

ICTC 2022

2022 3RD INFORMATION COMMUNICATION TECHNOLOGIES CONFERENCE

EEIT 2022

2022 2ND INTERNATIONAL CONFERENCE ON ENGINEERING EDUCATION AND INFORMATION TECHNOLOGY

NANJING, CHINA | MAY 6-8, 2022 | VIRTUAL CONFERENCE

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Welcome Message

We are pleased to welcome you to 2022 3rd Information Communication Technologies Conference (ICTC 2022) & 2022 2nd International Conference on Engineering Education and Information Technology (EEIT 2022) which is to be held in Nanjing, China, during May 6-8, 2022. It aims to bring together researchers, developers, and users in both industry and academia in the world for sharing state-of-art results, for exploring new areas of research and development, and to discuss emerging issues on ICT and EEIT.

These 3 days will be focusing on information communication technologies, engineering education and information technology. We are fortunate to have 6 prominent speakers. The chairman and speakers played a great role in conducting the program of the conference.

As usual, we would like to take this opportunity to thank all the authors who have submitted their works to the conference. Without them, such an event would not have been possible. Also, we would like to extend our gratitude to all the conference organization committees who have been involved in organizing ICTC & EEIT this year, which include our Advisory Committee Chair, Conference Committees Chair, Conference Co-chair, Conference Executive Chair, Program Co-chairs, Publication Chairs, Publicity Chairs, Special Session Chairs, Local Arrangement Chairs and Technical Committee. We would like to thank their great support and help in conference planning, operations, paper reviews, as well as publication.

Last but not the least, we hope that you will find the conference program interesting and stimulating. We are looking forward to meeting you again physically next year.

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Xudong Pan, Harbin Institute of Technology, China

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Participants' Guideline

- ✓ The following time arrangement is for reference only. In case that any absence or some presentations are less than 15 minutes, please join the meeting room 30 minutes before starting.
- ✓ Please unmute audio and start video while your presentation.
- ✓ It's suggested to use headset with microphone or earphone with microphone.
- ✓ Please prepare the slide file of your presentation on your laptop in advance.
- ✓ Duration of each Presentation: about 12 Minutes of Presentation and 3 Minutes of Q&A.
- ✓ E-certificate will be sent to presenters after conference by email. An excellent presentation will be selected from each session and announced on the website after conference. An excellent presentation certificate will be sent after conference by email.



Download and Install ZOOM

- ✓ URL: <https://zoom.com.cn/download>
Please complete the installation in your PC before the conference.



Join a Meeting without Sign In

- Enter the conference ID to join the conference room.
- ✓ **ROOM 1: 844 7956 0211**
 - ✓ **ROOM 2: 879 6981 6327**
- Password: 050608**



Set Names

- Author: Paper ID + Name
Keynote Speaker: KN + Name
Invited Speaker: IS + Name
Committee: Position + Name



ZOOM Test Schedule

May 6, 2022 | Friday (GMT+8)

ICTC & EEIT 2022

	Online Test	ZOOM ID & Link
9:30 – 17:00	Keynote Speakers, Invited Speakers, Committee Members, Session Chairs	ZOOM 1: 844 7956 0211 (Password: 050608) https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09
14:00 – 15:30	Session 1: T04, T05, T11, T17, T26, T52, T54, T30, T37 Session 2: T204, T206, T211, T213, T217, T219, T208, T224, T225, T215, T226 Session 3: T24, T32, T44, T220, T06, T14, T53, T57, T402 Session 4: T302, T03, T20, T40, T41, T43, T48, T51, T221	ZOOM 2: 879 6981 6327 (Password: 050608) https://us02web.zoom.us/j/87969816327
16:00 – 17:30	Session 5: T07, T15, T16, T21, T36, T45, T13, T47 Session 6: T29, T08, T10, T49, T42, T39, T55, T12 Session 7: T205, T210, T203, T207, T209, T214, T218, T201, T202 Session 8: T25, T28, T31, T33, T38, T46, T50, T2001	ZOOM 2: 879 6981 6327 (Password: 050608) https://us02web.zoom.us/j/87969816327



Meeting Agenda

May 7, 2022 | Saturday (GMT+8)

ICTC & EEIT 2022

ZOOM ID: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Time	Activity	Speaker
Conference Host: Prof. Chuan Zhang, Southeast University, China		
9:00 am—9:05 am	Welcome Message	Prof. Zaichen Zhang, Southeast University, China
9:05 am—9:10 am	Opening Remarks	Prof. Wanyang Dai Forum President & CEO, U.S.A.
9:10 am—9:55 am	Keynote Speech I Speech Title: A Source Coding Perspective to Optimize Heterogeneous Wireless Sensor and UAV Networks	Prof. Hamid Jafarkhani IEEE Fellow, AAAS Fellow University of California Irvine, USA
9:55 am—10:40 am	Keynote Speech II Speech Title: Empowering Sustainability with Energy Efficiency	Prof. Sonia Aissa IEEE Fellow University of Quebec, Montreal, QC, Canada
10:40 am—11:00 am	Break Time	



Meeting Agenda

May 7, 2022 | Saturday (GMT+8)

ICTC & EEIT 2022

ZOOM ID: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Time	Activity	Speaker
11:00 am—11:45 am	Keynote Speech III Speech Title: Towards Environment-Aware Wireless Networks	Prof. Mohamed-Slim Alouini Fellow of IEEE, OSA, AAS, EASA, AE, TWAS King Abdullah University of Science and Technology, Saudi Arabia
11:45 am—12:15 pm	Invited Speech I Speech Title: Arbitrary Beam Pattern Design for RIS-Assisted Wireless Communication in High Frequency Band	Assoc. Prof. Jian Dang Southeast University, China
12:15 pm—13:30 pm	Break Time	
13:30 pm—14:00 pm	Invited Speech II Speech Title: Topological Data Analysis : Discriminative Representation for Persistence Diagram	Assoc. Prof. Gang Li Deakin University, Australia
14:00 pm—14:30 pm	Invited Speech III Speech Title: Enhancement of A Web-based Electromagnetic Simulation Tool	Assoc. Prof. Josefa Gómez University of Alcalá, Spain



Meeting Agenda

May 7, 2022 | Saturday (GMT+8)

ICTC & EEIT 2022

ZOOM 1: 844 7956 0211 (Password: 050608)

<https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

ZOOM 2: 879 6981 6327 (Password: 050608)

<https://us02web.zoom.us/j/87969816327>

15:00 pm—17:45 pm

Online Session 1

Topic: Space-Earth Integration Network

T04, T05, T11, T17, T26, T52, T54, T30, T37

Online Session 2

Topic: Engineering Education and Teaching Model

T204, T206, T211, T213 , T217, T219, T208, T224, T225, T215, T226



Meeting Agenda

May 8, 2022 | Sunday (GMT+8)

ICTC & EEIT 2022

	<p>ZOOM 1: 844 7956 0211 (Password: 050608)</p> <p>https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09</p>	<p>ZOOM 2: 879 6981 6327 (Password: 050608)</p> <p>https://us02web.zoom.us/j/87969816327</p>
9:30 am—11:45 am	<p>Online Session 3</p> <p>Topic: Modern Communication Theory and Technology</p> <p>T24, T32, T44, T220, T06, T14, T53, T57, T402</p>	<p>Online Session 4</p> <p>Topic: Computer Models and Optimization Calculation</p> <p>T302, T03, T20, T40, T41, T43, T48, T51, T221</p>
11:45 am—13:30 pm	<p>Break Time</p>	
13:30 pm—15:30 pm	<p>Online Session 5</p> <p>Topic: Communication and Information System</p> <p>T07, T15, T16, T21, T36, T45, T13, T47</p>	<p>Online Session 6</p> <p>Topic: Image and Signal Analysis</p> <p>T29, T08, T10, T49, T42, T39, T55, T12</p>
15:30 pm—15:45 pm	<p>Break Time</p>	
15:45 pm—18:00 pm	<p>Online Session 7</p> <p>Topic: Talent Training and Education Strategy</p> <p>T205, T210, T203, T207, T209, T214, T218, T201, T202</p>	<p>Online Session 8</p> <p>Topic: Advanced Information Technology and Security</p> <p>T25, T28, T31, T33, T38, T46, T50, T2001</p>



Prof. Hamid Jafarkhani, *IEEE Fellow, AAAS Fellow*

University of California Irvine, USA

9:10 – 9:55 | May 7, 2022 | GMT+8

Speech Title: A Source Coding Perspective to Optimize Heterogeneous Wireless Sensor and UAV Networks

Bio: Hamid Jafarkhani is a Chancellor's Professor at the Department of Electrical Engineering and Computer Science, University of California, Irvine, where he is also the Director of Center for Pervasive Communications and Computing, the Director of Networked Systems Program, and the Conexant-Broadcom Endowed Chair. He is the 2020-2022 elected Faculty Chair of the UCI School of Engineering.

He was a Visiting Scholar at Harvard University in 2015 and a Visiting Professor at California Institute of Technology in 2018. Among his awards are the NSF Career Award, the UCI Distinguished Mid-Career Faculty Award for Research, the School of Engineering Excellence in Research Senior Career Award, the IEEE Marconi Prize Paper Award in Wireless Communications, the IEEE Communications Society Award for Advances in Communication, the IEEE Wireless Communications Technical Committee Recognition Award, and the IEEE Eric E. Sumner Award.

Dr. Jafarkhani is listed as an ISI highly cited researcher. According to the Thomson Scientific, he is one of the top 10 most-cited researchers in the field of "computer science" during 1997-2007.

He is the 2017 Innovation Hall of Fame Inductee at the University of Maryland's School of Engineering. He is a Fellow of AAAS, an IEEE Fellow, a Distinguished Fellow of IETI, and the author of the book "Space-Time Coding: Theory and Practice."

Abstract: Future wireless networks are envisioned to be highly heterogeneous including flying nodes. In many applications, an optimal deployment of nonidentical nodes in a geographic area of interest is desired. These networks may include a multitude of connected autonomous nodes, for example UAVs, in one or more tiers. We formulate these deployment challenges as source coding problems where different distortion measures should be associated with different quantization indices. We discuss fundamental design challenges like the best spatial node deployment to minimize the energy consumption or maximize the sensing accuracy while guaranteeing network connectivity. This is done by developing a new quantization theory of heterogeneous reproduction points. We will also discuss the characteristics of the heterogeneous networks with optimal deployment and the role of UAVs in future wireless networks.



Prof. Sonia Aïssa, *IEEE Fellow*
University of Quebec, Montreal, QC, Canada

9:55 – 10:40 | May 7, 2022 | GMT+8

Speech Title: Empowering Sustainability with Energy Efficiency

Bio: Sonia Aïssa received her Ph.D. degree in Electrical and Computer Engineering from McGill University, Canada, in 1998. Since then, she has been with INRS (Institut National de la Recherche Scientifique), Montreal, Canada, where she is a Full Professor and known as one of its most distinguished professors for her excellence in research, education, and outreach. Her awards include the NSERC University Faculty Award 1999, the FRQNT Strategic Faculty Fellowship 2001-2006, the INRS Performance Award for outstanding achievements in research, teaching and outreach multiple times since 2004, the FRQNT-SYTACom Technical Community Service Award 2007, NSERC Discovery Accelerator Supplement Award 2013, and multiple Best Paper Awards in the IEEE and the Japanese IEICE. She was a Distinguished Lecturer of the IEEE Communications Society (ComSoc) 2013-2016. She is Fellow of the IEEE and Fellow of the Canadian Academy of Engineering.

Prof. Aïssa has an outstanding record of service to the IEEE. She was a Member-At-Large of ComSoc's Board of Governors 2014-2016, and serves regularly on many of its standing committees. Her editorial activities include: Area Editor of IEEE Transactions on Wireless Communications 2014-2019, Editor of IEEE Transactions on Wireless Communications 2004-2012, Associate Editor and Technical Editor of IEEE Communications Magazine 2004-2015, Technical Editor of IEEE Wireless Communications Magazine 2006-2010, and Associate Editor of Wiley Security and Communication Networks Journal 2007-2012. She currently serves as Editor-At-Large for the IEEE Transactions on Communications. She has been involved in organizing many flagship conferences, including the 2021 IEEE International Conference on Communications for which she served as TPC Chair. She is active in promoting women in engineering, and is the Founding Chair of the IEEE Women in Engineering Affinity Group in Montreal.

Abstract: This speech discusses several scenarios for the beyond 5G generation societies and how sustainability in envisioned future smart cities and societies can be empowered using new and emerging cutting-edge technologies. Focusing on the energy efficiency facet of sustainability, the speech provides a foundational background on the energy efficiency of wireless communications to have a proper insight into the vision and requirements of beyond 5G networks. Then, it provides a panoramic view of the enabling technologies that will contribute significantly to global energy efficiency of these future networks. Finally, it highlights the research trends, open research issues, and key take-away lessons for future research exploration in energy-efficient wireless communications.



Prof. Mohamed-Slim Alouini, *Fellow of IEEE, OSA, AAS, EASA, AE, TWAS*
King Abdullah University of Science and Technology, Saudi Arabia

11:00 – 11:45 | May 7, 2022 | GMT+8

Speech Title: Towards Environment-Aware Wireless Networks

Bio: Mohamed-Slim Alouini (Fellow of IEEE and Optica) was born in Tunis, Tunisia. He received the Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA, in 1998. He served as a faculty member at the University of Minnesota, Minneapolis, MN, USA, then in the Texas A&M University at Qatar, Education City, Doha, Qatar before joining King Abdullah University of Science and Technology (KAUST), Thuwal, Makkah Province, Saudi Arabia as a Professor of Electrical Engineering in 2009. His current research interests include modelling, design, and performance analysis of wireless communication systems.

Abstract: It goes without saying that we suffer from severe gaps in global internet connectivity. We tend indeed to forget that we still have about 3 billion people who are unconnected or under-connected. And it is expected that 5G (in its current initial deployment stages) will further accentuate this connectivity divide. Actually, the Covid 19 pandemic also showed that the connectivity divide is in a way becoming one of the modern faces of inequality, deepening the economic and social unbalances between the ‘Haves’ and ‘Have Nots’ in a digital context. To achieve digital inclusiveness, we need to develop and deploy new technological solutions that help connecting the unconnected/under-connected in a reliable and affordable fashion. In this context, many of the regions suffering from this connectivity divide are regions where reliable power grids are insufficient and/or infeasible to deploy. In this case, renewable energy (RE)-powered base stations (BSs) are being considered as an alternative power source for wireless networks. In this talk, we provide an overview of RE-enabled wireless networks, detailing their analysis, classification, and related works. We also present some of our recent work showing the use of wind-turbine-mounted BSs as a cost-effective solution for regions with high wind energy potential, since it could replace or even outperform current solutions requiring additional cell towers, satellites, or aerial BSs.



Assoc. Prof. Jian Dang
Southeast University, China

11:45 – 12:15 | May 7, 2022 | GMT+8

Speech Title: Arbitrary Beam Pattern Design for RIS-Assisted Wireless Communication in High Frequency Band

Bio: Jian Dang received his Bachelor degree in Information Engineering from Chien-Shiung Wu College of Southeast University, Nanjing, China, at 2007 and Ph.D. degree in Information and Communication Engineering from School of Information Science and Engineering of Southeast University, Nanjing, China, at 2007. From 2010 to 2012, he studied in University of Florida, USA, as a visiting student. From 2013, he was with School of Information Science and Engineering of Southeast University, Nanjing, China, as a lecturer (2013) and associated professor (2017).

His research interests include waveform designs, optical wireless communications and signal processing. He is a senior member of IEEE and editor of IET Communications. He received best paper awards of ICC 2021 and WCSP 2021. He also received first prize for Technological Invention Award of the Ministry of Education in 2019.

Personal page: <https://radio.seu.edu.cn/2018/0423/c19938a213566/page.htm>

Abstract: Reconfigurable intelligent surface (RIS) has found various applications in wireless communication, sensing, power transfer, etc. A fundamental utility required by many applications is to generate arbitrary beam patterns including focusing on some points and broadcasting on specified areas with designed power distributions. The latter is even more desired in communications with mobile users and information broadcasting. This talk reports the relationship between RIS beam pattern design and 2-D FIR filter design. With this view, a fast designing algorithm based on 2-D IFFT is proposed. Simulations are conducted to verify the validity of the proposed algorithm. Potential applications in future works such as wireless positioning are also discussed.



Assoc. Prof. Gang Li
Deakin University, Australia

13:30 – 14:00 | May 7, 2022 | GMT+8

Speech Title: Topological Data Analysis: Discriminative Representation for Persistence Diagram

Bio: Gang Li, IEEE Senior member, and he is an Associate Professor of Deakin University. He serves as the chair for IEEE Task Force on Educational Data Mining (2020-2023), and on the IEEE Data Mining and Big Data Analytics Technical Committee (2017-2019 Vice Chair), IEEE Enterprise Information Systems Technical Committee. He is an associate editor for various A/A* journals, including Journal of Travel Research (Sage), Decision Support Systems (Elsevier), and Cyber Security (Springer). A/Prof. Li acted as the chair of a number of international conferences, including KSEM 2020 (CORE B), ISCC 2021 (CORE B), etc.

A/Prof. Li is the AI director in the Strategic Research Center of Cyber Security Research and Innovation (CSRI) at Deakin University. Since his employment in Deakin, he has developed his research in data mining, privacy preservation, group behavior analysis and business intelligence. His research results have been well cited. A/Prof. Li has co-authored eight papers that won best paper prizes, including the KSEM 2018 best paper award, IEEE Trustcom2016 best student paper award, PAKDD2014 best student paper award, IFITT Journal Paper of the Year 2016 (3rd price), ACM/IEEE ASONAM2012 best paper award, the 2008 Nightingale Prize by Springer, etc. He holds one international patent, and his research has been funded by various agencies, including ARC-LP, India's Sparc Scheme and Hong Kong GRF.

Abstract: Topological data analysis (TDA) extracts the topological features that are complementary to statistical quantities, which has been found in many applications in computer vision. In TDA, Persistence diagram (PD) has been considered as a compact descriptor for topological data analysis (TDA). Unfortunately, PD cannot be directly used in machine learning methods since it is a multiset of points. Recent efforts have been devoted to transforming PDs into vectors to accommodate machine learning methods. However, existing methods share one common shortcoming: the mapping of PDs to a feature representation depends on a pre-defined polynomial. This presentation will introduce two recent advances: polynomial representation and Hilbert representation for PD, with the aim of extracting the discriminative topological features. Finally, potential applications in the field of computer vision, and biomedical science will be discussed.



Assoc. Prof. Josefa Gómez
University of Alcalá, Spain

14:00 – 14:30 | May 7, 2022 | GMT+8

Speech Title: Enhancement of A Web-based Electromagnetic Simulation Tool

Bio: Josefa Gómez was born in 1984. She received the BS and MS in Telecommunications Engineering from the University Polytechnic of Cartagena, Spain, in 2005 and 2007, respectively, and the PhD in Telecommunications Engineering from the University of Alcalá, Spain, in 2011. She is associate professor at the University of Alcalá. She also worked as a faculty researcher at the Hong Kong University in 2011 and at the Instituto de Telecomunicações of Lisbon in 2014. She has participated in around 50 research projects with Spanish and European companies. She has published 27 papers in peer-reviewed journals, a book, two book chapters, and more than 50 conference contributions at national and international symposia. Her current research interests are data science and education, and the study of propagation for mobile communications or wireless networks in both outdoor and indoor environments.

Abstract: This work presents the development and improvement of an efficient computer tool for field coverage data visualization in urban mobile radio systems. A comparison of techniques and technologies used for the visualisation of the 2D and 3D geospatial data used as input for the radio-propagation as well as the radio-propagation results themselves is provided. The web simulation tool is able to display data on a 2D interactive map and on urban environments in 3D. For the 2D map, different possible technologies and architectures are discussed to achieve the goal of displaying the data on it, such as terrain information and animations in real time. For the 3D environment, the aim is to show the results of the ray tracing simulation in a dynamic render over the 3D environment providing advanced functionalities such as filtering rays depending on several criteria. A comparison of 2D and 3D rendering libraries for spatial data is discussed, and an implementation for loading OBJ files that represent the urban environment is proposed. This combination results in an improved simulator that can display the results in a scalable, dynamic, optimized and suitable way for the end user.

May 7 | Saturday | 15:00 – 17:15 (GMT+8)

ZOOM 1: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Topic: Space-Earth Integration Network

Session Chair: Assoc. Prof. Gang Li, Deakin University, Australia

T04, T05, T11, T17, T26, T52, T54, T30, T37

A Multi-dimensional Resource Allocation Algorithm based on Task Splitting and Adjustment in Satellite Networks

Qu Hua, Wang Hongqiang, Zhao Jihong, Yu Yongyue

Presenter: Wang Hongqiang, Xi'an Jiaotong University, China

T04
15:00 – 15:15

Abstract: Currently, most resource allocation algorithms in satellite networks only focus on single resource allocation scenarios. But there are many kinds of resources in the actual satellite network, and these resources restrict each other. In addition, most satellite network systems treat the services requested by users as an independent and indivisible task. However, the duration of the task is different and satellites have time windows to execute tasks, as well as multiple resource constraints. With the increase of tasks, the number of tasks that the satellite network system can complete and the resources utilization will be limited. For the above problems, this paper proposes a multi-dimensional resource allocation algorithm based on task splitting and adjustment, including task splitting algorithm (TSA) and dynamic task adjustment algorithm (DTAA). First, build a model that takes task completion rate, resource utilization and districition window utilization as the optimization targets in a single districition window, and solve the problem of lower resource utilization by splitting the last task that cannot be executed in the districition window. Then, build a dynamic task adjustment model among multiple districition windows, and solve the conflict problem of task execution through the original window task adjustment or the new window task adjustment strategy. Finally, compare the algorithm with the existing decoupled resource algorithm (DRA) and improved greedy algorithm (IGA), and verify its gains in the number of tasks completed, resource utilization and districition window utilization through simulation experiments.

<div data-bbox="56 58 183 184"></div> <div data-bbox="183 425 244 454">T05</div> <div data-bbox="127 482 308 511">15:15 – 15:30</div>	<p data-bbox="410 161 1600 189">Time and Energy Optimization Scheme of Task Offloading for Single-Cell MEC-D2D Networks</p> <p data-bbox="410 208 1240 237">Zhiying Peng, Ju Liu, Zheng Dong, Zhichao Gao and Qian Zhang</p> <p data-bbox="410 255 1082 284">Presenter: Zhiying Peng, Shandong University, China</p> <p data-bbox="410 351 2474 808">Abstract: With the advent of the era of the Internet of Things (IoT), massive amounts of data generated by computationally intensive mobile devices have brought a huge burden on network bandwidth resources. To tackle it, both device-to-device (D2D) and multi-access edge computing (MEC) technologies can further improve the computation capability of cellular networks. In this paper, we consider a single-cell wireless network based on MECD2D technology to maximize the utilization of computational resources of the edge server while minimizing the average task completion time. To that end, we minimize the offloading energy consumption of users when the task is indivisible. More specifically, we propose two computation offloading schemes by solving the computational resources allocation problem and the task offloading strategy of the edge server. We formulate the first optimization scheme of joint average time and resource allocation (JATRA) to minimize the average task completion time which is formulated by a 0-1 integer programming problem. By seeking the factor of computation resource allocation, the joint average time and energy consumption (JATEC) optimization scheme is carried out to minimize the energy consumption of task offloading. As the result evaluated by numerous simulations shown, the schemes we present significantly reduce the average task completion time and energy consumption compared with the baseline schemes.</p>
<div data-bbox="183 1061 244 1089">T26</div> <div data-bbox="127 1118 308 1146">15:30 – 15:45</div>	<p data-bbox="410 915 986 943">Research on 5G Uplink Coverage Technology</p> <p data-bbox="410 962 1031 991">Pinping Lin, Chunlei Hu, Weiliang Xie, Jinyang Yu</p> <p data-bbox="410 1009 1225 1038">Presenter: Pinping Lin, China Telecom Research Institute, China</p> <p data-bbox="410 1105 2474 1276">Abstract: The 5G band mainly adopts high frequency band with large bandwidth and high downlink rate, but poor penetration and high road loss, coupled with the fact that the power of the terminal is much less than the transmitting power of the base station, the problem of insufficient uplink coverage is becoming increasingly prominent. Three traditional uplink coverage enhancement techniques, as well as super uplink techniques using uplink Tx switching, are introduced in this paper, and the various schemes are analysed as advantages and disadvantages to provide some reference for network construction.</p>

<p>T17 15:45 – 16:00</p>	<p>Design and Implementation of Multimedia Data Acquisition and Acoustic/Optical Dual Mode Communication System for Underwater Sensor Networks Zhen Tan, Hongxi Yin, Zhongwei Shen, Huhao Xiao and Changjun Liu Presenter: Zhen Tan, Dalian University of Technology, China</p> <p>Abstract: Underwater information network and information acquisition system is an indispensable infrastructure for the protection, development, utilization and national defense of the ocean, and the information to be collected includes data, sound, image, video and other multimedia services. Otherwise, most of the existing information acquisition systems only consider a single type of media, such as data, etc. Therefore, a multimedia data acquisition system based on STM32 for underwater information network with functions of storage and dual-mode communication of underwater sound and underwater wireless light as well, is designed and developed in this paper. It is capable of acquiring both low-speed, small-volume data such as environmental parameters of the ocean such as water temperature, salinity, and water depth, and real-time, high-speed, large-data-volume services such as sound, images, video and so forth. The effectiveness of the developed system is verified by our experimental tests.</p>
<p>T11 16:00 – 16:15</p>	<p>A Multi-dimensional Resource Modeling Method Based on Tree Structure in Space-air-ground Integrated Network Hua Qu, Yongyue Yu, Jihong Zhao, Feng Wei, Hongqiang Wang Presenter: Yongyue Yu, Xi'an Jiaotong University, China</p> <p>Abstract: With the development of space-air-ground integrated network (SAGIN), the network become more and more complexity. The diversification in device types and differentiation in equipment performance leads to the heterogeneity of network structure and multi-dimensionality of resources. And the satellite network is highly dynamic and network topology changes frequently, resulting in time-varying. Therefore, there are a stronger demand to meet the requirements of network structure characterization, resource dimensional expansion and the time-varying presentation in integrated network. In this paper, a multi-dimensional resource model named space-time resource tree (S-TRT) is proposed to deal with these problems. S-TRT is composed of two independent tree structures: node tree and node resource tree. Node tree represents the heterogeneous characteristics of integrated network by the hierarchy of the tree structure. Node resource tree uses the number of sub nodes, which is unlimited in N-ary tree, to adapt to the expansion of resource dimensions. Then use a series of basic operations such as node inserting, updating and combining to realize the time-varying characteristics of resources in integrated network. Finally, through the simulations, prove the model contributes to reducing node complexity and time-varying cost.</p>

<p>T52</p> <p>16:15 – 16:30</p>	<p>Dynamic Allocation of FlexE Discrete Resource Based on Regional Traffic Prediction</p> <p>Yuqi Hu, Deyu Ma, Jingqi Sui, Lei Yao, Haonan Bai and Yong Zhang</p> <p>Presenter: Yuqi Hu, Beijing University of Posts and Telecommunications, China</p> <p>Abstract: Flexible Ethernet (FlexE) can ensure hard isolation of network slicing and match flexible rate. We consider the process of network slicing transmitting from the radio access network to the transport network. However, resources are allocated discretely in FlexE and they have different granularities. Therefore, we propose a dynamic deployment method of discrete resources based on regional traffic prediction, which comprehensively considers the delay and bandwidth requirements of different slicing services, while improving the overall resource utilization and reducing the traffic loss rate. Simulation results show that the proposed algorithm can improve resource utilization and reduce traffic drop rate while meeting the service delay requirements.</p>
<p>T54</p> <p>16:30 – 16:45</p>	<p>Optimal Power Allocation Strategy for a MIMO-Integrated Radar and Communication System Based OFDM Waveform</p> <p>Nihad A. A. Elhag, Ping Wei, Xu Tang, Mohammad.A.B. Mohammad and Abba Smahi</p> <p>Presenter: Nihad A. A. Elhag, University of Electronic Science and Technology of China, China</p> <p>Abstract: Multiple-input multiple-output (MIMO)-Integrated Radar and Communication System (IRCS) configuration is made up of multiple IRCS and communication users. The MIMO-IRCS uses the Orthogonal Frequency Division Multiplexing (OFDM) waveform, and this paper provides a power allocation strategy for both systems. The Karush-Kuhn-Tuckers (KKT) optimality requirements are used to formulate and solve the convex optimization problem analytically. The suggested strategy reduces total transmitted power while meeting two system prerequisites: SCNR (Signal-to-Clutter-plus-Noise Ratio) for target detection and SNR (Signal-to-Noise Ratio) for communication system performance. The simulation results show that the proposed strategy is effective in reducing the MIMO-IRCS system's total power consumption.</p>

<div>T30</div> <div>16:45 – 17:00</div>	<div> A Novel Method for Studying 3D-MANET Capacity Based on Zipf's Law Zairan Cheng, Ying Liu Presenter: Zairan Cheng, Beijing Jiaotong University, China </div> <div> Abstract: Emerging three-dimensional (3D) mobile ad hoc networks paradigms such as flying ad hoc network and 3D-vehicular ad hoc network have contributed significantly to various fields. Accurately characterizing the throughput capacity of 3D-MANET is becoming increasingly critical. For the convenience of model solving, the prior work has typically been analyzed based on the uniform or specific probability distribution of network nodes, but ignoring such the node distribution is difficult to describe the real application scene. With was formerly different, in this paper, we propose a cell-gridded 3D network model in which movement and distribution of nodes follow Zipf's law with exponent φ (many scholars have proved this law to conform to the movement law of the actual world). Moreover, our model can cover a variety of distribution scenarios with changes in φ value. We derived the packet delivery rate and network throughput capacity scaling law under the two-hop relay routing algorithm with the help of Zipf's law and classical capacity analysis theories and discussed the impact of φ on capacity. Additionally, our research findings indicate that if we can fully utilize network users' movement and distribution status information in different areas and reasonably divide network cells, it will be expected to improve network throughput capacity performance. </div>
<div>T37</div> <div>17:00 – 17:15</div>	<div> Artificial Rich Scattering-Assisted MIMO Systems Using Passive Backscatter Devices Azzam Al-nahari, Riku Jäntti, and Muhammad Usman Sheikh Presenter: Azzam Al-nahari, Aalto University, Finland </div> <div> Abstract: Reconfigurable intelligent surfaces (RIS) are emerging as a promising technology for the future 6G networks. One of the challenges of IRS systems is that they require feedback control which in turn means that they have to have receiver and microcontroller that consume power. In this paper, we propose to use passive chipless backscatter devices to shape the channel between the transmitter and the receiver. We propose a novel artificial rich scattering (ARS)-assisted MIMO system, that uses passive chipless backscatter devices to shape the channel covariance matrix such that the channel remain of full rank even if the direct transmission channel has strong line-of-sight (LoS) component. In particular, we conduct a large system analysis and show that the achievable rate is independent of the phase shift matrix at the backscattering nodes. Moreover, by introducing large number of passive scattering elements in the system, we can improve the system capacity even with the presence of strong LoS component in MIMO channel. We also consider the case of ARS-assisted MISO case when the channel state information (CSI) is available at the transmitter side and derive tight lower bound on the ergodic rate. </div>

May 7 | Saturday | 15:00 – 17:45 (GMT+8)
ZOOM 2: 879 6981 6327 (Password: 050608)
Link: <https://us02web.zoom.us/j/87969816327>

Topic: Engineering Education and Teaching Model
Session Chair: Prof. Hong Xiao, Beijing Jiaotong University, China
T204, T206, T211, T213 , T217, T219, T208, T224, T225, T215, T226

Teaching Reform and Practice of Strengthening Engineering Education in Mechanical Engineering Specialty
Hongrui Ao, Hui Yan, Hongsheng Zhang, and Jin Zhang
Presenter: Ao Hongrui, Harbin Institute of Technology, China

T217
15:00 – 15:15

Abstract: With the in-depth implementation of engineering education, colleges and universities have shifted their attention and focus to the cultivation of engineering talents through changing the training mode and deepening the reform of education and teaching so as to improve the quality of engineering talents and let engineering education "return to engineering". The current cloud computing, Internet of Things, and artificial intelligence technologies have posed new and higher requirements for the knowledge system, multi-faceted ability and comprehensive quality of engineering teaching faculty. In the teaching reform and construction of mechanical engineering major, the talent training system with the characteristics of mechanical engineering disciplines and the characteristics of HIT, "Outstanding Engineer Education and Training Program" has been formulated, and it has been reformed and practiced in several aspects, including the construction of student training programs and curriculum systems, the construction of experimental teaching and practical teaching platforms, the construction of teaching teams, and international exchanges.

<p>T206</p> <p>15:15 – 15:30</p>	<p>Research on Case Method in Engineering Cognition and Practice Xiuqin Han, Jun Bao, Yan Lyu, Xiaohui Xing, Chen Gao Presenter: Xiuqin Han, Harbin Institute of Technology, China</p> <p>Abstract: Case method is a newly developed teaching method aiming at improving students' comprehensive ability and engineering quality. In recent years, it has gradually drawn the attention of education industry. As a core course for undergraduate quality cultivation, Engineering Cognition and Practice can provide students with good engineering education and lay a solid foundation for students' engineering quality and innovation ability. The case method is further employed to intrigue the initiative and curiosity of students. With the distance between classroom and society shortened, students are encouraged to effectively integrate the learned theory into actual practice.</p>
<p>T211</p> <p>15:30 – 15:45</p>	<p>Blended Teaching Mode of the Course of Mechanical Engineering Materials and Forming Technology Fundamentals using Rain Classroom Jun Bao, Xiuqin Han, Hongliang Yang Presenter: Jun Bao, Harbin Institute of Technology, China</p> <p>Abstract: In order to improve the teaching effect and reform the traditional teaching mode, based on online course resources and intelligent teaching platforms such as Rain Classroom, an online and offline blended teaching model of the course of engineering materials and forming technology fundamentals is constructed. This teaching mode enables students deeply participate in learning and teaching, so as to give full play to the advantages of online teaching, improve teaching quality, and promote teaching reform.</p>

<p>T213 15:45 – 16:00</p>	<p>Study on progressive teaching system of practice base for engineering education Han Wanjiang, Han Zhuoyan, Tian Yifan, Sun Pengfei, Yang Jincui, Zhang Yongping Presenter: Han Wanjiang, Beijing University of Posts and Telecommunication, China</p> <p>Abstract: Graduate education of professional degree aims at cultivating high-level applied talents. Applicability and professionalism are the essential attributes of graduate education of professional degree, and the teaching system of practice base is an important factor to guarantee the teaching quality of engineering graduate degree. Based on the progressive thinking, this paper proposes three stages of practical teaching system for graduate students of engineering education, namely "Basic practice management", "Key practice management" and "practice process management", and explores the implementation of the integration of industry and education. The key practice management constructs a four-in-one practice process of "case teaching", "school project practice", "innovation competition practice" and "enterprise project practice". It has proved that the implementation of practical teaching system improves students' practical ability and innovation consciousness.</p>
<p>T219 16:00 – 16:15</p>	<p>A Self-guided Mold Assembly System Based on Deep Learning for Engineering Training Xudong Pan, Hong Huo, Lvyin Cai, Jianfeng Lv, Qianghui Han, Yuan Pan Presenter: Xudong Pan, Harbin Institute of Technology, China</p> <p>Abstract: Smart assembly is a part of smart manufacturing that, with the rapid development of the latter, has become a weak link in modern production chains. The corresponding training experiments for mechanical assembly and disassembly used in colleges and universities need to integrate new technologies to improve the quality of education being imparted to engineering students. This study develops a self-guided system for mold assembly that is suitable for engineering training. It can identify the parts of a given system in images and project them to increase our knowledge of them. A deep learning network model is designed to facilitate the replacement of the assembly that recorded an accuracy of identification above 99% in experiments. A hand detection and tracking model is built in Python that can detect and track the real-time movements of hands in a video at a speed of recognition of up to 37 FPS. The proposed system was used in an engineering training course to verify its accuracy of recognition of assemblies. It improved the students' interest in learning owing to its novel teaching methods and helped cultivate their ability for autonomous learning.</p>

<p>T208 16:15 – 16:30</p>	<p>Project-Based Learning of Professional Courses in Department of Electrical Engineering Wanling Deng, Zhi Luo, Weijie Ye, Junkai Huang Presenter: Wanling Deng, Jinan University, China</p> <p>Abstract: Under the background of “New Engineering” in China, the improvement of undergraduates' engineering application ability through professional courses, becomes especially important. A project-based innovative teaching method is presented in this paper, which is called “Knowledge Module-Project-Ability” mode. The teaching content of professional courses is divided into several knowledge modules, consisting of basic, extended and advanced parts. Based on each knowledge module, course projects are designed in which undergraduates can learn by doing. With the implementation of knowledge modules and projects, the engineering ability and skill are gradually improved. The proposed teaching mode has been practiced in Department of Electronic Engineering, Jinan University. Teaching elements in this mode iterate with each other, and work together on the curriculum goals. It enhances students' capability of applying those learnings in novel, problem-solving contexts.</p>
<p>T224 16:30 – 16:45</p>	<p>Design and development of reconfigurable desktop type turn-milling compound teaching machine tool Ruilin Gao, Xin Jin, Zhongxin Li, Juan Hao, Jicheng Bai, Chaojiang Li Presenter: Ruilin Gao, Beijing Institute of Technology, China</p> <p>Abstract: Aiming at solving the problems of limited function in teaching equipments, high purchase investment and multiple students sharing one equipment in the practice of metal machining and the training of mechanical courses for mechanical engineering students, a miniaturized, multi-functional, reconfigurable, open, desktop design method for turn-milling compound teaching machining have been proposed, which can realize the integration of turning, milling, turn-milling, drilling, grinding and other process capability. A teaching machine tool prototype have also been developed, which has the characteristic of multiple functions, modularization and low cost. It has strong operability and can carry out basic, comprehensive and innovative training experiments for mechanical engineering majors, which can also be extended to the experimental teaching in domestic and foreign colleges.</p>

<p>T225 16:45 – 17:00</p>	<p>Implementation strategies of undergraduate GP for mechanical engineering major based on PBL Yanqing Wang, Xiuzhi Wang, Jicheng Bai, Shengqiang Yang Presenter: Yanqing Wang, Taiyuan University of Technology, China</p> <p>Abstract: The project-based learning (PBL) method was introduced into the mechanical engineering majors' Graduation Project (GP). This paper discusses the process of implementing PBL in GP. Combined with the actual situation in GP, the implementation strategies of PBL have been perfected. Mechanical design online calculators, Excel Calculations, APP tools, and CAE software are widely introduced to speed up the design progress. These advanced design calculation methods are trained and used, which ensures that the design process keeps pace with the times. The application of 3D drawing software ensures the synchronization between the graduation design and enterprise application requirements. In addition, projects from the real needs of the enterprise, and the full participation of enterprise engineers are important features of GB, which al-so help to solve the disconnection with the actual needs of society. The five-year teaching attempts results show that: through PBL in graduation design, students can master the basic design process and design methods, and some projects can be used to meet enterprise engineering needs. GB based on the PBL has better-trained students' ability to solve practical engineering needs.</p>
<p>T215 17:00 – 17:15</p>	<p>Research on the Quality Assurance of Engineering Education for New engineering Hui YAN, Hongui AO, Zhaobo CHEN Presenter: Hui YAN, Harbin Institute of Technology, China</p> <p>Abstract: Taking the construction and implementation of "new engineering" as the background, this paper takes improving the quality of engineering education as the core task of teaching reform and development, continues to carry out the construction of engineering education teaching quality assurance system, continuously improves the teaching quality monitoring mechanism, pays attention to the effective use of quality information, realizes multi-dimensional linkage, strengthens internal and external evaluation, and through the effective operation of teaching and quality assurance system, To ensure the continuous improvement of teaching quality, achieved good results, and provided reference ideas for the reform of engineering education related teaching system.</p>

<p>T204 17:15 – 17:30</p>	<p>Linking engineering and natural sciences in a “nanoscience” student laboratory in Germany Tim Göbel, Prof. Dr. David-S. Di Fuccia Presenter: Tim Göbel, University of Kassel, Germany</p> <p>Abstract: Research shows that students often fail to recognize the relevance of science. In addition, engineering science issues that would show the usefulness of scientific knowledge, are hardly found as subjects of teaching in general schools in Germany. The aim of our work is therefore to link the engineering and natural sciences by merging the process of technical development with the path of knowledge acquisition in natural science. The link between the two areas sciences is desirable, as it - in the sense of contextualizing scientific knowledge - could increase the students' motivation and interest in technical and scientific issues. Moreover, in this way the learners could better understand the fundamental process from basic research to the finished technical application. In the English-speaking world, first concepts have been developed that show a positive effect in this merger, but a corresponding adaptation is still lacking for Germany. In our approach, the pupils are to be offered insights into both methodologies and content-related aspects of current technical and scientific research in the field of “nanostructures” in a prepared learning environment, featuring an atomic force microscope.</p>
<p>T226 17:30 – 17:45</p>	<p>Innovation practice evaluation system for civil engineering major with BIM technology Liangli Xiao, Zhao Yang and Shuang Peng Presenter: Liangli Xiao, Wuhan University of Science and Technology, China</p> <p>Abstract: BIM technology application ability has become the important assessment index of the students for civil engineering major. In this paper, BIM is integrated into the curriculum, graduation design and internship, and the evaluation system of innovation ability incorporated BIM into practical teaching is established and the evaluation level standard of this system is proposed as well. The evaluation system demonstrate the students' innovation ability reasonably and get good feedback of practical teaching reform effectively.</p>

May 8 | Sunday | 9:30 – 11:45 (GMT+8)

ZOOM 1: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Topic: Modern Communication Theory and Technology

Session Chair: Assoc. Prof. Jian Dang, National Mobile Communications Research Laboratory, Southeast University, China

T24, T32, T44, T220, T06, T14, T53, T57, T402

Wireless Channel Simulation and Measurement of Maglev Tunnel

Hongbo Liu, Jiaqi Liang, Kewei Chen, Tao Liao

Presenter: Hongbo Liu, National Key Laboratory of Science and Technology on Vessel Integrated Power Naval Engineering University Wuhan, China

T24
9:30 – 9:45

Abstract: According to the fading characteristics of wireless channel in Maglev scene, the wireless channel simulation in Maglev scene and wireless channel measurement based on software radio are mainly studied. The 3D tunnel maglev track model has been built, the cloudrt simulation platform has been used, the radio wave propagation in tunnel scene has been simulated based on ray tracing method, and the wireless channel characteristics have been extracted, It includes path loss model, root mean square delay spread and multipath characteristic statistics. The channel measurement system based on software radio is used. It is measured in a tunnel like environment, and the channel impulse response is obtained. The multipath statistical characteristics and maximum delay distribution are analyzed in detail. The multipath delay spread in the tunnel scenario is 45 ns. The simulation and measurement results are compared and analyzed.

<p>T32 9:45 – 10:00</p>	<p>Multi-Agent Model-Based Reinforcement Learning for Trajectory Design and Power Control in UAV-Enabled Networks Shiyang Zhou, Yufan Cheng and Xia Lei Presenter: Shiyang Zhou, University of Electronic Science and Technology of China, China</p> <p>Abstract: Unmanned aerial vehicles (UAVs) serving as aerial base stations is a promising technology for wireless communications. This paper formulates a joint optimization problem of UAV trajectory design and power control to minimize the power consumption when satisfying users' QoS requirements in a downlink transmission. Firstly, a multi-agent deep deterministic policy gradient (MADDPG) scheme with centralized training and decentralized execution is proposed to improve the overall performance of the UAVs in cooperation. Secondly, model value expansion (MVE) is incorporated into the model-free MADDPG scheme. By imaging future transitions, the proposed multi-agent model value expansion deep deterministic policy gradient (MA-MVE-DDPG) algorithm generates more experiences, and thus accelerates training. Simulation results have demonstrated that our proposed MA-MVE-DDPG algorithm achieves better performance and converges faster than benchmark schemes.</p>
<p>T44 10:00 – 10:15</p>	<p>An Improved DCT-Based Channel Estimation Algorithm with Channel PDP Modeling Junzi Luo and Dongming Wang Presenter: Junzi Luo, Southeast University, China</p> <p>Abstract: In this paper, we focus on the improvement of denoising performance of discrete cosine transform (DCT)-based channel estimator under different channel modeling. We present an improved DCT-based channel estimation algorithm for orthogonal frequency-division multiplexing mobile communication systems. This algorithm is based on a simplified denoise filter in DCT domain which is derived by traditional LMMSE filter, but has low computational complexity. In the algorithm, we employ different channel power delay profile (PDP) model to calculate coefficients of the denoise filter and propose a method to obtain coefficients without complicated calculations. Simulation results show that the use of improved DCT-based channel estimation algorithm can effectively reduce the noise in DCT domain, and consequently, improve the channel estimation performance.</p>

<p>T220 10:15 – 10:30</p>	<p>Channel Estimation for Reconfigurable Intelligent Surface-Assisted Multiple Antennas Communication Systems Pingping Xu, Zhichao Zhu, Hongyun Chu, Maoqi Li Presenter: Zhichao Zhu, Southeast University, China</p> <p>Abstract: Reconfigurable intelligent surfaces (RISs) have a large number of reflection units, and the manufacturing and deployment costs are much lower than those of large base stations (BSs). Moreover, in the millimeter-wave (mmWave) communication system, the direct path from the BS to the user (UE) may be blocked, and the RIS is an ideal scheme to reshape the wireless propagation path. How to obtain the channel state information (CSI) of the RIS-assisted communication system is still a problem worthy of attention at present, and the accurate acquisition of CSI is an important prerequisite for beamforming design. In this paper, we propose a new channel estimation (CE) scheme in RIS-assisted multiple-input multiple-output (MIMO) millimeter-wave communication system. Firstly, the CSI between the BS and the RIS is calculated based on the location information, then the beamforming design is carried out for the transmitted signal at BS according to the calculated CSI, and then the CSI between the RIS and the UE is estimated by orthogonal matching pursuit (OMP) algorithm.</p>
<p>T06 10:30 – 10:45</p>	<p>Joint Beamforming and Channel Allocation for Multi-User and Multi-Channel URLLC Systems Wenmeng Li, Yehua Zhang, Baoyin Bian, Hongzhen Yang, Lang Li, Qingming Wang, Hua Zhang, and Jun-Bo Wang Presenter: Wenmeng Li, NARI Group Corporation (State Grid Electric Power Research Institute), China</p> <p>Abstract: One of the key components in the sixth generation (6G) wireless networks is to support ultra-reliable low-latency communication (URLLC) for realizing mission-critical applications. For such networks, most existing works study the throughput and the power consumption while ignoring the decoding error probability. In this paper, the worst-case decoding-error probability is minimized for downlink multi-user and multi-channel systems under finite blocklength coding. We jointly design beamforming and channel allocation at a central controller for serving multiple downlink users under the subject of transmit power and available channels. Based on the correlation of the users on channel state information, we propose a channel allocation scheme with low complexity. Then, we address the beamforming optimization through sequential convex approximation. Finally, simulation results illustrate that the proposed schemes obtain lower decoding-error probability compared with other baseline schemes.</p>

<p>T14</p> <p>10:45 – 11:00</p>	<p>Research on 5G URLLC Standard and Key Technologies Xiao Li, Weiliang Xie, Chunlei Hu Presenter: Xiao Li, China Telecom Research Institute, China</p> <p>Abstract: The ITU (International Telecommunication Union) defines three major 5G application scenarios: eMBB, mMTC and URLLC. With the maturity and commercialization of 5G, URLLC as an important entry point in the vertical industry is also gradually improving and optimizing. This paper first introduces the evolution of URLLC standard, and then analyzes the key technologies to achieve URLLC from three aspects of low latency, high reliability and multiplexing of URLLC and eMBB. The integration of URLLC and TSN is described. Finally, gives experimental verification.</p>
<p>T53</p> <p>11:00 – 11:15</p>	<p>Design of an active dual-controlled broadband absorber in the terahertz range Yixuan Gao, Ye Cheng Presenter: Yixuan Gao, Fuzhou University, China</p> <p>Abstract: In this work, a dual-controlled tunable broadband terahertz (THz) meta-absorber based on phase-change materials and checkerboard-shaped graphene arrays is theoretically investigated. Due to the rotational symmetry of the design, the absorption spectrum of this metasurface is polarization-independent and maintains good properties over a wide range of incident angles. During the simulation, by changing the conductivity of vanadium dioxide (VO₂), the dynamic adjustment of the absorption amplitude between 0.32 and 0.99 can be achieved. In addition, the peak absorption efficiency of the absorption spectra can be gradually increased from 0.38 to 0.99 by independently changing the Fermi energy of graphene in software. Furthermore, the physical absorption mechanism is explained in detail by introducing the impedance matching theory. Therefore, the designed dual-controlled meta-absorber opens up possible avenues for efficiently manipulating THz waves in a single meta-device.</p>

<p>T57 11:15 – 11:30</p>	<p>Research on Smart Home System Based on STM32 Peixin Liu, Chi Xiao, Jun He and Yan Wang Presenter: Peixin Liu, Wuhan Business University, China</p> <p>Abstract: With the continuous development of science and technology and economy, people's living standards are constantly improving, which makes the research and development of intelligent equipment attract much attention. Taking smart home as the research object, this paper designs a remote network home system based on Android platform control and voice control through the combination of software and hardware. The system is composed of STM32 single chip microcomputer and each module. It designs and realizes three functions: outdoor rainfall monitoring function, indoor fire monitoring and alarm function and indoor light intensity monitoring function. The environmental information collected by each sensor is transmitted to the STM32 main control chip, which responds and judges and sends at commands to each module, such as stepper motor module, buzzer module, display screen, etc. At the same time, it is connected with the mobile app through the Bluetooth module to realize the functions of real-time monitoring and remote control. At the same time, the sound control module will intelligently identify the control command and transmit the identified command to the main control chip, so as to realize the sound control function.</p>
<p>T402 11:30 – 11:45</p>	<p>The Design and Construction of Load Balancing Architecture Based on KNTML Yunman Fan, Yusheng Yang, Feng Zhu, Quan He, An Fang Presenter: Yunman Fan, Chinese Academy of Medical Sciences, China</p> <p>Abstract: Single-node websites suffer slow response speed and unbrowsable pages when facing surges, and even server downtime causing service interruptions. It proposed a load balancing architecture KNTML (Keepalived+Nginx+Tomcat+Mysql+Linux) on the basis of technical research and load balancing for server cluster, which can meet the service requirement for high availability, high concurrency, and high performance. Taking the STEM platform as the experimental object, the new architecture performed well after the stress test before online and the actual load-balance after online. It satisfied the needs of high concurrent services and proved that the architecture is a solution to the surge problem.</p>

May 8 | Sunday | 9:30 – 11:45 (GMT+8)

ZOOM 2: 879 6981 6327 (Password: 050608)

Link: <https://us02web.zoom.us/j/87969816327>

Topic: Computer Models and Optimization Calculation

Session Chair: Dr. Yuji Dong, Xi'an Jiaotong-Liverpool University, China

T302, T03, T20, T40, T41, T43, T48, T51, T221

Research on the Intelligent Bidding Information Fit Model for Large Enterprises

Jian-hua LU, Shou-zhi LI, Jia-he XU, Zu-bao SHENG, Qi-ming ZHANG

Presenter: Jian-hua LU, State Grid Electric Power Research Institute, China

T302

9:30 – 9:45

Abstract: Large enterprises generally lack a system that automatically obtains Internet bidding information and accurately pushes it to the corresponding marketing personnel, and it is easy to miss business opportunities. At present, some companies rely on manual efforts to collect bidding information and deal with it, but it is easy to make mistakes or omissions, and the practicality is low. This paper proposes an intelligent bidding information fit model, which includes a precise bidding information fit method based on a simple word segmentation mechanism and a loose matching bidding information fit model based on machine learning. Experiments based on a large amount of real bidding historical data show that the intelligent bidding information fit model has good engineering applicability, and can be used in the construction of the large enterprise intelligent customer service fit system.

<p>T03 9:45 – 10:00</p>	<p>Modified Hegselmann-Krause model with social pressure in social networks Yanjie Li, Xianyong Li, Yajun Du, Ying Tang and Yongquan Fan Presenter: Yanjie Li, Xihua University, China</p> <p>Abstract: Public opinions largely depend on the evolution of individual opinions in social networks. There are few existing evolution models of public opinions to distinguish opinion formation from opinion expression. The expression of individual opinions is often affected by the social environment. Meanwhile, individuals express their opinions under social pressure from other individuals. In order to enhance the power of predicting public opinions, this paper introduces individual inertia to measure the degree of individuals' adherence to their own opinions. It also introduces social pressure to modify the individual opinions. Integrated with individual inertia, social pressure and Hegselmann Krause model, a modified Hegselmann Krause model is proposed. Simulation experiments show that the proposed individual inertia and social pressure affect the evolution of opinions in social networks. The modified Hegselmann Krause model can promote the formation of consensus by changing the individual inertia and social pressure to a certain extent.</p>
<p>T20 10:00 – 10:15</p>	<p>Rolling Bearing Health State Assessment based on K-Means and Ensemble HMM Xinmeng Cai, Longsheng Cheng and Qifeng Yao Presenter: Xinmeng Cai, Nanjing University of Science and Technology, China</p> <p>Abstract: The division and identification of rolling bearing health states are the basis for Condition-based Maintenance, which effectively guarantee the safe and stable operation of the equipment. In order to accurately divide the normal and failure states, analyze failure occurrence time and identify the current state, the K-Means clustering method is used to cluster the data of the full life cycle, and the ensemble Hidden Markov Model (HMM) method for pattern recognition of online data. The experimental bearing life cycle data set provided by the Institute of Design Science and Basic Component at Xi'an Jiaotong University (XJTU) and the Changxing Sumyoung Technology Co. Ltd. (SY) is selected to verify the effectiveness of the proposed method. The results show that the data consist of different states can get a good clustering effect and each state data can also be accurately identified.</p>

<p>T40 10:15 – 10:30</p>	<p>Requirements for Developing A Mobile Application to Assist with Career Transition: Design Science Research Methodology Manoj Chatpibal, Singha Chaveesuk Presenter: Manoj Chatpibal, King Mongkut's Institute of Technology Ladkrabang, Thailand</p> <p>Abstract: The purpose of this study is to propose the Design Science Research (DSR)'s phases of problem identification and solution development for the development of a mobile application for career transition assistance. The application aims to connect dismissed employees to potential transitional careers. As a result, the requirements are gathered through interviews with an Outplacement & Career Transition consultant, a downsizing employer, and an impacted employee using Qualitative Research Methodology. The mobile application could help outplaced people by identifying their current skill sets, listing potential careers ranked by skill gaps, and connecting them to resources to close those gaps. Contributing to the body of knowledge within a pragmatic research paradigm by developing a set of designed career transition principles. Researchers will benefit from the established model of career transition requirements, whereas practitioners, such as software developers, will be able to apply these findings to further develop the mobile application. Employers, employees, and consulting firms will all benefit from this identified requirement once the application is developed appropriately.</p>
<p>T41 10:30 – 10:45</p>	<p>Research on logistics distribution problem based on improved ant colony algorithm Yimin Xiao, Li Xiao, Fan Yu and Xiaopin Xu Presenter: Yimin Xiao, Ezhou University, China</p> <p>Abstract: This paper describes the logistics distribution vehicle routing optimization scheduling problem with time window, and gives the mathematical model. Based on the maximum minimum ant colony algorithm, an improved ant colony algorithm is proposed. It is improved in the construction of the initial solution of the logistics distribution routing optimization problem, routing optimization, transfer rules, pheromone update mode, algorithm termination judgment, etc. by introducing the concept of information moisture, The value of information moisture related to the operation process of the algorithm is used to represent the uncertainty in the selection process, so as to control the probability of path selection and local random variation disturbance, so as to realize the adaptive adjustment of the algorithm. At the same time, the solution is optimized twice in combination with the local optimization method. Through these improvements, the search efficiency of the algorithm is improved, and the experimental simulation shows the effectiveness of the improved algorithm.</p>

<div>T43</div> <div>10:45 – 11:00</div>	<div>An edge computing offloading algorithm based on second-order oscillatory particle swarm optimization Dan Ye; Xiaogang Wang; Jin Hou Presenter: Dan Ye, Sichuan University of Science & Engineering, China</div> <div>Abstract: In the research of edge computing offloading for IoT devices, most researchers only focus on the optimization of single index. This will cause the offloading algorithm not to meet the expected effect. To solve the above problems, a joint optimization edge computing offloading algorithm based on second-order oscillatory particle swarm optimization is proposed. Firstly, adaptive parameters are used to improve the processing ability of particle swarm optimization algorithm for joint optimization problems. Secondly, the second-order oscillation function is introduced into particle swarm optimization algorithm, which improves the evolution stability and the convergence speed. The simulation experimental results confirm the effectiveness of the proposed scheme. The improved algorithm can optimize the task execution delay and energy consumption of IoT devices jointly, and it has good convergence speed and optimization ability.</div>
<div>T48</div> <div>11:00 – 11:15</div>	<div>Stock Trend Prediction Based on ARIMA-LightGBM Hybrid Model Xiuyan Zheng, Jiajing Cai, Guangfu Zhang Presenter: Xiuyan Zheng, Hainan Vocational University of Science and Technology, China</div> <div>Abstract: As an important part of capital market, stock market is playing an increasingly important role in social and economic development. Stock trend prediction model research has been a popular topic of study among specialists and academics in the fields of economic finance and data analysis. In this paper, Gree Electric Appliance stock is selected as the research object. When the training set and test set are determined, the ARIMA model and LightGBM model, which are commonly used for forecasting, are used to predict the trend of the stock respectively, and then the benefits and drawbacks of these two models in stock trend prediction are analyzed and summarized. On this basis, we propose the ARIMA-LightGBM hybrid model to predict the stock change trend of Gree Electric Appliances stock in six months. In the proposed hybrid model, The ARIMA model was used for the six-month prediction of exogenous variables. Secondly, the LightGBM model is used to model the exogenous variables predicted by the ARIMA model to obtain the predicted stock trend in the next six months. By comparing with the actual Gree Electric Appliances stock price trend, the results show that the prediction accuracy of the proposed ARIMA-LightGBM hybrid model is better than that of the LightGBM model. At the end of the paper, we also put forward some valuable investment strategies based on the forecast results.</div>

<div data-bbox="56 59 183 182"></div> <div data-bbox="188 311 244 339">T51</div> <div data-bbox="127 368 308 396">11:15 – 11:30</div>	<div data-bbox="410 47 1607 75">Short-term PV Output Prediction Method Based on Feature Analysis and Multi-model Fusion</div> <div data-bbox="410 94 1401 122">Yuansheng Song, Teng Zhao, Ziru Niu, Jin Du, Fanghui Jiang and Fangyue Zhai</div> <div data-bbox="410 141 1039 169">Presenter: Jin Du, Qufu Normal University, China</div> <div data-bbox="410 237 2474 694"><p>Abstract: In the future, photovoltaic power generation will usher in a larger market. The rapid development of artificial intelligence provides a new solution for photovoltaic power generation forecasting. In this paper, combined with the current cutting-edge theoretical research in the field of artificial intelligence, a short-term photovoltaic power generation power prediction method based on multi-model fusion Stacking ensemble learning is proposed. Random Forest and correlation coefficient feature importance analysis were used to determine the important climate factors as the input characteristics of the prediction model. On this basis, multiple machine learning models with good single prediction performance and certain differences are integrated into the Stacking ensemble learning photovoltaic output prediction model. The base learner of the model includes XGBoost tree ensemble algorithm and GRU neural network algorithm. To prevent overfitting, the meta-learner consists of the LSSVM algorithm with relatively simple complexity and high accuracy. The calculation example uses the photovoltaic power and climate data provided by the Australian Solar Energy Research and Development Center to verify the effectiveness of the algorithm. The prediction results show that the Stacking model has higher prediction accuracy than the traditional single model which can better track the fluctuation of output power.</p></div>
<div data-bbox="188 1025 244 1053">T221</div> <div data-bbox="127 1082 308 1110">11:30 – 11:45</div>	<div data-bbox="410 739 1536 768">Field Strength Prediction of High Altitude Drop Mountain Area based on Deep Learning</div> <div data-bbox="410 786 1398 815">Min Zhou, Yifan Xiao, Bingcheng Li, Jialin Li, Wei Shao, Yang Liu, Xiaoqin Yang</div> <div data-bbox="410 833 1238 862">Presenter: Min Zhou, Army Engineering University of PLA, China</div> <div data-bbox="410 929 2474 1386"><p>Abstract: Accurate prediction of radio wave propagation is very important for mobile communication network planning and optimization. In view of the difficulty of radio measurement in high altitude drop mountain area and the urgent need for radio prediction in some important high altitude areas, the following work is mainly done in this paper: First of all, we used ray tracing simulation software to calculate the radio wave propagation data in high altitude drop mountain area, and obtained the data set required by deep learning after pre-processing. Secondly, a neural network suitable for radio wave propagation prediction was built by us. Thirdly, the hyperparameter tuning algorithm based on Optuna framework was used to obtain appropriate hyperparameters. Finally, we changed the types of environmental features in the input data and trained the neural network to obtain the predicted values of the field intensity and make comparison. The results show that under the condition of proper hyperparameters, good training effect can be obtained by using the constructed model. It can be observed that the proposed method has a good prediction effect, and the prediction accuracy will be greatly improved with the addition of environmental features. The area of the high altitude drop mountain studied in this paper is large, and the electric field intensity at any point in the area can be predicted quickly by using the method proposed in this paper with a small computational cost.</p></div>

May 8 | Sunday | 13:30 – 15:30 (GMT+8)

ZOOM 1: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Topic: Communication and Information System

Session Chair: Assoc. Prof. Xiaogang Wang, Sichuan University of Science & Engineering, China

T07, T15, T16, T21, T36, T45, T13, T47

Joint Precoding for Intelligent Reflecting Surface-Aided Millimeter Wave Secure Communications

Wenmeng Li, Yehua Zhang, Baoyin Bian, Hongzhen Yang, Lang Li, Xuan Wang, Jun-Bo Wang and Hua Zhang

Presenter: Wenmeng Li, NARI Group Corporation (State Grid Electric Power Research Institute), China

T07
13:30 – 13:45

Abstract: In this paper, we investigate an intelligent reflecting surface (IRS) aided millimeter wave (mmWave) secure communication system. To maximize the secrecy rate at the legitimate receiver, we jointly optimize the active hybrid precoding at the transmitter and passive precoding at the IRS. Since the optimization problem is non-convex, an alternating optimization based algorithm is proposed, i.e., we iteratively solve digital baseband precoding, analog radio frequency precoding or one of the reflection coefficients with the others fixed. Simulation results show that our proposed algorithm can effectively improve the security performance of the system.

<p>T15</p> <p>13:45 – 14:00</p>	<p>Design of mQAM-OFDM Underwater Wireless Optical Communication System Based on LED Array Yanxin Yao, Hongxi Yin, Xiuyang Ji, Lianyou Jing, Yanjun Liang, and Jianying Wang Presenter: Yanxin Yao, Dalian University of Technology Dalian, China</p> <p>Abstract: In this paper, we design a compact UWOC transmitter based on LED array light source and mQAM-OFDM modulation using FPGA, and a verification system with the transmitter and a low-cost optical receiving module, is experimentally demonstrated. In this system, the LED array is used to enhance the optical power, and a free form lens is designed for beam forming. It is shown by experimental results that this system can achieve data rates up to 50 Mbps over a 5m underwater channel. In addition, the impacts of data rate and deviation of the optical receiver's position from the optical axis on the performance of communication system are also compared. This provides an idea for the practical design of compact UWOC system.</p>
<p>T16</p> <p>14:00 – 14:15</p>	<p>An Improved Auction based Power Control in Multi-Cell NOMA Networks Abuzar B. M. Adam, Moatssim Saif, and Abdalrhman A. A. Abdallah Presenter: Moatssim Saif, Chongqing University of Posts and Telecommunications, China</p> <p>Abstract: In this paper, we introduce an improved Auction-based scheme to handle power control in multi-cell non-orthogonal multiple access (MC-NOMA) networks. The problem is formulated as the maximization of some energy efficiencies under the quality of service (QoS) and the interference constraints. The problem is non-convex. However, we leveraged the fractional nature of the energy efficiency function and the Lagrangian relaxation to design the proposed scheme. The proposed scheme is designed to allocate the power to fulfill the QoS requirements while suppressing interference. The simulation results show that the proposed scheme achieves good results and outperforms other methods in the literature.</p>

<p>T21 14:15 – 14:30</p>	<p>A Fragmentation-Aware Load-Balanced RMSCA Algorithm in Space-Division Multiplexing Elastic Optical Networks Qiuwang Lan, Yifeng Cai, Shangjun Chen, Xin Chen, and Jianhua Shen Presenter: Qiuwang Lan, Nanjing University of Posts and Telecommunications, China</p> <p>Abstract: With the rapid increase of transmission bandwidth and the emergence of a variety of network services, there has been an ever-growing research enthusiasm on routing, modulation, spectrum and core allocation (RMSCA) in spatial multiplexing elastic optical networks (SDM-EONs). Based on frequency slot allocation pattern (FSAP), this paper proposes a fragmentation-aware load-balanced routing, modulation, spectrum and core allocation algorithm (FALBR). Simulation results demonstrate that compared with two kinds of RMSCA algorithm, the FALBR algorithm can reduce the request blocking probability (RBP) by approximate 68.31% and 23.07%, and improve the spectrum utilization (SU) by about 9.35% and 0.60%, respectively.</p>
<p>T36 14:30 -14:45</p>	<p>Price-Driven Positive-Sum Game Offloading Strategy in Smart Grid enabled by 5G Cloud-Edge Collaboration Jing Jiang, Yudong Wang, Peizhe Xin, Peng Wu and Yize Tang Presenter: Jing Jiang, State Grid Economic and Technological Research Institute Co., Ltd., China</p> <p>Abstract: As the key technology of the sixth generation(6G), cloud-edge collaboration has attracted people's attention in smart grids. However, the complex network structure of cloud-edge collaboration not only requires a reasonable offloading scheme to deal with real-time traffic changes, but also requires an effective incentive mechanism to prompt servers to provide resources for users. This paper designs an offloading scheme in Smart Grid enabled by 5G Cloud-Edge Collaboration. On the one hand, a back-off mechanism is introduced to alleviate the contradiction between supply and demand of resources, and on the other hand, a dynamic pricing strategy is introduced as an incentive mechanism for the server. To minimize the user's offloading cost, we propose a price-driven positive-sum game offloading(PPGO) algorithm, which can meet the different computing needs of users while ensuring server revenue. The simulation results show that the algorithm has good performance compared with other algorithms, and the back-off strategy can effectively alleviate the problem of insufficient computing resources.</p>

<div>T45</div> <div>14:45 – 15:00</div>	<div>Optimal Sampling Interval Acquisition Method for WiFi Fingerprint-based Localization based on Monte Carlo Method and Multi-Objective Optimization</div> <div>Xiaoli Zhang, Yifei Xu, Xiaomeng Li and Zhe Yang</div> <div>Presenter: Zhe Yang, Shandong University, China</div> <div>Abstract: In recent years, with the gradual popularization of Wireless Local Area Networks (WLAN) and mobile devices, WiFi-based fingerprint localization technology has won wide attention from researchers due to its simple principle and high universality. Although there are numerous performance analysis and optimization works for this technology, the mechanism of error formation is still unclear, and it is still very challenging to optimize the localization performance, especially the relationship between the site survey and localization error is very complicated, and the sampling interval not only affects the localization error but also determines the survey workload. To address the above problems, this paper obtains the relationship between localization error and sampling interval in two-dimensional scenes based on Monte Carlo method, and then defines a survey cost formula based on multi-objective optimization theory to weigh localization error and site survey workload, and then obtains the optimal sampling interval. The simulation results prove the correctness of this study, which is consistent with the previous conclusions obtained through experiments.</div>
<div>T13</div> <div>15:00 – 15:15</div>	<div>Blind Interference Alignment Scheme for Dynamic TDD Systems</div> <div>Yuanhao Chen, Liang Wu, Zaichen Zhang, Jian Dang, Bingcheng Zhu, and Lei Wang</div> <div>Presenter: Yuanhao Chen, Southeast University, China</div> <div>Abstract: This paper proposes a multi-cell blind interference alignment (BIA) scheme to eliminate the cross-link interference in the dynamic time division duplex (TDD) wireless communication system. The proposed BIA scheme focuses on the interference between base stations. In the proposed BIA scheme, the transmitter does not need to know channel state information (CSI), and the implementation process is divided into two parts. In the first part, the interfering base station and the users of the interfered cell transmit signal vectors at the same time. In the second part, only the interfering base station transmits signal vectors, which is received by the interfered base station and is employed to eliminate the interference caused in the first part. The proposed scheme can eliminate interference efficiently and achieve a high degree of freedom (DoF).</div>



T47

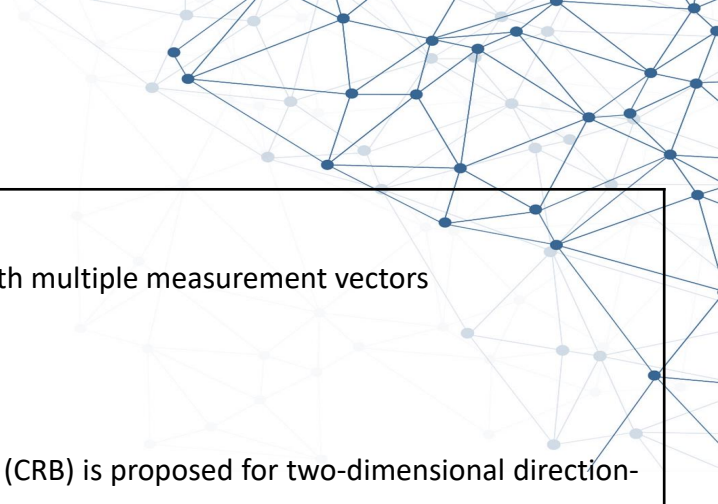
15:15 – 15:30

A new method to calculate complex Cramer-Rao bound for two-dimensional direction-of-arrival estimation with multiple measurement vectors

Lin Han, Di Huang, Hanxu Li and Xian Zhu

Presenter: Lin Han, Hangzhou Applied Acoustics Research Institute, China

Abstract: A new method to calculate the complex Fisher information matrix (FIM) and the Cramer-Rao bound (CRB) is proposed for two-dimensional direction-of-arrival (2D-DOA) with multiple measurement vectors (MMVs). The detailed theoretic calculation process is presented in the text. Finally, numerical results are conducted not only to verify accuracy of the theoretical result by comparing against another method to calculate complex CRB, but also to demonstrate the effectiveness of CRB as the performance metric.



May 8 | Sunday | 13:30 – 15:30 (GMT+8)

ZOOM 2: 879 6981 6327 (Password: 050608)

Link: <https://us02web.zoom.us/j/87969816327>

Topic: Image and Signal Analysis

Session Chair: Dr. Xiuxia Cai, Xi'an University of Posts and Telecommunications, China

T29, T08, T10, T49, T42, T39, T55, T12



Consensus One-step Multi-view Image Clustering Based On Low-Rank Tensor Learning

Lin Li, Xiaojun Zhou, Zhiqiang Lu, Dongxiao Li, Xiaoxiao Zhou, Li Song, Na Wu

Presenter: Zhiqiang Lu, MIGU Co., Ltd, China

T29
13:30 – 13:45

Abstract: Multi-view subspace clustering aims to divide a set of multi-source data into several groups according to their underlying subspace structure. Despite superior clustering performance in various applications, most existing methods directly construct noisy affinity matrices by self-representation, and isolate the processes of affinity learning, multi-view information and clustering. Both factors may cause insufficient utilization of multi-view information, leading to unsatisfying clustering performance. In this paper, we propose a novel consensus one-step multi-view clustering method based on low-rank tensor learning to address these issues. Low-rank tensor learning, consensus learning and labels learning in a unified framework. Through the three steps of mutual negotiation, the final clustering label is directly obtained. Experimental results on four benchmark datasets demonstrate that our method outperforms other state-of-the-art methods.

<p>T08 13:45 – 14:00</p>	<p>Adaptive Feature Fusion based Cooperative 3D Object Detection for Autonomous Driving Junyong Wang, Yuan Zeng, Yi Gong Presenter: Junyong Wang, Southern University of Science and Technology, China</p> <p>Abstract: In this paper, we focus on the collaborative 3D object detection problem in autonomous vehicle systems in which autonomous vehicles can improve their detection accuracy by aggregating the information received from spatially diverse sensors through wireless links. We propose a novel adaptive feature fusion based cooperative 3D object detection framework, which consists of feature transformation networks and an improved region proposal network. The framework learns to fuse features from different views to improve object detection accuracy on the autonomous vehicle. To evaluate the proposed method, we build a new synthetic dataset created in two driving scenarios (a Roundabout and a T-junction). Experiment analysis and results demonstrate that the proposed adaptive feature fusion approach performs better than two baseline approaches in terms of detection accuracy.</p>
<p>T10 14:00 – 14:15</p>	<p>Research on Laser Polarization Image Reconstruction Based on Wavelet Transform and Deep Learning Peipei Zhang and Xi Zhang Presenter: Peipei Zhang ,Xi'an Traffic Engineering Institute, China</p> <p>Abstract: The traditional laser polarization image reconstruction method is affected by environmental noise, resulting in poor image reconstruction effect. For this reason, a wavelet transform and deep learning laser polarization image reconstruction method is designed. The convolutional neural network is used to denoise the image, the wavelet transform method is used to extract the image texture features, and the overall nested network edge detection method in deep learning is introduced to detect the edge. In addition, the feature fusion module in the wavelet transform is used for processing, adding Multiscale Dilated Dense Block MDDB, Experimental Laser Polarization Image Reconstruction. The experimental comparison results show that the method proposed in this paper can accurately identify the target in the image, make full use of the activation function in it to learn and identify the image features, effectively prevent the loss of important information in the image feature learning and identification.This method significantly improves the quality of reconstructed images and achieves better visual effects.</p>

<p>T49 14:15 – 14:30</p>	<p>Research on autonomous decision-making of UCAV based on deep reinforcement learning Linxiang Wang, Hongtao Wei Presenter: Linxiang Wang, Wuhan University of Technology, China</p> <p>Abstract: In order to improve the intelligence level of training opponents in UCAV air combat simulation and the realism and immersion of air combat simulation in 3D space, this paper proposes a deep reinforcement learning algorithm for UCAV autonomous control based on virtual reality technology. A combination of reinforcement learning and Unity3D is used to train UCAV agents to achieve air combat tasks in 3D virtual reality space, and imitation learning is added to improve the efficiency of policy generation. Multiple perceptrons are used to simplify the agent's acquisition of environmental state data, and reward functions are designed by integrating UCAV angle, speed, and altitude considerations to visualize the entire 3D visualization process of reinforcement learning training UCAV agents to interact with the environment.</p>
<p>T42 14:30 -14:45</p>	<p>Sparse signal detection and fingerprint feature recognition based on fast 2D DFRFT Jun Yang and Jinshun Shen Presenter: Jun Yang, Xidian University, China</p> <p>Abstract: In this paper, a two-dimensional fractional Fourier transform (2D FRFT) based fingerprint feature extraction scheme is proposed, based on the fact that the fingerprint image can be approximated as two-dimensional chirp signals. And the sparse 2D fractional Fourier transform (STDFRFT) algorithm is proposed to achieve efficient computation of 2D FRFT. The effectiveness of the proposed STDFRFT algorithm is reflected in the simulations and applications of fractional domain sparse random signal detection, convergence analysis, two-dimensional chirp signal detection and fingerprint feature recognition.</p>

<div data-bbox="58 58 183 184"></div> <div data-bbox="186 348 242 376">T39</div> <div data-bbox="127 404 308 432">14:45 – 15:00</div>	<div data-bbox="410 112 1612 144">Combination of Denoising Algorithms for Video-based Non-contact Heart Rate Measurement</div> <div data-bbox="410 161 1009 192">Han Xiao, Jie Xu, Danfeng Hu, and Jiajun Wang</div> <div data-bbox="410 208 998 239">Presenter: Han Xiao, Suzhou University, China</div> <div data-bbox="410 304 2474 668"><p>Abstract: Denoising is very important for signal processing of non-contact heart rate measurement. Most studies of video-based heart rate measurement usually use a single denoising algorithm such as principal component analysis (PCA) or independent component analysis (ICA) to reduce noise in original signal. Using only one single denoising algorithm usually can not achieve satisfactory results, because each denoising algorithm has its shortcomings. To deal with this problem, this study has proposed to combine the following three denoising algorithms of wavelet transform (WT), PCA and ICA in different ways for noise removal in the original heart rate signal. The denoising performance is evaluated by root mean square error (RMSE) and mean absolute error (MAE). The experimental results have shown that the measurement accuracy of combined algorithms is higher than that of single algorithm. The proposed combined denoising algorithm in this study can improve accuracy and enhance stability of heart rate measurement, which is of practical significance for the application of non-contact heart rate measurement technology.</p></div>
<div data-bbox="186 971 242 999">T55</div> <div data-bbox="127 1026 308 1055">15:00 – 15:15</div>	<div data-bbox="410 758 1281 789">Certificateless Identification Schemes using Supersingular Isogenies</div> <div data-bbox="410 806 996 838">Keteng Huang, Guoqing Zhou, and Maozhi Xu</div> <div data-bbox="410 853 1057 885">Presenter: Keteng Huang, Peking University, China</div> <div data-bbox="410 949 2474 1268"><p>Abstract: Certificateless public key cryptography (CL-PKC) is a cryptosystem that lies between traditional public key cryptography (PKC) and identity-based cryptography (IBC). It not only removes the inherited key escrow property in IBC, but also is free from the problem of certificate management in PKC. In this paper, we propose a new certificateless identification (CLI) scheme that is based on isogenies between supersingular elliptic curves. Since supersingular isogeny problems are believed to be quantum-resistant, our scheme is post-quantum secure assuming hardness of some computational problems related to supersingular isogenies. Our scheme combines De Feo-Jao-Plaut identification scheme and SQISign. Note that compared to all other post-quantum signatures, SQISign has the smallest signature and public key sizes combined, this feature benefits our scheme as well. To our best knowledge, our scheme is the first certificateless identification scheme that is based on supersingular isogenies problems. Moreover, it achieves trust level 3 of public-key cryptosystem.</p></div>

T12

15:15 – 15:30

RCANet: A Rows and Columns Aggregated Network for Table Structure Recognition

Xinyi Shen, Lingjun Kong, Yunchao Bao, Yaowei Zhou, and Weiguang Liu

Presenter: Xinyi Shen, Jinling Institute of Technology, China

Abstract: Most existing table structure recognition methods can be classified into two major categories: detecting table borders methods and detecting table rows and columns methods. The method of detecting the table borders can produce the imbalance between positive and negative samples, because the number of pixels in the table borders is very small. Although the method of detecting the rows and columns of the table avoids this imbalance, some studies simplify the prediction of rows and columns into column-by-column and row-by-row prediction, which creates a problem with large error tolerance. To solve this problem, two modules are proposed, called Rows Aggregated (RA) module and Columns Aggregated (CA) module. Firstly, the method of feature slicing and tiling is used to make approximate prediction for the rows and columns that solves the problem of large error tolerance. Secondly, the row and column information is further retrieved by calculating the attention maps of channels. Finally, we use RA and CA to build a semantic segmentation network, which is called Rows and Columns Aggregated Network (RCANet), to complete the rows segmentation and columns segmentation. We generate rows and columns masks on ICDAR 2013 dataset and evaluate the model. Experiments show that the proposed model has better performance than the segmentation model based on detection table rows and columns method, and its average precision, recall and F1 value are 2.08%, 3.21% and 2.45% higher respectively.

May 8 | Sunday | 15:45 – 18:00 (GMT+8)

ZOOM 1: 844 7956 0211 (Password: 050608)

Link: <https://us02web.zoom.us/j/84479560211?pwd=MDhoS1gwN3R3VWNNZjVoTDdWNkppZz09>

Topic: Talent Training and Education Strategy

Session Chair: Dr. Ankan Bhattacharya, Mallabhum Institute of Technology, India

T205, T210, T203, T207, T209, T214, T218, T201, T202

Research on Project-guided Teaching Contents and method in Engineering Training

Xiuli Hu, Zhigang Cai, Jianwei Song, Peilian Feng, Xudong Pan

Presenter: Xiuli Hu, Harbin Institute of Technology, China

T205
15:45 – 16:00

Abstract: Project-guided teaching contents and method are characterized by students' active learning. In the process of completing the project, students' practical and innovative abilities are improved by practice, analyzing and solving problems of the project and teamwork. Project-guided teaching contents are added to traditional engineering training projects, which makes the contents and process of practical training exploratory. Two different examples of project-guided teaching in traditional engineering training project were given. According to the type of engineering training project and the students who are in different grades or in different majors, the project-guided teaching contents was designed in different levels. In order to make the project teaching contents keep up with modern technology development, the typical cases reflecting the development of modern technology in enterprises were taken as the basis of project teaching contents by the university-enterprise cooperation mode.

<p>T210 16:00 – 16:15</p>	<p>Reform and exploration of deliberative practical teaching model of non-traditional machining Xiaodong Yang, Dongbo WEI, Chen LIU, Jicheng BAI, Yongfeng GUO Presenter: Xiaodong YANG, Harbin Institute of Technology, China</p> <p>Abstract: The teaching of non-traditional machining is essential for students major in mechanical. Moreover, the emergence and development of non-traditional machining fully reflects the innovative thinking and plays a positive role in cultivating students' innovative consciousness and ability. However, the current practical teaching of non-traditional machining is generally a mode that many students watch a demonstration around a large machine tool, as a result, the teaching effect is limited. Based on the self-made miniature CNC electrical discharge machining teaching experimental machine tool series, this paper carried out the reform and practice of experimental contents, implementation methods and experimental methods, the deliberative practical teaching model of non-traditional machining was realized, and its significant effect in cultivating the practical innovation ability of students can be confirmed.</p>
<p>T203 16:15 – 16:30</p>	<p>The Multi-layer Grey Relational Analysis between the Training Factors and the Employment Factors of the Engineering Subjects College Students Xiaolin Cao, Qin Liang, Changchun Fang, Yuduo Yan, Dongsheng Li, Ying Huang, Shuangwei Wang Presenter: Xiaolin Cao, Jilin University, China</p> <p>Abstract: The aim of this paper is to construct an analyzing scheme for presenting the complex relationship between typical training factors and significant employment factors. This research was based on data acquired from senior college students majoring in different fields of engineering. Limited by the amount of questionnaires, grey relational analysis (GRA) was applied in this study for its ability to process limited data.</p> <p>Taking into consideration all the complexities of the training factors, an arrangement of three hierarchies were created with the training factors grouped together in a few categories for each hierarchy. Using this arrangement, the corresponding multi-layer synthetic GRA was constructed. According to the grey relational coefficient between the training and employment factors, the training factors were converged, from the lower hierarchy to the adjacent higher hierarchy, with different weights. The grey relational coefficient sequences of all training factors, within the different hierarchies, were then obtained. After the significant difference tests, the key training factors of each hierarchy were uncovered.</p>

<p>T207 16:30 – 16:45</p>	<p>Problems Analysis and Countermeasure Suggestions for Project-based Industry-University-Research Collaborative Innovation Wei Bao, Zhihao Li, Ruiyan Li Presenter: Wei Bao, Jilin University of Architecture and Technology, China</p> <p>Abstract: With the development of industry-university-research collaborative innovation, the depth and breadth of collaborative cooperation have been continuously improved. Based on the analysis and research of the existing literatures and theories of industry-university-research collaborative innovation, this paper investigates the examples of cooperation in industry-university-research, takes the “Research and product development of key technologies for in situ monitoring of surface water quality in Jilin province” project cooperated by a university and Jilin Jiaheng Geological Environment Surveying and Mapping Co., Ltd. as an example, combines the existing theories and research conclusions. From the four directions of object selection, technology transfer, knowledge transfer and benefit distribution, this paper analyzes the problems encountered in the practice of project-based collaborative innovation model in industry-university-research, fills the theoretical blanks of collaborative innovation in industry-university-research, puts forward solutions based on the platform, personnel, system, benefits and other aspects, improves the development of collaborative innovation in industry-university-research, and looks forward to industry-university-research collaborative innovation.</p>
<p>T209 16:45 – 17:00</p>	<p>Construction of non-traditional machining curriculum system for training innovative talents Jicheng Bai, Zimu Zhou, Zhengkai Li, Xiaodong Yang, Dongbo Wei Presenter: Jicheng Bai, Harbin Institute of Technology, China</p> <p>Abstract: In the stage of innovation-driven development, the cultivation of innovative talents is the core and focus of quality education. The quality of innovative thinking education depends on the positive interaction between educators and students, and more importantly on the setting of curriculum system bearing teaching activities, the provision of high-quality textbooks and practice platforms. This paper will analyze the relevant teaching practice and experience, innovative thinking training course design and its design logic in the construction of non-traditional machining course system, and discuss its effect, in order to provide an inspiring innovative thinking course teaching case for the educators of this specialty and other specialties.</p>

<p>T214 17:00 – 17:15</p>	<p>Cultivation of Innovative Talents with Information Characteristics for Engineering Education Orientation Meilan YE, Lijuan SUN, and Jianhua SHEN Presenter: Jianhua SHEN, Nanjing University of Posts and Telecommunications, China</p> <p>Abstract: Engineering education is one of the important parts in current higher education reform, and it is especially pivotal for the information technology field of the country's major development and strategic industries. Focusing on the meticulous division and rapid technological development in information technology field, along with the cultivation of students' preliminary ability to solve complex engineering problems, this paper introduces the continuous optimization and improvement of the outcome-based education mechanism in Nanjing University of Posts and Telecommunications (NJUPT). Some innovative initiatives are proposed for undergraduate students' engineering ability cultivation which empowers students to analyze and solve problems under complex engineering backgrounds.</p>
<p>T218 17:15 – 17:30</p>	<p>Curriculum Reform of Electronic Technology Training for Students' Autonomous Learning Ability Jinbo Li, Xudong Pan, Xiaohui Xing, Chen Gao, Xuelin Chen Presenter: Jinbo Li, Harbin Institute of Technology, China</p> <p>Abstract: Science and technology is rapidly developing in the direction of informatization, automation and intelligence. With the generation after 00s gradually being the subject of higher education, the development and popularization of electronic technology training is in urgent need of exploring new ideas. Under the impetus of the vigorous development of curriculum politics and the implementation of morality education in colleges and universities, this paper establishes and improves a new concept of practical teaching through curriculum reform practice, which is driven by project-based learning, aims to develop students' individuality and to improve students' autonomous learning ability. This paper also deeply studies the new system of electronic technology training which can cultivate students' comprehensive practical ability and personal quality, aiming to provide a reference for engineering talent training and researching in related fields.</p>

<p>T201</p> <p>17:30 – 17:45</p>	<p>Research and practice of curriculum group reform with Outcome based Education</p> <p>Peipei Zhang</p> <p>Presenter: Peipei Zhang, University of Electronic Science and Technology of China, China</p> <p>Abstract: Under the guidance of Outcome Based Education (OBE), aiming at the problems existing in traditional teaching, this paper carries out a continuous and all-round reforms of mechanical professional curriculums around graduate outputs. Firstly, the curriculum group is formed according to the logical relationship between professional knowledge, and then the teaching content, mode of teaching and mode of assessment are reformed. After the implementation of the reforms, from the perspective of curriculum achievement degrees and students' feedbacks, the reforms have achieved good results.</p>
<p>T202</p> <p>17:45 – 18:00</p>	<p>Demands Investigation of talent training in the railway field</p> <p>XIAO Hong, Wang Yang, Fang Shuwei, Hu Fei , CUI Xuhao, Wang Xiaoyu</p> <p>Presenter: XIAO Hong, Beijing Jiaotong University, China</p> <p>Abstract: Rail transit, as the artery of the national economy, an important national infrastructure and a popular means of transportation, is the backbone of the comprehensive transportation system, featuring energy conservation, environmental protection, safety and large transport capacity, plays a crucial role in China's economic development. With the rapid development of rail transit, the number, level and structure of personnel demand of railway transportation system will change significantly, and the existing rail engineering can no longer adapt to the new railway personnel demand. This paper investigates the training mode and teaching content of railway transportation department personnel through questionnaire. The results show that the existing talent training mode is weak in practice, the teaching content and methods are not suitable for training technical application-oriented talents, the teaching methods are backward, and the experimental and practical training equipment is insufficient. Some suggestions are put forward to construct competency-based curriculum content system and strengthen the construction of experimental and practical training base.</p>

May 8 | Sunday | 15:45 – 17:45 (GMT+8)

ZOOM 2: 879 6981 6327 (Password: 050608)

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Topic: Advanced Information Technology and Security

Session Chair: Prof. Ilija Basicovic, University of Novi Sad, Serbia

T25, T28, T31, T33, T38, T46, T50, T2001



Effective and secure two-factor multi-server authentication scheme without password

Shuwan Sun, Weixin Bian, Biao Jie, Dong Xie, Yi Huang

Presenter: Shuwan Sun, Anhui Normal University, China

T25
15:45 – 16:00

Abstract: Increasing number of online services have brought great convenience to users, and remote user authentication schemes have been widely used to verify the legitimacy of the authorized users. However, most of the existing authentication schemes are based on password, in which users need to remember the complex passwords and change them frequently. In addition, the great majority of authentication schemes have security defects. Through the analysis of the scheme proposed by Haq et al., we find that it is difficult to resist the key compromise impersonation attack. Therefore, an improved two-factor multi-server authentication scheme without password is proposed. The perfect combination of the user's biological characteristics and the PUF's physical characteristics enhances the practicality and efficiency of the solution. Security analysis of the proposed scheme shows that it can resist various known security attacks.

<p>T28 16:00 – 16:15</p>	<p>A User-Oriented Evaluation Mechanism for Mobile Applications Security Based on Behavior Relevance Guang Shi, Qinghe Zhou, Tao Li, Yuan Feng and Menglin Liu Presenter: Guang SHI, Southeast University, China</p> <p>Abstract: Due to Weak comprehensiveness, insufficient static detection, and failure to consider user's subjective factors exist in the traditional mobile application security detection. We propose a comprehensive mechanism for application security evaluation based on software behaviour relevancy and user tolerance. This mechanism integrates static analysis, dynamic analysis, and user evaluation, analyzes whether declaration permissions and API calls meet its functional requirements. User-Oriented Mechanism, which incorporates behavioural relevancy, compensates for the coarse-grained static detection and the inefficiency of dynamic monitoring and provides users with a safety reference for mobile applications. The user's tolerance for the application's behaviour is introduced in the evaluation phase. The experiments show that the detection framework can detect applications quickly and shallow false positive rate. The evaluation model can reflect users' expectations, effectively making up for the limitations of existing detection dimensions.</p>
<p>T31 16:15 – 16:30</p>	<p>Implementation of Cloud Component for Security Monitoring and Comprehensive Guarantee of Identifier Resolution System Zhongli Na, Wei Liu, and Kai Li Presenter: Zhongli Na, Research Institute of China Telecom, China</p> <p>Abstract: Aiming at the fact that the existing security protection technology cannot effectively solve the security risks faced by enterprises accessing the identifier resolution system, the security monitoring comprehensive guarantee cloud component is developed to realize the functions of security protection, performance monitoring and high availability guarantee suitable for the identifier resolution system. Firstly, encapsulate the cloud component parameter configuration and management process. Then improve the security protection management mechanism. Next, design four modules which include service proxy, aggregation request, response analysis and log processing to monitor the system status. Finally, realize the service degradation technology based on business indicators. The experimental result indicates that the cloud component exhibits competitive performances in improving the security, observability and high availability, so that provide a strong guarantee for the stable and reliable operation of the identifier resolution system.</p>

<p>T33 16:30 – 16:45</p>	<p>Big Open Data Aided Institutions’ Name Normalization and Attribute Enrichment Lei Wang, Jiahui Hu, Qian Wang, Yusheng Yang, Pei Lou and An Fang Presenter: Lei Wang, Institute of Medical Information, CAMS & PUMC, China</p> <p>Abstract: The institution is a critical component in the scientific resources. The peers in the field of the library have explored a variety of practices in the construction of its authority file. But the construction of the institution authority file still faces a series of challenges. The paper proposed a method to accomplish the institutions' name normalization and attribute enrichment, to link the affiliations' abbreviation in the article with its attribute value in the open data. It was separated into several parts, including data cleaning and normalization, big open data selection, data linking, big open data management, and export results. Open data was used to aid the name normalization and to provide the resource of the institutions' attributes. Compared with other practices, the method also considered the management of big data to reduce the cost of data storage and support updating data in the future. In practice, it is feasible and has been applied.</p>
<p>T38 16:45 – 17:00</p>	<p>Location privacy protection method based on geohash coding and pseudo-random sequence Liu Kai, Han Yiliang, Wang Jingjing and Guo Kaiyang Presenter: Liu Kai, Engineering University of PAP, China</p> <p>Abstract: The popularity of mobile communication devices and the rapid progress of social networks have not only promoted the development of location-based services, but also brought many risks to users' privacy. In order to better protect users' location privacy, based on the centralized structure, this paper proposes a k-anonymous location privacy protection scheme based on geohash coding and pseudo-random sequence generation technology, which uses the properties of region coding and pseudo-random sequence to solve the dependence on the credibility of the central server. Theoretical analysis and experimental simulation results show that this scheme can not only resist the central server attack and area central attack, but also has higher efficiency in constructing anonymous area compared with similar schemes.</p>

<div></div> <div></div> <p>T46 17:00 – 17:15</p>	<p>Research and application of data partition technology in distributed database Mingying Zhu, Zhiqiong Liu, Weicheng Chi, Jinjuan Zhang, Zhuxuan Hua, Lixue Shi Presenter: Mingying Zhu, Research Institute of China Telecom Co., Ltd, China</p> <p>Abstract: Distributed database has the characteristics of high scalability, high availability, low cost and performance improvement. How to build an appropriate data partition is the core problem for distributed database to solve the storage problem and improve the performance at the same time. By studying the data partition technology of distributed database, this paper gives the principles and design methods of database partition in distributed database design, and puts forward formulae of aggregation and balance that needs to be paid attention to in database partition, which provides a new idea for the transformation of database partition design from qualitative analysis to quantitative analysis. Moreover, why aggregation should be considered as one of the principles of data partitioning in distributed database is verified by experiments, and the application of database partition technology is illustrated by an example in telecom business support system.</p>
<p>T50 17:15 – 17:30</p>	<p>Evolutionary Game of Supply Chain Alliance based on Blockchain Chenglong Cao, and Xiaoling Zhu Presenter: Chenglong Cao, Anhui Finance and Trade Vocational College, China</p> <p>Abstract: The combination of blockchain and supply chain is conducive to building a trusted and shared alliance environment. This paper discusses the evolution direction of alliance members in a supply chain under the environment of blockchain network. Income matrix is firstly established and then dynamic equation is obtained. Based on dynamic equation, equilibrium points and Jacobian matrix are derived. Through analyzing the sign of determinant and trace of Jacobian matrix, the stability of equilibrium point is studied. Further, the simulation presents the evolution trajectories of alliance members under different situations. The experimental results show that blockchain has a positive effect on the choice of the strategy and on evolution speed of the alliance. The work will help to develop a supply chain alliance relationship that features openness, sharing, credibility and win-win cooperation.</p>



<div>T2001</div> <div>17:30 – 17:45</div>	<div>Estimation Based Feedback Reduction for Online Fountain Codes</div> <div>Yongwei Xiao, Yasheng Zhang and Jingxuan Huang</div> <div>Presenter: Jingxuan Huang, Beijing Institute of Technology, China</div> <div>Abstract: Online fountain codes attract much attentions for their good intermediate performance. However, the feedback requirement limits the application scenario of the coding scheme. In this paper, we reduce the feedback requirement of online fountain codes with no build-up phase (OFCNB). First we analyze the relationship between the overhead and the recovery rate as well as the relationship between the overhead and the buffer occupancy. Based on the analysis, we proposed an estimation based degree selection (EBDS) scheme for OFCNB, where the coded symbol degree is selected based on the estimation of decoding state rather than through feedback. Simulation results validate the effectiveness of the proposed analysis. Compared with other feedback reduction scheme, the proposed OFCNB-EBDS scheme requires less full recovery overhead with similar number of feedback transmissions.</div>
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Hope to see you next year!