VTC2022-Fall
LONDON:BEIJING
Intelligent Communications & Transportation

The flagship conference of
IEEE Vehicular Technology Society

2022 IEEE 96th Vehicular Technology Conference
26 – 29 September 2022 • London, UK and Beijing, China

IEEE **VTS**

Final Program

		Skemp 301 (G)	CAGB 649 (H)	CAGB 650 (I)	CAGB 651 (J)	Skemp 307 (K)
MONDAY 26 September						
8:00–17:30		Registration				
9:00–17:30		TUTORIALS and WORKSHOPS				
18:00–20:00		Welcome Reception (170 Queen's Gate)				
TUESDAY 27 September						
8:00–17:30		Registration				
8:00–8:30		Refreshments (CAGB Level 2)				
8:30–9:00		Welcome and opening (VTC2022-Fall General and TPC chairs; VTS President) (CAGB LT 200)				
9:00–9:45		Opening Keynote (Reinaldo Valenzuela, Nokia Bell Labs)				
9:45–10:30		Keynote: **Future Massive MIMO Technologies for 5G-Beyond and 6G** (Peiying Zhu, Huawei)				
10:30–11:00		Refreshments (CAGB Level 2)				
11:00–12:30	(1)	Antennas and RF Design II	MIMO I	Electric Vehicle Control and Management II	IoT and Networks	
12:30–14:00		Lunch (CAGB Level 2)				
14:00–15:30	(2)	MIMO / NOMA	Navigation and Satellites	Protocols, Security and Services	Recent Results I	
15:30–16:00		Refreshments (CAGB Level 2)				
16:00–17:30	(3)	Intelligent Transportation II			OTFS	
WEDNESDAY 28 September						
8:00–8:30		Refreshments (CAGB Level 2)				
8:00–17:30		Registration				
9:00–9:45		Keynote: **Location Awareness in Next Generation Networks** (Victor Lawrence, Stevens Institute of Technology) (CAGB LT 200)				
14:45–15:30		Keynote: **Collaborative collision avoidance using 5G/6G: "The wireless seat belt"** (Klaus David, Kassel University) (CAGB LT 200)				
10:30–11:00		Refreshments (CAGB Level 2)				
11:00–12:30	(4)	Vehicular Networks II	MIMO II		Neural Networks	
12:30–13:15		Lunch (CAGB Level 2)				
13:15–14:00		Awards Ceremony (CAGB LT 200)				
14:00–15:30	(5)	UAVs	Spectrum Management II		Recent Results II	
15:30–16:00		Refreshments (CAGB Level 2)				
16:00–17:30	(6)	Propagation II	Positioning		V2X	
18:00–23:00		Thames River Cruise & Banquet (busses depart 18:00 sharp)				
THURSDAY 29 September						
8:00–8:30		Refreshments (CAGB Level 2)				
8:00–12:00		Registration				
9:45–10:30		Virtual Keynote: **China Mobile's view on roadmap and development guideline of 6G** (Yuhong Huang, China Mobile) (CAGB LT 200)				
10:30–11:00		Refreshments (CAGB Level 2)				
11:00–12:30	(7)	Learning Techniques in Communications III	Transmission and Reception III		Recent Results IV	Radio Access and Heterogeneous Networks
12:30–13:15		Virtual Keynote: **Federated Learning in VTX Networks** (Vincent Poor, Princeton University)				
13:15–14:00		Lunch (CAGB Level 2)				

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Welcome from the General Co-chairs

We would like to commence by welcoming you to VTC2022-Fall in the 'twinned' cities of Beijing/London! May we invite you to reminisce for a moment and think of the best conference experience you have ever had, the nicest place you have ever been to... Well, our team has been working tirelessly towards matching these experiences for you...

VTC is one of the oldest wireless communications conferences and in this capacity it has contributed towards the spectacular growths of the communications industry over the past five wireless generations. The 'ride' has been amazing and as a community, we succeeded in turning the whole wide world into a global village... Until this wireless revolution the average global penetration of telephony was extremely low and many people never made a phone call. This community created a global infra-sturcture, which today facilitates communications for anyone at the touch of a dialling key and fuels global business.

Our hope is that you would enjoy the rich technical blend of plenaries and panels presented by distinguished industrial and academic leaders converging on Beijing/London from all over the globe. These will also be complemented by cutting-edge research-oriented tutorials, workshops and the regular technical sessions.

We are indebted to the entire organizing and technical program committee, especially to the TPC Chairs, namely Fu-Chun Zheng, Harbin Institute of Technology (Shenzhen); China Justin Coon, University of Oxford, UK; Xiaoming Tao, Tsinghua University, China; and Jiangzhou Wang, University of Kent, UK.

Our sincere thanks also go out to the entire executive committee for their generousity with their precious research-time invested in making VTC2022-Fall Bejing/London a success. We are particularly grateful to our Finance Chair J. R. Cruz, The University of Oklahoma, USA; to the Conference Managers Rodney C. Keele and Cerry Leffler, The University of Oklahoma, USA; to our Keynotes and Panels Chair Tony Constantinides, Imperial College London, UK; to the Industry Session Co-Chairs Sumei Sun, A*STAR, Singapore; Rong Li, Huawei Tech, China; and Alvin Chin, BMW, USA; to the Awards Chair Deniz Gunduz,

Imperial College London, UK; to the Publications Co-Chairs James Irvine, University of Strathclyde, UK; and Feifei Gao, Tsinghua University, China; to the Tutorials Chair Le Liang, Southeast University, China; to the Workshop Chair Shenglong Zhou, Imperial College London, UK; to the Local Arrangements Chair Jintao Wang, Tsinghua University, China; Many thanks also to the Track Chairs for 'oiling the wheels' every step of the way. Naturally, we are all grateful to our valued colleagues in the TPC and the research community at large who assisted us in securing timely reviews!

It is our privilege to convey the community's gratitude to the conference patrons as well, who appear at the conference home page. Needless to say that countless further volunteers contributed in numerous ways to the success of the conference.

On a technical note, following the gradual roll-out of the 5G system, research is now well under way towards the definition of next-generation standards with the goal of maintaining the current momentum of increasing the achievable bitrate. In the past each consecutive decade brought about a factor of ten bitrate improvement. Naturally, these orders of magnitude throughput improvements were achieved at the cost of a substantially increased power consumption. In the light of the escalating energy prices this motivated the design of 'green radios', aiming for more power-efficient designs. However, it is widely recognized that there is a clear trade-off between bandwidth- and power-efficiency. Hence the single-component optimization era is over and next-generation systems are expected to consider multi-component joint Pareto-optimization of the power- and bandwidth-efficiency, the delay and the complexity, to name just a few of the metrics. All in all, an exciting era for our community - please join the debate on Wireless Futures...

Our hope is that you, dear Colleague will enjoy the technical discussions, meeting old friends and forging new professional links, but that you will also be able to sample the local culture and history - we much look forward to an enlightening and enjoyable event with you!

Geoffrey Li, Jianhua Lu and Lajos Hanzo
General Co-chair, IEEE VTC2022-Spring

Welcome from the TPC Co-chairs

Welcome to VTC2022-Fall in London and Beijing! The Technical Program Committee (TPC) has prepared an exciting program of technical presentations covering the wireless & vehicular communications and transport areas. For the main conference, we have published a total of 306 papers via either physical or virtual presentations. As usual, the "Signal Transmission and Reception" track has attracted the largest number of paper submissions.

We would like to express our gratitude to all authors who have submitted their work to VTC2022-Fall. All submitted papers have been thoroughly and independently reviewed in accordance with standard blind reviewing practices. Each of the submitted papers was assigned to at least 3 reviewers.

The great effort of all the TPC members and reviewers is much appreciated. Without their hard work in coordinating and/or providing timely and high-quality reviews, we would not have been able to present such an excellent technical program.

Our special thanks go to all the track chairs of this VTC2022-Fall conference: Matthias Patzold (Lead), Yi Huang, Iftekhar Ahmad, Li Wang, Mehrdad Dianati (Lead), Dewei Yi, Ahu Ece Hartavi Karci, Dhammika, Widanalage, Li Chen, Zhijin Qin (Lead), Osvaldo Simeone, Yanxiang Jiang, Octavia Dobre, Shiwen Mao (Lead) , Yuanwei Liu, Guan Gui, Xudong Wang, Zhili Sun (Lead), Qing Guo, Kanglian Zhao, George Alexandropoulos (Lead), Haijun Zhang, Shuping Dang, Miguel Sepulcre, Michail Matthaiou (Lead), Jinho Choi, Seok-Hwan Park, Linglong Dai, Han Zhu (Lead), Kanapathippillai Cumanan, Swades De, Telex Ngatched, Li-Chun Wang (Lead), Hans-Jurgen Zepernick, Nathalie Mitton, Min Jia, Qiang Ye, Giovanni Giambene (Lead), Gaojie Chen, Guangyi Liu, Lin Gao, Xiangwei Zhou(Lead), Chenhao Qi, and Hao Ye.

We hope that you will not only find the program and presentations exciting but also enjoy the conference and your visit to London or Beijing after all the challenges caused by the COVID pandemic over the past three years.

Fu-Chun Zheng, Justin Coon, Xiaoming Tao and Jianzhou Wang, *TPC Co-chairs*, IEEE VTC2022-Fall

Welcome from the VTS President

On behalf of the IEEE Vehicular Technology Society, it is my pleasure to welcome you to the IEEE 96th Vehicular Technology Conference – VTC2022-Fall. The VTC has been the VT Society's flagship conference for over seventy years and has been successfully held semi-annually since 1999. VTC2022-Fall is the second hybrid VTC, after VTC2022-Spring, to be held both virtually and face-to-face after two years of virtual conferences due to the spread of the COVID-19 pandemic. Also, VTC2022-Fall is the first VTC to be held simultaneously in two venues: London, UK, and Beijing, China. Here we hope to see the end of the tunnel where normal lives and human relationships are restored and even improved with the development of new technologies.

VT Society has the unifying theme of 'mobility.' Under the slogan "Connecting the Mobile World," the VT Society is committed to all aspects of mobility related to wireless communications, motor vehicles, and land transportation. Over the past decade the role and stature of VT Society has grown very rapidly in these areas with the advent of 5G, 6G, electric and connected vehicles, autonomous driving, smart land transportation and urban air mobility. VTS conferences, including VTC and VPPC, provide participants with a solid platform to exchange new ideas and knowledge. The VT Society has also been very successful in its publications. The IEEE Transactions on Vehicular Technology and the IEEE Vehicular Technology Magazine attract more quality papers and interesting articles each year, such that their impact factors have increased for more than several years in a row. The new IEEE Open Journal of Vehicular Technology is expected to follow suit.

We invite you to join the VT Society as a member to help to shape the future of your profession. VT Society supports services and activities specifically designed for members' career development. Having one of the largest Distinguished Lecturer programs in the IEEE, VTS provides its local chapters with presentations by renowned experts on interesting and important topics.

I hope that this conference can inspire you to consider hosting a VTC in the future. Our conference committee is ready to listen to your proposals and provide any assistance you may need.

I wish to convey a special thank you to General Co-Chairs Geoffrey Li, Jianhua Lu, and Lajos Hanzo, Technical Program Co-Chairs Fu-Chun Zheng, Justin Coon, Xiaoming Tao, and Jiangzhou Wang, and other committee members of the 96th Vehicular Technology Conference for their thoughtful implementation of this excellent conference program.

Finally, I would like to express my sincere gratitude to all participants who attended this conference and I hope that you have a pleasant conference.

Jae Hong Lee, *President*
IEEE Vehicular Technology Society

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Tutorials

A range of tutorials will be held on Monday 26 September 2022 given by experts from industry and academia.

Beijing Tutorials

Monday, 26 September 2022 9:00-12:30 (CST) Meeting Room 6

T2: Age of Information: Bytes, Money, and Semantics

Howard H. Yang, Meng Zhang, ZJU-UIUC Institute, China; Nikolaos Pappas, Linköping University, Sweden

This tutorial aims to present the current research efforts on the analysis, optimization, and applications of the age of information (AoI) metric, a recently introduced notion that quantifies information freshness in networked and data systems. We will provide comprehensive coverage of the AoI, including its definition, applications, queueing theory based AoI analysis, spatiotemporal models for assessing AoI in large-scale wireless networks, and economic designs (including pricing and mechanism design) for AoI-oriented fresh data markets. Furthermore, we generalize AoI to other age-related semantic metrics and applications. We will also discuss and provide future research directions.

Howard H. Yang received the Ph.D. degree in Electrical Engineering from the Singapore University of Technology and Design, Singapore, in 2017. Currently, he is an assistant professor with the ZJU-UIUC Institute, Haining, China. His background also features appointments at the University of Texas at Austin and Princeton University. He is currently an Editor for IEEE Transactions on Wireless Communications. His research interests cover various aspects of wireless communications, networking, and signal processing.

Meng Zhang received his Ph.D. degree in Information Engineering from the Chinese University of Hong Kong in 2019. He is a current assistant professor with the ZJU-UIUC Institute, Haining, China. He was a postdoctoral fellow with Northwestern University and a visiting student research collaborator with Princeton University. His research interests include wireless networking and network economics, with a current focus on age of information, differential privacy, and distributed machine learning.

Nikolaos Pappas received his B.Sc., M.Sc, and Ph.D. degrees in computer science from the University of Crete, Greece, in 2005, 2007, and 2012, respectively. He received a B.Sc. degree in mathematics from the University of Crete in 2012. He is an Associate Professor in the Department of Science and Technology, Linköping University, Sweden. He is currently an Editor for IEEE Transactions on Communications, IEEE/KICS Journal of Communications and Networks, IEEE Open Journal of the Communications Society, and a Guest Editor for the IEEE Internet of Things Journal.

Monday, 26 September 2022 9:00-12:30 (CST) Meeting Room 7

T4: Holographic Radio: A New Paradigm for Ultra-Massive MIMO

Boya Di, Peking University, China; Hongliang Zhang, Princeton University, USA; Lingyang Song, Peking University, China

Ultra-massive multiple-input multiple-output (MIMO) is one of the key enablers in the forthcoming sixth generation (6G) networks to provide revolutionary mobile connectivity and high-speed data services by exploiting spatial diversity. Widely utilized phased arrays relying on costly components make the implementation of ultra-massive MIMO in practice become prohibitive from both cost and power consumption perspectives. The recent developed reconfigurable holographic surfaces (RHSs) composing of densely packing sub-wavelength meta material elements can achieve holographic beam forming without costly hardware components. By leveraging the holographic principle, the RHS serves as an ultra-thin and lightweight surface antenna integrated with the transceiver, thereby providing a promising alternative to phased arrays for realizing ultra-massive MIMO. In this tutorial, we will first provide a basic introduction of RHSs. We then introduce the unique features of RHSs which enables both communication and sensing, in a comprehensive way. Related design, analysis, optimization, and signal processing techniques will be presented. Typical RHS-based applications for the wireless communications and radio frequency sensing will be explored. The implementation issues along with our developed prototypes and experiments will also be discussed. Several up-to-date challenges and potential research directions will be discussed as well.

Boya Di (S'17-M'19) obtained her Ph.D. degree from the Department of Electronics, Peking University, China, in 2019. Prior to that, she received the B.S. degree in electronic engineering from Peking University in 2014. She was a postdoc researcher at Imperial College London and is now an assistant professor at Peking University. Her current research interests include holographic radio, reconfigurable intelligent surfaces, multi-agent systems, edge computing, and aerial access networks. She has published over 30 journal papers on the topic of reconfigurable holographic surface aided communications and sensing. She received the best doctoral thesis award from China Education Society of Electronics in 2019. She is also the recipient of 2021 IEEE ComSoc Asia-Pacific Outstanding Paper Award. She serves as an associate editor for IEEE Transactions on Vehicular Technology since June 2020. She has also served as a workshop co-chair for IEEE WCNC 2020&2021.

Hongliang Zhang (S'15-M'19) received the B.S. and Ph.D. degrees at the School of Electrical Engineering and Computer Science at Peking University, in 2014 and 2019, respectively. He was a Postdoctoral Fellow in the Electrical and Computer Engineering Department at the University of Houston, Texas. Currently, he is a Postdoctoral Associate in the Department of Electrical and Computer Engineering at Princeton University, New Jersey. His current research interest includes reconfigurable intelligent surfaces, aerial access networks, optimization theory, and game theory. He received the best doctoral thesis award from Chinese Institute of Electronics in 2019. He is also the recipient of 2021 IEEE Comsoc Heinrich Hertz Award for Best Communications Letters and 2021 IEEE ComSoc Asia-Pacific Outstanding Paper Award. He has served as a TPC Member for many IEEE conferences, such as Globecom, ICC, and WCNC. He is currently an Editor for IEEE Communications Letters, IET Communications, and Frontiers in Signal Processing. He has also served as a Guest Editor for several journals, such as IEEE Internet of Things Journal, Journal of Communications and Networks, etc.

Lingyang Song (S'03-M'06-SM'12-F'19) received his PhD from the University of York, UK, in 2007. He worked as a research fellow at the University of Oslo, Norway until rejoining Philips Research UK in March 2008. In May 2009, he joined the School of Electronics Engineering and Computer Science, Peking University, and is now a Boya Distinguished Professor. His main research interests include wireless communications, mobile computing, and machine learning. Dr. Song is the co-author of many awards, including IEEE Leonard G. Abraham Prize in 2016, IEEE ICC 2014, IEEE ICC 2015, IEEE Globecom 2014, and the best demo award in the ACM Mobihoc 2015. He received National Science Fund for Distinguished Young Scholars in 2017, First Prize in Nature Science Award of Ministry of Education of China in 2017. Dr. Song has served as an IEEE ComSoc Distinguished Lecturer (2015-2018), an Area Editor of IEEE Transactions on Vehicular Technology (2019-), Co-chair of IEEE Communications Society Asia Pacific Board Technical Affairs Committee (2020-). He is a Clarivate Analytics Highly Cited Researcher.

Monday, 26 September 2022 9:00-12:30 (CST) Meeting Room 16

T12: Semantic Communications: Transmission Beyond Shannon Paradigm

Zhijin Qin, Yiping Duan, Tsinghua University, China

Shannon and Weaver categorized communications into three levels:
- Level A. How accurately can the symbols of communication be transmitted?
- Level B. How precisely do the transmitted symbols convey the desired meaning?
- Level C. How effectively does the received meaning affect conduct in the desired way?

In the past decades, researchers primarily focus on level A communications. With the development of cellular

communication systems, the achieved transmission rate has been improved tens of thousands of times and the system capacity is gradually approaching the Shannon limit. Semantic communications have been regarded as a promising direction to improve the system efficiency and reduce the data traffic so that to realize the level B or even level C communications. Semantic communications aim to realize the successful semantic information transmission that is relevant to the transmission task at the receiver. In this tutorial, we first introduce the concept of the semantic communications and a general model of it. We then detail the principles and performance metrics of semantic communications. Afterwards, we present the latest work on deep learning enabled semantic communications for different sources, multi-user semantic communication systems, and multimedia semantic coding. Finally, we identify the research challenges in semantic communications.

Dr. Zhijin Qin is currently an Associate Professor at Tsinghua University, China.. Her research interests include semantic communications and sparse signal processing in wireless communications. She is serving as an area editor of IEEE JSAC Series on Machine learning in Communications and Networks, an editor of IEEE Transactions on Communications, IEEE Transactions on Cognitive Communications and Networking, and IEEE Communications Letters. Dr Qin has served as the symposium co-chair for IEEE VTC Fall 2019 and IEEE Globecom 2020/2021. She received the 2017 IEEE Globecom Best Paper Award, the 2018 IEEE Signal Processing Society Young Author Best Paper Award, 2021 IEEE ComSoC SPCC Early Achievement Award, and 2022 IEEE Communications Society Fred W. Ellersick Prize.

Dr. Yiping Duan received the Ph.D. degree from the department of computer science, Xidian University, in 2016. She has been with the department of Electronic Engineering at Tsinghua university as a postdoctoral fellow from 2017 to 2019. Since April 2019, she has been an assistant research fellow in the Department of Electrical Engineering at Tsinghua University. Her research interests include wireless multimedia communication, machining learning, image and video processing. She has published 45 SCI papers, and also won two Best Paper Awards in top international conferences. In addition, she has been granted 21 invention patents including 2 U. S. patents, and received the gold award of the national invention exhibition. She was awarded the Young Elite Scientist Sponsorship Program by China Association for Science and Technology. Meanwhile, she has undertaken the subproject of the National Key Research and Development Program of China, as well as the project of the National Natural Science Foundation of China. As one of the principal investigators, she received the first prize of the China Institute of Communications Science and Technology Invention Award, the first prize of Shanghai Technological Invention Award, and the first prize of Scientific and Technological Progress Award of the Ministry of Education, China.

London Tutorials
Monday, 26 September 2022 14:00-17:30 (BST) CAGB 651
T3: Evolution of NOMA Toward Next Generation Multiple Access

Zhiguo Ding, The University of Manchester, UK; Yuanwei Liu, Queen Mary University of London, UK

As more and more new mobile multimedia-rich services become available to larger audiences, there is an ever-increasing demand for higher data rates as well as larger capacity networks. This demand is to be met under the scope of next generation mobile communication systems characterized by high speed, large capacity, and good quality-of-service for millions of subscribers. To meet these requirements, numerous energy- and spectral-efficient technologies have been proposed for future networks. The sixth-generation (6G) networks need breakthroughs beyond the current 5G. The expected performance targets of 6G are: 1) The connectivity density is ten-fold larger compared to 5G; 2) The peak data rate reaches 1 terabit per second; 3) The energy efficiency is a hundred times higher than that of 5G; 4) The air interface latency decreases to 0.1 millisecond; and 5) The reliability increases to 99.99999%. To this end, highly efficient next-generation multiple access (NGMA) techniques are vital for 6G.

Non-orthogonal multiple access (NOMA) has been proposed to overcome the spectral inefficiency of orthogonal multiple access. Specifically, NOMA allows controllable interference via non-orthogonal resource allocation at the expense of a tolerable increase in receiver complexity. The signals transmitted to different users are superimposed into the same time and/or frequency band, and they are recovered with advanced receiver algorithms. Traditional NOMA schemes fail to address the new requirements of 6G. This tutorial will present our solutions about how to evolve the current NOMA to NGMA, which contributes to the Spectrum Sharing, Spectrum Management, Cognitive Radio, and Green Radio topic of VTC.

Zhiguo Ding received his B.Eng in Electrical Engineering from the Beijing University of Posts and Telecommunications in 2000, and the Ph.D degree in Electrical Engineering from Imperial College London in 2005. From Jul. 2005 to Apr. 2018, he was working in Queen's University Belfast, Imperial College, Newcastle University and Lancaster University. Since Apr. 2018, he has been with the University of Manchester as a Professor in Communications. From Sept. 2012 to Sept. 2020, he has also been an academic visitor in Princeton University.

Dr Ding' research interests are 5G networks, game theory, cooperative and energy harvesting networks and statistical signal processing. He has been serving as an Editor for IEEE Transactions on Communications, IEEE Transactions on Vehicular Networks, and Journal of Wireless Communications and Mobile Computing, and served as an editor for IEEE Wireless Communication Letters and IEEE Communication Letters. He was the TPC Co-Chair for the 6th IET International Conference on Wireless, Mobile & Multimedia Networks (ICWMMN2015), Symposium Chair for International Conference on Computing, Networking and Communications. (ICNC 2016), and the 25th Wireless and Optical Communication Conference (WOCC), and Co-Chair of WCNC-2013 Workshop on New Advances for Physical Layer Network Coding. He received the best paper award in IET Comm. Conf. on Wireless, Mobile and Computing, 2009 and the 2015 International Conference on Wireless Communications and Signal Processing (WCSP 2015), the EU Marie Curie Fellowship 2012-2014, IEEE TVT Top Editor 2017, 2018 IEEE Communication Society Heinrich Hertz Award, 2018 IEEE Vehicular Technology Society Jack Neubauer Memorial Award, and 2018 IEEE Signal Processing Society Best Signal Processing Letter Award. He is a Web of Science Highly Cited Researcher and a Fellow of the IEEE.

Yuanwei Liu received the B.S. and M.S. degrees from the Beijing University of Posts and Telecommunications in 2011 and 2014, respectively, and the PhD degree in electrical engineering from the Queen Mary University of London, U.K., in 2016. He has been a Senior Lecturer (Associate Professor) with the School of Electronic Engineering and Computer Science, Queen Mary University of London, where he was a Lecturer (Assistant Professor) from 2017 to 2021. Prior to that, he was with the Department of Informatics, King's College London, from 2016 to 2017, where he was a Post-Doctoral Research Fellow. His research interests are NOMA, RIS, Integrated sensing and communications, and machine learning. He received several research awards, including Web of Science Highly Cited Researcher 2021, the 2020 IEEE ComSoc Outstanding Young Researcher Award for EMEA, the 2020 Early Achievement Award of the IEEE ComSoc Signal Processing and Computing for Communications (SPCC) Technical Committee, the 2020 Early Achievement Award of IEEE Communication Theory Technical Committee, the 2021 IEEE ComSoc Best Young Professional Award Outstanding Nominee. Yuanwei Liu received several research recognition, including listing among the World's Top 2% Scientists by Stanford University in 2020 and 2021, 2022 AI 2000 Most Influential Scholar Honorable Mention in Internet of Things, being ranked among Top 1% scientists in the world and Top 100 in United Kingdom in the broad field of Electronics and Electrical Engineering.

Yuanwei Liu is currently a Senior Editor of IEEE Communications Letters, an Editor of the IEEE Transactions on Wireless Communications and the IEEE Transactions on Communications. He serves as the leading Guest Editor for IEEE JSAC special issue on Next Generation Multiple Access, a Guest Editor for IEEE JSTSP special issue on Signal Processing Advances for Non-Orthogonal Multiple Access in Next Generation Wireless Networks. He served as the academic Chair for the Next Generation Multiple Access Emerging Technology Initiative. He has served as the Publicity Co-Chair for VTC 2019-Fall. He serves as the chair of Special Interest Group (SIG) in SPCC Technical Committee on signal processing Techniques for next generation multiple access, the vice-chair of SIG WTC on Reconfigurable Intelligent Surfaces for Smart Radio Environments.

T7: Localization-of-Things: from Foundation to B5G Ecosystem

Moe Z. Win, Massachusetts Institute of Technology, USA; Andrea Conti, University of Ferrara, Italy

The availability of real–time high–accuracy location awareness is essential for current and future wireless applications, particularly those involving Internet–of–Things and beyond 5G ecosystem. Reliable localization and navigation of people, objects, and vehicles – Localization–of–Things – is a critical component for a diverse set of applications including connected communities, smart environments, vehicle autonomy, asset tracking, medical services, military systems, and crowd sensing. The coming years will see the emergence of network localization and navigation in challenging environments with sub- meter accuracy and minimal infrastructure requirements.

We will discuss the limitations of traditional positioning, and move on to the key enablers for high–accuracy location awareness: wideband transmission and cooperative processing.

Topics covered will include: fundamental bounds, cooperative algorithms for 5G and B5G standardized scenarios, and network experimentation. Fundamental bounds serve as performance benchmarks, and as a tool for network design. Cooperative algorithms are a way to achieve dramatic performance improvements compared to traditional non-cooperative positioning. To harness these benefits, system designers must consider realistic operational settings; thus, we present the performance of cooperative localization based on measurement campaigns.

Moe Win is a Professor at the Massachusetts Institute of Technology (MIT). Prior to joining MIT, he was at AT&T Research Laboratories for five years and at the Jet Propulsion Laboratory for seven years. His research encompasses fundamental theories, algorithm design, and network experimentation for a broad range of real–world problems. His current research topics include network localization and navigation, network interference exploitation, and quantum information science. Professor Win has served the IEEE Communications Society as an elected Member–at–Large on the Board of Governors, as elected Chair of the Radio Communications Committee, and as an IEEE Distinguished Lecturer. Over the last two decades, he held various Editorial posts for IEEE journals and organized numerous international conferences. Currently, he is serving on the SIAM Diversity Advisory Committee. He was honored with two IEEE Technical Field Awards: the IEEE Kiyo Tomiyasu Award and the IEEE Eric E. Sumner Award. Other recognitions include the IEEE Communications Society Edwin H. Armstrong Achievement Award, the Cristoforo Colombo International Prize for Communications, the Copernicus Fellowship and the Laurea Honoris Causa from the University of Ferrara, and the U.S. Presidential Early Career Award for Scientists and Engineers. Professor Win is elected Fellow of the AAAS, the EURASIP, the IEEE, and the IET. He is an ISI Highly Cited Researcher.

Andrea Conti is a Professor at the University of Ferrara and Research Affiliate at the MIT Wireless Information and Network Sciences Laboratory. His research interests involve theory and experimentation of wireless systems and networks including network localization and distributed sensing. He received the HTE Puskás Tivadar Medal, the IEEE Communications Society's Stephen O. Rice Prize in the field of Communications Theory, and the IEEE Communications Society's Fred W. Ellersick Prize. Dr. Conti has served as editor for IEEE journals, as well as chaired international conferences. He has been elected Chair of the IEEE Communications Society's Radio Communications Technical Committee. He is a co–founder and elected Secretary of the IEEE Quantum Communications & Information Technology Emerging Technical Subcommittee. Professor Conti is an elected Fellow of the IEEE and of the IET, and he has been selected as an IEEE Distinguished Lecturer.

T10: Reconfigurable Intelligent Surfaces 2.0: Beyond Diagonal Phase Shift Matrices

Bruno Clerckx, Imperial College of London, UK; Mohammed El-Hajjar, University of Southampton, UK; Hongyu Li, Imperial College of London, UK

Reconfigurable intelligent surface (RIS) has gained much traction due to its potential to manipulate the propagation environment via nearly-passive reconfigurable elements. Attention has been drawn to the use of RIS 1.0 architectures based on diagonal phase shift matrices where each element of the RIS is connected to a load disconnected from the other elements. This enables simple RIS architectures to control the phase of the impinging phase to reflect the wave in the desired direction. This tutorial argues that to truly exploit the benefits of RIS, RIS need to depart from this conventional approach based on diagonal phase shift matrices. We introduce the attendance to RIS 2.0 based on non-diagonal phase matrices and show the benefits of such architectures in terms of controlling both phases and magnitudes of reflected waves, enabling simultaneous transmission and reflection, increasing reflected power, boosting sum-rate, flexibility in various deployments, and enabling omnidirectional transmission and reflection, etc. To design RIS 2.0, the tutorial bridges microwave network theory, wireless communications, and optimization and is pitched to the typical audience attending VTC.

Bruno Clerckx is a Professor, the Head of the Wireless Communications and Signal Processing Lab, and the Deputy Head of the Communications and Signal Processing Group, within the Electrical and Electronic Engineering Department, Imperial College London, London, U.K. He received the MSc and Ph.D. degrees in Electrical Engineering from Université Catholique de Louvain, Belgium, in 2000 and 2005, respectively, and the Doctor of Science (DSc) degree from Imperial College London, U.K. in 2022. From 2006 to 2011, he was with Samsung Electronics, Suwon, South Korea, where he actively contributed to 4G (3GPP LTE/LTE-A and IEEE 802.16m) and acted as the Rapporteur for the 3GPP Coordinated Multi-Point (CoMP) Study Item. Since 2011, he has been with Imperial College London as a Full Professor. From 2014 to 2016, he also was an Associate Professor with Korea University, South Korea, and from 2021 to 2022, he is a visiting Professor at Seoul National University, South Korea. He also held various long or short-term visiting research appointments at Stanford University, EURECOM, National University of Singapore, The University of Hong Kong, Princeton University, The University of Edinburgh, The University of New South Wales, and Tsinghua University.

He has authored two books on "MIMO Wireless Communications" and "MIMO Wireless Networks", 250 peer-reviewed international research papers, and 150 standards contributions, and is the inventor of 80 issued or pending patents among which 15 have been adopted in the specifications of 4G standards and are used by billions of devices worldwide. His research spans the general area of wireless communications and signal processing for wireless networks. He has been a TPC member, a symposium chair, or a TPC chair of many symposia on communication theory, signal processing for communication and wireless communication for several leading international IEEE conferences. He was an Elected Member of the IEEE Signal Processing Society "Signal Processing for Communications and Networking" (SPCOM) Technical Committee. He served as an Editor or Guest Editor on a number of IEEE Transactions and Special Issues. He was an Editor for the 3GPP LTE-Advanced Standard Technical Report on CoMP. He received the prestigious Blondel Medal 2021 from France for exceptional work contributing to the progress of Science and Electrical and Electronic Industries and the EURASIP (European Association for Signal Processing) best paper award 2022. He is a Fellow of the IEEE and the IET, and an IEEE Communications Society Distinguished Lecturer 2021-2022.

Mohammed El-Hajjar is an Associate Professor and the MSc Director of Programmes in the School of Electronics and Computer Science in the University of Southampton, U.K. He Received his BEng from the American University of Beirut, Lebanon in 2004 and then his MSc and PhD from the University of Southampton in 2005 and 2008, respectively. Following his Ph.D., he joined Imagination Technologies as a Design Engineer, where he was leading a team designing and developing a multi-standard communications platform, generating intellectual property (IP), which is currently used in many consumer electronics products. Since 2012, he has been with the school of Electronics and Computer Science in the University of Southampton, where he is leading a research team working on several aspects of wireless communications and signal processing. He is the recipient of several academic awards (including several best paper awards) and has published a Wiley–IEEE book and in excess of 100 IEEE journal papers.

His collaboration with industry has resulted in many patents, which are being actively considered for beyond 5G standardisation. Finally, he has contributed to many conferences as TPC member, workshop co-chair and has been editor and guest editor in journals and editor special issues.

Virtual Tutorials
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T1: 6G Wireless Channel Measurements, Characteristics Analysis, and Channel Modeling

Cheng-Xiang Wang, Jie Huang, Haiming Wang, Southeast University, China; Harald Haas, University of Strathclyde, UK

The proposed tutorial is intended to offer a comprehensive and in-depth course to communication professionals/academics, aiming to address recent advances and future challenges on channel measurements and models for sixth generation (6G) wireless communication systems. The 6G vision and paradigm shifts are summarized as global coverage, all spectra, full applications, all senses, all digitals, and strong security, which would bring new performance metrics and requirements. To meet these requirements, 6G networks will rely on novel key technologies, i.e., air interface and transmission technologies and network architecture. The underlying 6G wireless channels will face new channel characteristics, such as space-timefrequency non-stationarities, which need to be thoroughly studied. Channel measurements and non-predictive channel models are then reviewed for challenging 6G scenarios and frequency bands, focusing on millimeter wave (mmWave), terahertz (THz), and optical wireless communication channels under all spectra, satellite, unmanned aerial vehicle (UAV), and maritime communication channels under global coverage scenarios, and high-speed train (HST), vehicle-to-vehicle (V2V), ultra-massive multiple-input multiple-output (MIMO), reconfigurable intelligent surface (RIS), industry Internet of things (IoT), and orbital angular momentum (OAM) communication channels under full application scenarios. New machine learning based predictive channel models will also be investigated. A non-predictive 6G pervasive channel model will then be proposed, which is expected to serve as a baseline for future standardized 6G channel models. Future research challenges and trends for 6G channel measurements and models will be discussed in the end of the tutorial.

Cheng-Xiang Wang received the B.Sc. and M.Eng. degrees in Communication and Information Systems from Shandong University, China, in 1997 and 2000, respectively, and the Ph.D. degree in Wireless Communications from Aalborg University, Denmark, in 2004. He was a Research Assistant with the Hamburg University of Technology, Hamburg, Germany, from 2000 to 2001, a Visiting Researcher with Siemens AG Mobile Phones, Munich, Germany, in 2004, and a Research Fellow with the University of Agder, Grimstad, Norway, from 2001 to 2005. He has been with Heriot-Watt University, Edinburgh, U.K., since 2005, where he was promoted to a Professor in 2011. In 2018, he joined Southeast University, China, as a Professor. He is also a part-time professor with the Purple Mountain Laboratories, Nanjing, China. He has authored four books, three book chapters, and more than 470 papers in refereed journals and conference proceedings, including 25 Highly Cited Papers. He has also delivered 24 Invited Keynote Speeches/Talks and 14 Tutorials in international conferences. His current research interests include wireless channel measurements and modeling, B5G wireless communication networks, and applying artificial intelligence to wireless communication networks.

Prof. Wang is a Member of the Academia Europaea (The Academy of Europe), a Member of the European Academy of Sciences and Arts (EASA), a Fellow of the Royal Society of Edinburgh (FRSE), IEEE, IET, and China Institute of Communications (CIC), an IEEE Communications Society Distinguished Lecturer in 2019 and 2020, and a Highly-Cited Researcher recognized by Clarivate Analytics in 2017-2020. He is currently an Executive Editorial Committee Member of the IEEE Transactions on Wireless Communications. He has served as an Editor for nine international journals, including as Lead Guest Editor of the IEEE Journal on Selected Areas in Communications. He has served as a TPC Member, a TPC Chair, and a General Chair for more than 80 international conferences. He received 14 Best Paper Awards from IEEE GLOBECOM 2010, IEEE ICCT 2011, ITST 2012, IEEE VTC

2013-Spring, IWCMC 2015, IWCMC 2016, IEEE/CIC ICCC 2016, WPMC 2016, WOCC 2019, IWCMC 2020, WCSP 2020, CSPS2021, and WCSP 2021. Also, he received the 2020 & 2021 "AI 2000 Most Inuential Scholar Award Honourable Mention" in recognition of his outstanding and vibrant contributions in the field of Internet of Things.

Jie Huang received the B.E. degree in Information Engineering from Xidian University, China, in 2013, and the Ph.D. degree in Information and Communication Engineering from Shandong University, China, in 2018. From Oct. 2018 to Oct. 2020, he was a Postdoctoral Research Associate in the National Mobile Communications Research Laboratory, Southeast University, China, supported by the National Postdoctoral Program for Innovative Talents. From Jan. 2019 to Feb. 2020, he was a Postdoctoral Research Associate in Durham University, U.K. Since Mar. 2019, he is a part-time researcher in Purple Mountain Laboratories, China. Since Nov. 2020, he is an Associate Professor in the National Mobile Communications Research Laboratory, School of Information Science and Engineering, Southeast University, China. He has authored and co-authored more than 50 papers in refereed journals and conference proceedings. He received 3 Best Paper Awards from WPMC 2016, WCSP 2020, and WCSP 2021. He has also delivered 4 tutorials in IEEE/CIC ICCC 2021, IEEE PIMRC 2021, IEEE ICC 2022, and IEEE VTC2022-Spring. His research interests include millimeter wave, massive MIMO, reconfigurable intelligent surface channel measurements and modeling, wireless big data, and 6G wireless communications.

Haiming Wang received the B.Eng., M.S., and Ph.D. degrees in Electrical Engineering from Southeast University, Nanjing, China, in 1999, 2002, and 2009, respectively. Since 2002, he has been with the State Key Laboratory of Millimeter Waves, School of Information Science and Engineering, Southeast University, China, and he is currently a distinguished professor. He is also a part-time professor with the Purple Mountain Laboratories, Nanjing, China. In 2008, he was a Visiting Scholar with the Blekinge Institute of Technology (BTH), Sweden. He has authored and co-authored over 50 journal papers in IEEE Transactions on Antennas and Propagation and other peer-reviewed academic journals. Prof. Wang has authored and co-authored over more than 70 patents and 52 patents have been granted. He was awarded twice for contributing to the development of IEEE 802.11aj by the IEEE Standards Association in 2018 and 2020. He received the first-class Science and Technology Progress Award of Jiangsu Province of China in 2009 and was awarded for contributing to the development of IEEE 802.11aj by the IEEE-SA in 2018. His current research interests include AI-powered antenna and radiofrequency technologies (iART), AI-powered channel measurement and modeling technologies (iCHAMM), and integrated communications and sensing (iCAS).

Harald Haas received the Ph.D. degree in wireless communications from the University of Edinburgh, Edinburgh, U.K., in 2001. He is the Director of the LiFi Research and Development Centre at the University of Strathclyde. He is also the Initiator, co-founder and Chief Scientific Officer of pureLiFi Ltd. He has authored 550 conference and journal papers, including papers in Science and Nature Communications. His main research interests are in optical wireless communications, hybrid optical wireless and RF communications, spatial modulation, and interference coordination in wireless networks. His team invented spatial modulation. He introduced LiFi to the public at an invited TED Global talk in 2011. This talk on Wireless Data from Every Light Bulb has been watched online over 2.72 million times. LiFi was listed among the 50 best inventions in TIME Magazine in 2011. He gave a second TED Global lecture in 2015 on the use of solar cells as LiFi data detectors and energy harvesters. This has been viewed online over 2.75 million times. In 2016, he received the Outstanding Achievement Award from the International Solid State Lighting Alliance. In 2019 he was recipient of IEEE Vehicular Society James Evans Avant Garde Award. Haas was elected a Fellow of the Royal Society of Edinburgh (RSE) in 2017. In the same year he received a Royal Society Wolfson Research Merit Award and was elevated to IEEE Fellow. In 2018 he received a three-year EPSRC Established Career Fellowship extension and was elected Fellow of the IET. Haas was elected Fellow of the Royal Academy of Engineering (FREng) in 2019.

Virtual

T5: How to make practical RIS techniques (and evaluate them)?

Junil Choi, Korea Advanced Institute of Science and Technology (KAIST), South Korea

Recently, reflecting intelligent surface (RIS) has been proposed as an innovative technology that can significantly improve the performance of wireless communication systems

through the use of low-cost passive reflecting elements. There are two important issues to exploit the full benefit of RIS: 1) develop joint active beamforming (at the base station) and passive beamforming (at the RIS) techniques with high performance and low complexity, and 2) proper channel estimation techniques for RIS systems. Although effective in terms of performance, most of previous beamforming designs and channel estimation techniques for RIS systems have relied on complicated optimization methods, which are difficult to implement in practice. In this talk, I will first explain several practical channel estimation techniques with low training overhead for RIS systems. Then, I will explain low-complexity, non-iterative, and near-optimal RIS joint active and passive beamformer designs for both narrowband and wideband assuming full channel information. Lastly, I will introduce WiThRay, a versatile 3D wireless communication simulator based on ray-tracing developed by our lab, that can be used to evaluate different RIS techniques for various environments.

Junil Choi received the B.S. (with honors) and M.S. degrees in electrical engineering from Seoul National University in 2005 and 2007, respectively, and received the Ph.D. degree in electrical and computer engineering from Purdue University in 2015. He is now with the school of electrical engineering at KAIST as an (Named) Ewon Associate Professor.

From 2007 to 2011, he was a member of technical staff at Samsung Advanced Institute of Technology (SAIT) and Samsung Electronics Co. Ltd. in Korea, where he contributed to advanced codebook and feedback framework designs for the 3GPP LTE/LTE-Advanced and IEEE 802.16m standards. Before joining KAIST, he was a postdoctoral fellow at The University of Texas at Austin from 2015 to 2016 and an assistant professor at POSTECH from 2016 to 2019. His research interests are in the design and analysis of massive MIMO, mmWave communication systems, distributed reception, and vehicular communication systems.

Dr. Choi was a co-recipient of the 2021 IEEE Vehicular Technology Society Neal Shepherd Memorial Best Propagation Award, the 2019 IEEE Communications Society Stephen O. Rice Prize, the 2015 IEEE Signal Processing Society Best Paper Award, and the 2013 Global Communications Conference (GLOBECOM) Signal Processing for Communications Symposium Best Paper Award. He was awarded the Michael and Katherine Birck Fellowship from Purdue University in 2011, the Korean Government Scholarship Program for Study Overseas in 2011-2013, the Purdue University ECE Graduate Student Association (GSA) Outstanding Graduate Student Award in 2013, the Purdue College of Engineering Outstanding Student Research Award in 2014, the IEEE ComSoc AP region Outstanding Young Researcher Award in 2017, the NSF Korea and Elsevier Young Researcher Award in 2018, and the KICS Haedong Young Researcher Award in 2019. He is an editor of IEEE Communications Letters, IEEE Open Journal of the Communications Society, and Frontiers in Communications and Networks.

Virtual

T6: Leveraging Full-Duplex MIMO Systems for Beyond 5G Simultaneous Transmit and Receive Applications

George Alexandropoulos, National and Kapodistrian University of Athens, Greece; Himal A. Suraweera, University of Peradeniya, Sri Lanka; Kenneth Kolodziej, Massachusetts Institute of Technology, USA

This tutorial focuses on the latest advances in the full duplex Multiple-Input Multiple-Output (MIMO) technology, detailing its enabling features for beyond 5G wireless systems and overviewing the available hardware prototypes. The evolution of full duplex radios, from their initial proof of concept till their recent partial consideration in 3GPP Release 17 via the integrated access and backhaul paradigm, will be discussed together with the various emerging simultaneous transmit and receive applications, which can boost the physical-layer performance, while enabling channel sensing and localization. The key architectural components of the latest FD MIMO systems, their underlying mixed analog and digital optimization approaches, and their recent applications for simultaneous data communication and channel estimation, direction-aided beam

alignment and localization, and integrated sensing and communication will be presented. Moreover, the latest considerations of FD MIMO radios with metasurface-based antenna panels, wideband channels, machine learning, and up to THz frequencies will be overviewed. The tutorial will be concluded with a detailed discussion on novel perspectives and future directions for FD MIMO radios in 6G wireless systems.

George C. Alexandropoulos received the Engineering Diploma, M.A.Sc., and Ph.D. degrees in Computer Engineering and Informatics from the School of Engineering, University of Patras, Greece in 2003, 2005, and 2010, respectively. He has held research positions at various Greek universities and research institutes, as well as at the Mathematical and Algorithmic Sciences Lab, Paris Research Center, Huawei Technologies France, and he is currently an Assistant Professor with the Department of Informatics and Telecommunications, School of Sciences, National and Kapodistrian University of Athens (NKUA), Greece. He also serves as a Principal Researcher for the Technology Innovation Institute, Abu Dhabi, United Arab Emirates. His research interests span the general areas of algorithmic design and performance analysis for wireless networks with emphasis on multi-antenna transceiver hardware architectures, active and passive reconfigurable metasurfaces, full duplex radios, integrated communications and sensing, millimeter wave and THz communications, as well as distributed machine learning algorithms. He currently serves as an Editor for IEEE Transactions on Communications, IEEE Wireless Communications Letters, ELSEVIER Computer Networks, Frontiers in Communications and Networks, and the ITU Journal on Future and Evolving Technologies. In the past, he has held various fixed-term and guest editorial positions for IEEE Transactions on Wireless Communications and IEEE Communications Letters, as well as for various special issues at IEEE journals. Prof. Alexandropoulos is a Senior Member of the IEEE Communications, Signal Processing, and Information Theory Societies as well as a registered Professional Engineer of the Technical Chamber of Greece. He is also a Distinguished Lecturer of the IEEE Communications Society. He has participated and/or technically managed more than 10 European Union (EU) research and innovation projects, as well as several Greek and international research projects. He is currently NKUA's principal investigator for the EU H2020 RISE-6G research and innovation project dealing with RIS-empowered smart wireless environments. He has received the best Ph.D. thesis award 2010, the IEEE Communications Society Best Young Professional in Industry Award 2018, the EURASIP Best Paper Award of the Journal on Wireless Communications and Networking 2021, the IEEE Marconi Prize Paper Award in Wireless Communications 2021, and a Best Paper Award from the IEEE GLOBECOM 2021. More information is available at www.alexandropoulos.info.

Himal A. Suraweera received the B.Sc. Engineering (First Class Honors) degree from University of Peradeniya, Sri Lanka, in 2001, and the Ph.D. degree from Monash University, Australia in 2007. Currently he is a Senior Lecturer at the Department of Electrical & Electronic Engineering, University of Peradeniya, Sri Lanka. From January 2011 to May 2013, he was a Post-Doctoral Research Associate at the Singapore University of Technology and Design, Singapore. From July 2009 to January 2011, he was with the Department of Electrical and Computer Engineering, National University of Singapore, Singapore as a Research Fellow. From February 2007 to June 2009, he was a Research Fellow at Victoria University, Australia. His academic achievements include receiving the Mollie Holman medal, Kenneth Hunt medal upon graduating from Monash University, and the IEEE ComSoc Asia-Pacific Outstanding Young Researcher Award in 2011. He was a co-recipient of the 2017 IEEE Communications Society Leonard G. Abraham Prize. Also, he received best paper awards at WCSP 2013 and SigTelCom 2017. Dr. Suraweera currently serves as an Editor for the IEEE Transactions on Communications and IEEE Transactions on Green Communications and Networking. He was an Editor of the IEEE Transactions on Wireless Communications from 2014 to 2019, IEEE Journal on Selected Areas on Communications – Series on Green Communications and Networking from 2015 to 2016, IEEE Communications Letters from 2010 to 2015 and IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences from 2014 to 2018. His research interests are in the areas of wireless communications, signal processing for communications and communication theory, in particular, relay networks, energy harvesting communications, massive MIMO systems, full-duplex communications, and cognitive radio. He is a Senior Member of the IEEE.

Mr. Kenneth E. Kolodziej is a technical staff member in the RF Technology Group, where he is pursuing research on wideband

electronic and simultaneous transmit and receive (STAR) systems. He was previously an RF Engineer at BAE Systems in New Jersey. Since joining Lincoln Laboratory, Mr. Kolodziej has conducted research on RF, microwave and photonic circuits, including antenna, radar and communication systems. He is currently designing compact transceivers and RF cancellation techniques for STAR applications. Mr. Kolodziej also teaches an electromagnetics course to undergraduate students at the Massachusetts Institute of Technology (MIT), and several "Build Your Own Radar" courses on MIT campus. He has published more than 20 journal articles and conference papers, and holds several patents in the field of antennas and RF systems. He is a member of both the IEEE Microwave Theory and Techniques and IEEE Antennas and Propagation Societies, where he serves as a reviewer for several journals and conferences as well as on the steering and technical program committees for the International Microwave Symposium (IMS). Mr. Kolodziej received his BE and ME degrees in electrical engineering from Stevens Institute of Technology in Hoboken, New Jersey. His specialties include wideband electronic systems, technologies for STAR, antenna systems, and Education & Outreach.

Virtual
T8: Non-Terrestrial Networks: Fundamentals, Standards, Performance, and Practice
Talha Ahmed Khan, Ericsson, USA; Sebastian Euler, Ericsson, Sweden; Jonas Sedin, Ericsson, UK

The continuous evolution of 5G technology aims to improve performance and addresses new use cases. Enabling 5G system to support non-terrestrial networks (NTNs) has been one direction under exploration in 3GPP. NTN has become an umbrella term for any network that involves flying objects, including satellite communication networks, high altitude platform systems, and air-to-ground networks. The inherent flexibility of 5G technology provides a solid foundation for adapting it to support NTNs. However, NTNs are complex systems, the design of which requires a holistic approach.

The objective of this tutorial is to offer a comprehensive learning experience about the state-of-the-art research and development in NTNs. We will describe the fundamentals of NTNs, explain in detail the design aspects, provide an overview of the latest standardization development of NTNs in 3GPP, share design rationales influencing standardization, presenting system performance evaluation methodology and the latest results, delivering practical, current information on the best industry practices, and pointing out fruitful avenues for future research.

Talha Khan is currently working as a Senior Researcher at Ericsson Research Silicon Valley, USA. He received his M.S.E. and Ph.D. degrees in electrical and computer engineering from The University of Texas at Austin, USA, and his B.Sc. degree in electrical engineering from the University of Engineering and Technology Lahore, Pakistan. At Ericsson, he has been contributing to the 5G standardization activities in Non-terrestrial networks and cellular IoT technologies. His research interests include cellular systems, non-terrestrial networks, stochastic geometry applications and energy harvesting. In 2020, he received the IEEE WCNC Best Paper award. Before joining Ericsson, he has held summer internship positions at Broadcom, Mitsubishi Electric Research Labs and Connectivity Lab, Facebook.
Sebastian Euler is a Senior Researcher at Ericsson Research in Stockholm, Sweden. He joined Ericsson in 2016 and has since focused on the standardization of Non-Terrestrial Networks in 3GPP, extending the LTE and 5G New Radio standards with support for satellite networks and aerial vehicles. In 2021, he received the IEEE Communications Society Fred W. Ellersick Prize. He has a background in particle physics, and received his Ph.D. from RWTH Aachen University, Germany, in 2014.
Jonas Sedin is currently affiliated with Samsung R&D Institute, UK. Previously, he was a researcher at Ericsson Research in Kista, Stockholm, working on protocol aspects as well as system level evaluations in a wide range of topics within future wireless communications including 5G NR Non-terrestrial Networks and next generation Wi-Fi standards. He was involved in standardization as an 802.11 IEEE member as well as a RAN2 delegate in 3GPP. He has a master's and bachelor's degree from KTH Royal Institute of Technology.

Virtual
T9: Principles of active learning in wireless communications
Haris Gačanin, RWTH Aachen University, Germany

The next-generation (6G) of wireless communications has led to many advancements in technologies such as large and distributed antenna arrays, ultra-dense networks, software-based networks, and network virtualization. However, a higher level of automation is needed to establish hyper-low latency and hyper-high reliability for 6G applications. Advanced automation requires extensive research on machine learning with applications in wireless communications. Thereby, learning techniques will take a central stage in the sixth generation of wireless communications to cope with the stringent application requirements. This tutorial discusses the practical limitations of reinforcement and deep learning methods in resource management in nonstationary radio environments. We carefully compare supervised (deep) and reinforcement learning models to support rate maximization objectives under user mobility based on the practical limitations. We discuss practical systems such as latency and reliability on the rate maximization. We present a generic dataset generation method for standardized testing in the nonstationary environment to benchmark different learning models versus traditional optimal resource management solutions. We aim to motivate learning agents in the context of optimization in real-time. To this goal, we discuss differences between training-based methods such as deep learning and training-free methods such as reinforcement learning for both matching and dynamic problems.

Haris Gačanin [F'21] received his Dipl.-Ing. degree in Electrical engineering from the University of Sarajevo in 2000. In 2005 and 2008, respectively, he received MSc and Ph.D. from Tohoku University in Japan. He was with Tohoku University from 2008 until 2010 first as Japan Society for the Promotion of Science (JSPS) postdoctoral fellow and later, as an Assistant Professor. He joined Alcatel-Lucent Bell (now Nokia Bell) in 2010 as a Physical-layer Expert and later as Department Head at Nokia Bell Labs. Since April 2020, he is a chair professor at RWTH Aachen University. His professional interests are related to broad areas of digital signal processing and artificial intelligence with applications in wireless communications. He has 200+ scientific publications (journals, conferences and patent applications) and invited/tutorial talks. He is a fellow of IEEE and Distinguished Lecturer of IEEE Vehicular Technology Society. He served as an Associate Editor of IEEE Communications Magazine, the editor of IEICE Transactions on Communications and IET Communications. He acted as a general chair and technical program committee member of various IEEE conferences. He is a recipient of several Nokia innovation awards, IEICE Communications Society Best Paper Award in 2021, IEICE Communication System Study Group Best Paper Award (joint 2014, 2015, 2017), The 2013 Alcatel-Lucent Award of Excellence, the 2012 KDDI Foundation Research Award, the 2009 KDDI Foundation Research Grant Award, the 2008 JSPS Postdoctoral Fellowships for Foreign Researchers, the 2005 Active Research Award in Radio Communications, VTC2005-Fall Student Paper Award and the 2004 Institute of IEICE Society Young Researcher Award.

Virtual
T11: Reconfigurable Intelligent Surfaces: Electromagnetic models, design, and future directions
Alessio Zappone, University of Cassino and Southern Lazio, Italy; Marco Di Renzo, CNRS – CentraleSupelec – Univ. Paris-Sud, Paris, France

As 5G networks take their final form, connectivity demands continue to increase exponentially and new services pose more constraints on the performance that end-users expect. A recent technological breakthrough that holds the potential to meet these demands is that of reconfigurable intelligent surfaces.

A tutorial on the principles and latest approaches of reconfigurable intelligent surfaces for beyond 5G wireless communications will be of great value for both academics and industry practitioners.

Prof. Alessio Zappone obtained his Ph.D. degree in elec- trical engineering in 2011 from the University of Cassino and Southern Lazio, Cassino, Italy. His Ph.D. studies were focused on distributed algorithms for energy-efficient resource allocation in wireless networks. After obtaining his Ph.D. Alessio has been with the Technische Universita ̈ Dresden, Germany, managing the project CEMRIN on energy-efficient resource al- location in wireless networks, funded by the German Research Foundation. From 2017 to 2019 he has been the recipient of the H2020 Individual Marie Curie fellowship for experienced researchers BESMART, carried out in the LANEAS group of CentraleSupelec, Paris, France. He is now a tenured professor at the university of Cassino and Southern Lazio, Italy. He received the Marconi Prize paper award of the IEEE communication society with a paper on resource allocation for RIS-based networks. Alessio is an IEEE Senior Member, serves as senior area editor for the IEEE Signal Processing Letters, and Editor for the IEEE Transactions on Wireless Communications, and as guest editor for the IEEE Journal on Selected Areas on Communications.

Alessio is a co-founder and chair of the special interest group "REFLECTIONS", activated within the Signal Processing and Computing for Communications Technical Committee of the IEEE Communications Society, which focuses on the use of RIS for signal processing and communications. He is also a co-founder and vice-chair of the IEEE emerging technology initiative (ETI) on RIS, activated by the IEEE communication society.

Prof. Marco Di Renzo Marco Di Renzo (Fellow, IEEE) received the Ph.D. degrees in electrical engineering from the University of L'Aquila, Italy, in 2007. Since 2010, he has been with the French National Center for Scientific Research (CNRS), where he is a CNRS Research Director (CNRS Professor) in the Laboratory of Signals and Systems (L2S) of Paris-Saclay University – CNRS and CentraleSupelec, Paris, France. He served as an Editor and the Associate Editor-in- Chief of IEEE Communications Letters, and as an Editor of IEEE Transactions on Communications and IEEE Transactions on Wireless Communications. Also, he serves as the Founding Chair of the Special Interest Group "RISE" on Reconfigurable Intelligent Surfaces of the Wireless Technical Committee of the IEEE Communications Society, and is the Founding Lead Editor of the IEEE Communications Society Best Readings in Reconfigurable Intelligent Surfaces. In addition, he is a Co-Founder and the Emerging Technology Committee Liaison Officer of the Special Interest Group "REFLECTIONS" on Reconfigurable Intelligent Surfaces of the Signal Processing and Computing for Communications Technical Committee of the IEEE Communications Society and a Co-Founder and the Emerging Technology Committee Liaison Officer of the Emerging Technology Initiative on Reconfigurable Intelligent Surfaces. He is a Highly Cited Researcher (Clarivate Analytics, Web of Science), and a Fellow of IEEE and IET. He has received the IEEE Communications Society Best Young Researcher Award for Europe, Middle East and Africa, the Royal Academy of Engineering Distinguished Visiting Fellowship, the IEEE Jack Neubauer Memorial Best System Paper Award, the IEEE Communications Society Young Professional in Academia Award, the SEE-IEEE Alain Glavieux Award, and a 2019 IEEE ICC Best Paper Award. In 2019, he was a recipient of a Nokia Foundation Visiting Professorship for conducting research on metamaterial-assisted wireless communications at Aalto University, Finland, and in 2021 the Fulbright Fellowship to work on metamaterial-based wireless CUNY Advanced Science Research Center, USA. He received the 2021 EURASIP Best Paper Award for a paper on Reconfigurable Intelligent Surfaces and Smart Radio Environments.

Finally, Marco Di Renzo has served as a Guest Editor of several special issues on Reconfigurable Intelligent Surfaces, which include the first Special Issue on the topic published in November 2020 in the IEEE Journal on Selected Areas in Communications, as well as a Guest Editor IEEE Journal on Selected Areas in Signal Processing, IEEE Access, IEEE Wireless Communications Magazine, IEEE Transactions on Cognitive Communications and Networking, IET Communications, China Communications. Finally, Marco Di Renzo is the Vice-Chair of the Industry Specification Group on Reconfigurable Intelligent Surfaces within the European Telecommunications Standards Institute.

Virtual

T13: Ultra-Dense LEO Satellite-based Communication Systems: A Novel Modelling Technique

Mustafa Kishk, Maynooth University, Ireland; Mohamed-Slim Alouini, King Abdullah University of Science and Technology, Saudi Arabia

We are witnessing an unprecedented boost in the space industry. The significant technological advances in the industry of low earth orbit (LEO) satellites have opened the door to a new realm of LEO-based applications. One key application is providing internet broadband services to people everywhere around the globe, which is considered a significant step towards resolving the digital divide problem. The main driver to achieve such satellite-based global connectivity is deploying large numbers of LEO satellites at a set of altitudes, ranging from 300 km to 1500 km, to ensure that every part of the earth will be covered by at least one satellite at all times. Given that we have multiple competing companies launching various constellations with diverse altitudes and numbers of satellites, we can envision a set of spheres concentric with the earth with large numbers of LEO satellites distributed on the surfaces of each of these spheres. Due to the fundamental difference between these novel communication systems, specially the spatial distribution of the communication nodes, and the typical terrestrial communication networks, we need to think of creative techniques to enable mathematically analyzing such communication systems. In this tutorial, we discuss a recently proposed mathematical framework that enables tractable analysis of LEO satellite-enabled communication systems while capturing the influence of satellites' numbers and altitudes as well as the spatial distribution of earth stations. Firstly, we describe how this stochastic geometry-based framework is modeled and discuss its accuracy. Next, we provide a detailed example where this framework can be used for coverage analysis. We then introduce and discuss integrated space-aerial-terrestrial networks. Finally, we discuss how this framework can be used to study routing and end-to-end latency analysis in such networks. Realistic values from existing constellations, such as OneWeb and Starlink, are further used as case studies in this tutorial.

Mustafa A. Kishk [S'16, M'18] is an Assistant Professor in the Electronic Engineering Department at Maynooth University, Ireland. Before that, he was a postdoctoral research fellow in the communication theory lab at KAUST. He received his B.Sc. and M.Sc. degree from Cairo University 2013 and 2015, respectively, and his Ph.D. degree from Virginia Tech in 2018. His current research interests include UAV-enabled communication systems and satellite communications.

Mohamed-Slim Alouini [S'94-M'98-SM'03-F'09] 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 in the University of Minnesota, Minneapolis, MN, USA, then in the Texas A&M University at Qatar, Education City, Doha, Qatar before joining KAUST, Thuwal, Makkah Province, Saudi Arabia as a Professor of Electrical Engineering in 2009. His current research interests include the modeling, design, and performance analysis of wireless communication systems.

Virtual

T14: When Non-Terrestrial Networks Meet Deep Reinforcement Learning: Technologies, Challenges, and Opportunities

Yu-Jia Chen, National Central University, Taiwan; Shao-Yu Lien, National Chung Cheng University, Taiwan

The sixth-generation (6G) network aims to provide seamless global connectivity and high-speed broadband access through developing non-terrestrial networks (NTNs) which integrate unmanned aerial vehicles (UAVs) networks, high altitude platform systems, and satellite communication networks. However, NTNs are complex systems due to its decentralized and ad-hoc nature. In particular, a large number of network entities in NTNs such as UAVs need to make local and autonomous decisions to optimize different design objectives including completion time minimization and throughput maximization. Conventional optimization techniques like convex optimization are difficult to handle such large-scale problems, especially in a much more uncertain and stochastic environment. In recent years, deep reinforcement learning (DRL) has been developing as a promising solution to overcome

these challenges. In DRL, an agent can learn the optimal policy by interacting with the unknown environment and discovering which actions yield the highest reward. In this tutorial, we will first overview the latest 3GPP standardization status of NTNs, including the key performance issues of UAVs and satellite networks. As a step further, we will present how the state-of-art DRL methods enable autonomous aerial platforms, including satellites and UAVs. For UAVs, the following subjects will be addressed: (i) multi-agent distributed/federated reinforcement learning (RL) technique for UAV assisted mobile edge computing, (ii) self-imitation learning for UAV trajectory optimization, (iii) DRL with graph neural network (GNN) for NTN base station deployment, and (iv) multi-step/multi-agent RL for non-terrestrial base station deployment. For satellites, the following subjects will be elaborated: (i) DRL for multi-user access control in low-earth orbit (LEO) satellite networks, (ii) multi-tier DRL for LEO satellite networks, and (iii) multi-tier DRL for satellite-UAV multi-tier networks. Finally, research challenges and open issues will be discussed both in terms of practical applicability to various scenarios and algorithm perspectives.

Yu-Jia Chen received the B.S. degree and Ph.D. degree in electrical engineering from National Chiao Tung University, Taiwan, in 2010 and 2015, respectively. From 2015 to 2018, he was a postdoctoral research fellow with National Chiao Tung University, Taiwan, and he was a postdoctoral research fellow with Harvard University from 2018 to 2019. In 2019, he joined National Central University, Taiwan, where he is currently an assistant professor at the department of communication engineering. His research interests include non-terrestrial networks, wireless sensing and localization, and IoT security. Dr. Chen has

published more than 40 articles in peer-reviewed international journal and conference papers. He is holding four US patents and four ROC patents.

Dr. Chen has been serving as Technical Organizing Committee and Symposium Co-chair for many international conferences and symposia, including Globecom, ICC, and PIMRC. He is also co-founder of the IEEE workshop SPSCS, focusing on security and privacy in smart and connected systems. Prof. Chen has experience with tutorials at academic conferences such as Globecom and VTC. He also serves as a guest editor for IEEE Vehicular Technology Magazine special issue on Artificial Intelligence for Autonomous Vehicular Communication Networks. He is a Senior Member of IEEE.

Shao-Yu Lien received his B.S. degree from National Taiwan Ocean University in 2004, M.S. degree from National Cheng Kung University in 2006, and Ph.D. degree from National Taiwan University in 2011. He was with the National Formosa University, as an assistant professor and associate professor from 2013 to 2017, and he is now with National Chung Cheng University as an associate professor. Dr. Lien is also a technical director of Institute for Information Industry, since 2020. Dr. Lien received a number of prestigious research recognitions, including IEEE Tainan Section Best Young Professional Member Award 2019, IEEE Communications Society Asia-Pacific Outstanding Paper Award 2014, Scopus Young Researcher Award (issued by Elsevier) 2014, and IEEE ICC 2010 Best Paper Award. Dr. Lien is a guest editor of IEEE Transactions on Cognitive Communications and Networking in 2019, and a guest editor of Wireless Communications and Mobile Computing (WCMC) in 2017. In the meantime, Dr. Lien also served as the leading organizers of a number of technical workshops in IEEE VTC-Spring 2015, IEEE GLOBECOM 2015, Qshine 2015 and 2016, and IEEE PIMRC 2017, IEEE GLOBECOM 2019 and IEEE ICC 2020. Dr. Lien's research interests include configurable networks, cyber-physical systems, radio access networks and robotic networks.

Patrons and Exhibitors

IEEE VTS would like to thank the following patrons for their contributions to the success of the conference.

Registration

Registration will take place in the City and Guilds Building Level 2 Foyer. Hours are:

- Monday 26 September   0800 – 1730
- Tuesday 27 September   0800 – 1730
- Wednesday 28 September   0800 – 1730
- Thursday 29 September   0800 – 1200

Social Events

Coffee breaks will take place in the exhibit area in the City and Guilds Building Level 2 Foyer. Lunches and the banquet are included in the full registration. Lunch will be served in the CAGB Level 2 Foyer, while the banquet will be a river boat tour down the Thames by Bateaux London. This 3-hour tour with dinner and cocktails includes a historian giving us the highlights of the river and river banks. Buses pick up at 1800 at the college and return there by 2300. The reception on Sunday evening is open to all attendees, including student and life registrations.

Keynotes

Opening Keynote
Reinaldo Valenzuela, *Director, Communication Theory Department, Nokia Bell Labs*

Reinaldo A. Valenzuela is Director, Communication Theory Department, Distinguished Member of Technical Staff, Bell Laboratories. He is engaged in propagation measurements and models, MIMO/space time systems achieving high capacities using transmit and receive antenna arrays, HetNets, small cells and next generation air interface techniques and architectures. A Member National Academy of Engineering and a Fellow of the IEEE, his awards include the IEEE Eric E. Sumner Award, Bell Labs Fellow, WWRF Fellow, 2014 IEEE CTTC Technical Achievement Award, and 2015 IEEE VTS Avant Garde Award. He has a B.Sc. U. of Chile, Ph.D. Imperial College. He has published 190 papers and 44 patents. He has over 33,3000 Google Scholar citations and is a 'Highly Cited Author' In Thomson ISI and a Fulbright Senior Specialist

Future Massive MIMO Technologies for 5G-Beyond and 6G
Peiying Zhu, *Senior Vice President of Wireless Research, Huawei*

In this talk, we will first present the development of massive MIMO technologies for the 5G and associated challenges. The overall system performance and antenna design-choice in terms of spectrum and channel propagation properties will be discussed. In particular, we will present the novel massive MIMO antenna design to achieve higher capacity with same antenna aperture size and the field trial results. Finally we will discuss the directions for the evolution of massive MIMO technology for 6G.

Peiying Zhu, Senior Vice President of Wireless Research, is a Huawei Fellow, IEEE Fellow and Fellow of Canadian Academy of Engineering. She is currently leading 6G wireless research and standardization in Huawei. The focus of her research is advanced radio access technologies. She is actively involved in 3GPP and IEEE 802 standards development. She has been regularly giving talks and panel discussions on 5G/B5G vision and enabling technologies. She led the team to contribute significantly to 5G technologies and standardization. She served as the guest editor for IEEE Signal processing magazine special issue on the 5G revolution and IEEE JSAC on Deployment Issues and Performance Challenges for 5G.

Prior to joining Huawei in 2009, Peiying was a Nortel Fellow and Director of Advanced Wireless Access Technology in the Nortel Wireless Technology Lab. She led the team and pioneered research and prototyping on MIMO-OFDM and Multi-hop relay. Many of these technologies developed by the team have been adopted into LTE standards and 4G products. Dr. Zhu has more than 200 granted patents.

Location Awareness in Next Generation Networks
Victor Lawrence, *Director, Center for Intelligent Networked Systems, Stevens Institute of Technology*

Real-time high-accuracy location awareness is essential for numerous networked applications, particularly those involving Internet-of-Things and the beyond 5G (B5G) ecosystem such as factories of the future, autonomous vehicles, UAV fleet, and augmented reality. The coming years will see the emergence of network localization and navigation in challenging environments with sub-meter accuracy and minimal infrastructure requirements. This will call for the Localization-of-Things (LoT), a new paradigm referring to locating, tracking, and navigating collaborative and non-collaborative nodes (e.g., sensors, vehicles, and objects). This talk will give an overview of LoT, examining some recent research results in this exciting new field, from the perspectives of theoretical framework, cooperative algorithms, network operations, and network experimentation.

Victor B. Lawrence is Senior Research Scientist and Director of the Center for Intelligent Networked Systems (iNetS), and former Associate Dean and Batchelor Chair Professor at Stevens Institute of Technology. He was inducted into the National Inventors Hall of Fame in 2016. He is a Member of the US National Academy of Engineering, a Fellow of the IEEE, Fellow of AT&T Bell Labs, and Charter Fellow of the National Academy of Inventors. Dr. Lawrence is the co-author of five books and holds 53 U.S. and international patents and has published over 100 papers in referenced journals and conference proceedings.

Before joining Stevens Institute of Technology, Dr. Lawrence worked for Bell Laboratories for many years, retiring as Vice President, Advanced Communications Technology – AT&T Bell Laboratories and Lucent Technologies. He led the development of technologies for worldwide communications networks and managed an R&D staff of over 500 scientists/engineers and a budget of about $100M annually. During his career, his personal research activities provided major contributions to gigabit photonic and wireless networking, signal processing, modem technology, digital techniques, ATM and IP switching and protocols, HDTV, DSL, speech and audio coding, among other areas. Dr. Lawrence was the champion in bringing Fiber Optic Connectivity to Africa.

Dr. Lawrence co-funded four successful venture companies: Globespan Semiconductors Inc., Elemedia the Lucent's Internet software business, Lucent Digital Video, and Lucent Digital Radio, iBiquity.

He has received many awards including a 1997 Primetime Emmy Award for HDTV Grand Alliance Standard, a 2016 IEEE Simon Ramo Medal for technical innovation and leadership in the systems engineering of worldwide data communications networks, and a 2004 IEEE Field Award in International Communications. He also served as Chairman of the IEEE Awards Board and Editor-in-chief of the IEEE Transactions on communications.

He received a B.Sc. in 1968 from University of London, United Kingdom, a D.I.C. in 1969 from Imperial College, and a Ph.D. in 1973 Electrical Engineering from University of London, Imperial College in the United Kingdom.

Wednesday 27 September 20229:45–10:30 BST CAGB LT 200 London; 16:45–17:30 CST Meeting Room 06/07/16 Beijing

Collaborative collision avoidance using 5G/6G: "The wireless seat belt"

Klaus David, *Professor and Head of Communication Technology, Kassel University*

Worldwide, 351,000 vulnerable road users (VRU), like pedestrians and cyclists, were killed in 2016 due to collisions with vehicles, according to the World Health Organization.

To improve the safety of VRUs is a potential "killer" application for 5G/6G. In the presentation, several requirements for 6G/wireless networks will be given as well as the current state of the art for pedestrian/scooter/biker traffic safety, open research questions, and the linkage to Smart Cities and AI Artificial Intelligence. Also, one concrete solution, the "wireless seat belt," is presented.

Klaus David is a full professor and head of communication technology at Kassel University, Germany. His research interests include context awareness and AI focusing on applications such as smart cities, digital work, and VRU (Vulnerable Road User) safety.

He has 12 years of industrial experience in various management positions in HP, Bell Northern Research, IMEC, T-Mobile, and IHP, with five years of international experience in the UK, Belgium, USA, and Japan. He has published over 230 scientific articles, more than ten patents, and two books. He is active in IEEE (e.g., Editor in Chief IEEE VT Magazine 2015 – 2018), WWRF (Wireless World Research Forum), and at conferences, such as IST Future Network & Mobile Summit 2012 as TPC chair or General Chair IEEE PerCom 2021. He has co-founded two companies and is a regular consultant to the industry and public organizations.

Thursday, 29 September 2022, 9:45–10:30 BST CAGB LT 200 London

Virtual Keynote: China Mobile's view on roadmap and development guideline of 6G

Yuhong Huang, *General Manager, China Mobile*

Towards the 6G vision of "Digital Twin, Ubiquitous Intelligence", the next generation of mobile networks will integrate communication, sensing, computing, intelligence and security with the open architecture as the foundation. Driven by the new service and new industry demands, China Mobile has been actively investing in 6G R&D, and proposes research and development roadmap to 6G as well as six way-forward guidelines to lead the industrial consensuses on 6G development. Through establishing 6G Co-Innovation Initiative, we wish to promote openness and cooperation among global partners as well as to advocate a globally-unified 6G standards and ecology.

Yuhong Huang, General Manager of China Mobile Research Institute, graduated from Beijing University of Post and Telecommunications and joined China Mobile in 1996. She is currently the General Manager of China Mobile Research Institute. She has participated in the technical and strategic research, standardization and test verification of numerous mobile systems including GSM900/1800, GPRS/EDGE, CMNet, WLAN, 3G and 4G TD-LTE. She is now leading the research and standardization of 5G and 6G, and is a board member of NGMN and the Secretary-General of Global TD-LTE Initiative (GTI).

Thursday, 29 September 2022, 12:30–13:15 BST CAGB LT 200 London

Federated Learning in VTX Networks

Vincent Poor, *Michael Henry Strater University Professor, Priceton University*

The fifth generation and the emerging sixth generation of cellular networks aim to support vehicular networks, including communication among vehicles, pedestrians and road infrastructures, i.e., vehicle-to-everything (V2X) communications. These networks face difficult wireless propagation conditions due to rapidly varying channels, and must support low latency and high reliability, with vehicles forming dynamic topologies. However, with the help of such networks, vehicular applications can apply distributed machine learning techniques to enable assisted and self-driving systems. Federated learning (FL) is a collaborative distributed machine learning paradigm that is well-suited to this application. This talk will introduce the fundamentals of FL over wireless networks and discuss applications of FL in V2X communications, highlighting challenges, solutions, and open problems arising from the integration of these two technologies.

H. Vincent Poor is the Michael Henry Strater University Professor at Princeton University, where he has been on the faculty since 1990. He has also been a Visiting Professor at Imperial College since 2004, and he has held visiting appointments at several other universities as well, including most recently at Berkeley and Cambridge. His research interests are in the areas of information theory, machine learning and signal processing, and their applications in wireless networks, energy systems and related fields. Among his publications in these areas is the recent book Machine Learning and Wireless Communications (Cambridge University Press, 2022). An IEEE Fellow, Dr. Poor is also a member of the U.S. National Academy of Engineering and the U.S. National Academy of Sciences, and he is a foreign member of the Chinese Academy of Sciences, the Royal Society, and other national and international academies. He received the IEEE Alexander Graham Bell Medal in 2017 and the IEEE VTS Hall of Fame Award in 2021. He has served as an IEEE VTS Distinguished Lecturer since 2018.

VTC2022-Fall Technical Program

Beijing Papers

Tuesday 27 September 2022

Gacanin, RWTH Aachen University; Fumiyuki Adachi, Tohoku University

2 Data-Driven Multi-armed Beam Tracking for Mobile Millimeter-Wave Communication Systems
Shengdong Zhang, Yuan Ma, Shenzhen University; Xingjian Zhang, Harbin Institute of Technology, Shenzhen; Jian Wang, Nanjing University

3 Image generation from scene graph with object edges
Chenxing Li, Yiping Duan, Qiyuan Du, Tsinghua University; Chengkang Pan, China Mobile Research Institute; Guangyi Liu, China Mobile; Xiaoming Tao, Tsinghua University

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Tuesday, 27 September 2022 10:30-12:00 (CST) Meeting Room 7
2B: Intelligent Surfaces in Communications
1 Channel Estimation for Reconfigurable Intelligent Surface Assisted Wireless Communications via Structured Sparse Bayesian Learning
Ning Jin, China Telecom Research Institute; Fanyi Shu, Gang Yang, Ying-Chang Liang, University of Electronic Science and Technology of China; Xiaodong Chen, China Telecom Research Institute

2 Imperfect CSI Based Design for Intelligent Reflecting Surface Assisted MISO Systems
hongchao chen, samsung

3 Indoor Enhancement of mmWave Based on Reconfigurable Intelligent Surface: IRS or DF Relay Connection?
Hao Feng, Yuping Zhao, Peking University

4 On the Ergodic Capacity of Reconfigurable Intelligent Surface (RIS)-Aided MIMO Channels
Chongjun Ouyang, Beijing University of Posts and Telecommunications; Hao Xu, Beijing University of Posts and Communications; Xujie Zang, Hongwen Yang, Beijing University of Posts and Telecommunications

5 Parameter Estimation and Beam Tracking in Integrated Sensing and Communication System
Ruotong Xu, Chenhao Qi, Kangjian Chen, Southeast University

Tuesday, 27 September 2022 10:30-12:00 (CST) Meeting Room 16
2C: Intelligent Transportation I
1 A fast multi-UAV cooperative reconnaissance method exploiting payload diversity
Yinghong Ma, Xunan Li, Xidian University; Yi Jiao, Xi'an University of Posts and Telecommunications; Lin Guo, Suping Ren, Qi Zhang, China Academy of Aerospace Aerodynamics

2 Active fault tolerant approach based on pressure optimal prediction and Hâˇž control
Zhichao Lyu, Tongji University; Guangqiang Wu, School of Automotive Studies, Tongji University; Shang Peng, Tongji University

3 Autonomous Navigation for Mobile Robots with Weakly-Supervised Segmentation Network
Peinan Huang, Jialun Li, Jianping He, Shanghai Jiao Tong University

4 Sample-Efficient Multi-Agent Reinforcement Learning with Demonstrations for Flocking Control
Yunbo Qiu, Yuzhu Zhan, Yue Jin, Jian Wang, Xudong Zhang, Tsinghua University

Tuesday, 27 September 2022 10:30-12:00 (CST) Meeting Room 1
2D: IoT and Sensing
1 Coverage Performance Analysis of Piggyback Mobile IoT in 5G Vehicular Networks
Haiying, Yang Li, Chenguang He, Weixiao Meng, Harbin Institute of Technology

2 Dynamic Resource Allocation for 5G-Enabled Industrial Internet of Things System with Delay Tolerance
Heng Wang, YiXuan Bai, Xin Xie, Chongqing University of Posts and Telecommunications

ᵛ *Paper will be presented in virtual form only*

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4 Real-time Implementation and Evaluation of SDR-based Deep Joint Source-Channel Coding
Maolin Liu, Wei Chen, Jialong Xu, Bo Ai, Beijing Jiaotong University

5 Unified Mathematical Framework for Intelligent Transceiver Design
Feng Li, Gang Dai, Heng Du, Yiqing Zhang, Zhengyang Hu, Guanzhang Liu, Runhua Li, Jiang Xue, Zongben Xu, Xi'an Jiaotong University

3 Location-Dependent Task Bundling for Mobile Crowdsensing
Yan Zhen, Yunfei Wang, Peng He, Yaping Cui, Ruyan Wang, Dapeng Wu, Chongqing University of Posts and Telecommunications

4 Tandem Spreading Multiple Access with MIMO for Massive Reliable IoT Communications
Jiming Dai, Guoyu Ma, Yiyan Ma, Zhen Xue, Beijing Jiaotong University; Ning Wang, Zhengzhou University; Bo Ai, Beijing Jiaotong University

5 Worker Selection towards High Service Quality in Mobile Crowd Sening
Hong Zou, Hongli Wang, Yaping Cui, Peng He, Dapeng Wu, Ruyan Wang, Chongqing University of Posts and Telecommunications

Tuesday, 27 September 2022 10:30-12:00 (CST) Meeting Room 8
2E: Learning Techniques in Communications I
1 A Novel Radio Frequency Fingerprint Identification Method Using Incremental Learning
Jie Zhou, Yang Peng, Guan Gui, Nanjing University of Posts and Telecommunications; Yun Lin, Harbin Engineering University; Bamidele Adebisi, Manchester Metropolitan University; Haris Gacanin, RWTH Aachen University; Hikmet Sari, Nanjing University of Posts and Telecommunications

2 A Robust Few-Shot SEI Method Using Class-Reconstruction and Adversarial Training
Chao Liu, Xue Fu, Nanjing University of Posts and Telecommunications; Yunlu Ge, China Research Institute of Radiowave Propagation; Yu Wang, Nanjing University of Posts and Telecommunications; Yun Lin, Harbin Engineering University; Guan Gui, Hikmet Sari, Nanjing University of Posts and Telecommunications

3 An Automatic Pavement Crack Detection System with FocusCrack Dataset
Xinyun Yan, Jinling Institute of Technology; Shang Shi, Xiaohu Xu, Zhengran He, Nanjing University of Posts and Telecommunications; Xiaofeng Zhou, Hohai University; Chishe Wang, Jinling Institute of Technology; Zhiyi Lu, Nanjing Great Information Technology Co., Ltd.

4 An Effective Radio Frequency Signal Classification Method Based on Multi-Task Learning Mechanism
Hongwei Liu, Chengyao Hao, Yang Peng, Yu Wang, Nanjing University of Posts and Telecommunications; Tomoaki Ohtsuki, Keio University; Guan Gui, Nanjing University of Posts and Telecommunications

Tuesday, 27 September 2022 10:30-12:00 (CST) Meeting Room 9
2F: Transmission and Reception I
1 A Joint Design of Coherent Transmission and Coherent Receiving in 5G-Advanced Networks
Guohua Zhou, Huawei Technologies

2 An Improved PAPR Reduction Method Based on Imperialist Competition Algorithm for OTFS System
Xiangnan Xu, Ping Yang, University of Electronic Science and Technology of China

3 Blind Signal Recognition Method of STBC Based on Multi-channel Convolutional Neural Network
Yuting Gu, Yu Wang, Nanjing University of Posts and Telecommunications; Bamidele Adebisi, Manchester Metropolitan University; Guan Gui, Nanjing University of Posts and

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Telecommunications; Haris Gacanin, RWTH Aachen University; Hikmet Sari, Nanjing University of Posts and Telecommunication

4 Massive SIMO System Based on Energy Difference Detection in Rician Channels
Huan Meng, Guilin University of Electronic Technology; Lin Zheng, University of Electronic Technology; Chao Yang, Jianmei Chen,

Xiaofang Deng, Junyi Wang, Guilin University of Electronic Technology

5 Structured Phase Retrieval-aided Channel Estimation for Millimeter-Wave/Sub-Terahertz MIMO Systems
Kaihui Liu, Xiangning Li, Haiyang Zhao, Guoping Fan, Samsung Research China -- Beijing (SRC--B)

Tuesday, 27 September 2022 13:30-15:00 (CST) Meeting Room 6
3A: LEO / GNSS
1[v] A Group Handover Strategy for Massive User Terminals in LEO Satellite Networks
Lei Yang, Xiumei Yang, Shanghai Institute of Microsystem and Information Technology; Zhiyong Bu, Shanghai Institute of Microsystem and Information Technology CAS

2 Channel-Aware Gradient Fair Association for LEO Inter-Satellite Links
Xinyue Fan, Jiaojiao Hu, Yaping Cui, Peng He, Dapeng Wu, Ruyan Wang, Chongqing University of Posts and Telecommunications

3 Multi-hop Coflow Routing for LEO Distributed Computation Satellite Networks
zhikai zhang, Harbin Institute of Technology, Shenzhen; Shushi Gu, Harbin Institute of Technology (Shenzhen); Zhang Qinyu, Harbin Institute of Tech.

4 Quality Monitoring and Diagnostics of GNSS-enabled Virtual Balise Capturing using an Integrity Concept
Siqi Wang, Jiang Liu, Bai-gen Cai, Debiao Lu, Beijing Jiaotong University

5 Stochastic Geometry Analysis of LEO Constellation Coverage under Atmospheric Attenuation
Ruolin Wang, Pinyi Ren, Dongyang Xu, Lei Lu, Xi'an Jiaotong University

Tuesday, 27 September 2022 13:30-15:00 (CST) Meeting Room 7
3B: MIMO
1 Approximate Noise-Whitening in MIMO Detection via Banded-Inverse Extension
Sha Hu, Huawei Lund Research Center; Hao Wang, Huawei Technologies

2 Bilinear Approximate Message Passing Based Off-grid Channel Estimation for Multi-user Millimeter-Wave MIMO System
Yang Li, Shuyi Chen, Weixiao Meng, Harbin Institute of Technology

3 Distributed Optimization of Uplink Cell-Free Massive MIMO Networks
Rui Wang, Yi Jiang, Fudan University

4 Low Complexity IA Design for the Multi-Cell MIMO Downlink Cellular Network
Weihua Liu, Junchuan Fan, Yuanyuan Zhang, Zeqi Yu, Yong Cui, Zhengzhou University of Light Industry

5 Uplink MIMO Precoding Under Random Phase Imperfections
Hongxiang Xie, Huawei Technologies Co. Ltd.; Hao Wang, Huawei Technologies; Dzevdan Kapetanovic, Huawei Technologies Co. Ltd.

Tuesday, 27 September 2022 13:30-15:00 (CST) Meeting Room 16
3C: Positioning and Navigation
1 A Weighted Random Forest Based Positioning Algorithm for 6G Indoor Communications
Yang Wu, Southeast University; Yinghua Wang, Purple Mountain Laboratories; Jie Huang, Cheng-Xiang Wang, Southeast University; chen huang, purple mountain labrotary

2 Enabling accurate positioning in NLOS scenarios by hybrid machine learning with denoising and inpainting
Longhai Zhao, Qi Xiong, Samsung Electronics; Yunchuan Yang, Beijing Samsung R&D center; Pengru Li, Bin Yu, Feifei Sun, Chengjun Sun, Peng Xue, Samsung Electronics

3[v] Joint Localization and Environment Sensing by Harnessing NLOS Components in mmWave Communication Systems
Yixuan Huang, Jie Yang, Southeast University; Shuqiang Xia, ZTE Corporation; Shi Jin, Southeast University

4 Kernel Extreme Learning Machine-Based Dynamic Interval Construction for Outlier Detection of Telemetry Data
Haoran Xie, Yafeng Zhan, Shuqian Ren, Jianhua Lu, Tsinghua University

5 Multipath Ghosts Mitigation for Radar-based Positioning Systems
Xunze Wang, Mu Jia, Xinjie Meng, Tingting Zhang, Harbin Institute of Technology (Shenzhen)

Tuesday, 27 September 2022 13:30-15:00 (CST) Meeting Room 1
3D: Power Allocation
1 An Analysis of the Power Imbalance on the Uplink of Power-Domain NOMA
Shaokai Hu, Hao Huang, Guan Gui, Hikmet Sari, Nanjing University of Posts and Telecommunications

2 Multi-Agent Power and Resource Allocation for D2D Communications: A Deep Reinforcement Learning Approach
Honglin Xiang, Beijing University of Posts and Telecommunications; Jingyi Peng, China Industrial Control Systems Cyber Emergency Response Team; Zhen Gao, Beijing Institute of Technology; Lingjie Li, Yang Yang, Beijing University of Posts and Telecommunications

3 Optimal Power Allocation for Spatial Modulation in Cross-Media Communications
Tao Zhan, Xia Lei, Yue Xiao, Wei Jiang, You Li, University of Electronic Science and Technology of China

4 Power Allocation for Cross-Media Communications with Hybrid UAC/RF Transmission
Shiying Li, Yue Xiao, Yulan Gao, Yufeng Han, Mingming Wu, University of Electronic Science and Technology of China

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Wednesday 28 September 2022

Wednesday, 28 September 2022 08:30-10:00 (CST) Meeting Room 6
4A: Security
1 A Novel Malware Traffic Classification Method Based on Differentiable Architecture Search
Yunxiao Shi, Xixi Zhang, Zhengran He, Jie Yang, Nanjing University of Posts and Telecommunications

2 Authorized and Rogue LTE Terminal Identification Using Wavelet Coefficient Graph with Auto-encoder
Zhenni Wu, Linning Peng, Southeast University; Junqing Zhang, University of Liverpool; Ming Liu, Beijing Jiaotong University; Hua Fu, Aiqun Hu, Southeast University

3 Few-Shot Malware Traffic Classification Method Using Network Traffic and Meta Transfer Learning
Hanyi Guo, Xixi Zhang, Yu Wang, Nanjing University of Posts and Telecommunications; Bamidele Adebisi, Manchester Metropolitan University; Haris Gacanin, RWTH Aachen University; Guan Gui, Nanjing University of Posts and Telecommunications

4 Physical Layer Encryption Scheme Based on Dynamic Constellation Rotation
Yujie Hou, Guyue Li, Southeast University; Shuping Dang, University of Bristol; Lei Hu, Aiqun Hu, Southeast University

5 **TD3-based Joint UAV Trajectory and Power Optimization in UAV-Assisted D2D Secure Communication Networks**
Ziying Zhang, Jie Tian, Di Wang, Jingping Qiao, Tiantian Li, Shandong Normal University

Wednesday, 28 September 2022 08:30-10:00 (CST) Meeting Room 7
4B: Propagation I
1 **An Improved Equiangular Division Algorithm for SBR based Ray Tracing Channel Modeling**
Yuyang Zhou, Southeast University; Yinghua Wang, Purple Mountain Laboratories; Yuxiao Li, Jialing Huang, Jie Huang, Cheng-Xiang Wang, Southeast University

2 **An Improved Ray Tracing Acceleration Algorithm Based on Bounding Volume Hierarchies**
Chen Wang, Southeast University; Yinghua Wang, Purple Mountain Laboratories; Yuxiao Li, Jialing Huang, Jie Huang, Cheng-Xiang Wang, Southeast University

3 **An SBR Based Ray Tracing Channel Modeling Method for THz and Massive MIMO Communications**
Yuanzhe Wang, Hao Cao, Yifan Jin, Zizhe Zhou, Southeast University; Yinghua Wang, Purple Mountain Laboratories; Jialing Huang, Yuxiao Li, Jie Huang, Cheng-Xiang Wang, Southeast University

4 **Asymmetric channel characteristics analysis based on wideband channel measurement at 39 GHz in indoor office scenario**
Yadong Yang, Pan Tang, Tian Lei, Zhang Jianhua, Zhaowei Chang, Jun Men, Jiaxin Lin, Beijing University of Posts and Telecommunications

5 **Propagation Path Loss Models in Forest Scenario at 605MHz**
Zhe Xiao, Beijing University of Posts and Telecommunications; Shu Sun, Shanghai Jiao Tong University; Lianming Xu, Zhenyu Liu, Beijing University of Posts and Telecommunications; Wei Huang, Chengdu TD Tech Ltd, Chengdu; Li Wang, Aiguo Fei, Beijing University of Posts and Telecommunications

Wednesday, 28 September 2022 08:30-10:00 (CST) Meeting Room 16
4C: Quality of Service
1 **A Novel Subjective Perception Quality Evaluation Method of Video Based on EEG Signals**
Bingrui Geng, Yujing Zhang, Zanlin Dai, Communication University of China

2 **Design of Quality-of-Experience Criteria for Resource Allocation Toward 6G Wireless Networks: A Review and New Directions**
Mingming Wu, Yue Xiao, Yulan Gao, University of Electronic Science and Technology of China; Xianfu Lei, Southwest Jiaotong University

3 **Measuring Human Perception of Audiovisual Errors using EEG**
Dingcheng Gao, Tsinghua University; Bingrui Geng, Communication University of China; Yiping Duan, Xiaoming Tao, Tsinghua University; Chengkang Pan, China Mobile Research Institute

4 **Random Access Modelling and Performance Analysis for the 802.11ax UORA Mechansim in Multiple BSSs**
Jinyue Yang, Rong He, Xuming Fang, Yan Long, Honghao Ju, Southwest Jiaotong University

Wednesday, 28 September 2022 08:30-10:00 (CST) Meeting Room 1
4D: Radio Access
1ᵛ **Closed-form Approximations of MISO Broadcast System Capacity: a Massive-Antenna Perspective**
Weijia Han, Fengsen Chen, Xiao Ma, Shaanxi Normal University; Chao Xu, Northwest A&F University

2 **Edge Caching with Real-Time Guarantees**
Le Yang, Southeast University; Fu-Chun Zheng, Harbin Institute of Technology (Shengzhen) & The University of York; Shi Jin, Southern University

3 **Rate-Overhead Tradeoff in Beam Training for RRS-Assisted Multi-User Communications**
Shupei Zhang, Yutong Zhang, Boya Di, Peking University; Hongliang Zhang, Princeton University

4 **TOSE: A Fast Capacity Estimation Algorithm Based on Spike Approximations**
Dandan Jiang, Xi'an Jiaotong University; Han Hao, Tsinghua University; Lu Yang, Huawei Technology Co. Ltd.; Rui Wang, Xi'an Jiaotong University

Wednesday, 28 September 2022 08:30-10:00 (CST) Meeting Room 8
4E: Recent Results II
1 **5G Antenna with Hemispherical Coverage for AR Glasses**
Elena Shepeleva, Gennady Evtyushkin, Artem Nikishov, Anton Lukyanov, Mikhail Makurin, Samsung Research Russia

2 **Carrier Phase Positioning Using 5G NR Signals Based on OFDM System**
Jianfeng Li, Mengting Liu, Shunshun Shang, Xin Gao, Jianghua Liu, Balong Solution Dept, HiSilicon, Huawei Technologies Co., Ltd.

3 **Demo: Reconfigurable Intelligent Surface Aided Multi-User Real-Time Video Transmission System**
Yutong Zhang, Haobo Zhang, Yang Ziang, Boya Di, Peking University; Hongliang Zhang, Princeton University; Lingyang Song, Peking University

4ᵛ **Smooth Transition of Vehicles' Maximum Speed for Lane Detection based on Computer Vision**
Hamid Reza Ghaeini, Nils Ole Tippenhauer, CISPA Helmholtz Center for Information Security

Wednesday, 28 September 2022 10:30-12:00 (CST) Meeting Room 6
5A: Transmission and Reception II
1 **Noise-Assisted List Decoding for 5G LDPC Codes**
Jian Gao, Huawei Technologies Co., Ltd.; Hao Wang, Huawei Technologies; Kuangda Tian, Huawei Technologies Co., Ltd.

2ᵛ **NOMA based Terahertz Communication for High Altitude Platform System**
Mao Wang, Wataru Tachikawa, Kazutoshi Yoshii, Shigeru Shimamoto, Waseda University

3 **User Traffic based Adaptive Beam Codebook Management for mm-Wave communication**
Qing Zhu, Meifang Jing, Samsung Research China-Beijing; Hui Chen, Xiangli Lin, Weili Cui, Jinjing Huang, Jiajia Wang, Samsung Research China-Beijing(SRC-B)

ᵛ Paper will be presented in virtual form only

4 **When the CSI from Alice to Bob is Unavailable: What Can Eve Do to Eliminate the Artificial Noise?**
Hong Niu, Yue Xiao, Xia Lei, Gang Wang, University of Electronic Science and Technology of China; Ming Xiao, KTH; Shahid Mumtaz, Institute of Telecommunication, Aveiro

Wednesday, 28 September 2022 10:30-12:00 (CST) Meeting Room 7
5B: Semantic Communications
1 **A Multi-Task Semantic Communication System for Natural Language Processing**
Yucheng Sheng, Southeast University; Fang Li, Guangdong Communications and Networks Institute; Le Liang, Southeast University; Shi Jin, Southern University

2 **Deep Joint Source-Channel Coding for Wireless Image Transmission with Semantic Importance**
Qizheng Sun, Caili Guo, Yang Yang, Jiujiu Chen, Rui Tang, Chuanhong Liu, Beijing University of Posts and Telecommunications

3 **Deep Semantic Coding for Wireless Image Retrieval**
Ying Wang, Chenhao Qi, Southeast University

4 Performance Optimization of Energy Efficient Semantic Communications over Wireless Networks
Zhaohui Yang, Mingzhe Chen, Zhaoyang Zhang, Chongwen Huang, Qianqian Yang, Zhejiang University

5 SemBAT: Physical Layer Black-box Adversarial Attacks for Deep Learning-based Semantic Communication Systems
Zeju Li, Jinfei Zhou, Guoshun Nan, Zhichun Li, Cui Qimei, Xiaofeng Tao, Beijing University of Posts and Telecommunications

Wednesday, 28 September 2022 10:30-12:00 (CST) Meeting Room 16
5C: Sensor Networks

1 Distributed ADMM for Time-Varying Communication Networks
Zhuojun Tian, Zhaoyang Zhang, Richeng Jin, Zhejiang University

2 Information Freshness in Random-Access Poisson Network: Average AoI versus Peak AoI
Fangming Zhao, Xinghua Sun, Wen Zhan, Xijun Wang, Xiang Chen, Sun Yat-sen University

3 Multi-Relational Pedestrian Trajectory Prediction in Complex Scenes
Wenshuo Peng, Zhoujuan Cui, Yiping Duan, Xiaoming Tao, Tsinghua University

4 Peak Age of Information Optimization of Slotted Aloha
Dewei Wu, Wen Zhan, Xinghua Sun, Bingpeng Zhou, Jingjing Liu, Sun Yat-sen University

5 Specific Emitter Identification Based on Radio Frequency Fingerprint Using Multiscale Network
Yibin Zhang, Yang Peng, Nanjing University of Posts and Telecommunications; Bamidele Adebisi, Manchester Metropolitan University; Guan Gui, Nanjing University of Posts and Telecommunications; Haris Gacanin, RWTH Aachen University; Hikmet Sari, Nanjing University of Posts and Telecommunications

Wednesday, 28 September 2022 10:30-12:00 (CST) Meeting Room 1
5D: UAVs / IoV

1 FedDD: Federated Double Distillation in IoV
Peng Yang, Mengjiao Yan, Yaping Cui, Peng He, Dapeng Wu, Ruyan Wang, Luo Chen, Chongqing University of Posts and Telecommunications

2 Impacts of Obstacles and Jittering on Coverage and Throughput Performance of Large-Scale UAV Networks
Bonan Yin, Chenxi Liu, Mugen Peng, Beijing University of Posts & Telecommunications

3 Spatial-Temporal Correlation Multi-Agent Caching Policy in IoV
Yaping Cui, Li Cao, Peng He, Ruyan Wang, Dapeng Wu, Chongqing University of Posts and Telecommunications

4 UAV -Based Intelligent Reflecting Surface Transmission: Weighted Sum Rate Maximization of Wireless Network
Wen-jing Wang, Lisha Duziyang, Guangyue Lu, Long Chen, Xi'an University of Posts and Telecommunications; Nan Qi, Nanjing University of Aeronautics and Astronautics

Wednesday, 28 September 2022 10:30-12:00 (CST) Meeting Room 8
5E: Learning Techniques in Communications II

1 Cross-Person Activity Recognition Method Using Snapshot Ensemble Learning
Siyuan Xu, Zhengran He, Nanjing University of Posts and Telecommunications; Wenjuan Shi, Yancheng Teachers University; Yu Wang, Nanjing University of Posts and Telecommunications; Tomoaki Ohtsuki, Keio University; Guan Gui, Nanjing University of Posts and Telecommunications

2 Data Augmentation Aided Few-Shot Learning for Specific Emitter Identification
Xixi Zhang, Yibin Zhang, Yu Wang, Nanjing University of Posts and Telecommunications; Yun Lin, Harbin Engineering University; Guan Gui, Nanjing University of Posts and Telecommunications; Tomoaki Ohtsuki, Keio University; Hikmet Sari, Nanjing University of Posts and Telecommunications

3 Dynamic Content Caching Based on Actor-Critic Reinforcement Learning for IoT Systems
Lifeng Lai, Harbin Institute of Technology (Shenzhen); Fu-Chun Zheng, Harbin Institute of Technology (Shengzhen) & The University of York; Wanli Wen, Chongqing University; Jingjing Luo, Harbin Institute of Technology (Shenzhen)

4 Unsupervised Learning for Energy Efficient Power Allocation in Ultra-Reliable and Low-Latency Communications
Haitao Zhao, Bangning Xu, Qin Wang, Guan Gui, Hao Huang, Nanjing University of Posts and Telecommunications

Wednesday, 28 September 2022 14:00-15:30 (CST) Meeting Room 7
6B: Vehicular Networks I

1 Mobility-Aware Computation Offloading for Cloud-Assisted Mobile Edge Computing in Vehicular Networks
Qilie Liu, Rui Luo, Qian Liu, Chongqing University of Posts and Telecommunications

2 Radio Frequency Fingerprints Extraction for LTE-V2X: A Channel Estimation Based Methodology
Tianshu Chen, Hong Shen, Aiqun Hu, Weihang He, Jie Xu, Southeast University; Hongxing Hu, China Automotive Innovation Corporation

3 Sparse Measurement Data Driven Air-to-Ground Path Loss Prediction over Vegetation Area
Hanpeng Li, Xiaomin Chen, Kai Mao, Fuqiao Duan, Yanheng Qiu, Qiuming Zhu, Boyu Hua, Nanjing University of Aeronautics and Astronautics; Farman Ali, Qurtuba University of Science and Information Technology

4 Trust-based Intermediary Vehicle Election Provisioning with Resilience Under Information Asymmetry
Guiyu Zhang, Yanfei Lu, Xiaoxuan Wang, Xuehan Li, Beijing JiaoTong University

Wednesday, 28 September 2022 14:00-15:30 (CST) Meeting Room 16
6C: Wireless Networks

1 A Dynamic Spatiotemporal Prediction Method for Urban Network Traffic
Zhenyu Li, Yuchuan Fu, Pincan Zhao, Changle Li, Xidian University

2 Analysis on Age of Information in Partial Computing Edge Computing Systems with Multi Source-Destination Pairs
Haozhe Li, Guangwei Gong, Jiao Zhang, Haitao Zhao, Li Zhou, Jibo Wei, National University of Defense Technology

3 Broadcast Collision and Overhead Tradeoff for Enhanced Broadcast Service in IEEE 802.11bc
Yingying Tian, Honghao Ju, Xuming Fang, Yan Long, Rong He, Southwest Jiaotong University

4 Delay Evaluation for Cellular-Connected Drones: Experiments and Analysis
Jingjing Luo, Peng Zhao, Fu-Chun Zheng, Lingyu Li, Harbin Institute of Technology, Shenzhen

London Papers

Tuesday 27 September 2022

Tuesday, 27 September 2022 11:00 - 12:30 (BST) Skemp 301
1G: Antennas and RF Design II
Chair: Koichi Ichige, Yokohama National University, Japan

1 **Emulation of Electromagnetic Plane Waves for 3D Antenna Pattern Estimation**
Renato Zea, Technische Universität Ilmenau; Mario Lorenz, Fraunhofer IIS

2ᵛ **Hybrid-Field Channel Estimation for Massive MIMO Systems based on OMP Cascaded Convolutional Autoencoder**
Hasan Nayir, Istanbul Technical University; Erhan Karakoca, TÜBİTAK BİLGEM; Ali Gorcin, Yildiz Technical University; Khalid Qaraqe, TAMU

3 **Learning-Based Path Loss Estimation Using Multiple Spatial Data and System Parameters**
Kazuya Inoue, Keita Imaizumi, Koichi Ichige, Yokohama National University; Tatsuya Nagao, KDDI Research, Inc.; Takahiro Hayashi, KDDI Research Inc.

4 **Mediumband Wireless Communication**
Dushyantha A. Basnayaka, Dublin City University

5 **Wireless 3 GHz and 30 GHz Vehicle-to-Vehicle Measurements in an Urban Street Scenario**
Markus Hofer, David Löschenbrand, Stefan Zelenbaba, Anja Dakić, Benjamin Rainer, Thomas Zemen, AIT Austrian Institute of Technology

Tuesday, 27 September 2022 11:00 - 12:30 (BST) CAGB 649
1H: MIMO I
Chair: Masaaki Ito, KDDI Research, Japan

1ᵛ **Beam Squint Effect in Multi-Beam mmWave Massive MIMO Systems**
Liza Afeef, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

2 **Deep Learning-Aided Delay-Tolerant Zero-Forcing Precoding in Cell-Free Massive MIMO**
Wei Jiang, German Research Center for Artificial Intelligence; Hans Schotten, University of Kaiserslautern

ᵛ *Paper will be presented in virtual form only*

3 **Evaluation of Uplink Capacity of User-Cluster-Centric Cell-Free massive MIMO**
Ryo Takahashi, Hidenori Matsuo, Sijie Xia, Qiang Chen, Fumiyuki Adachi, Tohoku University

4 **Joint AP On/Off and User-Centric Clustering for Energy-Efficient Cell-Free Massive MIMO Systems**
Masaaki Ito, Issei Kanno, Yoshiaki Amano, Yoji Kishi, KDDI Research, Inc.; Wei Yu Chen, Thomas Choi, Andreas F. Molisch, University of Southern California

Tuesday, 27 September 2022 11:00 - 12:30 (BST) CAGB 650
1I: Electric Vehicle Control and Management II
Chair: Alessandro Ferrara, TU Wien, Austria

1 **Eco-driving of fuel cell electric trucks: optimal speed planning combining dynamic programming and Pontryagin's minimum principle**
Alessandro Ferrara, Christoph Hametner, TU Wien

2 **Electric Vehicle Battery Pack Design for Mitigating Thermal Runaway Propagation**
Ewan Copsey, Hongjian Sun, Durham University; Jing Jiang, Northumbria University

Tuesday, 27 September 2022 11:00 - 12:30 (BST) CAGB 651
1J: IoT and Networks
Chair: Yijing Ren, Kings College London, UK

1 **Efficient Pareto Optimality-based Task Scheduling for Vehicular Edge Computing**
Joahannes B. D. da Costa, Allan Souza, University of Campinas; Denis Rosario, Federal University of Pará (UFPA); Christoph Sommer, TU Dresden; Leandro Villas, University of Campinas

2 **Interference Aware Path Planning for Mobile Robots in mmWave Multi Cell Networks**
Yijing Ren, Vasilis Friderikos, King's College London

3 **Trading off SNR and the Number of Observations to Improve the Value of Information in IoT Networks**
Zijing Wang, Mihai-Alin Badiu, Justin Coon,University of Oxford

4 **TreeExplorer: a coding algorithm for rooted trees with application to wireless and ad hoc routing**
Amirmohammad Farzaneh, Mihai-Alin Badiu, Justin Coon, University of Oxford

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Tuesday, 27 September 2022 14:00 - 15:30 (BST) Skemp 301
2G: MIMO / NOMA

1ᵛ **Beam Squint Inspired Multiple Access Technique in Massive MIMO Systems**
Abuu Bakari Kihero, Liza Afeef, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

2 **Interference suppression for distributed CPU deployments in Cell-Free massive MIMO**
Akio Ikami, Yu Tsukamoto, Naoki Aihara, Takahide Murakami, Hiroyuki Shinbo, KDDI Research, Inc

3ᵛ **Maximizing Downlink User Connection Density in NOMA-aided NB-IoT Networks Through a Graph Matching Approach**
Shashwat Mishra, Lou Salaun, Nokia Bell Labs; Jean-Marie Gorce, INSA Lyon; Chung Shue Chen, Bell Labs, Nokia

4 **Min-Max Design and Analysis of NOMA with Adaptive Modulation Under BLER Constraints**
Hamad Yahya, The University of Manchester; Emad Al-Susa, Manchester University; Arafat Al-Dweik, Khalifa University

5 **Pilot Signal Design for Mixed Numerology NOMA Transmission**
Hayato Kanke, Yukitoshi Sanada, Keio University; Hiroki Matsuda, Mitsuki Takahashi, Sony Corporation; Ryota Kimura, Sony Group Corporation

Tuesday, 27 September 2022 14:00 - 15:30 (BST) CAGB 649
2H: Navigation and Satellites
Chair: Koichi Ichige, Yokohama National University, Japan

1 **An Overview of Channel Models for NGSO Satellites**
Victor Monzon Baeza, University of Luxembourg; Eva Lagunas, SnT, University of Luxembourg; Hayder AL-HRAISHAWI, University of Luxembourg; Symeon Chatzinotas, SnT, University of Luxembourg

2 **Deep Learning Empowered Secure RIS-Assisted Non-Terrestrial Relay Networks**
Chong Huang, Gaojie Chen, Yitong Zhou, University of Surrey; Haocheng Jia, University of Leicester; Pei Xiao, Rahim Tafazolli, University of Surrey

3 **Deep Reinforcement Learning-Based Routing for Space-Terrestrial Networks**
Kai-Chu Tsai, University of Houston; Ting-Jui Yao, Pin-Hao Huang, National Yang Ming Chiao Tung University; Cheng Sen Huang, National Chiao Tung University; Zhu Han, University of Houston; Li-Chun Wang, National Yang Ming Chiao Tung University

4 **LiDAR aided Wireless Networks - LoS Detection and Prediction based on Static Maps**
Nalin jayaweera, Dileepa Marasinghe, Nandana Rajatheva, University of Oulu; Sami Hakola, Timo Koskela, Oskari Tervo, Juha Karjalainen, Esa Tiirola, Nokia; Jari Hulkkonen, Nokia Standards

2I: Protocols, Security and Services
Chair: Masaaki Ito, KDDI Research, Japan

1 **Network Resource Optimization for Multi-View Streaming Mobile Augmented Reality**
Zhaohui Huang, King's College London

2 **QoS Prediction-based Radio Resource Management**
José Perdomo, Huawei Munich Research Center & Universidad Politecnica de Valencia; M.A. Gutierrez-Estevez, Munich Huawei Research Center; Apostolos Kousaridas, Chan Zhou, Huawei Technologies, German Research Center; Jose F. Monserrat, Polytechnic University of Valencia

3 **STARS Enabled Integrated Sensing and Communications: A CRB Optimization Perspective**
Zhaolin Wang, Xidong Mu, Yuanwei Liu, Queen Mary University of London

2J: Recent Results I
Chair: Alessandro Ferrara, TU Wien, Austria

1 **Adaptive and Efficient Key Extraction for Fast and Slow Fading Channels in V2V Communications**
Mahmoud A. Shawky, Muhammad Usman, Muhammad Ali Imran, Qammer H. Abbasi, Shuja Ansari, Ahmad Taha, University of Glasgow

2 **Blockage Prediction for Millimeter-wave Communications Based on People Flow Data**
Hirofumi Nakajo, Takeo Fujii, The University of Electro-Communications

3 **Deep Reinforcement Learning For Secure Communication**
Yinchao Yang, M, Shikh-Bahaei, King's College London

4 **Fast Channel Estimation for Massive Machine Type Communications**
Yonghong Zeng, Sumei Sun, Yuhong Wang, Yugang Ma, Institute for Infocomm Research

3G: Intelligent Transportation II
Chair: Yijing Ren, Kings College London, UK

1 **Attitude and Acceleration Estimation of Land Vehicle in Highly Dynamic Conditions**
Muhammad Azeem Javed, Muhammad Tahir, Lahore University of Management Sciences

2 **Cybersecurity and Capacity Requirement for Data Storage of Autonomous Driving System**
Bill Insup Kim, Ganggyu Lee, Samsung Electronics; Seyoung Lee, Korea University; Wonsuk Choi, Hansung University

3[v] **Enhancing Vehicle Flow in Random Environments through Dynamic Allocation of Sensing Resources**
Saadallah Kassir, Gustavo de Veciana, The University of Texas at Austin

4 **Local perception and BSM based misbehavior detection in Intelligent Transportation System**
Sohan Gyawali, East Carolina University; Takayuki Shimizu, Hongsheng Lu, Toyota Motor North America; Michael Clifford, John Kenney, Toyota Motor North America, R&D InfoTech Labs; Yi Qian, University of Nebraska-Lincoln

5 **Periodic and Event-Triggering for Joint Capacity Maximization and Safe Intersection Crossing**
Christian Vitale, Panayiotis Kolios, KIOS Research and Innovation Center of Excellence; George Ellinas, University of Cyprus

3H: Spectrum Efficiency and Security

1 **Energy-Efficient Symbiotic Radio Using Generalized Benders Decomposition**
Haoran Peng, Cheng-Yuan Ho, Yen-Ting Lin, Li-Chun Wang, National Yang Ming Chiao Tung University

2 **Kriging-based Trust Nodes Aided REM Construction under Threatening Environment**
Ying GAO, Takeo Fujii, The University of Electro-Communications

3[v] **Physical Layer Security of Overlay Cognitive NOMA Systems with Control-Jamming**
Kajal Yadav, Prabhat Kumar Upadhyay, Indian Institute of Technology Indore; Janne Lehtomäki, University of Oulu; Jules M. Moualeu, University of the Witwatersrand

3J: OTFS

1[v] **Exploiting OTFS Frame Structure for PAPR Reduction**
Ahmet Sacid Sümer, Talha Yılmaz, Ebubekir Memişoğlu, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

2[v] **Learning based Delay-Doppler Channel Estimation with Interleaved Pilots in OTFS**
Sandesh Rao Mattu, Indian Institute of Science; A. Chockalingam, Indian Institute of Science, Bangalore

3 **OTFS Waveform with Phase Noise in sub-THz**
Yaya Bello, CEA-Leti; Samuel Barnola, CEA Leti; David Demmer, Jean-Baptiste Doré, CEA-Leti

Wednesday 28 September 2022

4G: Vehicular Networks II
Chair: Martin Trullenque, i2CAT Foundation, Spain

1 **Experimental Characterization of Delay and Age of Information in DSRC V2V**
David Jiménez Soria, Universidad de Málaga; Beatriz Soret, University of Malaga; Mari Carmen Aguayo-Torres, Universidad de Malaga

2 **NOMA-dependent Low-Powered Retransmission in Sensing-based SPS for Cellular-V2X Mode 4**
Takeshi Hirai, Osaka University; Tutomu Murase, Nagoya University; Naoki Wakamiya, Osaka University

3 **On Alleviating Cell Overload in Vehicular Scenarios**
Martin Trullenque, i2CAT Foundation; Oriol Sallent, Universitat Politecnica de Catalunya (UPC); Daniel Camps-Mur, Josep Escrig, Carlos Herranz, Jad Nasreddine, i2CAT Foundation; Jordi Pérez-Romero, Universitat Politècnica de Catalunya

4 **Resource Scheduling under Knock-Out Congestion Control in New Radio (NR) Sidelink Mode 2**
Kyeongnam Park, Hyogon Kim, Korea University

4H: MIMO II
Chair: Omer Haliloglu, Ericsson Research, Turkey

1 **Layer-1 Mobility in Distributed MIMO with Non-Coherent Transmission**
Peng Lin, Omer Haliloglu, Ericsson Research

2 **System Design and Performance for Antenna Reservation in Massive MIMO**
Sidra Muneer, Jesus Rodriguez Sanchez, Lund University; Liesbet Van der Perre, KU Leuven; Ove Edfors, Lund University; Henrik Sjoland, Ericsson AB; Liang Liu, Lund University

[v] Paper will be presented in virtual form only

3 Towards Implementation of Neural Networks for Non-Coherent Detection MIMO systems
Alexis Falempin, University of Grenoble-Alpes, CEA-Leti; Julien Schmitt, Trung Dung Nguyen, VSORA; Jean-Baptiste Doré, CEA-Leti

4 URLLC with Coded Massive MIMO via Random Linear Codes and GRAND
Sahar Allahkaram, Francisco Monteiro, Instituto de Telecomunicações / ISCTE-IUL; Ioannis Chatzigeorgiou, Lancaster University

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Wednesday, 28 September 2022 14:00 - 15:30 (BST) Skemp 301
5G: UAVs
Chair: Hans-Jürgen Zepernick, Blekinge Institute of Technology, Sweden

1 NOMA-Based Full-Duplex UAV Network with K-Means Clustering for Disaster Scenarios
Chu Thi My Chinh, Hans-Jürgen Zepernick, Blekinge Institute of Technology; Trung Q. Duong, Queen's University Belfast

2 Outage Performance with Deep Learning Analysis for UAV-Borne IRS Relaying NOMA Systems with Hardware Impairments
Chandan Kumar Singh, Prabhat Kumar Upadhyay, IIT Indore; Janne Lehtomäki, Markku Juntti, University of Oulu

3 PSO-Based Joint UAV Positioning and Hybrid Precoding in UAV-Assisted Massive MIMO Systems
Mobeen Mahmood, Asil Koc, Tho Le-Ngoc, McGill University

4 PSO-OLSR: A Particle Swarm Optimization based Proactive Routing Protocol for UAV Networks
Fatima Zahra Rabahi, Saadi Boudjit, Université Sorbonne Paris Nord; Nour El Houda Bahloul, Altim Consulting; Soufiene Djahel, Manchester Metropolitan University; ChemsEddine Bemmoussat, STIC, University of Ain T'emouchent, Algeria

Wednesday, 28 September 2022 14:00 - 15:30 (BST) CAGB 649
5H: Spectrum Management II
Chair: Shuping Dang, University of Bristol, UK

1 A Fully-Distributed Radio Source Detector for Fast Fading Rayleigh Channels
Juan Augusto Maya, Andrea Tonello, University of Klagenfurt

2 Adaptive Resource Allocation for Satellite Illumination Pattern Design
Lin Chen, University of Luxembourg

3 Deep Learning-Based Dynamic Spectrum Access for Coexistence of Aeronautical Communication Systems
David Kopyto, Sebastian Lindner, Leonard Schulz, Daniel Stolpmann, Gerhard Bauch, Andreas Timm-Giel, Hamburg University of Technology

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Wednesday, 28 September 2022 16:00 - 17:30 (BST) Skemp 301
6G: Propagation II
Chair: Miguel A. Bellido-Manganell, German Aerospace Center

1 A Novel Estimation Method of Radio Propagation Characteristics Based on Color Images
Takahiro Tomie, Satoshi Suyama, Koshiro Kitao, Mitsuki Nakamura, NTT DOCOMO, INC.

2 Aircraft-to-Aircraft Channel Measurements in the VHF/UHF Band: Analysis of the Line-of-Sight and Lake-Reflected Channel Components
Miguel A. Bellido-Manganell, Uwe-Carsten Fiebig, Michael Walter, German Aerospace Center (DLR)

3 Fine-Tuning for Propagation Modeling of Different Frequencies with Few Data
Tatsuya Nagao, Takahiro Hayashi, KDDI Research, Inc.

4ᵛ On Emulating and Controlling Rician Propagation in Wireless Laboratory
Abuu Bakari Kihero, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

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Wednesday, 28 September 2022 11:00 - 12:30 (BST) CAGB 651
4J: Neural Networks
Chair: Shuping Dang, University of Bristol, UK

1 Autoencoding Graph Neural Networks for Scalable Transceiver Design
Junbeom Kim, Jeonbuk National University; Hoon Lee, Pukyong National University; Seok-Hwan Park, Jeonbuk National University

2 On the Performance of Quantized Neural Networks based Digital Predistortion for PA linearization in OFDM systems
Alexis Falempin, Johan Laurent, Jean-Baptiste Doré, Rafik Zayani, Emilio Calvanese Strinati, CEA-LETI

4 QoE-Oriented Resource Allocation Design Coping with Time-Varying Demands in Wireless Communication Networks
Teweldebrhan Mezgebo Kebedew, University of Luxembourg; Eva Lagunas, Vu Nguyen Ha, SnT, University of Luxembourg; Joel Grotz, SES. S.A.; Symeon Chatzinotas, SnT, University of Luxembourg

Wednesday, 28 September 2022 14:00 - 15:30 (BST) CAGB 651
5J: Recent Results III
Chair: Praveen Sai Bere, IIT Hyderaba, India

1 Flexe: Investigating Federated Learning in Connected Autonomous Vehicle Simulations
Wellington Viana Lobato Junior, Joahannes B. D. da Costa, University of Campinas; Allan M. de Souza, UNICAMP; Denis Rosario, Federal University of Pará (UFPA); Christoph Sommer, TU Dresden; Leandro Villas, UNICAMP

2 Low complexity, diversity preserving hard decision decoder for CRC codes with IoT applications
BERE PRAVEEN SAI, Indian Institute of Technology, Hyderabad; Mohammed Zafar Ali Khan, Indian Institute of Technology Hyderabad

3 Measurement-Based Cellular Band Air–to–Ground Channel Modeling for UAVs
Necati Kagan Erkek, Istanbul Technical University; Ubeydullah Erdemir, TÜBİTAK BİLGEM; Ali Gorcin, Yildiz Technical University; Emre Balci, Hakan Ali Cirpan, Berkin Halay, Istanbul Technical University

4 On the Energy-Efficiency Maximization for IRS-Assisted MIMOME Wiretap Channels
Anshu Mukherjee, Vaibhav Kumar, University College Dublin; Derrick Wing Kwan Ng, University of New South Wales; Le-Nam Tran, University College Dublin

5 Second-Order Statistics of Non-Stationary Channels: An Off-Body Communications Example
Kenan Turbic, RWTH Aachen University; Luis M. Correia, IST - University of Lisbon / INESC

Wednesday, 28 September 2022 16:00 - 17:30 (BST) CAGB 649
6H: Positioning
Chair: Birendra Ghimire, Fraunhofer IIS, Germany

1 Accurate and Efficient Wi-Fi Fingerprinting-Based Indoor Positioning in Large Areas
Moises Ramires, CCG; Joaquin Torres Sospedra, Universidade do Minho; Adriano Moreira, University of Minho

2 Locating Multiple RFID Tags with Swin Transformer-based RF Hologram Tensor Filtering
Xiangyu Wang, Auburn University; Jian Zhang, Kennesaw State University; Shiwen Mao, Senthilkumar CG Periaswamy, Justin Patton, Auburn University

3 Reference Signal Enhancement in 5G for Extended Coverage in Multi-User Scenarios
Birendra Ghimire, Ernst Eberlein, Mohammad Alawieh, Fraunhofer IIS, Fraunhofer Institute of Integrated Circuits

4 Simultaneous Indoor and Outdoor 3D Localization with STAR-RIS-Assisted Millimeter Wave Systems
Jiguang He, Aymen Fakhreddine, TII; George Alexandropolos, National and Kapodistrian University of Athens

Wednesday, 28 September 2022 16:00 - 17:30 (BST) CAGB 651
6J: V2X
Chair: Rafael Molina-Masegosa, Universidad Miguel Hernandez de Elche, Spain

1 Enhancing the Safety of Vulnerable Road Users: Messaging Protocols for V2X Communication
Silas Lobo, Christian Facchi, Andreas Festag, Technische Hochschule Ingolstadt (THI)

2 Insights into the Design of V2X-based Maneuver Coordinations for Connected Automated Driving
Rafael Molina-Masegosa, Universidad Miguel Hernandez de Elche (UMH); Sergei S. Avedisov, Toyota North America R&D - InfoTech Labs; Miguel Sepulcre, Universidad Miguel Hernandez de Elche (UMH); Yashar Zeynali Farid, Toyota North America R&D - InfoTech Labs; Javier Gozálvez, Universidad Miguel Hernandez de Elche (UMH); Onur Altintas, Toyota Motor North America R&D

3 Optimal Packet Transmission Rates for Platooning under Random Access C-V2X
Andres Villamil, Arturo Gonzalez, Technische Universität Dresden; Gerhard Fettweis, TU Dresden

4 PAVEMENT: Passing Vehicle Detection System with Autonomous Incremental Learning using Camera and Vibration Data
Arnan Maipradit, Nara Institute of Science and Technology; Yumiko Moriyama, Tomoki Okuro, Onkyo Corporation; Makoto Yoshida, Nara Institute of Science and Technology; Nobuya Tachimori, Onkyo Corporation; Shinya Akiyama, Hirohiko Suwa, Keiichi Yasumoto, Nara Institute of Science and Technology

Thursday 29 September 2022

Thursday, 29 September 2022 11:00 - 12:30 (BST) Skemp 301
7G: Learning Techniques in Communications III
Chair: Shiwen Mao, Auburn University, USA

1 Federated Learning for Multi-view Synthesizing in Wireless Virtual Reality Networks
Yiyu Guo, Queen Mary University of London; Zhijin Qin, Tsinghua University

2 Data Augmentation for RFID-based 3D Human Pose Tracking
Ziqi Wang, Chao Yang, Shiwen Mao, Auburn University

3 Deep Reinforcement Learning Based Resource Allocation for LoRaWAN
Aohan Li, The University of Electro-Communcations

4 TinyQMIX: Distributed Access Control for mMTC via Multi-agent Reinforcement Learning
Thanh Le, SOKENDAI; Yusheng Ji, National Institute of Informatics; John C.S. Lui, The Chinese University of Hong Kong

Thursday, 29 September 2022 11:00 - 12:30 (BST) CAGB 649
7H: Transmission and Reception III
Chair: Shuja Ansari, University of Glasgow, U.K.

1ᵛ Control of Fractional Delay Effect for SC Transmission in Beyond 5G Networks
Talha Yılmaz, Armed Tusha, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

2 Forney Observation Models for Faster-Than-Nyquist Signaling on Nonlinear Satellite Links
Philipp Mohr, Rainer Grünheid, Gerhard Bauch, Hamburg University of Technology

3 Hardware Implementation of 60 GHz D&F Relay Node for use in 5G Co-operative Networks
Randy Verdecia-Peña, José I. Alonso, Universidad Politécnica de Madrid

4ᵛ Secrecy Performance of RIS-Aided Wireless Systems in the Presence of Mobile Interferers and Eavesdropper Mobility
Aman Sikri, Indian Institute of Technology Delhi; Aashish Mathur, Indian Institute of Technology Jodhpur

Thursday, 29 September 2022 11:00 - 12:30 (BST) CAGB 651
7J: Recent Results IV
Chair: Deepa Jagyasi, InterDigital Communications, UK

1 Rate Loss due to Beam Cusping in Grid of Beams
Krishan Kumar Tiwari, Giuseppe Caire, Technical University of Berlin

2 Re-Evaluation Strategies for 5G NR V2X Communications
Alejandro Molina-Galan, Baldomero Coll-Perales, Universidad Miguel Hernandez de Elche; Javier Gozálvez, Universidad Miguel Hernandez de Elche (UMH)

3 The Nearest Is Not The Fastest : On The Importance Of Selecting In/Out Routing Hops Over A Satellite LEO Constellation
Alexia Auddino, Anna Barraqué, ISAE-SUPAERO; Oana Hotescu, ISAE-SUPAERO, University of Toulouse; Jérôme Lacan, José Radzik, ISAE-SUPAERO; Emmanuel Lochin, ENAC

4 Unsupervised Learning-Aided Discrete RIS Configuration Estimator
Deepa Jagyasi, InterDigital Communications, Inc.; Arman Shojaeifard, InterDigital; Ibrahim Hemadeh, InterDigital Europe, Ltd; Patrick Svedman, InterDigital Communications, Inc.

Thursday, 29 September 2022 11:00 - 12:30 (BST) Skemp 307
7K: Radio Access and Heterogeneous Networks
Chair: Gaojie Chen, University of Surrey, UK

1 LiDAR aided Wireless Networks - Beam Prediction for 5G
Dileepa Marasinghe, Nalin Jayaweera, Nandana Rajatheva, University of Oulu; Sami Hakola, Timo Koskela, Oskari Tervo, Juha Karjalainen, Esa Tiirola, Jari Hulkkonen, Nokia Standards

2ᵛ Performance Analysis of OSTBC in NOMA Assisted Downlink System with SIC Errors
Rahul Makkar, LNM Institute of Information Technology, Jaipur; Kotha Venugopalachary, Shiv Nadar University; Divyang Rawal, LNM Institute of Information Technology, Jaipur Vijay Kumar Chakka, Shiv Nadar University; Nikhil Sharma, LNM Institute of Information Technology, Jaipur

3 Slice-aware Open Radio Access Network planning and dimensioning
Parisa Foroughi, Philippe Martins, Telecom Paris; Patrice Nivaggioli, Cisco; Jean-Louis Rougier, Telecom Paris

4 Stochastic Geometry Analysis for RIS-Assisted Large-Scale Cellular Networks
Tianxiong Wang, University of Oxford; Gaojie Chen, University of Surrey; Mihai-Alin Badiu, Justin Coon, Oxford University

ᵛ Paper will be presented in virtual form only

Virtual Sessions

Tuesday 27 September 2022

Tuesday, 27 September 2022 11:00 - 12:30 (BST) Virtual

1V: Antenna Systems, Propagation, and RF Design

1 A Study on Radio Propagation Characteristics at 100 GHz between the User Equipment and a Wearable Device
Kazuki Takezawa, Tatsuya Nagao, Takahiro Hayashi, KDDI Research Inc.

2 On Three-Phase S-Parameters and its Application to Coupling Attenuation of Automotive High-Voltage Lines
Franz G. Aletsee, Augsburg University of Applied Sciences

3 Outdoor Localization of Intelligent Reflecting Surfaces using Radio Maps
Purnima Lala Mehta, Satya Kumar Vankayala, Kuldeep Sharma, Prashant N, Samsung R&D Institute; Seungil Yoon, Samsung Electronics; Sai Krishna Santosh Gollapudi, Samsung R&D Institute

4 Practical Evaluation Method for Large IRS: RCS Pattern Synthesis of Sub-IRS with Mutual Coupling
Hiromi Matsuno, Takuya Ohto, Michihiro Harada, Tatsuya Nagao, Takahiro Hayashi, KDDI Research Inc.

Tuesday, 27 September 2022 11:00 - 12:30 (BST) Virtual

1X: Electric Vehicles, Vehicular Electronics, and Intelligent Transportation

1 Aggressive Driving Detection on Other Vehicles
Tomohiro Matsuda, Seyhan Ucar, Yongkang Liu, E. Akin Sisbot, Kentaro Oguchi, InfoTech Labs Toyota Motor North America R&D

2 An Autonomous Valet Parking Algorithm for Path Planning and Tracking
Yutao Shi, Tongji University

3 Decision-making with Triple Density Awareness for Autonomous Driving using Deep Reinforcement Learning
Zhang Shuwei, Wu Yutian, Waseda University

4 Deep Reinforcement Learning with Intervention Module for Autonomous Driving
Huicong Chi, Ping Wang, Chao Wang, Xinhong Wang, Tongji University

5 UAV-Assisted Image Acquisition: 3D UAV Trajectory Design and Camera Control
Xiaowei Tang, Tongji University; Shuowen Zhang, The Hong Kong Polytechnic University; Changsheng You, Southern University of Science and Technology; Xinlin Huang, Tongji University; Rui Zhang, National University of Singapore

Tuesday, 27 September 2022 14:00 - 15:30 (BST) Virtual

2V: Intelligent and Semantic Communications

1 Federated Meta Learning for Traffic Steering in O-RAN
Hakan Erdol, Xiaoyang Wang, Peizheng Li, Jonathan Thomas, Robert Piechocki, George Oikonomou, University of Bristol; Rui Inacio, Abdelrahim Ahmad, Vilicom UK Ltd.; Keith Briggs, Shipra Kapoor, BT

2 Valuation-Aware Federated Learning: An Auction-Based Approach for User Selection
Pan-Yang Su, Pei-Huan Tsai, Yu-Kang Lin, Hung-Yu Wei, National Taiwan University

Tuesday, 27 September 2022 14:00 - 15:30 (BST) Virtual

2X: IoT, M2M, Sensor Networks, and Ad-Hoc Networking

1 An Open-Source GNU Radio Framework for LoRa Physical Layer and Collision Resolution
Weixuan Xiao, Université Clermont Auvergne; Gil De Sousa, Université Clermont-Auvergne, INRAE; Nancy El Rachkidy, University Clermont-Auvergne; Alexandre Guitton, Université Clermont Auvergne

2 Multi channel spectrum prediction algorithm based on GCN and LSTM
Han Zhang, Qiao Tian, Yu Han, Harbin Engineering University

3 Optimal Scheduling for Minimizing Peak Age of Information in Uplink Systems
Ridong Li, Junwei Lei, Chongqing University; Qianying Zhou, Chongqing university; Zhengchuan Chen, Chongqing University; Min Wang, Chongqing University of Posts and Telecommunications; Zhong Tian, Chongqing University

4 Sequential State Q-learning Uplink Resource Allocation in multi-AP 802.11be Network
Yue Liu, Yide Yu, Zhenyu Du, Laurie Cuthbert, Macao Polytechnic University

5 Situation-Aware Hybrid Time Synchronization Based on Multi-Source Timestamping Uncertainty Modeling
Haide Wang, Pengyi Jia, Western University; Xianbin Wang, The University of Western Ontario

6 Uplink and downlink are not orthogonal in LoRaWAN!
Rachida Saroui, Univ Lyon, INSA Lyon, Inria, CITI; Alexandre Guitton, Université Clermont Auvergne; Oana Iova, Fabrice Valois, Univ Lyon, INSA Lyon, Inria, CITI

Tuesday, 27 September 2022 16:00 - 17:30 (BST) Virtual

3V: Positioning, Navigation and Mobile Satellite Systems

1 Analysis of GEO Satellite Relay Coded Systems
Jiaming Zhang, Shaohua Wu, Aimin Li, Jian Jiao, Zhang Qinyu, Harbin Institute of Technology (Shenzhen)

2 Energy Efficient Sparse Precoding Design for Satellite Communication System
Tedros Salih, University of Luxembourg; Steven Kisseleff, Eva Lagunas, Symeon Chatzinotas, SnT, University of Luxembourg; Bjorn Ottersten, University of Luxembourg

3 Exploiting Phase Difference of Arrival of V2X Signals for Pedestrian Positioning
Suhua Tang, Sadao Obana, The University of Electro-Communications

Tuesday, 27 September 2022 16:00 - 17:30 (BST) Virtual

3X: Radio Access Technology and Heterogeneous Networks

1 Activation Control of Base Stations Based on Multi-agent DQN for Heterogeneous Networks
Daiki Kato, Tokyo University of Science; Yuto Muroki, Nobuhide Nonaka, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science

2 Autonomous Decentralized User Association Method to Maximize Integrated System Throughput for Multi-service Coexistence
Kazuma Matsumoto, Takanori Hara, Tokyo University of Science; Yasuaki Yuda, Panasonic Corporation; Kenichi Higuchi, Tokyo University of Science

3 CoMP Based Delta-OMA Scheme for Visible Light Communications
Samikkannu Rajkumar, Sri Lanka Technological Campus; Dushantha Nalin K. Jayakody, University Autónoma de Lisboa; Priyashantha

Tennakon, Sri Lanka Technological Campus; Marko Beko, University of Lusofona

4 **Comparisons of Physical Cell ID Detection Methods with Carrier Frequency Offset Compensation for Millimeter-Wave Bands**
Shun Yoneda, Mamoru Sawahashi, Tokyo City University; Satoshi Nagata, NTT DOCOMO, INC.

5 **Delay-Outage Analysis of OFDMA-Based Task Offloading in Edge Computing Networks**
Aigerim Ospanova, Behrouz Maham, Nazarbayev University

6 **Improving MIMO Secrecy Rate through Efficient Power Allocation**
Jyothsna S, Indian Institute of Technology Palakkad; Lakshmi Narasimhan, IIT Palakkad

7 **Joint Power and Time Allocation in NOMA-SWIPT Enabled Wireless Caching Networks**
Yuan Ren, Kaiyue Qian, Xuewei Zhang, Fan Jiang, Guangyue Lu ,Xi'an University of Posts and Telecommunications

8 **On Relay User Equipment Activation in Beyond 5G Radio Access Networks**
Jordi Pérez-Romero, Oriol Sallent, Olga Ruiz, Universitat Politecnica de Catalunya (UPC)

9 **Resource Allocation Mechanism for Cooperative Multicast in Integrated Satellite-Terrestrial Network**
Jhen-Syuan Wu, Pan-Yang Su, Kuang-Hsun Lin, Hung-Yu Wei, National Taiwan University

10 **Transmit Power Control for Indoor Small Cells: A Method Based on Federated Reinforcement Learning**
Peizheng Li, Hakan Erdol, University of Bristol; Keith Briggs, BT; Xiaoyang Wang, Robert Piechocki, University of Bristol; Abdelrahim Ahmad, Rui Inacio, Vilicom UK Ltd.; Shipra Kapoor, BT; Angela Doufexi, University of Bristol; Arjun Parekh, BT

11 **Wideband Delta-Sigma Radio over Fiber Embedding Pulse Distortion Model for Beyond 5G**
Masaaki Tanio, Naoto Ishii, Kazushi Muraoka, NEC Corporation

Wednesday 28 September 2022

Wednesday, 28 September 2022 11:00 - 12:30 (BST) Virtual
4V: Recent Results V

1 **A Two-Factor Authentication Scheme for Moving Connected Vehicles**
Dajiang Suo, Sanjay Sarma, Massachusetts Institute of Technology

2 **Clustering-based Pilot Assignment for User-Centric Cell-Free mmWave Massive MIMO Systems**
Bowen Zhong, University of Liverpool; Xu Zhu, Harbin Institute of Technology (Shenzhen); Eng Gee Lim, Xi'an Jiaotong-Liverpool University

3 **Comparison of V2N STUN/TURN Round Trip Time Performance on a Public 5G Network**
Billy Kihei, Tyler Davison, Mfon Okpok, Kennesaw State University; Jim Song, T-Mobile

4 **Composite Robot Aided Coexistence of eMBB, URLLC and mMTC in Smart Factory**
Wenjun Hou, Xu Zhu, Harbin Institute of Technology (Shenzhen); Cao Jei, Singapore A*STAR; Zeng Haiyong, Yufei Jiang, Harbin Institute of Technology (Shenzhen)

5 **DQN-based Power Control and Offloading Computing for Information Freshness in Multi-UAV-Assisted V2X System**
Baolin Yin, Jiahui Li, David Lee, Jiaxin Yan, SWUST

6 **Edge Intelligence in Mobile Nodes: Opportunistic Pipeline via 5G D2D for On-site Sensing**
Terry Guo, Tennessee Tech University; Hawzhin Mohammed, Penn State University; Syed R. Hasan, Tennessee Tech University

7 **Error Analysis of an Optimal Rotated M-PSK Constellation in a SOMA-Based Wireless Communication System**
Badri Ramanjaneya Reddy, Soumya Prakash Dash, Indian Institute of Technology Bhubaneswar; Sandeep Joshi, Birla Institute of Technology and Science Pilani

8 **External Passive Intermodulation Suppression by General Linear Combination based Robust Adaptive Beamforming**
Zhongrui Wang, Xu Zhu, Yufei Jiang, Haiyong Zeng, Baiqi Li, Harbin Institute of Technology, Shenzhen

9 **Federated Learning-based Inter-slice Attack Detection for 5G-V2X Sliced Networks**
Abdelwahab Boualouache, Thomas Engel, University of Luxembourg

10 **Identification of Distorted RF Components via Deep Multi-Task Learning**
Mehmet Ali Aygul, Vestel; Ebubekir Memişoğlu, Hakan Ali Cirpan, Istanbul Technical University; Hüseyin Arslan, University of South Florida

11 **Multicast MMSE-based Precoded Satellite Systems: User Scheduling and Equivalent Channel Impact**
Eva Lagunas, Vu Nguyen Ha, SnT, University of Luxembourg; Trinh Van Chien, University of Luxembourg; Stefano Andrenacci, SES, Luxembourg; Nicolo Mazzali, European Space Agency (ESA), The Netherlands; Symeon Chatzinotas, SnT, University of Luxembourg

12 **On the Performance of Dual RIS-assisted V2I Communication under Nakagami-m Fading**
Mohd Hamza Naim Shaikh, Nazarbayev University; Khaled Rabie, Manchester Met University; Xingwang Li, Henan Polytechnic University; Theodoros A. Tsifsis, Jinan University; Galymzhan Nauryzbayev, Nazarbayev University

13 **Outage Probability of Indoor-outdoor C-NOMA Enabled UAV-Relay Over κ-μ Fading**
Emad Al-Susa, Manchester University; Adel Alqahtani, University of Manchester, and King Khaled University; Arafat Al-Dweik, Khalifa University

14 **Performance Analysis of V2I Zone Activation and Scalability for C-V2X Transactional Services**
Mahdi Zaman, MD Saifuddin, Mahdi Razzaghpour, Yaser P. Fallah, University of Central Florida

15 **Performance Comparison of Error-Control Schemes in Collaborative Multiple-Input Multiple-Output Systems**
Hokuto Taromaru, Kyoto University; Hidekazu Murata, Yamaguchi University

16 **Performance of RIS-empowered NOMA-based D2D Communication under Nakagami-m Fading**
Mohd Hamza Naim Shaikh, Nazarbayev University; Sultangali Arzykulov, Abdulkadir Çelik, Ahmed M. Eltawil, King Abdullah University of Science and Technology (KAUST); Galymzhan Nauryzbayev, Nazarbayev University

17 **Research on Fairness Algorithm of User Allocation Problem in MOBA Edge Gaming**
dang, Zhengzhou University

18 **Social-Assisted Hypergraph Based Subchannel Assignment for UAV Cellular Networks**
Kanhu Charan Gouda, Sangya Shrivastava, Indian Institute of Technology Roorkee, India; Rahul Thakur, IIT Roorkee

19 **The Impact of Distributed Data Preprocessing on Automotive Data Streams**
Amal Tawakuli, Thomas Engel, University of Luxembourg

20 **Towards Quantum Annealing for Multi-user NOMA-based Networks**
Eldar Gabdulsattarov, Nazarbayev University; Khaled Rabie, Manchester Met University; Xingwang Li, Henan Polytechnic University; Galymzhan Nauryzbayev, Nazarbayev University

5V: Signal Transmission and Reception, MIMO Techniques

1 A Beam Scheduling Scheme Based on Real-Time Traffic Distribution in 5G Millimeter-Wave Networks
Guangcan Yan, Samsung Research Insitute China - Beijing(SRC-B)

2 A Low-Complexity DNN-Based DoA Estimation Method for EHF and THF Cell-Free Massive MIMO
Seyyed Saleh Hosseini, Benoit Champagne, Xiao-Wen Chang, McGill University

3 Adaptive DNN-based CSI Feedback with Quantization for FDD Massive MIMO Systems
Junjie Gao, Mondher Bouazizi, Tomoaki Ohtsuki, Keio University; Guan Gui, Nanjing University of Posts and Telecommunications

4 An Experimental Study on Multibeam Digital Predistorter with Intercarrier Interference Suppression
Tomoya Ota, Alexander N. Lozhkin, Ken Tamanoi, Hiroyoshi Ishikawa, Takurou Nishikawa, Fujitsu Limited

5 Band-Oriented Predistorter for Fully Connected Hybrid Antenna Arrays
Alexander N. Lozhkin, Tomoya Ota, Ken Tamanoi, Hiroyoshi Ishikawa, Takurou Nishikawa, Fujitsu Limited

6 Codebook Design of All Index Modulation with Deep Reinforcement Learning
Ya-Yi Chuang, Jen-Ming Wu, National Tsing Hua University

7 Delay-Doppler Frequency Domain-Aided Superimposing Pilot OTFS Channel Estimation Based on Deep Learning
Yang Chaoyi, Wang Junlong, Pan Zhenni, Shigeru Shimamoto, Waseda University

8 Design and Analysis of Probabilistic Shaping for Polar Coded Communication Systems with Finite Blocklength
Hongjie He, Bin Xia, Yinghong Guo, Manlin Wang, Shanghai Jiao Tong University

9 Design of Robust LoS-MIMO Transmission in HAPS Feeder Link
Motoshi Tawada, Yoshichika Ohta, Atsushi Nagate, SoftBank Corp.

10 Enhanced Informed Dynamic BP Decoding Scheduling Strategies for 5G NR LDPC Codes
Tofar C.-Y. Chang, National Taipei University of Technology; I-Hsiang Lee, Pin-Han Wang, MediaTek Inc.; Jian-Jia Weng, National Taiwan Ocean University; Yu T. Su, National Yang Ming Chiao Tung University

11 Federated Deep Reinforcement Learning for THz-Beam Search With Limited CSI
Po-Chun Hsu, Li-Hsiang Shen, National Yang Ming Chiao Tung University; Chun-Hung Liu, Mississippi State university; Kai-Ten Feng, National Yang Ming Chiao Tung University

12 HARQ Using Hierarchical Tree-Structured Random Access Identifiers with Random Retransmission Time Back-Off in NOMA-Based Random Access
Katsuya Yanai, Takanori Hara, Tokyo University of Science; Nobuhide Nonaka, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science

13 Highly Efficient OFDM Applying Symbol-Edges Truncating Transmission Technique
Yuu Ichikawa, Keiichi Mizutani, Hiroshi Harada, Kyoto University

14 Inter-Access Point Coordinated User and Beam Selection for mmWave Distributed MIMO Systems
Jun Shikida, Kazushi Muraoka, Toshiki Takeuchi, Naoto Ishii, NEC Corporation

15 Optimal Multicast Scheduling for Switched Beamforming Systems Leveraging Reflections
Chao Chen, Ziye Li, Zhejiang Gongshang University; Seungjun Baek, Korea University; Rui Yin, Zhejiang University City College; Xiaohan Yu, Chuanhuang Li, Zhejiang Gongshang University

16 PAPR Reduction Using Null Space in MIMO Channel Based on Signal Processing at Base Station for Downlink AF-Based Relaying MIMO-OFDM Signals
Asuka Kakehashi, Tokyo University of Science; Nobuhide Nonaka, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science

17 Physical Layer Security Performance Analysis of RIS-Assisted Wireless Communication
Suneel Yadav, Ashutosh Kumar Yadav, Indian Institute of Information Technology Allahabad; Devendra Singh Gurjar, National Institute of Technology Silchar; Anshul Pandey, Technology Innovation Institute

18 Repetition-Based NOMA-HARQ with Adaptive Termination for URLLC
Go Takita, Takanori Hara, Tokyo University of Science; Yasuaki Yuda, Panasonic Corporation; Kenichi Higuchi, Tokyo University of Science

19 Spectrally Precoded OTFS Modulation
Wei-Chang Chen, National Taipei University of Technology; Chang-Hung Lu, Char-Dir Chung, National Taiwan University

20 Virtualized terminal utilizing terahertz band radio waves for Beyond 5G : Timing Synchronization Scheme of Relay Device
Yoshio Kunisawa, Yoshiaki Amano, Takahiro Hayashi, KDDI Research Inc.

6V: Spectrum Sharing, Spectrum Management, Cognitive Radio, and Green Radio

1 A Smart Contract based Spectrum Trading System for Elastic Virtual Optical Networks
Qiwei Hu, Tao Jiang, Huazhong University of Science and Technology

2 Coded Physical Layer Security through Secure Interleaving and Puncturing of Turbo Codes
Ahmed Aladi, Emad Al-Susa, Manchester University

3 Cooperative Spectrum Sensing Algorithm for UAV Based on Deep Learning
Wei Wang, Wei Zhang, Juncheng Peng, Harbin Engineering University

4 Minimum Target Coverage for Air Quality Monitoring Using Bus Routes
Bodhayan Roy, IIT Kharagpur; Vorapong Suppakitpaisarn, The University of Tokyo; Bubai Manna, IIT Kharagpur; Cam Ly Nguyen, Criteo K.K.

6X: Unmanned Aerial Vehicle Communications, Vehicular Networks, and Telematics

1 Cognitive Risk Control for Anti-Eavesdropping in Connected and Autonomous Vehicles Network
Yu Yao, East China Jiaotong University; Junhui Zhao, Zeqing Li, School of Information Engineering; Xu Cheng, Shenzhen Campus of Sun Yatsen University; Lenan Wu, Southeast University

2 Cost Efficient UAV Deployment and Resource Allocation for UAV-Assisted Networks
Lin He, Rong Chai, Chongqing University of Posts and Telecommunications; Sun Ruijin, Pengcheng Laboratory

3 Crowdsourcing and monetization as a strategy to reduce vehicular greenhouse gases emissions
Wilson de Souza Melo Junior, Paulo Roberto de Mesquita Nascimento, Kauã Gomes, Malkai Oliveira, Raphael Carlos Santos Machado, National Institute of Metrology, Quality, and Technology

4 Energy Efficient 3-D Placement of Capacity Constrained UAV Network for Guaranteed QoS
Kirtan Gopal Panda, Debarati Sen, Indian Institute of Technology Kharagpur

5 Evaluating Participation in Cooperative Maneuvers among Connected and Automated Vehicles
Bernhard Häfner, Technical University of Munich; Georg A. Schmitt, BMW Group Development; Jörg Ott, TU München

6 Multi-Agent Reinforcement Learning Aided Resources Allocation Method in Vehicular Networks
Yuxin Ji, Xixi Zhang, Yu Wang, Nanjing University of Posts and Telecommunications; Haris Gacanin, RWTH Aachen University; Hikmet Sari, Nanjing University of Posts and Telecommunication; Fumiyuki Adachi, Tohoku University; Guan Gui, Nanjing University of Posts and Telecommunications

7 Optimal Index Code Design for IC-NOMA Transmission in VANETs
B. Sundar Rajan, Indian Institute of Science, Bangalore

8 Study on Optical Fiber Communication in Vehicle
Toshihito Tatsuoka, Pan Zhenni, Shigeru Shimamoto, Waseda University

9 UAV Path Planning in Urban Environments with Dynamic Risk-Map Generation by Vehicle and Pedestrian Perception
Yuuri Iwashina, Masashi Kunibe, Sho Kato, Hiroshi Shigeno, Keio University

10 Vehicle Localization utilizing a Novel Hybrid TDOA-Based Estimation
Oscar Owen, Pan Zhenni, Shigeru Shimamoto, Waseda University

11 Vehicle Tracking under Vehicle-Road Collaboration Using Improved Particle Flow Filtering Algorithm
Chenxi He, Ping Wang, Xinhong Wang, Tongji University

Thursday 29 September 2022

Thursday, 29 September 2022 11:00 - 12:30 (BST) Virtual
7V: Wireless Networks: Protocols, Security and Services

1 Application-Level Data Rate Adaptation in Wi-Fi Networks Using Deep Reinforcement Learning
Ibrahim Sammour, Gérard Chalhoub, Université Clermont Auvergne

2 IEEE 802.1 TSN Time Synchronization over Wi-Fi and 5G Mobile Networks
Minh-Thuyen, Institute LIST, CEA, Paris-Saclay University

3 Message Source Identification in Controller Area Network by Utilizing Diagnostic Communications and an Intrusion Detection System
Masaru Matsubayashi, Takuma Koyama, Masashi Tanaka, Yasushi Okano, Asami Miyajima, Nippon Telegraph and Telephone Corporation

4 Optimum Jamming in User-Centric Cell-Free Networks
Ahmad Halimi Razlighi, S. Mohammad Razavizadeh, Iran University of Science & Technology; Behrouz Maham, Nazarbayev University

5 Physical Layer Security based OFDM Transmission with Phase Error Insertion
Ahmed Aladi, Emad Al-Susa, Manchester University

6 Throughput-Fairness Tradeoff MAC for Multiuser IBFD (TFMAC)
Yazeed Alkhrijah, Joseph Camp, Dinesh Rajan, Southern Methodist University

7 Toward a Multi-Layer Intrusion Response System for Connected Vehicles
Jan Lauinger, Mohammad Hamad, Sebastian Steinhorst, Technical University of Munich

8 Virtual MIMO Based Self-Interference Utilization for a Full-Duplex AF Relay OFDM System
Qingyu Cao, Xu Zhu, Yufei Jiang, Harbin Institute of Technology (Shenzhen)

Workshops

Monday, 26 September 2022 Virtual
W1: 4th International Workshop on Connecting All Things for Enabling Smart Cities (CONTEST)

1 3-D Placement Strategy for VLC Enabled UAV Network with Guaranteed QoS
Ankana Das, Kirtan Gopal Panda, Murala Laxmi Naresh Kumar, Debarati Sen, Sandip Chakraborty, Indian Institute of Technology Kharagpur

2 Cloud game computing offload based on Multi-Agent Reinforcement Learning
Kaicong Tian, Yitong Liu, Hongwen Yang, Beijing University of Posts and Telecommunications; Qingbi Zheng, China Mobile Research Institute

3ᵛ Decentralized Smart Grid System:A Survey On Machine Learning-Based Intrusion Detection Approaches
Makhmoor Fiza Murk, Begum Nusrat Bhutto Women University Sukkur; Noman Zahid, The University of Faisalabad; Ali Hassan Sodhro, Kristianstad University; Bilal Zahid, National University of Computer and Emerging Sciences

4 Deep Reinforcement Learning for Over-the-Air Federated Learning in SWIPT-Enabled IoT Networks
Xinran Zhang, Tian Hui, Wanli Ni, Mengying Sun, Beijing University of Posts and Telecommunications

5 Digital Twins for Smart Cities: Case Study and Visualisation via Mixed Reality
William Piper, Hongjian Sun, Durham University; Jing Jiang, Northumbria University

6 Model Prediction Control Path Tracking Algorithm Based on Adaptive Stanley
Qiang Hua, ShenZhen Technology University; Baoshao Peng, Shanghai YISU Information Technologies Co.,Ltd; Xiaolin Mou, Zhang Ouwen, Tao He, Li Xia, Heyan Li, Shenzhen Technology University

7 Research on Energy Consumption Model of Campus Micro-cycle Bus System
Zhang Ouwen, Jinrong Tan, Bian Gong, Shenzhen Technology University; Qiang Hua, ShenZhen Technology University; Qi Wang, Heyan Li, Shenzhen Technology University

8 Routing based on Overcommitment Approach in Stochastic Time-Varying Networks
Fei Liu, Hongyan Li, Keyi Shi, Xidian University

W2: 5th Workshop on Connected Intelligence for IoT and Industrial IoT Applications- C3IA

1 An Effective Traffic Management Approach For Decentralized BSNs
Noman Zahid, Sukkur IBA University

2 CNN-Based Hybrid Precoding Design with Geometric Mean Decomposition
Mahmoud A. Abugubba, Nagia M. Gaboua, Taissir Elganimi, University of Tripoli; Khaled Rabie, Manchester Met University

3 Development of a Mixed Reality System Based on IoT and Augmented Reality
Dhia Jenzeri, National Engineering School of Monastir; Abdellah Chehri, University of Ottawa; Gwanggil Jeon, Incheon National University

4 FedCLS:A federated learning client selection algorithm based on cluster label information
Changsong Li, Hao Wu, Beijing Jiaotong University

5 IRS-Assisted Beamspace Millimeter-wave Massive MIMO with Interference-Aware Beam Selection
Taissir Elganimi, Retaj I. Elmajdub, University of Tripoli; Galymzhan Nauryzbayev, Nazarbayev University; Khaled Rabie, Manchester Met University

6 Metamorphic testing for Edge real time face recognition and intrusion detection solution
Mourad Raif, El Hassania School Of Public Works; El Mehdi Ouafiq, Hassania School of Public Works; El Rharras Abdessamad, hassania school of public works; Abdellah Chehri, University of Ottawa; Rachid Saadane, SIRC-LaGeS Hassania School of Public Works

7 Real-time emotion recognition using deep learning algorithms
Abderrahmane El Mettiti, Mohammed Oumsis, Mohammed V University in Rabat, Morocco; Abdellah Chehri, University of Ottawa; Rachid Saadane, SIRC-LaGeS Hassania School of Public Works

8 Reinforcement Learning based Multi-connectivity Resource Allocation in Factory Automation Systems
Mohammad Farzanullah, McGill University; Van Hung Vu, Huawei Technologies Canada; Tho Le-Ngoc, McGill University

W3: B5G/6G support for space/air/ground/marine/submarine cooperative, connected, and autonomous vehicles

1 A Comparative Measurement Study of Commercial WLAN and 5G LAN System
Vanlin Sathya, Celona; Lyutianyang Zhang, University of Washington; Mehmet Yavuz, Celona

2 Age of Information Optimization in UAV-enabled Intelligent Transportation System via Deep Reinforcement Learning
David Lee, Baolin Yin, Jiaxin Yan, Jiahui Li, SWUST; Yuan Fang, The Chinese University of Hong Kong

3 LSTM-based RIS Phase Shift Control for V2X Communication Systems
Hyunsoo Kim, Yongsuk Byun, Byonhyo Shim, Seoul National University

4 Multipath Ghost Target Identification for Automotive MIMO Radar
Yunda Li, Xiaolei Shang, University of Science and Technology of China

5 On the Reliability Analysis of C-V2X Mode 4 for Next Generation Connected Vehicle Applications
Aslıhan Reyhanoğlu, Bugra Turan, Feyzi Ege Kümeç, Emrah Kar, Yahya Şükür Can Kara, Koc University

6 Research, Implementation and Practice of Congestion Control Mechanism in LTE-V2X
Jinling Hu, Li Zhao, Communications, China Academy of Telecommunications Technology (CATT); Yuan Feng, Yinghao Liu, Mingjun Gao, Datang Gohigh Intelligent and Connected Technologies Co., Ltd

7 Sensing Assisted Robust Vehicle-to-Vehicle Communication with Multiple Antennas
Yanjie Pu, Xidian University; Zhiying Song, Fuxi Wen, Tsinghua University; Shenghua Zhou, Xidian University

8 The Enhanced Sidelink Resource Reservation Mechanism of NR-V2X
Li Zhao, Jinling Hu, Rui Zhao, China Academy of Telecommunication Technology (CATT); Yan Shi, Beijing University of Posts and Telecommunications

9 Detection of Constrained Unknown Beacon Signals of Terrestrial Transmitters and LEO Satellites with Application to Navigation
Zak (Zaher) Kassas, The Ohio State University; Mohammad Neinavaie, Joe Khalife, University of California, Irvine

W5: Emerging Physical-layer Security Technologies and Applications for B5G and 6G

1 Embrace Imperfect Datasets: New Time Representations for RFF Identification in real-world scenarios
Xinyu Qi, Aiqun Hu, Southeast University

2 ESP32-driven Physical Layer Key Generation: A Low-cost, Integrated, and Portable Implementation
Guangchuan Cao, Yan Zhang, Zijie Ji, Mengyi Zhang, Zunwen He, Beijing Institute of Technology

3ᵛ Green Jamming Power Control for Secure OFDMA in Industrial IoT
Bhawna, Indian Institute of Techology; Ganesh Prasad, National Institute of Technology Silchar; Deepak Mishra, University of New South Wales

4ᵛ Optimal AI-Enabled Secured NOMA Among Untrusted Users
Sapna Thapar, Indian Institute of Technology Jammu; Ganesh Prasad, National Institute of Technology Silchar; Deepak Mishra, University of New South Wales; Ravikant Saini, Indian Institute of Technology Jammu, India

5 Secret Key Rate Upper-bound for Reconfigurable Intelligent Surface-combined System under Spoofing
Zhuangkun Wei, Liang Wang, Weisi Guo, Cranfield University

ᵛ Paper will be presented in virtual form only

W6: Empowering Wireless Networks with Digital Twin

1 Real-time Optimal Resource Allocation in Multiuser Mobile Edge Computing in Digital Twin Applications with Deep Reinforcement Learning
Yijiu Li, Queen's University Belfast; James Adu Ansere, Sunyani Technical University; Octavia A. Dobre, Memorial University; Trung Q. Duong, Queen's University Belfast

2 Robust Q-learning for Fast And Optimal Flying Base Station Placement Aided By Digital Twin For Emergency Use
Terry Guo, Tennessee Tech University

W7: Localization and Sensing with Intelligent Surfaces for 6G Networks

1 Cooperative Positioning with the Aid of Reconfigurable Intelligent Surfaces and Zero Access Points
Mustafa Ammous, Shahrokh Valaee, University of Toronto

2 Early Wildfire Detection using UAVs Integrated with Air Quality and LiDAR Sensors
Doaa Rjoub, Ahmad Alsharoa, Missouri University of Science and Technology; Ala'eddin Masadeh, Al-Balqa Applied University

3 Joint RIS Calibration and Multi-User Positioning
Yi Lu, Tampere University; Hui Chen, Chalmers University of Technology; Jukka Talvitie, Tampere University; Henk Wymeersch, Chalmers University of Technology; Mikko Valkama, Tampere University

4 Power Allocation in Infrastructure Limited Integration Sensing and Localization Wireless Networks
Mu Jia, Jiayan Yang, Tingting Zhang, Harbin Institute of Technology (Shenzhen)

Monday, 26 September 2022 16:00 - 17:30 (CST) "Room 1 (Beijing), LT200 (London)"

W8: Next Generation Multiple Access (NGMA) for Future Wireless Communications

1 A Deep Learning-Based Channel Aware Single Step Signal Detection in Downlink Multi-User NOMA
Sarang Kumar, Mohamed Elnourani, Baltasar Beferull-Lozano, Surender Redhu, University of Agder

2 Bridging the Digital Divide Using SuperCell Massive MIMO
Unnikrishnan Kunnath Ganesan, Linkoping University; Emil Björnson, KTH Royal Institute of Technology; Erik G., Larsson

3 Cooperative MARL for Resource Allocation in High Mobility NGMA-enabled HetNets
Leyou Yang, Jie Jia, Jian Chen, Xingwei Wang, Northeastern University

4 Federated Reinforcement Learning for RIS-Aided Non-Orthogonal Multiple Access MEC
Zhong Yang, Yaxing Li, Hongbo Liu, Fangmin He, Naval University of Engineering

5 Joint Task Offloading and Resource Allocation in STAR-RIS assisted NOMA System
Liang Guo, Northeastern University of China; Jie Jia, Jian Chen, Northeastern University; An Du, Northeastern University of China; Xingwei Wang, Northeastern University

6 Non-Orthogonal Neighbor Election Random Access for Distributed 6G Wireless Networks
Xu Li, Wenjun Huang, Mingqiang Yang, Yanan Liang, Beijing Jiaotong University

7 Secrecy Performance of RIS Aided NOMA Networks
Yingjie Pei, Xinwei Yue, Beijing Information Science and Technology University; Wenqiang Yi, Yuanwei Liu, Queen Mary University of London; Xuehua Li, Beijing Information Science and Technology University; Zhiguo Ding, UMIST

8 User-Pair Selection for QoS-Aware Secrecy Rate Maximization in Untrusted NOMA
Sapna Thapar, Indian Institute of Technology Jammu; Deepak Mishra, University of New South Wales; Ravikant Saini, Indian Institute of Technology Jammu; Zhiguo Ding, UMIST

Monday, 26 September 2022 Virtual

W9: Second Workshop on Symbiotic Radio Paradigm for Integrated Active and Passive Communications

1 Achievable Rate and Capacity Analysis for Ambient Backscatter Communications with Dynamic Sources
Chen Jixiang, Hua Yu, Quansheng Guan, South China University of Technology; Gang Yang, Ying-Chang Liang, University of Electronic Science and Technology of China

2 Channel Estimation and Optimal Training Design for Ambient Backscatter Communication Systems under Sensitivity Constraint
Ziqi Cui, Gongpu Wang, Beijing Jiaotong University; Xusheng Wei, VIVO Mobile Company; Rongtao Xu, Xia Chen, Beijing Jiaotong University

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3 Cybertwin-Driven Multi-Intelligent Reflecting Surfaces aided Vehicular Edge Computing Leveraged by Deep Reinforcement Learning
Xuhui Zhang, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences; Huijun Xing, Chinese University of HongKong, Shenzhen; Weilin Zang, Shenzhen Institute of Advanced Technology, Chinese Academy of Sciences; Zhenzhen Jin, Southern University of Science and Technology; Yanyan Shen, Shenzhen Institutes of Advanced Technology, CAS

4 Energy-Efficient Symbiotic Cellular-UAV Communication via aerial RIS: Joint Trajectory Design and Resource Optimization
Ning Jin, China Telecom Research Institute; Yating Liao, University of Electronic Science and Technology of China; Gang Yang, University of Electronic Science and Technology of China (UESTC); Ying-Chang Liang, University of Electronic Science and Technology of China; Xiaodong Chen, China Telecom Research Institute

5 Optimal Designs for Throughput and Range Maximization in Backscattering Tag-to-Tag Network
Dongming Bi, University of New South Wales (UNSW) Sydney; Deepak Mishra, Shaghik Atakaramians, University of New South Wales; A. Seneviratne, UNSW Sydney

6 Reconfigurable Intelligent Surface Assisted Secure Symbiotic Radio Multicast Communications
Chao Zhou, Bin Lyu, Nanjing University of Posts and Telecommunications; Dinh Thai Hoang, University of Technology Sydney; Shimin Gong, Sun Yat-sen University

7 SNR-based Configuration for RIS-Integrated NR
Visa Tapio, Univ. Oulu; Deepa Jagyasi, InterDigital Communications, Inc.; Arman Shojaeifard, InterDigital; Pekka Pirinen, Markku Juntti, University of Oulu

8 Symbiotic Backscatter System over Cascaded Fading Channels
Haiyang Ding, National University of Defense Technology; Maged Elkashlan, Queen Mary University of London; Hancheng Yang, Haipeng Li, Kewei Xin, National University of Defense Technology

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Monday, 26 September 2022 9:00 - 12:30 (BST), 14:00 - 17:30 (CST) Room 2

W10: Semantic Communications

1 Interference Identification Based on China Mobile Current Network Data
Bingrui Geng, Communication University of China; Baoping Cheng, China Mobile (Hangzhou) Information Technology Co., Ltd.; Lei Zhang, China Mobile Research Institute; Shuai Liu, Tsinghua University; Guangjin Zhang, China Mobile Research Institute; Lei Jun, China Mobile (Hangzhou) Information Technology Co., Ltd.; Tao Xiang, Tsinghua University

2 Investigation Of Infants' Crying Detection In Noisy Home Scene With Deep Learning
Jiaming Lin, Baoping Cheng, Lei Jun, China Mobile (Hangzhou) Information Technology Co., Ltd.

3 Path-based Multimodal Trajectories Prediction
ziqi zhao, Yiping Duan, Xiaoming Tao, Tsinghua University

4 Robust Semantic Communications Against Semantic Noise
Qiyu Hu, Guangyi Zhang, Zhejiang University; Zhijin Qin, Tsinghua University; Yunlong Cai, Guanding Yu, Zhejiang University; Geoffrey Ye Li, Imperial College

5 Semantic Communication Approach for Multi-Task Image Transmission
Zhenguo Zhang, Qianqian Yang, Shibo He, Zhiguo Shi, Zhejiang University

6 Semantic Communication as a Signaling Game with Correlated Knowledge Bases
Jinho Choi, Jihong Park, Deakin University

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7 SemKey: Boosting Secrect Key Generation for RIS-assisted Semantic Communication Systems
RanZhao, Qi Qin, Ningya Xu, Guoshun Nan, Cui Qimei, Xiaofeng Tao, Beijing University of Posts and Telecommunications

8 Signal Shaping for Semantic Communication Systems with A Few Message Candidates
Shuaishuai Guo, Yanhu Wang, Shandong University; Peng Zhang, Weifang University

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Monday, 26 September 2022 Virtual
W11: The 4th International Workshop on Intelligent Communication Network Technologies (ICNET-4)

1 Centralized Resource Allocation Latency of SideLink Communication in NR V2X
Saif Sabeeh, Poznan University of Technology

2 Connotation of Unconventional Drones for Agricultural Applications with Node Arrangements Using Neural Networks
Gautam Srivastava, Brandon University; Hariprasath Manoharan, Panimalar Institute of Technology Poonamallee, Chennai; Thippa Reddy G, VIT University, India; Rutvij Jhaveri, Pandit Deendayal Energy University- PDEU (Formerly PDPU); Shitharth Selvarajan, KebriDehar University, KebriDehar, Ethiopia; Ramana Kadiyala, Chaitanya Bharathi Institute of Technology, Hyderabad, India

3 Optimal Path Selection in Cascaded Intelligent Reflecting Surfaces
Awais Bin Bin Asif, National University of Sciences and Technology; Christos K. Liaskos, University of Ioannina; Andreas Pitsillides, University of Cyprus Nicosia, Cyprus; Hassaan Khaliq Qureshi, National University of Sciences and Technology (NUST), Pakistan; Marios Lestas, Frederick University, Nicosia, Cyprus

4 Performance Evaluation over DL-Based Channel Prediction Algorithm on Realistic CSI
Qiuheng Zhou, Wei Jiang, German Research Center for Artificial Intelligence; Donglin Wang, Technical University of Kaiserslautern; Hans Schotten, University of Kaiserslautern

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Monday, 26 September 2022 14:00 - 17:30 (BST) Skemp 307
W12: The Role of NTN in 6G (NTN6G)

1 A Convolutional Attention Based Deep Network Solution for UAV Network Attack Recognition over Fading Channels and Interference
Joseanne Viana, ISCTE-IUL/Instituto de telecomunicações; Hamed Farkhari, ISCTE-IUL / PDM FC; Miguel Campos, PDM FC; pedro sebastiao, ISCTE-IUL/Instituto de telecomunicações; Katerina Koutlia, Sandra Lagen, CTTC/CERCA; Luis Bernardo, Universidade Nova de Lisboa / Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa

2 Distributive ACB factor Estimation for Delay-Sensitive Applications in Non-Terrestrial Networks
Changwei Zhang, Nanjing University of Post and Telecommunications; Xinghua Sun, Sun Yat-sen University; Wenchao Xia, Nanjing University of Posts and Telecommunications; Ruochen Huang, The First Affiliated Hospital of Nanjing Medical University; Hongbo Zhu, Nanjing University of Posts and Telecommunications

3 Integration of Aerial-Relay-Based Network With Terrestrial Network Towards B5G/6G Evolution
Terry Guo, Tennessee Tech University

4 Joint Caching and Computing of Software-Defined Space-Air-Ground Integrated Networks for Video Streaming Service Improvement
Tianyi Zhou, Chongqing University of Posts and Telecommunications; Chengchao Liang, Carleton University; Qianbin Chen, University of Posts and Telecommunications

5 Joint Space Location Optimization and Resource Allocation for UAV-Assisted Emergency Communication System
Yuan Ren, Xinxin Cao, Xuewei Zhang, Fan Jiang, Guangyue Lu, Xi'an University of Posts and Telecommunications

6 Low Overhead Drone Relaying in Dense Urban and Suburban Environments
Mateen Ashraf, Bo Tan, Mikko Valkama, Tampere University

7 Power Allocation for Distributed LoS Massive MIMO With Nonlinear Power Amplifiers
Bin Liu, François Rottenberg, Sofie Pollin, KU Leuven

8 Underwater Optical Communication Module: An Extension to the ns-3 Network Simulator
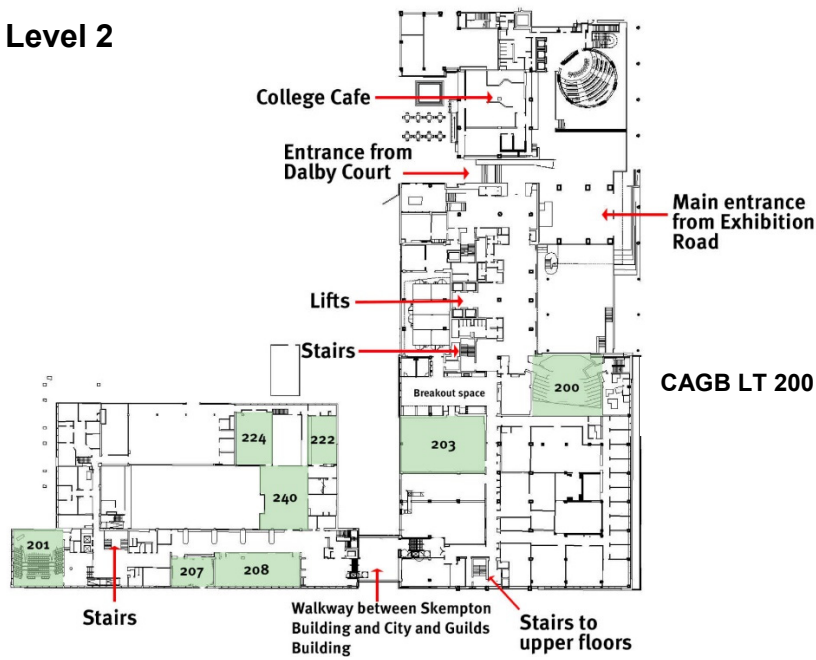Rabia Qadar, Waleed Bin Qaim, Bo Tan, Tampere University; Jari Nurmi, TAU

Monday, 26 September 2022 9:00 - 17:30 (BST) Skemp 301
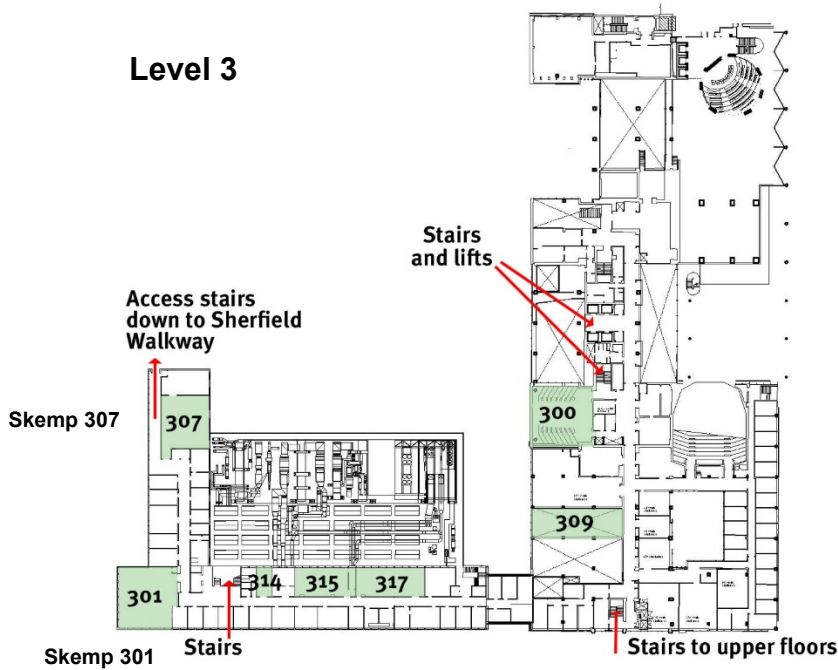## W13: Towards Net-Zero Energy Communication Networks

1 A Linear MMSE Receiver for SWIPT-enabled Wireless Networks
Yuan Guo, Christodoulos Skouroumounis, Ioannis Krikidis, University of Cyprus

2 Black-box model for estimating efficiency curves in DC-DC converters for energy storage systems
Marco Virgili, University of Manchester; Pete James, Lyra Electronics; Andrew Forsyth, University of Manchester

3 Cost-Efficient Deployment of a Reliable Multi-UAV Unmanned Aerial System
Nithin Babu, The American College of Greece

4 Empirical Characterization of Solar Panel Outlay and Dimension for Net-Zero Energy IoT System
Sudhakar Modem, Indian Institute of Technology Jammu; Deepak Mishra, University of New South Wales; Sudhakar Modem, Indian Institute of Technology Jammu

5 Enabling On-Demand Cyber-Physical Control Applications with UAV Access Points
Igor Donevski, Jimmy Jessen Nielsen, Aalborg University

6 Multi-Site Energy Harvesting for Battery-Less Internet-of-Things Devices: Prospects and Limits
Morteza Esmaeili Tavana, Emil Björnson, Jens Zander, KTH Royal Institute of Technology

7 Optimizing IRS-Assisted Uplink NOMA System for Power Constrained IoT Networks
Mahmoud AlaaEldin, Emad Al-Susa, University of Manchester; Karim Seddik, American University in Cairo; Mohammad Al-Jarrah, University of Manchester

8 Path Design for Portable Access Point in Joint Sensing and Communications under Energy Constraints
Xiaoye Jing, UCL; Fan Liu, Southern University of Science and Technology, China; Christos Masouros, University College London

9 PV-Powered Base Stations Equipped by UAVs in Urban Areas
Mahshid Javidsharifi, Aalborg University; Hamoun Pourroshanfekr Arabani, Lund University; Tamas Kerekes, Aalborg University; Dezso Sera, Queensland University of Technology; Josep M. Guerrero, Aalborg University

10 Resource Allocation Policies for Hybrid Power-Grid and Harvested Energy Communication Systems
Iman Valiulahi, Christos Masouros, Abdelhamid Salem, University College London
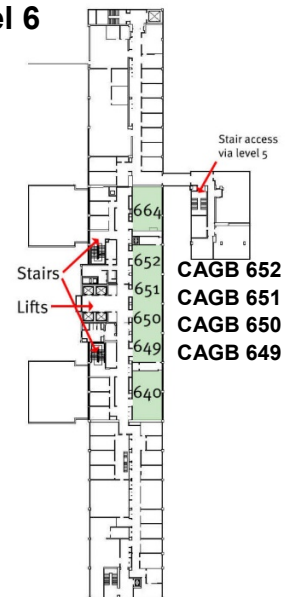
Floor Plans

Level 2

College Cafe

Entrance from Dalby Court

Main entrance from Exhibition Road

Lifts

Stairs

Breakout space

200

CAGB LT 200

224 | 222

240

203

201

207 | 208

Stairs

Walkway between Skempton Building and City and Guilds Building

Stairs to upper floors

Level 3

Stairs and lifts

Access stairs down to Sherfield Walkway

Skemp 307

307

300

309

Skemp 301

301

314 | 315 | 317

Stairs

Stairs to upper floors

Level 6

Stair access via level 5

664

Stairs

652

CAGB 652

651

CAGB 651

Lifts

650

CAGB 650

649

CAGB 649

640

2023 IEEE 97th Vehicular Technology Conference

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IMPORTANT DATES

Papers due for review **12 December 2022**

Acceptance notice **2 March 2023**

**Final papers due
Author registration** **30 March 2023**

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