efficiency.

ET1036 16:47-16:54	**Title: A QoS-Aware Routing Mechanism with Flow Classification for SDN-IoT Architechure** **Authors:** Pengjie Cheng, Jing Hu, Tiecheng Song **Presenter:** Pengjie Cheng, Southeast University, China

Abstract: With the continuous expansion of the Internet of Things (IoT) technology landscape, the proliferation of diverse devices and the resulting surge in data traffic demand a reassessment of our network infrastructure. Integrating Software Defined Networking (SDN) into IoT networks emerges as a viable solution. In practical scenarios of the SDN-IoT architecture, all users express a desire to subscribe to IoT services, each presenting unique Quality of Service (QoS) requirements based on their distinct business needs. This paper introduces a hierarchical routing mechanism with flow classification for SDN-IoT architecture. Initially, a method is developed to classify IoT traffic flow, considering user levels, standard classification models, and QoS relative priorities. Subsequently, customized routing strategies are proposed for the hierarchically classified flows. To optimize the utilization of transmission bandwidth, we present a congestion control mechanism based on Grey Wolf Algorithm (CCGWA), which can identify an alternative path for multipath transmission. Simulation analysis of the proposed

routing solution indicates its effectiveness in addressing flows with different priorities, demonstrating reduced average end-to-end delay and improved overall throughput when compared to alternative routing schemes.

ET1027	**Title: Ambiguity function based on specific radiation sources of ADS-B signals identification**
	Authors: Yunfei Zheng, Xuejun Zhang, Shenghan Wang, Weidong Zhang
16:54-17:01	**Presenter:** Yunfei Zheng, Beihang university, China

Abstract: As Automatic Dependent Surveillance-Broadcast (ADS-B) devices are widely used, verification of the authenticity of ADS-B signals becomes increasingly important. False signals can disrupt normal aircraft navigation and seriously threaten airspace safety. This paper proposes an ADS-B signal recognition method based on the ambiguity function (AF). It utilizes two-dimensional convolutional images to represent radio frequency fingerprint (RFF) characteristics in both time and frequency domains by convolving the actual received signal with an ideal reconstructed signal. A convolutional neural network is used to extract the fingerprint information of the signal and verify the identity of the radiation source, achieving the purpose of determining the authenticity of the signal. The experiments analyzed the impact of the number of aircraft categories and signal-to-noise ratio on recognition results, confirming the effectiveness of ADS-B recognition based on the AF. This study demonstrates the feasibility of RFF in the aerospace industry and can be generalized for use in Internet of Things (IoT) devices.

ET1024	**Title: A Random-function-based Observation-weighting Method for Mining Actionable Behavioral Rules**
	Author: Yuan Liu
17:01-17:08	**Presenter:** Yuan Liu, Qilu Normal University, China

Abstract: One of the critical challenges faced by the mainstream data mining community is to make the mined patterns or knowledge actionable. Knowledge is considered actionable if users can take direct actions based on such knowledge to their advantage. Among the most important and distinctive actionable knowledge are actionable behavioral rules that can directly and explicitly suggest specific actions to take to influence (restrain or encourage) the behavior in the users' best interest. The problem of mining such rules is a search problem in a framework of support and expected utility. The previous definition of a rule's support assumes that each instance which supports a rule has the uniform contribution to the support. However, this assumption is usually violated in practice to some extent, and thus will hinder the performance of algorithms for mining such rules. In this paper, to handle this problem, an observation-weighting model for support based on random function and corresponding mining algorithm are proposed. The experimental results strongly suggest the validity and the superiority of our approach.

ET1045	**Title: Data Driven Non-Markovian Quantum Process tomography**
	Authors: Yingwen Wu, Zetong Li, Dafa Zhao, Tian Luan, Xutao Yu, Zaichen Zhang
17:08-17:15	**Presenter:** Yingwen Wu, Southeast University, China

Abstract: We advance non-Markovian quantum process tomography through a novel neural network-based approach, effectively transforming experimental data into a process tensor represented by the Choi state. Our investigations validate that neural networks excel in reconstructing process tensors with superior precision and robustness against noise, particularly under the challenges of undersampling. The neural network model we present not only outstrips traditional linear inversion methods in computational efficiency and accuracy but also showcases remarkable generalization across varying environments. This study fully leverages causality constraints to reduce the number of parameters in process tensor prediction, significantly enhancing the training and data efficiency of neural networks in quantum process tomography. This work marks progress in

quantum computing, leveraging the strengths of neural networks to robustly characterize and identify quantum processes, thereby broadening the horizons for practical quantum process tomography applications.

ET1028 17:15-17:22	Title: Hypergraph Matching Based Efficient Virtual Network Embedding Algorithm for Data Centers **Authors:** Weidi Su,Yufei Zhang, Wei Liu **Presenter:** Wei Liu, Xidian University, China

Abstract: With the rapid development of data centers, the problem of high energy consumption has become more and more serious. By using the virtual network embedding technology, a large number of virtual resources can be merged into a small number of physical resources to reduce energy consumption. This paper proposes an efficient virtual network embedding algorithm based on hyper-graph matching for data centers. Firstly, the virtual network embedding system model is presented, and the optimization problem of minimizing energy consumption is established. Then, the system model is transformed into a weighted hypergraph model. The problem of minimum energy consumption of virtual network embedding becomes a problem of finding a perfect matching with the maximum total weight in the hypergraph, which is NP-Hard. In this paper, the low complexity heuristic algorithms are investigated. The simulation results show that the proposed algorithm outperforms the bin packing algorithm and can effectively reduce the total energy consumption of the data center in the scenario of computation intensive tasks.

ET1046 17:22-17:29	Title: Towards Intelligent Access Control in Internet of Things **Authors:** Lvguan Xu, Huan Luo, Zhanhui Xiao, Ting Yu, Tianshi Mu, Honghua Tan, Qinwen Mi **Presenter:** Lvguan Xu, China Southern Power Grid Digital Platform Technology Company, China

Abstract: The Internet of Things (IoT) has experienced significant growth and widespread application across diverse fields, including healthcare, transportation, agriculture, and the smart home. As the IoT devices routinely transmit sensitive and private data over the Internet, they are particularly vulnerable to hacking and tampering attacks. It is essential to implement crucial and effective security measures for the IoT. Standing out as a crucial safeguard, the access control can effectively shield data and resources from unauthorized access. Due to its diversity, heterogeneity, and dynamism, the IoT presents many challenges for access control. Towards intelligent access control in IoT, we propose a Transformer-based access control method, leveraging its ability to effectively capture long-range dependencies and its flexibility in modeling various types of access requests. The experimental results demonstrate that our proposed Transformer-based method outperforms the state-the-art methods in making access decisions in the IoT.

ET1055 17:29-17:36	Title: Mobility Analysis of Visible Light Communications with Orientation-based Random Waypoint Model **Authors:** Tang Tang, Lei Shi, Qian Li **Presenter:** Tang Tang, Air Force Engineering University, China

Abstract: Visible Light Communication (VLC) has the potential to play an important role in future indoor short-range communication scenarios. Since the coverage of each light-emitting diode array in VLC is limited and mainly relies on line-of-sight link transmission, it is necessary to consider the impact of user equipment (UE) mobility, orientation, and the occurrence of blockage on the quality of communication. Random movement and orientation of UEs can affect link maintenance and channel gain, leading to fluctuations in performance and inter-cell handover of UEs. Blockage can directly obstruct the communication link. In this paper, we propose the Orientation-based Random Waypoint Model (ORWP) to investigate the orientational movement of UEs under the perspective of the polar coordinate system in a multi-cell indoor VLC system and consider the case of blockage to characterize the movement of UEs more accurately. The simulation results

compare the achievable rates of the proposed scheme with the RWP model, which illustrates that the orientation has a non-negligible impact on the channel quality. Furthermore, the application of this model to VLC systems is studied as a use case by analyzing the handover rate under different cell formation strategies.

ET1065-A 17:36-17:43	**Title: Asynchronous RIS/HRIS-assisted Localization: A Comprehensive Analysis of Fundamental Limits** **Authors:** Ziyi Gong, Liang Wu, Zaichen Zhang **Presenter:** Ziyi Gong, Southeast University/Purple Mountain Laboratories, China

Abstract: The reconfigurable intelligent surface (RIS) has drawn considerable attention for its ability to enhance the performance of not only the wireless communication but also the indoor localization with low-cost.

We first investigate the performance limits of the traditional passive RIS-based near-field localization in the asynchronous scenario, and analyzes the impact of each part of the cascaded channel on the localization performance. We derive the position error bound (PEB) and the equivalent Fisher information (EFI) for the position-related intermediate parameters. Enabled by the derived EFI, we verify that both the ranging and bearing information of the user can be obtained when the near-field model is considered for the RIS-User equipment (UE) part of the channel, while only the direction of the UE can be inferred in the far-field scenario. This result is well known in the scenario that the curvature of arrival (COA) is directly sensed by the traditional active large-scale array, and we prove that it still holds when the COA is sensed passively by the large RIS. For the base station (BS)-RIS part of the channel, we reveal that this part of the channel determines the type of the gain provided by the BS antenna array. Besides, we also show that the well-known focusing control scheme for RIS, which maximizes the received SNR, is not always a good choice and may degrade the localization performance in the asynchronous scenario.

However, the traditional passive RIS assisted system suffered from the severe path-loss due to the reflection. Therefore, we also investigate the near-field localization performance based on the hybrid RIS (HRIS), which contains both passive and active elements and is capable of simultaneously reflecting and receiving signals. We show that turning only a small part of the elements into active ones can significantly improve the PEB performance. We propose the Focnear scheme which jointly adjusts the phases of the passive and the active elements of the HRIS. We show that the Focnear sche.

ET1007 17:43-17:50	**Title: Joint Optimization of Computation Offloading and Resource Allocation for LEO Satellite Edge Computing Networks** **Authors:** Feihu Dong, Yasheng Zhang, Qingqing Tang, Kaixiang Wei **Presenter:** Kaixiang Wei, Beijing Institute of Technology, China

Abstract: The LEO satellite edge computing network can provide communication and computing services to ground users. However, the computing resources of LEO satellites are limited and may not be able to provide computing services to all ground users. To this end, this paper proposes a problem of jointly optimizing computation offloading decisions and computing resource allocation to minimize the total energy consumption of computation task processing, which can ensure that the computation tasks of all ground users can be effectively processed. However, the proposed problem contains 0-1 variables, and the computation offloading decision and computing resource allocation are coupled, which makes the problem difficult to solve directly. To solve this problem, this paper first uses the relaxation algorithm to transform the original problem and then proposes a joint optimization algorithm to solve the transformed problem. Simulation results show that the proposed algorithm can effectively reduce the total energy consumption of computation task processing.

ET1054	**Title: Meta-Learning with QAOA for Channel Decoding**
	Authors: Jun Zhu, Xutao Yu, Han Zeng
17:50-17:57	**Presenter:** Jun Zhu, Southeast University, China

Abstract: With the development of 6G networks, the required computational power has been greatly increased, and quantum computing offers promising approaches for this purpose due to its properties such as superposition and entanglement. It has been proposed to combine the Quantum Approximation Optimization Algorithm (QAOA) with the Learning-to-Learn (L2L) strategy using classical Recurrent Neural Networks (RNN) to solve the problem of channel decoding on Noisy Intermediate-Scale Quantum (NISQ) devices. In this paper, we build on this foundation to further investigate the impact of different RNNs on channel decoding. The experimental results show that by training the RNN model of Minimal Gated Unit (MGU) with fewer parameters, the initial parameters of the obtained QAOA have a certain degree of similarity with the Long Short Term Memory Network (LSTM), and the decoding results are comparable. The method of training RNNs improves the performance and saves the cost compared to the random initialization method. Despite the limitation by the current quantum hardware, this quantum computation approach provides the future for channel decoding in the 6G network a promising scheme.

ET1008	**Title: Channel Estimation for 5G Non-Terrestrial Communication Systems**
	Authors: Haifeng Zhao, Yasheng Zhang, Kaixiang Wei, Yifeng Liu
17:57-18:04	**Presenter:** Kaixiang Wei, Beijing Institute of Technology, China

Abstract: Non-terrestrial networks represented by low orbit satellites have been viewed as key techniques to complement terrestrial communication systems. However, there are significant differences in the frequency band occupied by its signal and the transmission environment compared to traditional terrestrial communication systems, and there are differences in channel models. This paper focuses on the channel estimation methods of satellite-ground links. According to the characteristics of FR1 and FR2 band Non-Terrestrial Networks (NTN) channels, channel estimation methods based on the basis expansion model (BEM) and compressive sensing (CS) are designed respectively to improve the channel estimation performance in flat channels and frequency selective channels, and provide support for efficient satellite communications oriented to B5G and 6G.

ET1079	**Title: Blockchain-Based Task Offloading for Mobile Edge Computing Networks with Server Collaboration**
	Authors: Jiayu Ma, Yuhan Yi, Wenqian Zhang, Yue Sun, Guanglin Zhang
18:04-18:11	**Presenter:** Guanglin Zhang, Donghua University, China

Abstract: Multi-server collaboration offloading refers to one kind of task offloading mechanism that can balance the workloads of edge servers (ESs) and reduce the waste of computing resources in mobile edge computing (MEC) systems. However, few previous works have investigated the reliability of ESs during collaboration. To solve this issue, we design a blockchain-based task offloading scheme for MEC systems with server collaboration, in which the blockchain is employed to evaluate and manage the offloading reliability of ESs. In addition, we model a transaction queue to describe the long-term dynamic process of verifying transactions in the blockchain and utilize the age of information (AoI) to describe the freshness of offloading reliability. We consider the mutual influence between the MEC and the blockchain, instead of making decisions separately. By jointly optimizing the task offloading and the blockchain consensus, the utility of ESs can be enhanced. Finally, the simulation experiments are implemented to demonstrate the effectiveness of our proposed scheme for mobile edge computing.

ET1088	**Title: A Study of Selection Mechanisms for Hub CPEs in SD-WAN Network Systems**
	Authors: Bo Yuan, Hongtao Li, Haisheng Yu
18:11-18:18	**Presenter:** Bo Yuan, Southeast University, China

Abstract: SD-WAN (Software-Defined WAN) is an important edge access solution for compute-first networks. SD-WAN interconnects the Spoke CPEs at the enterprise branches with the Hub CPEs at the enterprise headquarters by establishing overlay tunnels through third-party networks. Since there are multiple pairs of Hub CPEs in the enterprise network, and the computing resources of each pair of Hub CPEs are limited, the Spoke CPEs need to select the Hub CPE that meets the demand for computing resources. In the past, network administrators often used manual selection based on network planning to select appropriate Hub CPEs for new Spoke CPEs, and this manual selection process is very complex, and the error of manual computation under the multi-dimensional arithmetic factor is relatively large, and the resource estimation of Hub CPEs is also prone to errors. To solve this problem, this paper proposes a subscription and collection mechanism for computing resources in SD-WAN networks, and presents a Hub CPE selection method based on multidimensional computing resources. Compared with the traditional manual selection process of Hub CPE selection, the method proposed in this paper has a simpler process and a more robust network, and it can also realize the dynamic elastic balanced access of Spoke CPE, which can better guarantee the network bearing quality of the enterprise services.

ET1016	**Title: A Spectrum Map Prediction Approach Based on Spatial-Temporal Residual Network**
	Authors: Shoushuai He, Lei Zhu, Lu Yu, Kaixin Cheng, Zhen Qin
18:18-18:25	**Presenter:** Shoushuai He, Army Engineering University of PLA, China

Abstract: Spectrum maps, as effective indicators of wireless environments, have been widely used in various applications, including localization and anomaly signal detection. However, it is difficult to maintain the latest spectrum map on a large scale, as it changes rapidly. Previous studies typically relied on long-term measurements at dense sensing nodes, resulting in delayed spectrum maps. This paper focuses on the scenario of constructing spectrum maps and investigates the problem of spatial-temporal data prediction. In this paper, a model based on spatial-temporal residual network is designed, which can effectively extract features from historical spatial-temporal data and predict the current spectrum map. Specifically, it explores the spatial-temporal relationships in historical spectrum maps and constructs real-time ones through deep neural networks. In addition, a recalibration block is designed to clearly quantify the differences in the contribution of spatial correlations. In order to evaluate the performance of the proposed model, extensive experiments are conducted on a simulated dataset. The experimental results indicate that the proposed model has exceeded the baseline models for multiple task settings. In particular, the transferability of the proposed model for different scenarios is also studied. The results indicate that the fine-tuned model can significantly reduce training time and improve prediction accuracy.

ET1035	**Title: Quantum Annealing with Post-processing of Maximum Likelihood for LDPC Decoding**
	Authors: Yuhang Guo, Han Zeng, Feng Xiong, Tian Luan, Zaichen Zhang, Xiaojun Wang
18:25-18:32	**Presenter:** Yuhang Guo, Southeast University, China

Abstract: In the forthcoming 6G era, driven by the escalating demands for enhanced performance and reliability in communication systems, Low-Density Parity-Check (LDPC) codes emerge as a robust error correction coding scheme poised to effectively meet these requirements. In recent years, with the advancement of quantum computing, a proposal has emerged to integrate classical and quantum computing for the decoding of LDPC. The LDPC decoding can be treated as a Quadratic Unconstrained Binary Optimization (QUBO) problem, thereby allowing the utilization of the D-Wave 2000Q quantum annealer for solving it. Expanding on this groundwork, the paper proposes an approach to enhance quantum annealing performance using classical algorithms. Specifically, it involves performing quantum annealing on the problem first, followed by post-processed using Maximum Likelihood Estimation (MLE) for the multiple outputs, known as QAML. Furthermore, to

fully exploit the advantages of quantum annealing, this paper incorporates the energy and frequency of occurrence of candidate codewords as prior information into the Maximum Likelihood Estimation. These are called QAMLE and QAMLF respectively, further enhancing decoding performance. The proposed method is evaluated and compared with direct Quantum Annealing (QA) and Quantum Annealing with post-processing using Minimum Distance (QAMD). Research findings indicate that QAML exhibits a lower bit error rate compared to QA and QAMD.

Session 5: Network and Information Security

Session Time Period: 16:40-18:35 (GMT+8, Beijing Time), Saturday, May 11, 2024
Conference Room: 智慧厅B/Knowledge Room B, 5th Floor
Session Chair: Assoc. Prof. Liangliang Lou, Taizhou University, China

Invited Speech 16:40-17:05	Title: Improving Age of Information (AoI) in Vehicular Edge Computing Based on Multi-Agent Deep Reinforcement Learning With Attention Mechanism **Invited Speaker:** Assoc. Prof. Yan Lin, Nanjing University of Science and Technology, China

Abstract: In the face of increasingly computing-intensive and delay-sensitive vehicular applications, vehicular edge computing (VEC) has emerged as a promising paradigm by deploying computing resources at the edge. This speech introduces the age of information (AoI) challenge in VEC, and presents the vehicular edge offloading problem formulation and solutions by dynamically adjusting the edge offloading ratio and the VEC server selection. Aiming for improving both AoI and computing energy efficiency (CEE), a novel cooperative edge offloading solution based on multi-agent deep reinforcement learning is proposed. To better adapt to the time-varying network topology, the actor-attention-critic framework is employed, where the importance of different levels of attention to other vehicular agents is considered in decision-making for each vehicular agent. The simulation results show that the proposed solution can achieve a more compelling trade-off between AoI and CEE compared to the baseline solutions.

ET1020 17:05-17:20	Title: VAEMax: Open-Set Intrusion Detection based on OpenMax and Variational Autoencoder **Authors:** Zhiyin Qiu, Ding Zhou, Yahui Zhai, Bo Liu, Lei He, Jiuxin Cao **Presenter:** Zhiyin Qiu, Purple Mountain Laboratories, China

Abstract: Promptly discovering unknown network attacks is critical for reducing the risk of major loss imposed on system or equipment. This paper aims to develop an open-set intrusion detection model to classify known attacks as well as inferring unknown ones. To achieve this, we employ OpenMax and variational autoencoder to propose a dual detection model, VAEMax. First, we extract flow payload feature based on one-dimensional convolutional neural network. Then, the OpenMax is used to classify flows, during which some unknown attacks can be detected, while the rest are misclassified into a certain class of known flows. Finally, use VAE to perform secondary detection on each class of flows, and determine whether the flow is an unknown attack based on the reconstruction loss. Experiments performed on dataset CIC-IDS2017 and CSE-CIC-IDS2018 show our approach is better than baseline models and can be effectively applied to realistic network environments.

ET1049 17:20-17:35	Title: Zipf Based Video Segment Distribution Mechanism in D2D Networks **Authors:** Li Wentao, Pan Zhiwen, Liu Nan **Presenter:** Li Wentao, Southeast University, China

Abstract: The proliferation of electronic devices has driven the demand for online office work and video conferencing. However, when multiple users within a certain range request similar or identical video services, it leads to redundant video transmission, consuming a significant amount of network resources and increasing the load on base stations. Device-to-Device (D2D) direct communication technology effectively addresses this issue. In this paper, combined with the Zipf distribution, we segment popular videos and distribute different video segments to different cluster head users based on the level of video attention in D2D networks. Different cluster head users perfect the video segments by sharing them through the D2D network after distribution, and then the cluster head performs unicast or multicast transmission to the cluster members who request services. In this process, the goal is to maximize user Quality of Experience (QoE) with system energy consumption as a

constraint. This paper selects a D2D video distribution mechanism based on a cluster-based segmentation coordination algorithm as a control group. Experimental results show that compared to the control group, our video distribution mechanism improves QoE by 10.5%, increases system throughput by 22%, and reduces total transmission delay by 26.5% while the energy consumption of the system is the same as the control group.

ET1037	Title: Network security risk evaluation and inducement analysis based on Bayesian method
	Authors: Zhe Bu, Shuaichen Ye
17:35-17:50	Presenter: Shuaichen Ye, China Academy of Information and Communications Technology, China

Abstract: With the extension of the cyberspace, network safety issue emerges gradually, especially in scientific and industrial fields. To evaluate the network security status rapidly and precisely, a Bayesian network (BN) with 4 layers and 28 nodes is proposed in this paper. The BN diverges with the network system risk as the child node, and 5 qualitative risk stages of the network are defined. By taking an enterprise-level network system as an example, prior and posterior probabilities of each nodes are determined via long-term observation and expert experience, respectively. A transformation between the qualitative risk evaluation from BN and the quantitative risk value calculation is given. By analyzing influence factors of the system risk status, it is found that disposing rapidity, CPU resource anomaly and malware implantation attack are top three factors causing potential network safety hazard.

ET1071	Title: An Imbalanced Data Processing Method for Intrusion Detection
	Authors: Yichao Xu, Rui Zhao, Wenyue Zhang
17:50-18:05	Presenter: Yichao Xu, Huaqiao University, China

Abstract: In the field of intrusion detection, the high dimensionality, complexity, and imbalance of data bring huge challenges to it. In response to these problems, this paper proposes a resampling algorithm called CInfFS-SPISE. To enhance the diversity of the training features, the algorithm first applies random sparse projection to the original features. Subsequently, the feature space is clustered into predefined subspaces. Within each subspace, features are ranked using the Inf-FS algorithm, which leverages a combination of information theory and cluster size metrics. Redundant features are discarded, and resampling is employed to generate candidate subsets. The diversity between these candidate subsets and the similarity between subsets and the feature space are calculated iteratively to select the optimal subset. Finally, this chosen subset is used to construct a balanced dataset for classifier training. This paper conducts experimental verification on the CICIDS2017 dataset, using G-Mean and FAR as evaluation indicators. The experimental results show that the algorithm proposed in this article performs well, with G-Mean values maintained above 99.62% for different categories and FAR values below 0.7%. It is less affected by data imbalance and delivers both better performance and higher robustness than common methods.

ET1090	Title: Shielding Object Detection: Enhancing Adversarial Defense through Ensemble Methods
	Authors: Ziwen Peng, Xi Chen, Wei Huang, Xianglong Kong, Fan Zhang
18:05-18:20	Presenter: Ziwen Peng, Zhengzhou University, China

Abstract: Deep Learning (DL) techniques have gained significant attention in the field of object detection. However, the susceptibility of DL models to adversarial attacks has raised concerns regarding their applicability in safety-critical domains. While adversarial training can improve the robustness of object detection models, it often comes at the expense of reduced detection performance. In light of this tradeoff, this paper proposes a novel framework aimed at enhancing the adversarial robustness of object detection models through the utilization of ensemble methods. The proposed approach uses a novel diversity training strategy to reduce the attack transferability between submodels in the ensemble. Specifically, it adds penalties to the cosine similarity of input gradients with respect to localization loss and classification loss between submodels. Furthermore, a detection aggregation algorithm is developed to effectively combine the detection results obtained from the

submodels. Extensive experiments are conducted on real-world benchmarks, as well as popular object detection models. The results validate the effectiveness of the approach in countering both adversarial perturbation-based and adversarial patch-based attacks.

ET1081	Title: A Quantum-Classical Codesign Framework for Security Enhanced Quantum Networks
	Author: He Li
18:20-18:35	**Presenter:** He Li, Southeast University, China

Abstract: Secure quantum communication networks with multiple quantum key distribution (QKD) links have witnessed a booming development in the past decade. When the quantum network structure becomes complicated with a large number of users, it is important to investigate security issues, particularly in terms of quantum key distillation and key management, which are required to be performed at trusted nodes within the quantum network. In this work, we propose a novel cross-layer security enhancement framework based on key authentication and graph theory in quantum networks. We first build an efficient and adaptive framework for the integration of quantum key distillation and quantum key management. We then utilize final quantum keys to build a secure authentication between quantum key distribution links and key management parties. We finally evaluate our framework with cross-layer security enhancement techniques, to allow efficient key scheduling and distribution in quantum networks. Our framework can be directly integrated into current metropolitan and free-space quantum network infrastructure, and potentially be a standard classical-quantum co-design method for quantum network architecture explorations.

Session 6 : Massive MIMO Systems and Key Technologies

Session Time Period: 16:40-18:45 (GMT+8, Beijing Time), Saturday, May 11, 2024

Conference Room: 协同厅/Alliance Room, 5th Floor

Session Chair: Assoc. Prof. Tianming Ma, Shanghai University of Engineering Science, China

Invited Speech 16:40-17:05	Title: Cross-System Collaboration Design of Communications, Computing, and Caching in Virtualized
	Invited Speaker: Dr. Huaiyu Tang, China Research Institute of Radiowave Propagation, China

Abstract: With the proliferation of smart devices, the traffic volume has been growing exponentially. In this context, traditional cellular networks fall short of accommodating these explosive service demands with ever-changing requirements. Thus, the future network, such as beyond 5G, 6G, etc., is expected to make great efforts to achieve a convergence of communications, computing, and caching (3C), where intermediate nodes within access networks should be endowed with sufficient storage and computation capabilities. To further support massive simultaneous information exchange, a novel paradigm shift to virtualized multicast also becomes a promising enabler to enhance the network capacity.

Invited Speech 17:05-17:30	Title: Expectation Propagation for Massive MIMO Detection: Algorithms and Implementations
	Invited Speaker: Dr. Xiaosi Tan, Southeast University, China

Abstract: With the escalating demands for high-speed, low-latency, and wide-coverage communications, massive multiple-input multiple-output (MIMO) has emerged as a key technology for B5G and 6G wireless communication systems. However, the MIMO detection problem still poses substantial computational challenges due to the large number of antennas and users involved. Expectation Propagation (EP), a powerful inference technique rooted in Bayesian probability theory, offers an elegant solution for MIMO detection by iteratively refining approximate posterior distributions. This talk will provide a comprehensive overview of EP-based detection algorithms tailored for massive MIMO scenarios, highlighting their theoretical foundations and performance-complexity trade-offs. In addition, various EP-based joint detection and decoding techniques will be covered. Furthermore, we will discuss efficient hardware architectures and implementations of EP-based detectors.

ET1053 17:30-17:45	Title: WSRDualNet: Duality Based Deep Unfolding Network for Downlink MU-MIMO Transciever
	Authors: Rui Dong, Hong Shen, Panjuan Xu, Zhicheng Li, Wei Xu, Chunming Zhao
	Presenter: Rui Dong, Southeast University, China

Abstract: In this work, we consider the deep learning based transceiver design in order to maximize the weighted sum rate of multiuser multiple-input multiple-output (MU-MIMO) systems. Instead of directly using the black-box neural network, we develop an interpretable deep unfolding model WSRDualNet for the downlink transceiver design. The model is constructed by unfolding the iterative algorithm based on the uplink-downlink duality, where we calculate the downlink transceiver according to the theoretically optimal structure in each network layer. In particular, the conjugate gradient (CG) algorithm is incorporated into the network to calculate the high-dimensional matrix inversion involved in the calculation of the transmit precoding with the power allocation vectors being learnable parameters. Simulation results demonstrate that our proposed

unfolding model can even outperform the conventional duality based transceiver design while remarkably reducing the computational complexity.

ET1077	**Title: Active RIS-Assisted Secure Wireless Communication Based on DRL**
	Authors: Kexin Wang, Junxuan Wang, Yanyan Zhang, Fan Jiang
17:45-18:00	**Presenter:** Kexin Wang, Xi'an University of Posts and Telecommunications, China

Abstract: Since the Reconfigurable Intelligent Surface (RIS) can precisely regulate electromagnetic waves, it is widely used in the field of physical layer security to enhance the security of transmission. However, in contrast to active RIS, passive RIS can only attain a limited secrecy benefit due to the "multiplicative fading" effect in the reflecting channel link between the transmitter and receiver. In this paper, a secure communication scheme is proposed for active RIS-assisted wireless networks. The problem is formulated by jointly optimizing the phase shift of the active RIS and the transmission beamforming vectors of the base station (BS). Given the complexity of the problem, the optimization of secure beamforming is cast as a deep reinforcement learning (DRL) problem and the optimal solution is sought using the Deep Deterministic Policy Gradient (DDPG) algorithm. The simulation results indicate that the active RIS demonstrates a substantial enhancement in the system's secrecy rate (SR) and alleviates the impact of the "multiplicative fading" phenomenon.

ET1078	**Title: Maximum Likelihood Detection Based on Warm-start Quantum Optimization Algorithm**
	Authors: Xinlin He, Han Zeng, Xutao Yu
18:00-18:15	**Presenter:** Xinlin He, Southeast University, China

Abstract: Quantum computing, with its powerful parallel computing capabilities, is considered one of the promising candidates for solving complex communication problems. This paper proposes a new detection scheme by combining quantum approximation optimization algorithms (QAOA) with maximum likelihood (ML) detection. The scheme addresses the computational complexity problem faced by ML detection in large-scale multiple-input multiple-output (MIMO) channels. The primary focus lies in the warm-start optimization based on the QAOA-ML detection. We use semi-definite relaxation (SDR) to calculate the temporary solution of ML for initializing quantum circuits. The feasibility of the scheme is verified through simulation. The proposed detection scheme is evaluated and compared with classical computer-based ML detection and Minimum Mean Square Error (MMSE) detection, demonstrating similar bit error rate (BER) performance. The enormous potential of quantum algorithms in computing power solving the drawbacks of traditional ML detection algorithms provides new possibilities for improving detection efficiency.

ET1043	**Title: A Novel Design Method of Redundancy Ring for High Throughput Satellite**
	Authors: Chen Wang, Ming Jiang, Nan Qi, Guang Zhao
18:15-18:30	**Presenter:** Chen Wang, Institute of Telecommunication and Navigation Satellites, China

Abstract: High throughput satellites have some gateway stations to manage beams. In traditional high throughput satellite forward link and backward link, there are both two-cascade redundancy rings using microwave switches to switch gateway stations and on-board equipments separately. This traditional method will use many switches and have high input and output insertion loss, so, the output power will decline and noise figure is a bit high. In this paper, we propose a novel design method for switch redundancy ring which can overcome the defects. This method which has been applied in some Ka band high throughput satellite can enhance forward link G/T by 0.72dB and backward link EIRP by 0.55dB, can also enhance forward link throughput by 4.27%. It can also promote satellite competitive.

ET1075	**Title: Block-Diagonal Belief-Propagation Detection for Cell-Free Massive MIMO Systems**
18:30-18:45	**Authors:** Bohan Yang, Wenyue Zhou, Zeqiong Tan, Xiaosi Tan, Yongming Huang, Chuan Zhang
	Presenter: Bohan Yang, Southeast University/ Purple Mountain Laboratories, China

Abstract: Cell-Free Massive MIMO (CF-mMIMO) is a promising technology owing to its high user spectrum efficiency. However, CF-mMIMO faces the challenges of baseband signal processing, especially for uplink data detection. In this paper, Gaussian interference of approximation (GAI) Belief Propagation (BP) detection is utilized for CF-mMIMO systems to achieve near-optimal performance. Based on the natural feature of the block-diagonal (BD) channel matrix, a reduced-complexity GAI-BP, which is named BD-GAI-BP, is proposed to save the computational complexity while maintaining the performance merits. Numerical results show that compared with the state-ofthe-art data detection algorithm, the GAI-BP detection supports 28.93% more UEs with BER = 10^{-3}. The proposed BD-GAI-BP saves 10.94% computational costs while achieving comparable performance with the GAI-BP.

Session 7: Intelligent Algorithms and Calculations Based on Data

Session Time Period: 16:40-18:20 (GMT+8, Beijing Time), Saturday, May 11, 2024

Conference Room: 独特厅/Unique Room, 5th Floor

Session Chair: Prof. Wanyang Dai, Nanjing University, China

Invited Speech 16:40-17:05	**Title: Gendered Patterns in Engineering IdGendered Patterns in Engineering Identities, Participation, and Persistence in Engineering Fieldsentities, Participation, and Persistence in Engineering Fields** **Authors:** Ravinder Koul, Yuwarat Srisupawong **Invited Speaker:** Prof. Ravinder Koul, Department of Curriculum and Instruction Penn State University, University Park, USA

Abstract: English-medium instruction (EMI) is a prominent trend in engineering programs at institutions of higher education in countries, such as China, where English is not the first language (L1) for most of the population. A student's willingness to communicate in English as a second language (L2) is a significant challenge in EMI settings. Willingness to Communicate (WTC) in English is defined as "a readiness to enter into discourse at a particular time with a specific person or persons, using a L2" (MacIntyre, Dörnyei, Clément, & Noels, 1998). Past research has shown that students with a higher willingness to communicate in English are more likely to be academically engaged which leads to their greater academic success in content-area classrooms (Ducker, 2022; Gu & Sun, 2021). This paper reviews research on individual and contextual factors associated with student willingness to communicate in English and then reports preliminary findings from a mixed-methods investigation on the associations between personal and classroom contextual factors and student willingness to engage in EMI. Data was collected from 600 undergraduate students enrolled in EMI engineering programs at a public institution of higher education in China. Structural equation modeling was used to test a hypothesized model for the influence of personal factors (demographic variables and L2 motivation selves) and contextual factors (measures of classroom learning environment) on Willingness to Communicate in English. Findings from this study contribute to understanding the motivational influence of individual factors and learning situation in EMI classrooms. The paper concludes with a discussion of pedagogical implications for EMI instruction in engineering education.

ET1018 17:05-17:20	**Title: Energy Consumption Minimization for a Data Compression Based NOMA-MEC System** **Authors:** WeiZheng Tu, Xuan Liu **Presenter:** Xuan Liu, Xi'an University of Posts & Commmunications, China

Abstract: In this paper, we study the energy consumption minimization problem in a data compression based non-orthogonal multiple access-mobile edge computing (NOMA-MEC) system. Considering the partial compression and offloading schemes, we formulate a non-convex system energy consumption minimization optimization problem by jointly optimizing the users' data compression and offloading time, transmit power, as well as task compression and offloading ratios. Then we derive the closedform expression of the optimal transmit power for each user and propose a successive convex approximation (SCA) based iterative algorithm to solve the optimization problem. Computer results verify the advantages of the proposed scheme via computer simulations and show that compared with other benchmark schemes, the proposed scheme can effectively reduce the system energy consumption.

ET1005 17:20-17:35	**Title: A comprehensive Survey of Datasets for Large language model evaluation** **Authors:** Yuting Lu, Chao Sun, Yuchao Yan, Hegong Zhu, Dongdong Song, Qing Peng, Li Yu, Xiaozheng Wang, Jian Jiang, Xiaolong Ye **Presenter:** Hegong Zhu, China Mobile(Zhejiang) Research & Innovation Institute, China

Abstract: Natural Language Processing is an important branch of Artificial Intelligence. In the past few years, we have witnessed the remarkable advancement of large language models, however, how to evaluate them in a comprehensive way has become an urgent problem to be solved. Datasets can help evaluate and compare their performance and clarify their weaknesses. In order to guide the subsequent research work and promote the technological progress in the field, this paper collects 147 popular evaluation datasets, and proposes a new classification method to categorize them into six categories according to the evaluation capabilities. In addition, we organize several common evaluation metrics and usage scenarios. We compile the list of datasets and the main features (introduction, samples, metrics, links, etc.) into a document, which is consistently maintain available online at: https://github.com/lyt719/LLM-evaluation-datasets.

ET1022 17:35-17:50	**Title: Batched SVD on CPU-GPU based on integer programming** **Authors:** Jialin Huang, Shufeng He, Chunqi Tian, Yanjun Xu **Presenter:** Jialin Huang, Tongji University, China

Abstract: Singular value decomposition (SVD) is a commonly employed matrix factorization. In real-world applications, the data requiring SVD is usually batched in small matrices within a size not greater than 1024 times 1024. However, the professional high performance libraries on CPU like MKL do not provide any interfaces for batched SVD while the libraries on GPU such as Nvidia cuSOLVER do not provide ones within matrices greater than 32 times 32. Although several studies aim to address this problem, they only focus on GPU's computing power but ignore CPUs'. In this paper, we improve the batched SVD from the novel perspective of heterogeneous computing within matrices greater than 32 times 32 but not greater than 1024 times 1024. We propose a methodology based on statistics and integer programming to partition data between CPU and GPU. The evaluation demonstrates that compared to cuSOLVER, our proposed methodology can achieve a speedup of 1.4x - 1.9x.

ET1057 17:50-18:05	**Title: Quantifying Bias in Agentic Large Language Models: A Benchmarking Approach** **Authors:** Riya Fernando, Isabel Norton, Pranay Dogra, Rohit Sarnaik, Hasan Wazir, Zitang Ren, Niveta Sree Gunda, Anushka Mukhopadhyay, Michael Lutz **Presenter:** Zitang Ren, SJI International, Singapore

Abstract: The rapid adoption of large language models (LLMs) as agents raises concerns about potential biases in their decision-making processes. While previous work has explored bias mitigation in open text generation, the analysis of bias in LLM-based agents with constrained choices is under-explored. This paper introduces a new benchmark for evaluating bias in such agents, utilizing a question-answering framework across simulated real-life scenarios in healthcare, criminal justice, and business. We analyze potential biases related to race, gender, age, political affiliation, and socioeconomic status. Our novel question-answering bias distribution diversity metric quantifies the LLM's decision-making tendencies.   We find that pre-trained models exhibit varying degrees of bias across domains and categories, offering insights for future bias mitigation strategies.

ET1080	**Title: Study on the Correlation between As-Cast Surface Roughness and Pore Size Using Trained Semantic Segmentation Model**
18:05-18:20	**Authors:** Fangtian Den, Xingyu Rui, Shuang Lu, Zhang Liu
	Presenter: Fangtian Deng, Fraunhofer IGCV, Germany

Abstract: As-cast surface roughness is a crucial quality indicator for cast parts, representing not only the surface quality of the product but also serving as an important marker for analyzing the internal microstructure of the casting. Consequently, an inline measurement method for as-cast surfaces is essential. However, traditional methods such as visual inspection and stylus profilometry face challenges in automation, while advanced laboratory methods like Laser Scanning Confocal Microscopy (LSCM) and computer vision systems with optical images encounter limitations in measurement speed or accuracy. In response to these challenges, we propose a training strategy based on observations: the pores in the web-like topography of the as-cast surface tend to enlarge as the surface roughness increases. To leverage this observation, we selected and trained two segmentation models, Unet and DeepLabv3+, to identify pores on the as-cast topography images and to calculate their sizes, thereby predicting the corresponding as-cast surface roughness. Our modified Unet model demonstrated superior performance in pore segmentation, enabling us to calculate pore area and diameter accurately. A high Pearson correlation coefficient of 0.956 between the average pore diameter and the values of as-cast surface roughness S_a, arithmetical mean height, confirmed our hypothesis. This segmentation technique not only predicts the as-cast surface roughness but also holds potential for identifying other casting surface defects, such as cold shut and porosity.

Session 8: AI Based Intelligent System Design and Information Management

Session Time Period: 09:30-11:55 (GMT+8, Beijing Time), Sunday, May 12, 2024
Zoom link: https://us02web.zoom.us/j/81073456804   Password: 51012
Session Chair: Prof. Yan Yang, Beijing Jiaotong University, China

Invited Speech 09:30-09:55	**Title: Causal Inference, Machine Learning and Deep Learning** **Invited Speaker:** Dr. Abhimanyu Mukerji, Amazon, USA

Abstract: This talk will provide an overview of the problem of causal inference in the technology industry and current approaches to address it. We will discuss the applications of machine learning and deep learning to this problem space, with inspiration from our own work. We will also touch upon the challenges involved in validating solutions and some tests that can be performed to build confidence in causal results.

ET1061 09:55-10:10	**Title: Scheduling Services Orchestration Architecture and Algorithm for Computing Power Networks** **Authors:** Dongjian Gao, Peixi Liao **Presenter:** Dongjian Gao, Beijing Jiaotong University, China

Abstract: In this paper, we investigate the problem of scheduling services orchestration problem for Computing Power Networks (CPN) with different quality of service (QoS) requirements, in which multiple scheduling services compete or cooperate to process computing tasks to accomplish the same goal. A scheduling services orchestration architecture is proposed to solve the problems of model lifecycle management, scheduling services resource collaboration and scheduling. The proposed solution includes a cloud-edge architecture, which comprises cloud-side training models, cloud-side collaborative deployment, and edge-side inference, along with centralized Scheduling service perception and resource synchronization. Additionally, it incorporates Scheduling service mapping for dynamically orchestrate scheduling service resources. In order to obtain the best scheduling services orchestration strategy to adapt to the diversity of scheduling service optimization goals and resource allocation goals, we formulate an scheduling services orchestration problem to Minimize load balancing of computing and communication resources on the basis of maximizing the number of scheduled computing tasks. We propose a deep reinforcement learning (DRL) based scheduling services orchestration (DRL-SSO) algorithm. This algorithm allocates scheduling service combinations, along with corresponding computing and communication resources, to computing tasks. Experimental results show that the algorithm converges quickly and effectively reduces resource load balancing while maximizing the number of scheduled computing tasks compared with the baseline.

ET1083 10:10-10:25	**Title: Cichla Oasis: Smart Solutions for Monster Fish Enthusiasts with IntelliTank Technology** **Authors:** William P. Rey, Kieth Wilhelm Jan D. Rey **Presenter:** WILLIAM P. REY, Mapua University, Philippines

Abstract: Aquarium keeping has undergone a transformative evolution with the intersection of technology and the timeless fascination for aquatic life. This study delves into the development, functionality, and applications of the Cichla Oasis IntelliTank, a pioneering smart aquarium system designed explicitly for Peacock Bass enthusiasts. Focusing on the intricate needs of Cichla Monster Fish, the system integrates Internet of Things (IoT) technology, offering aquarists unparalleled

control over critical parameters, real-time monitoring, and anomaly detection through machine learning algorithms like the Isolation Forest. The study employs a comprehensive user evaluation, utilizing the PSSUQ, affirming the Cichla Oasis's high acceptability, usability, and overall positive user experience. The findings underscore the system's effectiveness in meeting the demands of aquarists while contributing to the evolving landscape of intelligent aquarium management systems. The Cichla Oasis signifies a paradigm shift in the synergy between technology and aquatic stewardship, enriching the world of ornamental fishkeeping and fostering a future where innovation enhances our understanding and care of diverse aquatic ecosystems.

ET1070	**Title: Gemini-the most powerful LLM: Myth or Truth**
10:25-10:40	**Authors:** Raisa Islam, Imtiaz Ahmed
	Presenter: Raisa Islam, New Mexico Institute of Mining and Technology, USA

Abstract: Gemini models excel in various tasks including image generation and interpretation, video understanding, and solving mathematical problems, among others. The Vertex AI Gemini API and Google AI Gemini API both enable developers to integrate Gemini model functionalities into their applications. This paper offers a concise summary of the Gemini Framework, focusing on its distinctive modalities that distinguish it from current systems. In our research, we explored the details of its architecture, pointing out the innovative strategies employed to improve generative AI capabilities. Furthermore, we conduct a comparative study, assessing Gemini's performance against other top generative AI models.

ET1064	**Title: MulmQA: Multimodal Question Answering for Database Alarm**
10:40-10:55	**Authors:** Dequan Gao, Jiwei Li, Bao Feng, Zhijie Ren, Xuewei Ding, Linfeng Zhang
	Presenter: Zhijie Ren, Nanjing University of Information Science and Technology, China

Abstract: In response to the dramatic increase in data volume and diversification of data types, traditional question answering systems face significant challenges in understanding and processing complex data sources. This challenge becomes particularly acute when addressing urgent database alarms, where providing a rapid and accurate solution is crucial. To address this, we introduce MulmOA-anovel integrated model designed to effectively combine multimodal knowledge graphs with database alarm question-answering systems, MulmQA incorporates a variety of modal data, including text and images, into a unified knowledge graph. We employ cutting-edge techniques to process image and text data and have developed a specialized fusion algorithm to enhance contextual understanding and the accuracy of answers. Our framework provides a 3-4% improvement in BLUE and PPL performance metrics compared to SOAT approaches.

ET1072	**Title: Enhancing Brain Tumor Diagnosis: A Comparative Review of Systems With and Without eXplainable AI**
10:55-11:10	**Authors:** Janidu Chathumina, Krishnakripa Jayakumar
	Presenter: Janidu Chathumina, Informatics Institute of Technology, Sri Lanka

Abstract: Deep Learning (DL) and computer vision may be used to distinguish between various anatomical features in the human body. As technology has developed, several DL methods have been used to diagnose brain tumors and have shown promise in terms of early diagnosis. Nevertheless, due to their lack of explainability and state-of-the-art (SOTA) accuracy, a smooth integration of these technologies into clinical workflows raises issues. Existing literature reveals that certain studies have obtained SOTA performance by experimenting with cutting-edge technologies and where the model exhibits a black-box nature, several eXplainable Artificial Intelligence (XAI) techniques have been used to resolve their explainability issues.

This review paper will include an overview of brain tumors, a review of the recent research publications that involve XAI, and which do not, along with the techniques used and their performances. A comparative analysis will be presented to gather ideas on the strengths and weaknesses while narrowing down the limitations to discover research gaps which need to be addressed. Finally, key findings from the review which will be followed by concluding remarks and a possible future scope will be included at the end.

ET1082	**Title: Intuitionistic Fuzzy Method for Criteria Weights in MCGDM Based on Degree of Consensus**
11:10-11:25	**Authors:** Chao Huang, Xiaoyue Wu
	Presenter: Chao Huang, National University of Defense Technology, China

Abstract: In multi-criteria group decision-making (MCGDM), to determine the importance of criteria, multiple experts are needed to assess the importance of multiple criteria. However, due to the limitations of the experts' expertise and knowledge, experts cannot provide accurate judgment information and may give hesitant judgments. Meanwhile, the fact that consensus has been reached does not mean that the group has achieved absolute consistency, which means that there is still some disagreement among experts. The consensus level reflects not only the similarity of experts' assessments on the overall decision but also the consistency of experts' assessments on each criterion. Existing studies commonly use the consensus degree to measure the quality of experts' assessments, but fewer studies have focused on the quality of assessments for criteria. To address the problem of determining criteria weights containing hesitant judgments, this paper proposes an intuitionistic fuzzy method for determining criteria weights in MCGDM based on triangular intuitionistic fuzzy numbers (TIFNs) and consensus degrees. Finally, an example is used to demonstrate the effectiveness and applicability of the proposed method. A comparison with the current weighting methods demonstrates the advantages of the proposed approach.

ET1069	**Title: An Experiment on Feature Selection using Logistic Regression**
11:25-11:40	**Authors:** Raisa Islam, Subhasish Mazumdar, Rakibul Islam
	Presenter: Raisa Islam, New Mexico Institute of Mining and Technology, USA

Abstract: This study investigates feature selection using L1 and L2 regularization methods associated with logistic regression (LR) by leveraging its coefficient-based feature ranking. This research aims to optimize the feature set, enhancing model explainability and performance. The CIC-IDS2018 dataset was selected for the experiment, partially due to its huge volume and the inclusion of problematic classes. The research undertakes a detailed analysis, initially excluding one of the problematic classes and subsequently including both. Feature ranking was performed first with L1 followed by L2 regularization; and thereafter comparing performance of LR with L1 (LR+L1) against LR with L2 (LR+L2) by varying the feature set sizes for each ranking. Through comparative analysis, the outcome reveals no significant discrepancy in accuracy upon finalizing the feature set. Adopting a synthesis approach, the research selects features common to both L1 and L2-derived sets, and this optimized set was tested on more complex models such as Decision Tree and Random Forest. Results indicate a marginal mean accuracy reduction, by 0.8% and 0.6% respectively, while significantly reducing the feature set by 72%, regardless of the incorporation of the problematic class. Additionally, the confusion matrix is reported to facilitate the calculation of standard metrics: accuracy, precision, recall, and F1-score.

ET1040	**Title: Design of the Capacity Evaluation System for Satellite Mobile Communications**
	Authors: Entong Meng, Song Jin, Xinyu Gao
11:40-11:55	**Presenter:** Entong Meng, China Academy of Space Technology, China

Abstract: As the popularization of satellite mobile communications, the user capacity evaluation of mobile satellites has become a widely concerned issue in academia and industry. In this article, we propose a model-based capacity evaluation system for mobile communication satellite systems. Specifically, we adopt lightweight modeling approach for the design of entity and function models, which significantly improves the efficiency of model development and operation. Besides, we also integrate the functionality of scene editing into digital simulation platform, by which various service scenes can be constructed and the user capacity in different scenarios can be calculated conveniently. To verify the effectiveness of the proposed system, we conduct simulations based on the Tiantong satellite communication system. The real-time calculation results of the resource consumption are presented by the dynamic monitoring interfaces, and the statistical results of the user capacity are also shown via the analysis interfaces.

Session 9: Wireless Communication and Data Transmission

Session Time Period: 13:30-15:50 (GMT+8, Beijing Time), Sunday, May 12, 2024
Zoom link: https://us02web.zoom.us/j/81073456804   Password: 51012
Session Chair: Assoc. Prof. Jie Zhang, Xi'an Jiaotong-Liverpool University, China

Invited Speech	Title: Advanced Architectures of Next Generation Wireless Networks
	Invited Speaker: Prof. Pascal Lorenz, University of Haute-Alsace, France
13:30-13:55	

Abstract: Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services. New standards and new communication architectures allowing guaranteed QoS services are now developed. We will cover the issues of QoS provisioning in heterogeneous networks, Internet access over 5G networks and discusses most emerging technologies in the area of networks and telecommunications such as IoT, SDN, Edge Computing and MEC networking. We will also present routing, security, baseline architectures of the inter-networking protocols and end-to-end traffic management issues.

Invited Speech	Title: Laser Diode-Based high speed optical wireless communication and high CRI Solid State Lighting
	Invited Speaker: Dr. Amjad Ali Amjad, Donghai Laboratory/Zhejiang University, China
13:55-14:20	

Abstract: Gallium nitride (GaN) phosphor-converted white light-emitting diodes (Pc-WLEDs) are emerging as an indispensable solid-state lighting (SSL) source for next-generation display systems and the lighting industry. Together with the function of lighting, visible light communication (VLC) using Pc-WLEDs has gained increasing attention to fulfill the growing demand for wireless data communication. Over the past few years, white-light-emitting diodes have been used for both high-speed visible light communication and solid-state lighting simultaneously. Practically, the low modulation response and low emitting intensity of light-emitting diodes (LED) are the drawbacks to the development of ultrahigh-speed VLC and a high-quality SSL system. Blue GaN laser diode (LD) and color convertor quantum dots-based white light can simultaneously be used for both high-speed VLC and SSL.

ET1051	Title: Radio number of complete bipartite graphs and even cycles
	Authors: Linlin Cui, Feng Li
14:20-14:35	Presenter: Linlin Cui, Qinghai Normal University, China

Abstract: With the continuous progress of wireless communication network technology, more and more users have formed a strong dependence on it, and also put forward higher requirements for the quality of network signal transmission. In wireless communication network, the channel plays a very important role. However, due to the limited channel resources in the communication network, the interference between channels is intensified, and the channel resources are not fully utilized. Therefore, it is very important to seek a reasonable and effective channel assignment strategy. In this paper, we study the network constructed by Cartesian product, and focus on the optimal channel allocation strategy for two sets of stations and even cycle networks under Cartesian product condition.

ET1038	**Title: A Channel Difference-based PUEA Defense Method for Cooperative Cognitive Wireless Networks**
14:35-14:50	**Authors:** Bingchao Song, Hao Lu, Selamu Wolde Sebicho, Xiaoxue Feng, Wenlong Zheng
	Presenter: Bingchao Song, Hohai University, China

Abstract: In cognitive wireless networks, secondary users gain access to the spectrum by identifying and occupying primary users' frequency resources. However, Primary User Emulation Attack (PUEA) has become a common method of attack in cognitive wireless networks. In a PUEA, malicious users try to deceive secondary users by mimicking the signals of primary users, thereby preventing them from utilizing idle frequency resources. In this paper, we propose a channel difference-based energy detection method to defend against PUEA, which takes into account the distance differences between the primary user, attacker, and secondary user. In the proposed scheme, the fusion center does not discriminate directly based on the received signal power, but rather based on the difference between the signal power received by each user and the average of all received signal powers. Closed-form expressions for the detection probability and false alarm probability of the proposed scheme are derived, and we analyze the impact of the minimum distance between the simulated primary user attacker and the secondary user, as well as the number of cooperative users, on the detection performance. Numerical results demonstrated the effectiveness of the proposed scheme in defending against PUEA.

ET1009	**Title: Direct Localization of Strong and Weak Sources with a Moving Array**
14:50-15:05	**Authors:** WangHao Tang, Jianfeng Li, ZhongKang Cao, MingYi You, WeiMing Deng, Si Mao
	Presenter: Wanghao Tang, Nanjing University of Aeronautics and Astronautics, China

Abstract: In the context of complex electromagnetic environments, the accurate localization of weak radiation sources is susceptible to interference or obscuration caused by powerful signals. To address this issue, this study explores a direct localization algorithm which is capable of simultaneously determining the positions of multiple strong and weak sources with a moving antenna array. By leveraging the property of noise subspace invariance, spatial spectrum are derived from the outputs obtained at different positions of the array and these spatial spectrum are subsequently merged. This moving array-based algorithm avoids the data association problem in traditional two-step localization and reduces the impact of strong signals on the estimation of weak signals. In the simulation experiments, our method is compared with traditional direct localization and other algorithms for strong and weak signal localization. The results demonstrate that the proposed method surpasses the performance of alternative approaches, particularly in scenarios characterized by a substantial power disparity between strong and weak signals.

ET1042	**Title: Non-Coherent Fusion Detection Method for Distributed MIMO Radar Based on Modified Principal Component Analysis**
15:05-15:20	**Authors:** Yong Huang, Tianci Qin, Hao Ding, Hengli Yu, Guoqing Wang
	Presenter: Tianci Qin, Yantai University, China

Abstract: A distributed multiple input multiple output (MIMO) radar non-coherent fusion T_{MPCA} detector based on modified principal component analysis (MPCA) is proposed. Firstly, for each resolution cell grid in the unified "range-azimuth-pitch" three-dimensional observation space, the data of the cells to be detected in each observation channel of the corresponding distributed radar and its reference cell data are extracted. Then, according to the false alarm probability of detection threshold, the method of iterative optimization combined with Monte-Carlo simulation is used to solve the detection threshold required for the detection of global statistics formed after the non-coherent fusion of different numbers of effective local statistics. Finally, using the detection thresholds obtained above, the detection of the entire observation space is completed by traversing all the resolved cell grids. Compared with non-adaptive filtering methods such as direct incoherent summation, taking the maximum value, and taking the sum of the first few larger values, the T_{MPCA} detector solves the problem of solving the second

threshold corresponding to the sum of different effective local statistics through a combination of iterative optimization and Monte-Carlo simulation. The practicality of the proposed detector has been demonstrated through the analysis of fusion detection performance under multiple local statistics at 2, 3, and 4 stations.

ET1004	**Title: Fairness-Constrained Throughput Optimization for Coexistence of WiFi and Duty-Cycle 5G NR in the Unlicensed Spectrum**
15:20-15:35	**Authors:** Yuwei Li, Yayu Gao **Presenter:** Yuwei Li, Huazhong University of Science and Technology, China

Abstract: In this paper, we consider a WiFi and Duty-Cycle-based 5G NR-U coexisted network in the unlicensed spectrum, and study how to maximize the total network effective throughput under two widely-adopted notions of fairness, throughput fairness and 3GPP fairness, by adaptively tuning the system parameters. By properly characterizing the inter-network collisions between WiFi and 5G NR-U, explicit expressions of the maximum network effective throughput, the corresponding optimal duty-cycle ratio of 5G NR-U network and the optimal initial backoff window size of WiFi nodes are obtained, and verified by simulation results. Comparison between the performance limits with two fairness constraints shows that a higher maximum network throughput can be achieved under 3GPP fairness when the ratio of the number of WiFi nodes and the number of 5G NR-U nodes does not exceed a certain threshold. The analysis shows that DC-based 5G NR-U network can fairly coexist with WiFi while maximizing the throughput performance of the coexisting network through meticulous system parameter tuning, which sheds crucial insights for practical network design for unlicensed spectrum sharing.

ET1091	**Title: A Novel Geometric Cluster-Based Propagation-Graph Channel Model for Vehicle-to-Infrastructure Communications**
15:35-15:50	**Authors:** Jiachi Zhang, Liu Liu, Lu Li **Presenter:** Jiachi Zhang, Shandong Police College, China

Abstract: A systematic vehicular network is the cornerstone of the future intelligent transportation system. In this paper, we propose a novel propagation-graph channel model based on geometric clusters. First, we propose the cluster-based propagation-graph channel model, which uses some geometric clusters to represent the surrounding environment. Then, a novel hard-core Poisson cluster process (PCP) is used to initialize and generate geometric clusters located within the maximal radio coverage. Regarding the cluster evolution, the cluster generation and recombination processes are influenced by transceivers' velocities and distance-related link probability. Finally, the time-varying non-stationary vehicle-to-infrastructure (V2I) channel impulse response (CIR) is obtained. Based on the proposal, we emulate the V2I scenarios and investigate the cluster evolution, power delay profile (PDP), and Doppler power spectral density (DPSD), respectively. Relevant results reveal that our proposal can capture the channel non-stationarity of V2I channels, providing insights into the development of vehicular communications.

Session 10: Modern Teaching Models and Innovative Mechanisms

Session Time Period: 16:05-17:45 (GMT+8, Beijing Time), Sunday, May 12, 2024
Zoom link: https://us02web.zoom.us/j/81073456804   Password: 51012
Session Chair: Prof. Kelum A.A. Gamage, University of Glasgow, UK

Invited Speech	Title: Transnational Education Sector: Emerging Opportunities, Challenges and Trends
16:05-16:30	**Invited Speaker:** Prof. Kelum A.A. Gamage, University of Glasgow, UK

Abstract: Demand for transnational education programmes has remained relatively steady over the years, but with the current pandemic circumstances, significant changes in student numbers can be seen in the transnational education sector. This paper explores the past, present and future direction of the transnational education sector and investigates and identifies the impacts of the pandemic on the transnational education sector. We identify the challenges of a post-pandemic era, which has resulted in long-term changes to the global higher education landscape. Transnational Education engagement can benefit students, overseas partners, and UK universities, and it is critical to investigate trends and challenges to ensure that transnational academic program partners can adapt to the environment and reap the benefits. It highlights students pursuing a transnational education programme as a more sustainable approach to obtaining an international degree compared to leaving their home country for a period of higher education abroad.

ET1089	Title: Pricing Game of Flight Ticket Using Reinforcement Learning
16:30-16:45	**Authors:** Chenglong Cao, Xiaoling Zhu
	Presenter: Chenglong Cao, Anhui Finance and Trade Vocational College, China

Abstract: Flight ticket pricing not only significantly impacts airlines' operations but also plays a crucial role in consumer welfare and the sustainable development of the air transportation industry. The pricing of tickets has consistently been a focus of research for scholars and experts in the aviation industry. However, existing works often lack the research on integrating multiple factors into decision-making across continuous decision points. To address this gap, we propose a new game approach involving multiple intelligent agents across consecutive states to simulate the sequential game process of parallel flights using reinforcement learning theory. The action space represents the price space, action selection corresponds to price decisions, and the state space represents the set of decision points. Ultimately, the optimal action sequence output by the intelligent agents represents equilibrium solution of sequential game. Particularly, maximizing enterprise profits is the core objective at each decision point, while considering multiple factors such as market demand, enterprise supply and passenger buying preferences. Simulation experiments illustrate action sequences converge rapidly to stable points. By analyzing the convexity of the utility function, we demonstrate the existence of Nash equilibrium points. Our findings show that total revenue increases with higher passenger preferences, decreases with greater demand sensitivity, and increases with higher supply sensitivity. Therefore, this study offers novel insights into dynamic ticket pricing across the entire sales range and presents the solution for sequential game.

ET3008 16:45-17:00	**Title: Research on the reform of school-enterprise cooperative teaching and education mode for computer majors** **Authors:** Shi Cheng, Zhiqiang Chen, Jing Wang **Presenter:** Shi Cheng, Nantong University, China

Abstract: This article aims to explore the reform of cooperative education and talent development models between universities and enterprises in the field of computer science, to meet current industry demands and students' developmental needs. An analysis of the current situation reveals some issues in these cooperative models that require reform. Therefore, this paper proposes a series of reform suggestions, including strengthening university-enterprise cooperation, innovating in teaching and talent development models, transforming the roles of teachers and students, and improving the evaluation mechanism. These suggestions are intended to enhance the comprehensive quality and practical skills of students in computer science, promote the integration of industry and education, and drive the continuous development of computer science education. The measures discussed can provide references for relevant educational institutions and enterprises to promote ongoing innovation and improvement in the cooperative education and talent development models in computer science.

ET3054 17:00-17:15	**Title: Enhancing DriveCare: A Holistic Examination of Usability and User Experience in Automotive Assistance Applications in the Philippines** **Authors:** William P. Rey, Kieth Wilhelm Jan D. Rey **Presenter:** WILLIAM P. REY, Mapua University, Philippines

Abstract: This study presents a comprehensive evaluation of DriveCare, an automotive assistance application, focusing on its usability and user experience. Employing a mixed-methods approach, the study integrates quantitative assessment using the System Usability Scale (SUS) with qualitative analysis based on the PACMAD usability model and the User Experience Questionnaire (UEQ). Fifty participants engaged with the DriveCare system, providing feedback on its effectiveness, efficiency, satisfaction, learnability, memorability, errors, and cognitive load. The findings reveal that DriveCare exhibits commendable usability and user experience attributes, scoring an average SUS score of 86.8 and receiving high ratings across PACMAD dimensions. However, areas for improvement are identified, including memorability, error handling, and certain aspects of sttractiveness and stimulation. The study underscores the importance of continuous enhancement efforts to address these areas and enhance DriveCare's competitiveness and user engagement. The implications of the findings for DriveCare's market positioning, along with recommendations for enhancements and future research directions, are discussed. Overall, the study provides valuable insights into DriveCare's performance and opportunities for refinement, contributing to the advancement of automotive assistance applications and user-centric design practices.

ET3055 17:15-17:30	**Title: Redefining Learning: Virtual Lab Integration in Network Management (VLI-NM) E-Learning Modules** **Authors:** William P. Rey **Presenter:** WILLIAM P. REY, Mapua University, Philippines

Abstract: In response to the evolving landscape of education, this study explores the development and evaluation of an E-Learning Module for the Network Management Laboratory (VLI-NM) at Mapua University's School of Information Technology. Employing the ADDIE Model, the module integrates a Virtual Lab Environment to provide immersive, hands-on experiences aligned with network management education. The study aims to delineate the stages of development, conceptualize and execute the Virtual Lab Environment, and assess its perceived acceptability by teachers and students. The research draws on instructional design theories, including the Heutagogical Approach, to create a student-centric learning environment. Evaluation results indicate high levels of system usefulness and information quality, with moderate ratings for interface quality. These findings underscore the importance of leveraging technology-enhanced learning tools to enhance the

learning experience in network management education. Continuous refinement and iteration are essential to ensure the module remains relevant and effective in preparing students for success in the information technology field.

ET3058 17:30-17:45	**Title: The University-industry Collaborative Training Strategy in "digital medical image processing" Course** **Authors:** WU Hui-Qun, JI Da-Feng, GENG Xing-Yun, LI Zhao-Tong, Ni Xue-Jun, LV Guang-Ming **Presenter:** Huiqun Wu, Nantong University, China

Abstract: The curriculum system of intelligent medical engineering (IME) students covers various aspects such as medicine, engineering, and information technology. Among them, the course of "digital medical image processing" is of great significance for cultivating the skills of medical image data processing required by the profession. In the context of "University-industry collaboration", it is of great significance to establish an education system that can effectively integrate the resources of the intelligent medical industry, education, and society, and cultivate talents that meet the needs of the intelligent medical industry. This article explores the reform ideas of this course and aims to integrate hospitals, universities, and enterprises to form a university-industry collaborative education model, with the goal of cultivating students to acquire comprehensive knowledge and skills and to apply their knowledge to solve practical problems. In short, this system aims to provide reference for the talent cultivation of IME professionals by promoting cooperation and communication between hospitals, universities, and enterprises.

Purple Mountain Laboratories Visit on May 10, 2024

Please gather at Holiday Inn Nanjing Qinhuai South Lobby at 14:00 on May 10, 2024

Purple Mountain Laboratories

NO.9 Mozhou East Road, Jiangning District, Nanjing, JS, 211111, China

地址：南京市江宁区秣周东路 9 号

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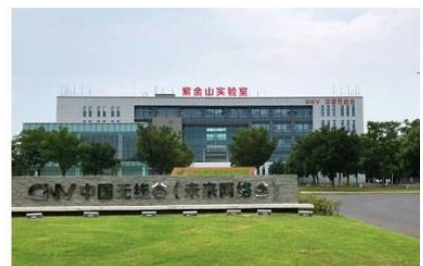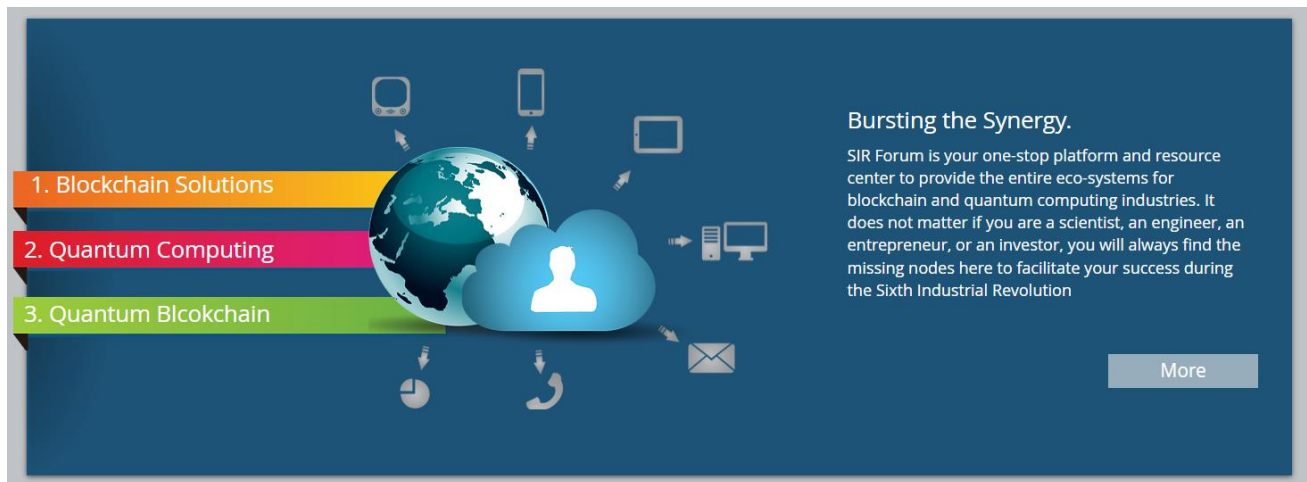
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Enabling and Leading the Sixth Industrial Revolution

What SIR Forum Brings to You

Bursting the Synergy.

SIR Forum is your one-stop platform and resource center to provide the entire eco-systems for blockchain and quantum computing industries. It does not matter if you are a scientist, an engineer, an entrepreneur, or an investor, you will always find the missing nodes here to facilitate your success during the Sixth Industrial Revolution

1. Blockchain Solutions
2. Quantum Computing
3. Quantum Blcokchain

The Circle

SIR Forum has several focused groups with each using difference language. Members of SIR's focused groups are joined by invitation only. SIR membership is company / orgnization based and the members' representatives consist of researchers, scientists, engineers, entrepreneurs, venture capitalists and investors with focus on blockchain and quantum computing industries. Members share freely recently technologies, inventions, product news, hiring, and global investment activities in blockchain and quantum computing industries.

For inquiry on SIR membership, please e-mail to info@sirforum.com

The Forum

SIR Forum currently holds four quarterly conferences and meetings each year. And the frequency is expected to increase soon. The quarterly meetings are open to all registered SIR members. External VIPs are also invited and they are ranging from top notch scientists, industrial experts, seasoned venture capitalists to government regulators associated to enabling commercialization of blockchain and quantum computing technologies. In addition, SIR also holds various types of blockchain and quantum computing seminars at different locations worldwide.

For inquiry on SIR conferences, please email to info@sirforum.com

The Expo

As part of its integrated services, the SIR Forum plans to organize and host the tri-annual SIR Expo dedicated to provide trade shows and exhibitions to public to promote technologies, products and commercialization of blockchain and quantum computing industries. It is planned be held once every year each in North America, Asia and Europe.

For inquiry on SIR expo, please email to info@sirforum.com

SIR FORUM

SIR Stands for the Sixth Industrial Revolution Powered by Blockchain and Quantum Computing Technologies.

Founded in Los Angeles on February, 2018, SIR Forum is a global non-profit organization dedicated putting synergy to enable and lead the Sixth Industrial Revolution enabled by blockchain and quantum computing technologies. Members of SIR Forum are scientists, engineers, entrepreneurs, and investors in the blockchain and quantum computing industries from around the world.

Our vision is to enable and lead the Sixth Industrial Revolution. Our mission is to share, guide and lead blockchain and quantum computing industries from research, invest, design, develop to productization.

The Sixth Industrial Revolution and Quantum Age, Press Release.

April 3, 2018 – The Council of the SIR Forum held in Shanghai recently proposed for first time the Sixth Industrial Revolution (SIR) based on blockchain and quantum computing technologies. Participants included scientists and engineers, entrepreneurs, and venture capitalists from the blockchain and quantum computing technologies industries.

"In the history of mankind, we have experienced four disruptive leaps in the industrial revolution: steam engines, electricity, computer technology, and Internet and information technologies," said Mei Yuan, rotating chairman of the SIR Forum. "When the world is engaged in the fifth industrial revolution of artificial intelligence and robotics, the sixth industrial revolution has come quietly – the blockchain and quantum computing technologies."

With the globalization of technology, industry globalization, commodity globalization, consumer globalization, and information globalization, the market is increasingly relying on global information security and credit security. Blockchain emerged as the times have required. Its underlying technologies and applications based on powerful cryptographic algorithms have sprung up in various commercial fields and government agencies ranging from soybean cultivation to digital payments.

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Memo