VTC2022-Spring
Final Program

2022 IEEE 95th Vehicular Technology Conference • 19 – 22 June 2022 • Helsinki, Finland

The flagship conference of IEEE Vehicular Technology Society

IEEE   VTS   VTC2022-Spring
HELSINKI
Connecting the Mobile World

VTC2022-Fall
LONDON:BEIJING
Intelligent Communications & Transportation

Important Dates

CALL FOR PAPERS

Submit papers by 10 July 2022
(from 2-page extended summaries to 5-page full papers)
Acceptances sent by 31 July 2022
Final papers due 24 August 2022

CALL FOR WORKSHOPS

Submit proposals by 30 June 2022

CALL FOR TUTORIALS

Submit proposals by 30 June 2022

Please submit your paper or proposal through
events.vtsociety.org/vtc2022-fall/
vtc2022fall.trackchair.com/

Call For Papers

2022 IEEE 96th Vehicular Technology Conference

To be held on 26 – 29 Sep 2022, simultaneously in London, UK and Beijing, China

The 2022 IEEE 96th Vehicular Technology Conference will be held on 26 – 29 September 2022, in London, United Kingdom and Beijing, China. This semi-annual flagship conference of the IEEE Vehicular Technology Society will bring together individuals from academia, government, and industry to discuss and exchange ideas in the fields of wireless, mobile, and vehicular technology. The theme of VTC2022-Fall is

"*Connecting the World through Intelligent Communications and Transportation*".

In addition to high-quality technical sessions, the conference will feature world-renowned onsite plenary speakers, tutorials, workshops, and industry sessions. Even if it is a hybrid conference, the authors are encouraged to present their papers either in London or in Beijing.

Prospective authors are invited to submit 2-page extended summaries or up to 5-page, original, unpublished, full technical papers in, but not limited to, the following 10 areas:

- ❖ Antenna Systems, Propagation, and RF Design
- ❖ Signal Transmission and Reception, MIMO Techniques
- ❖ Spectrum Sharing, Spectrum Management, Cognitive Radio, and Green Radio
- ❖ Radio Access Technology and Heterogeneous Networks
- ❖ IoT, M2M, Sensor Networks, and Ad-Hoc Networking
- ❖ Wireless Networks: Protocols, Security and Services
- ❖ Positioning, Navigation and Mobile Satellite System
- ❖ Unmanned Aerial Vehicle Communications, Vehicular Networks, and Telematics
- ❖ Intelligent and Semantic Communications
- ❖ Electric Vehicles, Vehicular Electronics, and Intelligent Transportation

IEEE **VTS** Connecting the Mobile World

Final Program

VTC2022-Spring
HELSINKI
Connecting the Mobile World

2022 IEEE 95th Vehicular Technology Conference

19 – 22 June 2022

Helsinki, Finland

Welcome from the General Co-chair

On behalf of the organizing committee it is my honor to welcome you to VTC2022-Spring. After many virtual editions we are finally able to provide an on-site edition of the Vehicular Technology Society flagship conference. The VTC has sustained its standing as an attractive publication venue and we have received a notable amount of high-quality submissions providing a basis for an excellent technical program.

On top of the cutting-edge research in vehicular technology presented in technical tracks, we are bringing together in panels, keynotes and tutorials widely acknowledged and valued experts and visionaries. As is known, the Vehicular Technology Conference follows closely the recent progress in both academic and industry research domains, the most visible topics in this spring being 6G and related key technologies.

We are confident that VTC2022-Spring provides the research community a stimulating opportunity for gaining understanding on the recent progress in the field. It will be also inspiring to meet many of you in Helsinki.

Organizing a world-class conference is possible only with a dedicated team. I thank General Co-Chair Merouane Debbah and give special recognition for the Technical Program Chair Mikko Valkama and Co-Chairs Rui Dinis and Daniel B. da Costa. I also give my appreciation to other members of the organizing committee and recall that this conference would not be possible without a large number of TPC members and reviewers who dedicate their time to ensure a high-quality review process. Finally, I want to recall an important aspect: Solid and professional support from Vehicular Technology Society have tremendously simplified the work of the Program Committee. Many thanks for conference administrators Rodney C. Keele and Cerry Leffler, Publication Chair James Irvine, and Financial Chair J. R. Cruz.

Welcome to Helsinki and VTC, the flagship conference of the Vehicular Technology Society.

Jyri Hämäläinen
General Co-chair, IEEE VTC2022-Spring

Welcome from the TPC Co-chairs

On behalf of the Technical Program Committee, we would like to welcome you to the 95th IEEE Vehicular Technology Conference (VTC2022-Spring) that will be organized in a hybrid format. This edition of VTC has been able to attract an exciting technical program ranging across the latest areas of research in wireless systems and networks, connected and autonomous vehicles, both manned and unmanned, emerging trends in applications of machine learning and artificial intelligence in wireless communications, as well as many other emerging topics. We received a total of 981 paper submissions (one of the larger values in recent years, even before the Covid-19 pandemic), out of which 614 outstanding papers will be presented in 12 technical tracks and the recent results track that comprise the IEEE VTC2022-Spring technical program. In addition to the regular and recent results sessions, the conference will feature 22 topical workshops, 14 tutorials delivered by the leading experts in the field, a balanced mix from industry and academia of five extraordinary keynote speakers, two exceptional plenary keynote panels entitled 'Global View on 6G' and 'On the Road to Quantum Communications', and two industry panels entitled 'Connecting Intelligence in 6G: Learning to Communicate & Communicating to Learn' and 'Perspectives on Sustainable Strategies for a Zero Emissions Future'.

We would like to use this opportunity to thank all co-chairs of the 12 technical tracks and the recent results for their excellent work. They all managed to obtain at least 3 reviews for each paper within a short time frame, and the decision process was completed smoothly. We also sincerely thank the workshop organizers for putting together the set of very timely workshops and organizing the review process in a professional manner. We would like to thank the members of the IEEE VTC2022-Spring organizing committee for their great responsiveness and support during the entire period of technical program preparation and development. We would also like to thank the technical program committee (TPC) members for their diligent work. We also sincerely thank the keynote speakers and panelists for contributing to the VTC2022-Spring program. Finally, we would like to thank the authors, who always stood by in difficult times, waiting for last minute changes and updates for the conference organization. We hope you are proud to have your work as part of this hybrid edition, and still enjoy the in-person and/or virtual networking. We encourage you all to maximally dive into the program, and to engage with the many experts that will gather together. Let's learn, interact, and enjoy!

Mikko Valkama, Rui Dinis and Daniel B. da Costa
TPC Co-chairs, IEEE VTC2022-Spring

Welcome from the VTS President

On behalf of the IEEE Vehicular Technology Society, it is my pleasure to welcome you to the IEEE 95th Vehicular Technology Conference – VTC2022-Spring. The VTC has been the VT Society's flagship conference for over seventy years and has been successfully held semi-annually since 1999. VTC2022-Spring is the first hybrid VTC to be held both virtually and face-to-face in Helsinki, Finland, after being held virtually for two years due to the spread of the COVID-19 pandemic. 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 Jyri Hämäläinen and Merouane Debbah, General Co-Chairs of the IEEE 95th Vehicular Technology Conference, Mikko Valkama, Technical Program Chair, and other committee members for their thoughtful implementation of this excellent conference program.

Finally, I would like to express my 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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Daniela Renga
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Taneli Riihonen
Federica Rinaldi
Luca Rinaldi
Omar Rinchi
Ian P. Roberts
Ignacio Rodriguez
Rusber Rodriguez
Fon Rodrique
Sandra Roger
Maik Röper
José Rosado
Thomas
    Rosenstatter
François Rottenberg
Mohammad
    Rowshan
Luca Rugini
Runzhong
Jorge Sá Silva
Malik Saad
Harri Saarnisaari
Joonas Säe
Yalin Sagduyu
Hemant Saggar
Fabio Saggese
Ravikant Saini
André Saito
Shuhei Saito
Manabu Sakai
Ahmed Hamdi Sakr
Hefdhallah Sakran
Alia Salah
Ayoob Salari
Lou Salaun
Abdelhamid Salem
Sumudu
    Samarakoon
Mostafa Samy
Yukitoshi Sanada
Stephan Sand
Malcolm Sande
Michiel Sandra
Luca Sanguinetti
Plinio Santini Dester
Nikos Sapountzis
Saquib
Mamoru Sawahashi
Ankit Saxena
Davide Scazzoli
Anke Schmeink
Christian Schneider
Cedrik Schüler
Adrian Schumacher
Karim Seddik
Michele Segata
Lehlohonolo
    Sekokotoana
Bassant Selim
Vasilii Semkin
Priyangshu Sen
Sejin Seo
Kari Seppänen
Miguel Sepulcre
Takashi Seyama
Wei E. I. Sha
Mansoor Shafi
Awais Aziz Shah
A. F. M. Shahen
    Shah
Adnan Shahid

Ying Shang
Chenglong Shao
Hua Shao
Jiafeng Shao
Ravi Sharan
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Donghui Shen
Yuan Shen
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Liqin Shi
Qin Shi
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Basem Shihada
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Osvaldo Simeone
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Anand Singh
Keshav Singh
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Henrik Sjoland
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Benjamin Sliwa
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Amna Sodhro
Ali Hassan Sodhro
Diana Sofia Mendoza
Paschalis Sofotasios
Sourabh Solanki
Mohammad Soliman
Ramin Soltani
Christoph Sommer
Hao Song
Heekang Song
Meiyan Song
Yuhui Song
Paola Soto

Francesco Sottile
Richard Demo Souza
Hayato Soya
Mujdat Soyturk
Dimitris Spiliotopoulos
Pavan Koteshwar Srinath
Sharanya Srinivas
Gautam Srivastava
Maximilian Stahlke
Kamil Staniec
Hsin-Lung Su
Jingyi Su
Nanchi Su
Ruoyu Su
Zixun Su
Hirofumi Suganuma
Timo Sukuvaara
Norrozila Sulaiman
Gizem Sümen
Bo Sun
Chen Sun
Geng Sun
Haijian Sun
Shiyuan Sun
Shu Sun
Siyi Sun
Sumei Sun
Yanglong Sun
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Yuzhe Sun
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Ekaterina Svertoka
Michal Sybis
Tazeen Syed
Ehsan Moeen Taghavi
Dario Tagliaferri
Ching-Lun Tai
Satoshi Takabe
Takumi Takahashi
Keigo Takeuchi
Kenichi Takizawa
Osamu Takyu
Jukka Talvitie
Sergey Tambovskiy
Yasumasa Tamura
Bo Tan
Soo Jin Tan
Islam Tanash
Fengxiao Tang
Jie Tang
Qinqin Tang
Xiao Tang
Visa Tapio
Muhammad Ashar Tariq
Harsh Tataria

Bamrung Tausiesakul
Ahmad Rida Tawakuli
Akihito Taya
Sotiris A. Tegos
Ngatched Telex
Yinglei Teng
Enrico Testi
Chen-Khong Tham
Thang
Ganesan Thiagarajan
Christo Kurisummoottil Thomas
John Thompson
Do Dinh Thuan
Hansen Tian
Kuangda Tian
Zhenyang Tian
Pan Tian-zhu
Andreas M. Tillmann
Prayag Tiwari
Stefano Tomasin
Hiromichi Tomeba
Waqas Tariq Toor
Usman Toro
Joaquin Torres Sospedra
Luis Torres Figueroa
Marcos Tostado-Véliz
Kentaroh Toyoda
Morio Toyoshima
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Stylianos Trevlakis
Phuc V. Trinh
Chih-Cheng Tseng
Theodoros Tsiftsis
Eirini-Eleni Tsiropoulou
Haiyan Tu
Dee Tubail
Caglar Tunc
Ion Turcanu
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Seyhan Ucar
Bernard Uguen
Mikko Uitto
Bige D. Unluturk
Paul Unterhuber
Muhammed Abdullah Unutmaz
Prabhat Kumar Upadhyay
Cristian Vaca-Rubio
Mojtaba Vaezi
Mikko Valkama

Robbe Van Rompaey
Trinh Van Chien
Jorge Varela
Mihaly Varga
Guilherme Vettorazzi Vargas
Natalia Vassileva Vesselinova
T. Venkatesh
Rahul Kumar Verma
Carlos Alberto Vieira Campos
Ville Viikari
Jordi Vilà-Valls
Evgenii Vinogradov
Julia Vinogradova
Sajani Vithana
Thanh Vo-Duy
Triet Vo-Huu
Oliviero Vouch
Mai Vu
Thang X. Vu
Vuong Quoc Bao
Burhan Wafai
Matthias Wagner
Michael Walter
Haodong Wan
Chao Wang
Chu-Fu Wang
Hanqing Wang
Hao Wang
Jiaxing Wang
Junyan Wang
Le Wang
Lifeng Wang
Lingfei Wang
Lixin Wang
Michael Mao Wang
Miao Wang
Qian Wang
Qipeng Wang
Qixu Wang
Rui Wang
Shuai Wang
Tengjiao Wang
Tianshun Wang
Tianxiong Wang
Wenbo Wang
Xinyi Wang
Xu Wang
Yichen Wang
Ying Wang
Yuanchen Wang
Yue Wang
Yuhong Wang
Yunfeng Wang
Yuntao Wang
Zhaorui Wang
Zhuwei Wang
Ziyi Wang

Muhammad Waseem
Andreas Weber
Lantian Wei
Li Wei
Tong Wei
Yannan Wei
Zhe Wei
Zhongxiang Wei
Weizhemin
Chao-Kai Wen
Miaowen Wen
Russ Whiton
Risto Wichman
Christian Wietfeld
Sven Wittig
SeungHwan Won
Hao Wu
Hongjia Wu
Huici Wu
Kai Wu
Lanxin Wu
Maoqiang Wu
Mincheng Wu
Peng Wu
Wen Wu
Yibo Wu
Yiqun Wu
Yuan Wu
Zidong Wu
Dirk Wübben
Henk Wymeersch
Jinhui Xia
Ping Xiang
Pei Xiao
He Xiaodong
Mangang Xie
Fangyuan Xing
Hong Xing
Baiping Xiong
Zehui Xiong
Bing Xu
Gangyan Xu
Hongjing Xu
Ke Xu
Mu Xu
Qian Xu
Shaoyi Xu
Yao Xu
Zhenlin Xu
He Xue
Animesh Yadav
Olfa Ben Yahia
Kanako Yamaguchi
Koji Yamamoto
Tetsuya Yamamoto
Fumihiro Yamashita
Kosuke Yamazaki
Longfei Yan
Bo Yang
Hailiang Yang
Hong Yang

Jin Yang
Lie-Liang Yang
Nan Yang
Peng Yang
Shizhao Yang
Wanting Yang
Xiaobo Yang
Yaxi Yang
Zhirong Yang
Kazuto Yano
Shuang Yao
Yaoyuan
Ferhat Yarkin
Anastasia Yastrebova
Qiang Ye
Phee Lep Yeoh
Zhanping Yin
Kai Ying
Jaehyun Yoo
Seong Ki Yoo
Jiadong Yu
Lisu Yu
Ningning Yu
Tianqi Yu
Tianqi Yu
Wentao Yu
Yue Yu
Deyu Yuan
Guocheng Yuan
Peihong Yuan
Weijie Yuan
Xiaoming Yuan
Jiang Yue
Yaxing Yue
Chau Yuen
Melda Yuksel
Tang Yuliang
Saniya Zafar
Syed Mohammad Zafaruddin
Noman Zahid
Alenka Zajic
Marco Zambianco
Alberto Zanella
Matteo Zecchin
Daniel Zelle
Thomas Zemen
Deze Zeng
Haiyong Zeng
Yonghong Zeng
Hans-Jürgen Zepernick
Nikita Zeulin
Chao Zhai
Andrew Zhang
Anxue Zhang
Chaoyue Zhang
Chuan Zhang
Di Zhang
Haiyang Zhang
Haobo Zhang

Heng Zhang
Hongliang Zhang
Jiayi Zhang
Jing Zhang
Junqing Zhang
Lihao Zhang
Lin Zhang
Mengying Zhang
Ming Zhang
Ran Zhang
Rui Zhang
Rusheng Zhang
Shiyao Zhang
Tiankui Zhang
Tong Zhang
Weiting Zhang
Xuefei Zhang
Yao Zhang
Yu Zhang
Yue Zhang
Yuning Zhang
Yusi Zhang
Zichao Zhang
Zijian Zhang
Bo Zhang
Chengcheng Zhao
Guozhu Zhao
Kun Zhao
Long Zhao
Ruijie Zhao
Yanhua Zhao
Yue Zhao
Yuqing Zhao
Zhongyuan Zhao
Zixiao Zhao
Gan Zheng
Jianping Zheng
Yandong Zheng
Kangda Zhi
Chen Zhijie
Lin Zhiping
Bo Zhou
Conghao Zhou
Gui Zhou
Guorong Zhou
Jiafeng Zhou
Jiaxing Zhou
Liang Zhou
Shigang Zhou
Xiangyun Zhou
Yanni Zhou
Yifeng Zhou
Yong Zhou
Bingjie Zhu
Jia Zhu
Lina Zhu
Meifang Zhu
Xu Zhu
Aviram Zilberman
Jiaqi Zou
Cong Zuo

Tutorials

A range of tutorials will be held on Sunday 19 June 2022 given by experts from industry and academia.

Sunday, 19 June 2022 9:00-12:30 Meeting Room 1
T1: Non-Terrestrial Networks: Fundamentals, Standards, Performance, and Practice
Talha Khan, Jonas Sedin, Sebastian Euler, Ericsson, Sweden

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. His research interests include cellular systems, non-terrestrial networks, stochastic geometry applications and energy harvesting. Before joining Ericsson, he has held summer internship positions at Broadcom, Mitsubishi Electric Research Labs and Connectivity Lab, Facebook.
Jonas Sedin is 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 is 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.

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.

Sunday, 19 June 2022 14:00-17:30 Meeting Room 1
T2: AI/ML-based Solutions for Automating Security in Future 6G Networks
Gurkan Gur, Zurich University of Applied Sciences, Switzerland; Pawani Porambage, University of Oulu, Finland; George Xilouris, Maria Christopoulou, NCSR "Demokritos", Athens, Greece

Next generation networks are expected to exhibit higher intelligence and more autonomy. In addition to the softwarization and cloudification in the current 5th generation (5G) wireless networks, the envisioned 6th generation (6G) will have added intelligence in the network and service management. It is expected to achieve fully automation of telecommunication network security with the assured privacy, by using many novel technologies and particularly with Artificial Intelligence (AI) and Machine Learning (ML). Therefore, it is highly timely to identify the applicability of AI/ML based security solutions in different aspects of network and service management. During this tutorial, we discuss about security automation in future 6G networks with respect to the involvement of ZSM architecture and the AI/ML-based security solutions in terms of intelligent network and service management orchestration, moving target defense (MTD) and federated learning (FL).

Dr. Gürkan Gür is a senior lecturer at Zurich University of Applied Sciences (ZHAW) InIT Information Security Group in Winterthur, Switzerland. His research interests include Future Internet, 5G and Beyond networks, information security, and information-centric networking. He has two patents and published more than 80 academic works (Google Scholar Citations: 1664, h-index: 20). He has been involved in various EU H2020, ITEA and CELTIC as well as national Innosuisse and TUBITAK (TR) research projects as senior researcher, project coordinator and academic consultant. He is a senior member of IEEE and a member of ACM.

Dr. Pawani Porambage is a senior researcher and an Adjunct Professor at Centre for Wireless Communications (CWC), University of Oulu, Finland. She has over ten years' experience in security and privacy in different networks including wireless sensor networks, telecommunication networks, and IoT. Currently she is involved in two EU projects including INSPIRE- 5Gplus and Hexa-X, and 6G Flagship supported by the Academy of Finland. Dr. Porambage has co authored 50+ publications (Google Citations: 1451, h-index: 17), including four book chapters. She was a visiting researcher at Nokia-Bell Labs, Finland, VUB and University of Zurich.

George Xilouris is a Research Scientist at the Institute of Informatics and Telecommunications in NCSR "Demokritos" in Athens, Greece. He received his B.Sc. in Physics from University of Ioannina in 1999 and his M.Sc. in "Automation Systems" from National Technical University of Athens (NTUA) in 2001. He joined MNLAB group in 2000 and he has worked on several research areas such as Future network architectures, Network Management, Software Networks and Telecommunications technologies. He has authored more than 80 publications in international journals and conferences.

Maria Christopoulou is a Research Associate in the Media Networks Laboratory (MNL) at the Institute of Informatics and Telecommunications in NCSR "Demokritos" and involved in few EU projects regarding 5G networks. She is currently a Ph.D. Candidate at the University of Peloponnese in the field of intelligent resource management in cellular telecommunication systems and an Adjunct Lecturer at the Hellenic Coast Guard Academy. She holds a B.Sc. in Physics and a M.Sc. in Radioelectrology and Electronics from the National and Kapodistrian University of Athens.

Sunday, 19 June 2022 9:00-12:30 Baltica
T3: OTFS and Delay Doppler Communications
Emanuele Viterbo, Yi Hong, Tharaj Thaj, Monash University, Australia

Emerging mass transportation systems – such as self-driving cars, high-speed trains, drones, flying cars, and supersonic flight – will challenge the design of future wireless networks due to high-mobility environments: a large number of high-mobility users require high data rates and low latencies. The physical layer modulation technique is a key design component to meet the system requirements of high mobility.

Currently, orthogonal frequency division multiplexing (OFDM) is the modulation scheme deployed in 4G-5G mobile networks, where the wireless channel typically exhibits time-varying multipath fading. OFDM can only achieve a near-capacity performance over a doubly dispersive channel with a low Doppler effect, but suffers heavy degradations under high Doppler conditions, typically found in high-mobility environments.

Orthogonal time frequency space (OTFS) modulation has been recently proposed by Hadani et al. at WCNC'17, San Francisco. It was shown to provide significant advantages over OFDM in doubly dispersive channels. The OTFS waveform is based on the idea that the mobile wireless channels can be effectively modelled in the delay-Doppler domain. This domain provides a sparse representation closely resembling the physical geometry of the wireless channel.

This tutorial will introduce the general notion of delay-Doppler communications, starting from the fundamental theory of the Zak transform. Then the transceiver architecture for detection and channel estimation will be presented. Finally, a software defined radio implementation will be shown.

Emanuele Viterbo (F'2011) received his degree (Laurea) in Electrical Engineering in 1989 and his Ph.D. in 1995 in Electrical Engineering, both from the Politecnico di Torino, Torino, Italy. From 1990 to 1992 he was with the European Patent Office, The Hague, The Netherlands, as a patent examiner in the field of dynamic recording and error-control coding. Between 1995 and 1997 he held a post-doctoral position in the Dipartimento di Elettronica of the Politecnico di Torino. In 1997-98 he was a postdoctoral research fellow in the Information Sciences Research Center of AT\&T Research, Florham Park, NJ, USA. He became first Assistant Professor (1998) then Associate Professor (2005) in Dipartimento di Elettronica at Politecnico di Torino. In 2006 he became Full Professor in DEIS at University of Calabria, Italy. From September 2010 he is Professor in the ECSE Department and Associate Dean Graduate Research of the Faculty of Engineering at Monash University, Melbourne, Australia.

Emanuele Viterbo is a 2011 Fellow of the IEEE, an ISI Highly Cited Researcher and Member of the Board of Governors of the IEEE Information Theory Society (2011-2013 and 2014-2018). He served as Associate Editor of IEEE Transactions on Information Theory, European Transactions on Telecommunications and Journal of Communications and Networks. His main research interests are in lattice codes for the Gaussian and fading channels, algebraic coding theory, algebraic space-time coding, digital terrestrial television broadcasting, and digital magnetic recording.

Yi Hong (S'00–M'05–SM'10) is currently an Associate Professor in the Department of Electrical and Computer Systems Eng. at Monash University, Melbourne, Australia. She obtained her Ph.D. degree in Electrical Engineering and Telecommunications from the University of New South Wales (UNSW), Sydney, and received the NICTA-ACoRN Earlier Career Researcher Award at the Australian Communication Theory Workshop, Adelaide, Australia, 2007. Dr. Hong was an Associate Editor for IEEE Wireless Communication Letters and Transactions on Emerging Telecommunications Technologies (ETT). She was the General Co-Chair of IEEE Information Theory Workshop 2014, Hobart; the Technical Program Committee Chair of Australian Communications Theory Workshop 2011, Melbourne; and the Publicity Chair at the IEEE Information Theory Workshop 2009, Sicily. She was a Technical Program Committee member for many IEEE leading conferences. Her research interests include communication theory,

coding and information theory with applications to telecommunication engineering.

Tharaj Thaj received the B.Tech. degree in electronics and communication engineering from the National Institute of Technology, Calicut, India, in 2012, and the M.Tech. degree in telecommunication systems engineering from the Indian Institute of Technology, Kharagpur, India in 2015. He is currently working toward the Ph.D. degree with the Department of Electrical and Computer Systems Engineering, Monash University, Australia. From 2012 to 2013, he was with Verizon Data Services India, Chennai, as a Software Engineer, focusing on network layer routing algorithms and protocols. From 2015 to 2017, he worked as a Senior Engineer with the Communication, Navigation and Surveillance (CNS) Department of Honeywell Technology Solutions Lab, Bengaluru. His current research interests include physical layer design and implementation of wireless communication systems for next generation wireless networks.

T5: Semantic Communications: Transmission beyond Shannon Paradigm

Geoffrey Ye Li, Imperial College London, UK; Zhijin Qin, Queen Mary University of London, UK

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 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 to 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 initial work on deep learning enabled semantic communications for different sources, multi-user semantic communication systems, and green semantic communications. Finally, we identify the research challenges in semantic communications.

Geoffrey Ye Li is currently a Chair Professor at Imperial College London, UK. Before moving to Imperial in 2020, he was a Professor with Georgia Institute of Technology, USA, for 20 years and a Principal Technical Staff Member with AT&T Labs – Research in New Jersey, USA, for five years. His general research interests include statistical signal processing and machine learning for wireless communications. In the related areas, he has published over 600 journal and conference papers in addition to over 40 granted patents and several books. His publications have been cited over 50,000 times with an H-index over 100 and he has been recognized as a Highly Cited Researcher, by Thomson Reuters, almost every year.

Dr. Geoffrey Ye Li was awarded IEEE Fellow and IET Fellow for his contributions to signal processing for wireless communications. He won several prestigious awards from IEEE Signal Processing Society (Donald G. Fink Overview Paper Award in 2017), IEEE Vehicular Technology Society (James Evans Avant Garde Award in 2013 and Jack Neubauer Memorial Award in 2014), and IEEE Communications Society (Stephen O. Rice Prize Paper Award in 2013, Award for Advances in Communication in 2017, and Edwin Howard Armstrong Achievement Award in 2019). He also received the 2015 Distinguished ECE Faculty Achievement Award from Georgia Tech.

Dr. Zhijin Qin is a Lecturer (Assistant Professor) at Queen Mary University of London since 2018. She was with Lancaster University as a Lecturer and Imperial College London as a research associate from 2016 to 2018. Her current research interest falls into semantic communications. She is serving as the guest editor of IEEE JSAC special issues on semantic communications, area editor of IEEE JSAC Series, and associate editor of IEEE Transactions on Communications. She has served as the co-chair of the 1st workshop on semantic communications at IEEE ICC 2022 and the symposium co-chair of IEEE Globecom 2020/2021. She received 2017 IEEE Globecom Best Paper Award, 2018 IEEE Signal Processing Society Young Author Best Paper Award, and 2021 IEEE SPCC Early Achievement Award.

T7: 6G Wireless Channel Measurements and Modeling for All Frequency Bands and All Scenarios

Cheng-Xiang Wang, Jie Huang, Haiming Wang, Southwest University and Purple Mountain Laboratories, China; Harald Haas, University of Strathclyde, UK

This tutorial is intended to offer a comprehensive and in-depth course to communication professionals/academics, aiming to address the vision, performance metrics, key technologies, and fundamental theory revolution of sixth generation (6G) wireless communication networks. 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-time frequency non-stationarities, which need to be thoroughly studied. We present our works on channel measurements and models 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), industry Internet of things (IoT), and reconfigurable intelligent surface (RIS) communication channels under full application scenarios. New machine learning based predictive channel models will also be investigated. A general non-predictive 6G pervasive channel model will then be proposed, which is expected to serve as a baseline for future standardized 6G channel models. In addition, a novel circuit-based channel model is proposed to illustrate the potential of electromagnetic information theory.

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, two book chapters, and more than 400 papers in refereed journals and conference proceedings, including 24 Highly Cited Papers. He has also delivered 22 Invited Keynote Speeches/Talks and 7 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 Fellow of the IEEE, IET, and China Institute of Communication (CIC), an IEEE Communications Society Distinguished Lecturer in 2019 and 2020, and a Highly-Cited Researcher recognized by Clarivate Analytics in 2017-2020.

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 received the Best Paper Awards from WPMC 2016, WCSP 2020, and WCSP 2021. 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). He served as the TPC member or the session chair of many international conferences such as IEEE ICCT 2011, IEEE IWS 2013, and IEEE VTC 2016.

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.

Sunday, 19 June 2022 14:00-17:30 Meeting Room 4
T9: 6G Software-Defined Radio Access Networks with Intelligent Reconfigurable Surfaces and UAV Communications

Li-Chun Wang, National Yang Ming Chiao Tung University, Taiwan

With the ever-increasing various new mobile services, such as meta verse, we can envisage that the upcoming sixth generation (6G) networks with numerous devices will demand extremely high-performance interconnections over a large territory. However, under strenuous scenarios such as diverse mobility, extreme density, and the uncontrollable random nature of wireless channels environments, achieving such a goal is a big challenge, especially when different kinds of aerial and ground mobile devices use different multiple radio access technologies to coexist in a wireless network. To meet such a demand, flexible and sustainable radio access network (RAN) techniques to meet very diverse needs and massive connectivity is of utmost importance. Key driving applications for 6G include smart cities, smart factories, unmanned aerial vehicles (UAVs), multidimensional detection services, metaverse applications, etc. These applications require the transformation of existing RAN techniques to reach the key performance metrics of 6G networks.

From a holistic aspect of delay, throughput, massive interconnectivity, extended coverage, etc., we discuss the potential solutions for 6G RAN:

(1) AI-enabled flexible RAN : Applying deep reinforce learning network slicing techniques on top of software-defined networking (SDN) for handling massive interconnectivity and heterogeneous traffic patterns, and multi tenant heterogeneous RAN.

(2) UAV-enabled cellular network: As a cost-effective aerial platform, UAVs can provide reliable air to-ground (A2G) line-ofsight (LOS) transmission and controllable maneuverability.

(3) Reconfigurable intelligent reconfigurable surface (RIS): This recent metamaterial technology can provide a feasible solution to alleviating the uncontrollability of wireless propagation environments such that the random characteristics of wireless channels are no longer completely uncontrollable.

In this tutorial, we will introduce the comprehensive background of UAV communications and RIS based beamforming. We discuss the main advantages in RIS-assisted UAV communications and identify some future research challenges.

Li-Chun Wang (M'96 — SM'06 — F'11) received Ph. D. degree from the Georgia Institute of Technology, Atlanta, in 1996. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. Since August 2000, he has joined the Department of Electrical and Computer Engineering of National Yang Ming Chiao Tung University in Taiwan and is jointly appointed by the Department of Computer Science and Information Engineering of the same university.

Dr. Wang was elected to the IEEE Fellow in 2011 for his contributions to cellular architectures and radio resource management in wireless networks. He won the Distinguished Research Award of the National Science Council, Taiwan (2012). He was the co-recipients of IEEE Communications Society Asia-Pacific Board Best Award (2015), Y. Z. Hsu Scientific Paper Award (2013), and IEEE Jack Neubauer Best Paper Award (1997). His current research interests are in the areas of software-defined mobile networks, heterogeneous networks, and data-driven intelligent wireless communications. He holds 19 US patents, has published over 200 journal and conference papers, and co-edited a book, "Key Technologies for 5G Wireless Systems," (Cambridge University Press 2017). He was recognized as Top 2% Scientists Worldwide in a study from Stanford University.

Virtual Tutorials
Virtual

T4: 3D Wireless Networks: Connecting the Dots between Ground, Air, and Space

Giovanni Geraci, Universitat Pompeu Fabra, Spain; Adrian Garcia-Rodriguez, Ericsson R&D, France

Barely seen in action movies until a decade ago, the progressive blending of UAVs—uncrewed aerial vehicles, commonly known as drones—into our daily lives will enhance safety and greatly impact labor and leisure activities alike. Most stakeholders regard reliable connectivity as a must-have for the UAV ecosystem to thrive. As a result, cellular communications involving UAVs have witnessed a surge of interest, following two philosophies epitomized as what can UAVs do for networks and what can networks do for UAVs, respectively. Whether

featuring UAVs as data beneficiaries or suppliers, the fly-and-connect dream faces technical showstoppers. Aware of these hurdles, the wireless research community has been rolling up its sleeves to drive a native and long-lasting support for UAVs in 5G NR and beyond.

Moving up, the prohibitive deployment cost and the lack of a unified standard have so far prevented satellite communications from unleashing their full potential on Earth. However, the recent introduction of more affordable insertions into the low orbit is luring new players to the space race, making a marriage between the satellite and cellular industries more likely than ever. Satellite cells could offer multi-connectivity to users—including UAVs—whose terrestrial connection is not as reliable as their use case might require. Altogether, the stars are aligning for a ground-air-space cellular network, but important challenges must be overcome to guarantee, more than mere coexistence, a full 3D wireless integration.

In this tutorial, we will navigate from 5G to 6G use cases and technical enablers involving aerial and spaceborne communications. Through our novel results, we will share the key lessons learnt and pose fundamental questions also acting as a catalyst for much-needed new research.

Giovanni Geraci is an Assistant Professor at Universitat Pompeu Fabra in Barcelona, and the coordinator of the Telecommunications Engineering program. He was previously a Research Scientist with Nokia Bell Labs and holds a Ph.D. from UNSW Sydney. He also held research appointments at the Singapore University of Technology and Design, the University of Texas at Austin, CentraleSupelec, and Alcatel-Lucent.

He is a Distinguished Lecturer of both the IEEE ComSoc and IEEE VTS, an Editor for the IEEE Transactions on Wireless Communications and IEEE Communications Letters, and the IEEE ICC'22 Wireless Communications Symposium co-Chair. He is a frequent organizer of IEEE international workshops, has delivered around twenty IEEE ComSoc tutorials, industry seminars, and workshop keynotes, and co-edited the book "UAV Communications for 5G and Beyond" (Wiley – IEEE Press). He is also co-inventor of a dozen patents, has written for the IEEE ComSoc Technology News, and received international press coverage. Giovanni was awarded two of the most competitive early-career fellowships in Spain: a "la Caixa" Junior Leader and a "Ramon y Cajal" Fellowship.

Adrian Garcia-Rodriguez is currently a Data Scientist in the AI Research & Systems Team of Ericsson R&D in France. Previously, he was a Senior Engineer at Huawei Mathematical and Algorithmic Sciences Lab in France [2020 – 2022] and a Research Scientist in Nokia Bell Labs in Ireland [2016 – 2020]. He joined Bell Labs after receiving the Ph.D. degree in Electrical and Electronic Engineering from University College London (U.K.).

He is a co-inventor of 25+ filed patent families and the main inventor in 10 of those, for which he received the Nokia Bell Labs Ireland Certificate of Outstanding Achievement for co-authoring the highest number of filed patents in 2019 and the Top 10 inventor in Nokia Ireland for patent filings in 2018. More recently, he received the 2021 IEEE ComSoc Outstanding Young Researcher Award for EMEA. He was also the recipient of the Best Paper Award in PIMRC'19 for his work on "UAV-to-UAV cellular communications", and was awarded the Most Attended Industry Program Award at IEEE GLOBECOM 2017 for delivering the industrial seminar "Drone Base Stations: Opportunities and Challenges Towards a Truly "Wireless" Wireless Network". He was named an Exemplary Reviewer for IEEE Communications Letters in 2016, and both IEEE Trans. on Wireless Communications and IEEE Trans. on Communications in 2017.

Virtual
T6: In-Band-Full-Duplex Radio for Integrated Access/Backhaul and Integrated Sensing/Communications in 6G Networks
Tharm Ratnarajah, University of Edinburgh, UK

In-band-full-duplexing (IBFD) is an emerging paradigm for wireless communication in 6G wireless networks wherein the two communication directions can simultaneously utilize the same frequency band. By using the antenna, analog and digital interference cancellation techniques to mitigate the ensuing self-interference, the feasibility of IBFD links for standalone wireless links has been recently demonstrated. Furthermore, they allow simultaneous transmission and sensing, opening up avenues for new random-access schemes. The objective of this tutorial is to provide an overview of the following ingredients:

1) To provide a recent advance on IBFD radio design in the frequency range 2 (FR2) band ($\geq$25.250GHz); specifically, we review the antenna domain cancellation, wideband optical domain analog cancellation and digital domain cancellations. We will provide wideband hardware impairment models and hardware nonlinear effect models; 2) To describe the design and analysis of IBFD transmission in the recently proposed 3GPP integrated access and backhaul (IAB) networks. Here we provide a 3GPP-inspired design for the IBFD-IAB networks in the FR2 band, which can enhance the spectral efficiency and coverage while reducing the latency; 3) To lay out the basics concepts of IBFD integrated sensing and communications (ISAC) and summarize the key advantages. We considered the multi-vehicle scenario and performed tracking and prediction using an extended Kalman filter at the IBFD-ISAC nodes; 4) To give a vision for IBFD for IAB and ISAC research towards in 6G Networks. We also describe the implementation constraints, research challenges, opportunities and potential solutions.

Prof. Tharm Ratnarajah is currently with the Institute for Digital Communications, the University of Edinburgh, Edinburgh, UK, as a Professor in Digital Communications and Signal Processing. He was the Head of the Institute for Digital Communications during 2016-2018. Prior to this, he held various positions at McMaster University, Hamilton, Canada, (1997-1998), Nortel Networks (1998-2002), Ottawa, Canada, University of Ottawa, Canada, (2002-2004), Queen's University of Belfast, UK, (2004-2012). His research interests include signal processing and information-theoretic aspects of beyond 5G wireless networks, full-duplex radio, mmWave communications, random matrices theory, interference alignment, statistical and array signal processing and quantum information theory. He has published over 400 peer-review publications in these areas and holds four U.S. patents. He has supervised 16 PhD students and 21 post-doctoral research fellows and raised $11+ million USD of research funding. He was the coordinator of the EU projects ADEL (3.7M €) in the area of licensed shared access for 5G wireless networks, HARP (4.6M €) in the area of highly distributed MIMO, as well as EU Future and Emerging Technologies projects HIATUS (3.6M €) in the area of interference alignment and CROWN (3.4M €) in the area of cognitive radio networks. Dr Ratnarajah was an associate editor of IEEE Transactions on Signal Processing, 2015-2017 and Technical co-chair, The 17th IEEE International Workshop on Signal Processing advances in Wireless Communications, Edinburgh, UK, 3-6, July 2016. Prof. Ratnarajah is a member of the American Mathematical Society and Information Theory Society and a Fellow of Higher Education Academy (FHEA).

Virtual
T8: Wireless Information and Energy Transfer in the Era of 6G Communications
Ioannis Krikidis, Constantinos Psomas, University of Cyprus, Cyprus

Conventional energy-constrained wireless systems such as sensor networks are powered by batteries and have limited lifetime. Wireless power transfer (WPT) is a promising technology for energy sustainable networks, where terminals can harvest energy from dedicated electromagnetic radiation through appropriate electronic circuits.

The integration of WPT technology into communication networks introduces a fundamental co-existence of information and energy flows; radio-frequency signals are used in order to convey information and/or energy. The efficient management of these two flows through sophisticated networking protocols, signal processing/communication techniques and network architectures, gives rise to a new communication paradigm called wireless powered communications (WPC).

In this tutorial, we discuss the principles of WPC and we highlight its main network architectures as well as the

fundamental trade-off between information and energy transfer. Several examples, which deal with the integration of WPC in modern communication systems, are presented. Specifically, we study some fundamental network structures such as the MIMO broadcast channel, the interference channel, the relay channel, the multiple-access channel, and ad-hoc networks. The integration of WPC in 6G and beyond is analyzed and discussed through the use of tools from stochastic geometry. Future research directions and challenges are also pointed out.

Dr. Ioannis Krikidis received the diploma in Computer Engineering from the Computer Engineering and Informatics Department (CEID) of the University of Patras, Greece, in 2000, and the M.Sc and Ph.D degrees from Ecole Nationale Superieure des Telecommunications (ENST), Paris, France, in 2001 and 2005, respectively, all in electrical engineering. From 2006 to 2007 he worked, as a Post-Doctoral researcher, with ENST, Paris, France, and from 2007 to 2010 he was a Research Fellow in the School of Engineering and Electronics at the University of Edinburgh, Edinburgh, UK. He is currently an Associate Professor at the Department of Electrical and Computer Engineering, University of Cyprus, Nicosia, Cyprus. He is an IEEE Fellow for contributions to full-duplex radio and wireless-powered communications. His current research interests include wireless communications, cooperative networks, 4G/5G communication systems, wireless powered communications, and secrecy communications. Dr. Krikidis serves as an Associate Editor for IEEE Transactions on Communications, IEEE Transactions on Green Communications and Networking, and IEEE Wireless Communications Letters. He has published over 250 papers in scientific journals and international conferences. He was the recipient of the Research Award Young Researcher from the Research Promotion Foundation, Cyprus, in 2013, as well as the recipient of the IEEE ComSoc Best Young Professional Award in Academia in 2016. He has been recognized by Thomson Reuters as an ISI Highly Cited Researcher 2017 to 2021.

Dr. Constantinos Psomas holds a BSc (Hons) in Computer Science and Mathematics from Royal Holloway, University of London, an MSc in Applicable Mathematics from London School of Economics, and a PhD in Mathematics (Combinatorics) from the Open University, UK. From 2011 to 2014, he worked as a Postdoctoral Researcher at the Department of Electrical Engineering, Computer Engineering and Informatics of the Cyprus University of Technology. Since 2014, he has held a postdoctoral position at the Department of Electrical and Computer Engineering of the University of Cyprus. Dr. Psomas serves as an Associate Editor for the IEEE Wireless Communications Letters and the Frontiers in Communications and Networks. He received an Exemplary Reviewer certificate by the IEEE Transactions on Communications for 2020 and by the IEEE Wireless Communications Letters for 2015 and 2018. His current research interests include wireless powered communications, cooperative networks and full-duplex communications.

Virtual
T10: Reinforcement Learning in Wireless Communications
Haris Gačanin, RWTH Aachen University, Germany

The fifth-generation (5G) 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 beyond 5G 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 non-stationary 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 non-stationary 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'20] 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 Distinguished Lecturer of IEEE Vehicular Technology Society and an Associate Editor of IEEE Communications Magazine, while he served as the editor of IEICE Transactions on Communications and IET Communications. He is a fellow of IEEE. 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, 2005 Vehicular Technology Conference (VTC 2005-Fall) Student Paper Award from IEEE VTS Japan Chapter and the 2004 Institute of IEICE Society Young Researcher Award.

Virtual
T11: Massive Connectivity based on High Performance NOMA-Based Random Access
Jinho Choi, Deakin University, Australia

Machine-type communication (MTC) becomes a key element for the Internet of Things (IoT) as it enables to support the connectivity of numerous devices within cellular systems such as 5th generation (5G) and beyond to provide a wide coverage. Due to the sparse device activity, uncoordinated transmission schemes (e.g., random access) are considered for most existing MTC schemes in standards. Furthermore, it is expected to have a wide system bandwidth to connect a large number of IoT devices, while the bandwidth is limited. In this tutorial, we discuss how non-orthogonal multiple access (NOMA) can be employed to support the connectivity of numerous sensors and devices with a limited spectrum. We focus on NOMA-based random access schemes for MTC and explain how they can be designed and analyzed. In addition, various approaches are introduced to show how NOMA can be applied to current MTC protocols in standard so that the performance can be improved in terms of throughput and the number of devices to be supported.

Jinho Choi was born in Seoul, Korea. He received B.E. (magna cum laude) degree in electronics engineering in 1989 from Sogang University, Seoul, and M.S.E. and Ph.D. degrees in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST) in 1991 and 1994, respectively. He is with the School of Information Technology, Burwood, Deakin University, Australia, as a Professor. Prior to joining Deakin in 2018, he was with Swansea University, United Kingdom, as a Professor/Chair in Wireless, and Gwangju Institute of Science and Technology (GIST), Korea, as a Professor. His research interests include the Internet of Things (IoT), wireless communications, and statistical signal processing. He authored two books published by Cambridge University Press in 2006 and 2010. Prof. Choi received a number of best paper awards including the 1999 Best Paper Award for Signal Processing from EURASIP. He is on the list of World's Top 2% Scientists by Stanford University in 2020 and 2021. Currently, he is an Editor of IEEE Wireless Communications Letters and a Division Editor of Journal of Communications and

Networks (JCN). He has also served as an Associate Editor or Editor of other journals including IEEE Trans. Communications, IEEE Communications Letters, JCN, IEEE Trans. Vehicular Technology, and ETRI journal.

Virtual

T12: 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 are becoming 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, a number of energy and spectrally 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 OMA. 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 Signal Processing for Wireless Communications 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), IEEE Communication Letter Exemplary Reviewer 2012, 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 is a Senior Lecturer (Associate Professor) in School of Electronic Engineering and Computer Science at Queen Mary University of London (QMUL), London, U.K. (Aug. 2021-present), where he started as a Lecturer at Sept. 2017. He was a Postdoctoral

Research Fellow at King's College London (KCL), London, U.K. (Sep. 2016- Aug. 2017). He received the Ph.D. degree from QMUL in 2016. Prior to that, he received the M.S. and B.S. degrees from the Beijing University of Posts and Telecommunications (BUPT) in 2014 and 2011, respectively. He currently serves as a Senior Editor of IEEE Communications Letters, an Editor of IEEE Transactions on Wireless Communications, IEEE Transactions ooon Communications. He is a Senior Member of the IEEE. Dr. Liu is the recipient of the 2020 IEEE ComSoc Outstanding Young Researcher Award for the Europe, Middle East and Africa Region, the 2020 Early Achievement Award of the IEEE ComSoc – Signal Processing and Computing for Communications (SPCC) Technical Committee, and the recipient of the 2021 IEEE CTTC Early Achievement Awards.

He has served as the Publicity Co-Chair for VTC 2019-Fall. He is the leading contributor for "Best Readings for Non- Orthogonal Multiple Access (NOMA)" and the primary contributor for "Best Readings for Reconfigurable Intelligent Surfaces (RIS)". He serves as the chair of Special Interest Group (SIG) in SPCC Technical Committee on the topic of signal processing Techniques for next generation multiple access (NGMA), the vice-chair of SIG Wireless Communications Technical Committee on the topic of Reconfigurable Intelligent Surfaces for Smart Radio Environments, and the Tutorials and Invited Presentations Officer for Reconfigurable Intelligent Surfaces Emerging Technology Initiative.

Virtual

T13: Orthogonal Time Frequency Space Modulation: Waveform for Future Wireless Networks

Weijie Yuan, Southern University of Science and Technology, China; Zhiqiang Wei, Fridrich-Alexander University Erlangen, Germany; Shuangyang Li, University of New South Wales, Australia

Future wireless networks are expected to support ubiquitous connectivity to a wide range of emerging applications operating in hostile environments, spanning from autonomous cars to low-earth-orbit satellites, and underwater acoustic communications. The strong multipath, high delay and Doppler features in those hostile environments can impose great challenges for reliable wireless communications. Consequently, the conventional OFDM modulation may fail due to the high dynamical channel fluctuations. Recently proposed orthogonal time frequency space (OTFS) modulation has provided a different perspective of waveform design in contrast to the time-frequency signal processing paradigm. OTFS has shown promising performance over various channels and its advantages has been widely evident from both academic and industry perspectives. This tutorial aims to provide the state-of-art of OTFS with specific focuses on its fundamentals, advanced designs, performance analysis, and applications.

This tutorial will firstly overview the background and fundamentals of OTFS and delay Doppler domain signal processing. Then the research progress on this topic will be introduced, which consists of 3 technical parts: 1) window designs and channel estimation for OTFS, 2) OTFS detection and performance analysis, and 3) OTFS-enabled integrating communications and sensing. Finally, we will conclude the tutorial by summarizing the future directions and open problems.

Weijie Yuan (Member, IEEE) received the B. E. degree from the Beijing Institute of Technology, China, and the Ph.D. degree from the University of Technology Sydney, Australia, in 2013 and 2019, respectively. From 2019 to 2021, he was a Research Associate with the University of New South Wales. He is currently an assistant professor with the Department of Electrical and Electronic Engineering, Shenzhen, China. He has served as a Research Assistant with the University of Sydney, a Visiting Associate Fellow with the University of Wollongong, and a Visiting Fellow with the University of Southampton, from 2017 to 2019. In 2016, he was a Visiting Ph.D. Student with the Institute of Telecommunications, Vienna University of Technology, Austria. He serves as the Co- Chair and Co-Organizer for workshops and special sessions on orthogonal time frequency space (OTFS) and integrated sensing and communication (ISAC) in ICC 2021, ICCC 2021,

SPAWC 2021, VTC 2021-Fall, WCNC 2022, and ICASSP 2022. He is the founding chair of the IEEE ComSoc special interest group on OTFS (OTFS-SIG). He is serving as an associate editor for the IEEE Communications Letters and EURASIP Journal on Advances in Signal Processing.

Zhiqiang Wei (Member, IEEE) received the B.E. degree in information engineering from the Northwestern Polytechnical University (NPU), Xi'an, China, in 2012 and the Ph.D. degree in Electrical Engineering and Telecommunications from the University of New South Wales, Sydney, Australia, in 2019. From 2019 to 2020, he was a Postdoctoral Research Fellow with the University of New South Wales. He is currently a Humboldt Postdoctoral Research Fellow with the Friedrich- Alexander University Erlangen-Nuremberg. He received the Best Paper Awards at the IEEE International Conference on Communications (ICC), 2018. He serves as the TPC Co-Chair of the IEEE ICC 2021 Workshop on orthogonal time frequency space.

Shuangyang Li (Member, IEEE) received the B.S., M.S., degrees from Xidian University, Xi'an, China, in 2013 and 2016, respectively, and the Ph.D. degree from the University of New South Wales, Sydney, Australia in 2021. He will join Technical University of Berlin as a post-doc research fellow. He was the TPC Co-Chair of the IEEE International Conference on Communications in China (ICCC) 2021 Workshop on orthogonal time frequency space (OTFS). He is a founding member and the secretary of the special interest group (SIG) on OTFS. He was a recipient of the 2021 student travel grant of IEEE International Conference on Communications (ICC). His research interests include signal processing, channel coding and their applications to communication systems, with a specific focus on waveform designs.

Virtual

T14: Terahertz Communications for 6G and Beyond: Challenges, Advances and Future Directions

Nan Yang, Australian National University, Australia; Chong Han, Shanghai Jiao Tong University, China; Josep Miquel Jornet, Northeastern University, USA

Terahertz (THz) communications is envisioned as a highly promising wireless technology for the sixth generation (6G) and beyond wireless networks. In particular, the ultra-wide THz band ranging from 0.1 to 10 THz offers enormous potential to alleviate the spectrum scarcity and break the capacity limitation of emerging wireless systems (such as 4G-LTE and 5G). This will undoubtedly support the epoch-making wireless applications that demand ultra-high quality of service requirements and multi-terabits per second data transmission in the 6G and beyond era, such as terabit-per-second backhaul systems, ultrahigh- definition content streaming among mobile devices, virtual/augmented reality, and wireless high-bandwidth secure communications.

Against this background, this tutorial will provide a comprehensive look at cutting-edge THz communications strategies for 6G and beyond wireless networks. To begin with, this tutorial will describe the importance of THz communications in the 6G and beyond era. Then, this tutorial will introduce the state-of-the-art fundamental research of THz devices, channels, testbeds, and simulators. After this, the tutorial will present a comprehensive survey of the THz communications solutions, including physical layer solutions (e.g., THz modulation and waveform de-sign, THz hybrid beamforming), networking strategies (e.g., THz interference and coverage analysis, THz beam tracking and alignment, and THz MAC protocols), and integration of THz communications with other 6G-oriented techniques (e.g., unmanned aerial vehicle, intelligent reflecting surface, and machine learning). Finally, this tutorial will identify and discuss the out-standing barriers that future wireless system designers must tackle to reap the full benefits of THz communications in the 6G and beyond era.

Nan Yang received his Ph.D. degree in Electronic Engineering from Beijing Institute of Technology in 2011. Since July 2014, he has been with the Australian National University, Canberra, Australia, where he is currently an Associate Professor at the School of Engineering and the Head of the Emerging Communications Laboratory. He received the Top Editor Award from the Trans-actions on Emerging Telecommunications Technologies in 2017, the Exemplary Reviewer Certificate of the IEEE Transactions on Communications in 2016 and 2015, the Top Reviewer Award from the IEEE Transactions on Vehicular Technology in 2015, the IEEE ComSoc Asia-Pacific Outstanding Young Researcher Award and the Exemplary Reviewer Certificate of the IEEE Wireless Communications Letters in 2014, and the Exemplary Reviewer Certificate of the IEEE Communications Letters in 2013 and 2012. Also, he is the co-recipient of Best Paper Awards at the IEEE Globecom 2016 and the IEEE VTC Spring 2013. He is currently serving on the Editorial Board of IEEE Transactions on Molecular, Biological, and Multi-Scale Communications, IEEE Communications Letters, IEEE Transactions on Vehicular Technology, and two other journals. He has also served as the Guest Editor of eight special issues in international leading journals and symposium/track chair at international flagship conferences such as IEEE ICC and IEEE Globecom. He is a Senior Member of the IEEE. Over the past years, he has published 1 book chapter and produced more than 10 journal and conference papers on THz communications. He organized two special issues on THz communications and served as the TPC Co-Chair of the 2021 IEEE ICC Workshop on THz communications. In addition, he has delivered three tutorials and five invited talks on THz communications in 2021.

Chong Han has been with Shanghai Jiao Tong University, Shanghai, China since June 2016, where he is currently an Associate Professor and the Head of the Terahertz Wireless Communications (TWC) Laboratory. He obtained the Master of Science and the Ph.D. degrees in Electrical and Computer Engineering from Georgia Institute of Technology, Atlanta, GA, USA, in 2012 and 2016, respectively. He received 2019 Distinguished TPC Member Award, IEEE International Conference on Computer Communications (INFOCOM) and 2018 Elsevier NanoComNet (Nano Com-munication Network Journal) Young Investigator Award, 2018 Shanghai Chenguang Funding Award, and 2017 Shanghai Yangfan Funding Award. He is an editor of Nano Communication Networks (Elsevier) Journal and IEEE Access. He is a TPC Co-Chair or General Co-Chair for the 1st–5th International Workshop on Terahertz Communications, in conjunction with IEEE ICC 2019, Globecom 2019, ICC 2020, ICC 2021, and ICC 2022. Furthermore, he is serving as a Vice Chair of IEEE ComSoc RCC Special Interest Group (SIG) on THz Communications. In addition, he has delivered six tutorials and more than 50 research talks on THz communications since 2019.

Josep M. Jornet is an Associate Professor in the Department of Electrical and Computer Engineering at Northeastern University, in Boston, MA. He received the B.S. in Telecommunication Engineering and the M.Sc. in Information and Communication Technologies from the Universitat Politecnica de Catalunya, Barcelona, Spain, in 2008. He received the Ph.D. degree in Electrical and Computer Engineering from the Georgia Institute of Technology, Atlanta, GA, in 2013. He has coauthored more than 160 peer-reviewed scientific publications, 1 book, and also been granted 4 US patents. These works have been cited over 11,400 times (h-index of 48). Since July 2016, he is the Editor-in-Chief of Elsevier's Nano Communication Networks Journal. He is serving as the lead principal investigator on multiple grants from U.S. federal agencies including the National Science Foundation, the Air Force Office of Scientific Research and the Air Force Research La-boratory. He is a recipient of the National Science Foundation CAREER award and several other awards from IEEE, ACM, UB and NU. He is a Senior Member of the IEEE and Member of the ACM. He is serving as a Vice Chair of IEEE ComSoc RCC SIG on THz Communications, and has delivered more than 70 tutorials, keynote speeches and invited talks on THz communications since 2016. He is an IEEE ComSoc Distinguished Lecturer (class of 2022-2023).

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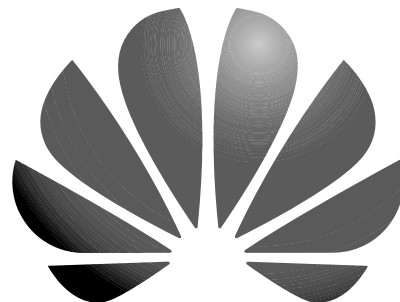
Registration

Registration will take place in the Europaea Foyer. Hours are:

Sunday 19 June	0700 – 1730	Tuesday 21 June	0800 – 1730
Monday 20 June	0700 – 1730	Wednesday 22 June	0800 – 1730

Breaks

Coffee breaks will take place in the exhibit area in the Europaea Foyer.

Social Events

Lunches and the banquet, which are included in the full registration, will be served in Fennia I & II. You will need the ticket included in your registration packet to gain entry. The reception on Sunday evening, located in the Europaea Foyer, is open to all attendees, including student and life registrations.

Keynotes

A Glimpse at 6G

Hannu Kauppinen, *CTO, Nokia Technologies*

The 6G era will be defined by the symbiosis of digital, physical, and biological worlds with the goal to augment human productivity and wellbeing. While in the 5G era, with thanks to the massive scale deployment of sensors, the digital world perfectly captures past and current states of the physical world, the connection of these two worlds with the biological or cognitive world remain largely unaddressed. We believe that in the 6G era cognitive systems will anticipate individual and collective intents to plan for actions in the worlds that optimally serve human needs. For that to happen we will need to witness significant advances in artificial intelligence, computing and sensing technologies. Sustainability will be an integral part of the new system architecture design. The 6G network will be the essential infrastructure for the integration of these future capabilities.

Hannu Kauppinen is the Chief Technology Officer in Nokia Technologies, the patent and technology licensing business group of Nokia Corporation. He manages Nokia's industry leading patent portfolio, that has been ranked as number one in 5G patents in independent studies. His teams are responsible for patent portfolio management and technical support of commercial licensing in the areas of cellular standards, devices and services, networks as well as multimedia technologies.

Hannu Kauppinen joined Nokia in 1997 and has since then held key leadership positions in Nokia's R&D. During 2007–2008 and 2010–2011 he was the Head of Radio Systems Laboratory in Nokia Research Center and was responsible for the research in 3GPP and IEEE radio standards in Nokia's products. During 2011-2014 he was the Head of Nokia Research Center and in 2014-1016 the Head of Labs in Nokia Technologies, driving research in Media Technologies, Sensor and Material Technologies as well as Radio Systems. His teams have contributed to Nokia's IPR portfolio in mobile technologies, a foundation to Nokia's 1.5-billion-euro IP licensing business. In 2016-2019 he held product and business management roles in

Mobile Networks, the largest business group of Nokia, and in 2019 he rejoined Nokia Technologies as the CTO.

Hannu Kauppinen is an entrepreneurial executive turning advanced technology research to commercialization and profitable growth. In addition to 5G and IoT wireless communication, his areas of interest include cloud connectivity and computing, mobile multimedia and AR/VR, sensors and nanomaterials, health technologies, data analytics and AI/ML. He has created technology portfolios, formed high-performing teams of scientists, engineers, and business developers, and acquired external innovation through M&A and partnering, leading to accelerated go-to-market and new product introduction. He has worked in the Silicon Valley (USA), United Kingdom, France, Japan, and Finland. He has led global R&D organizations of up to 500 people and small teams of experts in Europe, North America, Asia, and Africa.

Hannu Kauppinen holds a PhD degree in Physics (1997) and an Executive MBA (2007), both from the Aalto University in Helsinki.

6G – The Next Hyper-Connected Experience for All

Juho Lee, *Samsung*

While the mobile industry is now focusing on the realization of what 5G technologies promised and preparing the standard for the next version of 5G (i.e., 5G-Advanced), we can see that initial consideration about 6G is already happening. In this talk, we briefly review megatrends in terms of technologies and society and present initial view about vision, requirements, spectrum and standardization timeline for 6G and results from research on candidate technologies.

Juho Lee is currently a Fellow at Samsung Electronics, where he is leading research and standardization for mobile communications. He joined Samsung Electronics in 2000 and has worked on multiple generations of mobile communications, i.e., WCDMA and HSPA in 3G, LTE, LTE-Advanced, and LTE-Advanced Pro in 4G, and 5G NR technologies. His current research focus is on preparation of future technologies such as

5G evolution (e.g., 5G-Advanced in 3GPP) and 6G. He was a vice chairman of 3GPP RAN WG1 from February 2003 to August 2009 and chaired LTE/LTE-Advanced MIMO sessions. He received his Ph.D. degree in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST), Korea, in 2000. Dr. Lee is a Fellow of IEEE.

Federated Learning With Efficiency and Privacy Considerations in Wireless Networks

Rose Hu, *Utah State University*

Centralized data collection and training in conventional machine learning (ML) algorithms have raised many concerns including privacy restrictions and communication cost due to massive amount of data transfer. Federated leaning (FL) exploits the rapidly growing computational capacity in small local devices and allows these devices to train ML models locally and only exchange the trained model parameters with the edge server. Through this, FL can greatly alleviate data privacy concern, reduce communication cost, and help build a scalable centralized ML model. FL methods offer a number of prominent advantages, including scalability and data privacy. On the other hand, a large-scale wireless network normally involves many heterogeneous devices with varying constraints and encounters very dynamic channel environments. This raises many challenges such as system heterogeneity, statistical heterogeneity, privacy and security, user scheduling, fairness in FL. This talk will present some of our recent research outcomes on model parameter transmission schemes and user scheduling strategies in FL that tackle these challenges. Techniques such as NOMA and over-the-air computation are introduced to achieve fast ML training. Model parameter compression and sparsification are further introduced to reduce the wireless communication cost and model update-based aggregation is applied to defend against Byzantine attacks and individual client model initialization schemes are exploited to enhance privacy protection.

Rose Qingyang Hu is Professor with the Electrical and Computer Engineering Department and Associate Dean for research of College of Engineering at Utah State University. She also directs Communications Network Innovation Lab at Utah State University. Besides decades of academia research experience, she has more than 10 years industrial R&D experience with Nortel, Blackberry, and Intel as a technical manager, a senior research scientist, and a senior wireless system architect, actively participating in industrial 3G/4G technology development, standardization, system level simulation and performance evaluation. Her current research interests include next-generation wireless system design and optimization, Internet of Things, Cyber Physical system, Mobile Edge Computing, artificial intelligence in wireless networks.

She has published over 300 in leading IEEE journals and conferences and also holds 30+ patents in her research areas. Rose Hu is an IEEE Fellow, IEEE Communications Society Distinguished Lecturer 2015-2018, IEEE Vehicular Technology Society Distinguished Lecturer 2020-2022, NIST Communication Technology Laboratory Innovator 2020, and a recipient of Best Paper Awards from the IEEE GLOBECOM 2012, the IEEE ICC 2015, the IEEE VTC Spring 2016, and the IEEE ICC 2016. She is currently serving as the IEEE ComSoc BoG Chief Information Officer and Associate Editor-In-Chief of IEEE Commutations Magazine. She is also serving on the editorial boards of the IEEE Transactions on Wireless Communications, IEEE Transactions on Vehicular Technology, and IEEE Wireless Communications.

Tuesday, 21 June 2022, 14:00-14:45 Europaea
Building the Mega Constellation Satellite Network: 6G-NTN
Wen Tong, *CTO, Huawei Wireless*

In this talk, we present the concept and design of the emerging low orbit mega satellite constellations, the overall system performance evaluation and innovative new use cases. We present a host of the enabling technologies orbit designs: (1) the satellite-as-space-bastion; (2) the inter-satellite networking; (3) the satellite to mobile access and mobile to satellite access; (4) the spectrum comparison. As a foundational enabler for 6G, non-terrestrial-network will provide, for the first time, the full earth coverage, the 6G-NTN will create disruptive innovative use cases in many areas, we also discuss their revolutionary impacts.

Dr. Wen Tong is the CTO, Huawei Wireless. He is the head of Huawei wireless research. In 2011, Dr. Tong was appointed the Head of Communications Technologies Labs of Huawei, currently, he is the Huawei 5G chief scientist and led Huawei's 10-year-long 5G wireless technologies research and development. Prior to joining Huawei in 2009, Dr. Tong was the Nortel Fellow and head of the Network Technology Labs at Nortel. He joined the Wireless Technology Labs at Bell Northern Research in 1995 in Canada. Dr. Tong is the industry recognized leader in invention of advanced wireless technologies, Dr. Tong was elected as a Huawei Fellow and an

IEEE Fellow. He was the recipient of IEEE Communications Society Industry Innovation Award in 2014, and IEEE Communications Society Distinguished Industry Leader Award for "pioneering technical contributions and leadership in the mobile communications industry and innovation in 5G mobile communications technology" in 2018. He is also the recipient of R.A. Fessenden Medal. For the past three decades, he had pioneered fundamental technologies from 1G to 5G wireless with more than 530 awarded US patents. Dr. Tong is a Fellow of Canadian Academy of Engineering, and he serves as Board of Director of Wi-Fi Alliance.

Tuesday, 21 June 2022, 14:45-15:30 Europaea
Panel: Global View on 6G

Moderator:	**Mikko Uusitalo**	*Head of Research Department, Radio Systems Research*
Panelists:	**Hans Schotten**	*Coordinator 6G Platform Germany*
	Devaki Chandramouli	*Steering Group Co-Chair, Next G Alliance, Nokia Bell Labs Fellow*
	Juho Lee	*Samsung Fellow*
	Patrik Persson	*6G Program Manager Director*

Wednesday, 22 June 2022, 14:00-14:45 Europaea
Virtual Keynote: Reconfigurable Intelligent Surfaces for Wireless Communications
Marco Di Renzo, *CNRS Research Director, Paris-Saclay University – CNRS and CentraleSupelec, Paris*

A Reconfigurable Intelligent Surface (RIS) is a planar structure that is engineered to have properties that enable the dynamic control of the electromagnetic waves. In wireless communications and networks, RISs are an emerging technology for realizing programmable and reconfigurable wireless propagation environments through nearly passive and tunable signal transformations. RIS-assisted programmable wireless environments are a multidisciplinary research endeavor. This presentation is aimed to report the latest research advances on modeling, analyzing, and optimizing RISs for wireless communications with focus on electromagnetically consistent models, analytical frameworks, and optimization algorithms. In addition, the interplay between RISs and holographic surface-based transceivers will be discussed with focus on near-field communications in line-of-sight channels.

Marco Di Renzo is a CNRS Research Director (Professor) with the Laboratory of Signals and Systems (L2S) of Paris-Saclay University – CNRS and CentraleSupelec, Paris, France. He serves as the Coordinator of the Communications and Networks Research Area of the Laboratory of Excellence DigiCosme, as a Member of the Admission and Evaluation Committee of the Ph.D. School on Information and Communication Technologies, and as the Head of the Intelligent Physical Communications group with the Laboratory of Signals and Systems at CentraleSupelec. He serves as the Editor-in-Chief of IEEE Communications Letters, he is a founding member and a Vice

Chair of the Industry Specification Group (ISG) on RIS within the European Telecommunications Standards Institute (ETSI), and he serves as the Rapporteur of the work item on communication models, channel models, and evaluation methodology. He is a Fellow of the IEEE, IET, and AAIA; an Ordinary Member of the European Academy of Sciences and Arts, and the Academia Europaea; and a Highly Cited Researcher. Also, he is a Fulbright Fellow and a Nokia Foundation Visiting Professor. His recent research awards include the 2021 EURASIP Best Paper Award and the 2022 IEEE COMSOC Outstanding Paper Award.

Virtual Panel: Quantum Communications

Moderator:	**Lajos Hanzo**	*University of Southampton, UK*
Panelists:	**Mohsen Razavi**	*University of Leeds, UK*
	Mikko Möttönen	*Aalto University, Denmark*
	Gui-Lu Long	*Tsinghua University & Beijing Academy of QIS, China*

Lajos Hanzo (FIEEE'04) (http://www-mobile.ecs.soton.ac.uk, https://en.wikipedia.org/wiki/Lajos_Hanzo) received Honorary Doctorates from the Technical University of Budapest and Edinburgh University. He is a Foreign Member of the Hungarian Science-Academy, Fellow of the Royal Academy of Engineering (FREng), of the IET, of EURASIP and holds the IEEE Eric Sumner Field Award.

Mohsen Razavi is a Professor of Quantum Communications at the University of Leeds. He has worked in this area, focusing on QKD, for nearly two decades starting with his PhD at MIT. He is a recipient of the Marie-Curie International Reintegration Grant and coordinated the European Innovative Training Network QCALL.

Mikko Möttönen (PhD in 2005) leads the Quantum Computing and Devices (QCD) group at the QTF Centre of Excellence, Aalto University. He is an Associate Professor (tenured) of Quantum Technology shared between Aalto University and VTT Technical Research Centre of Finland and a Co-Founder of the quantum-computer company IQM.

Gui-Lu Long, APS & IoP fellow, professor at Tsinghua University & Deputy-President, Beijing Academy of QIS. He proposed quantum secure direct communication, quantum computing with linear combination unitaries, WISE interpretation of quantum mechanics, and constructed quantum exact search algorithm. He was former AAPPS President and C13 vice-chair of IUPAP.

Industry Panels

Connecting Intelligence in 6G: Learning to Communicate & Communicating to Learn

Moderator:	**Miltiadis Filippou**	*Intel*
Panelists:	**Riccardo Bassoli**	*TU Dresden*
	Emilio Calvanese-Strinati	*CEA-Leti*
	Devaki Chandramouli	*Steering Group Co-Chair of Next G Alliance*
	Merouane Debbah	*Technology Innovation Institute, Abu Dhabi, UAE*

The recent advent of commercial 5G network deployments offering ever powerful connectivity capabilities has further enabled an explosive generation and transfer of data tailored to either consumer applications or vertical industries. Nevertheless, to satisfy the intensifying society needs to communicate anywhere and anytime, dense (and, therefore, complex) networks need to be deployed, thereby leading towards increasing design complexity of a beyond 5G air interface. Unfortunately, some classical air interface design approaches may not be sustainable anymore, due to the induced model and algorithm deficiencies. To tackle such issues, the research community currently investigates ways of exploiting the availability of network data across the cloud-edge-device continuum and latest advances in AI/ML technologies to design the next generation air interface, factoring in performance, energy efficiency and flexible network reconfigurability needs. At the same time, as edge computing technology advances, significant processing, memory and storage resources can be offered by the network in close proximity to the end user to address significant processing workloads timely and with high performance. The challenge in this case lies in designing a 6G network architecture (functions, interfaces, protocols) that can be viewed as a "distributed learning platform" to best serve end user and industry needs. In this panel discussion, the aim is to deepen into both aspects of "learning to communicate" and "communicating to learn" and sketch a view of how 6G systems could be designed and operate to further boost user experience without sacrificing the principles of trustworthiness and sustainability.

Perspectives on Sustainable Strategies for a Zero Emissions Future

Moderator:	**Anthony D'Arcy**	*Nokia*
Panelists:	**Helena Soimakallio**	*Exec. Director, Sustainable Development at Teknologiateollisuus – Technology Industries of Finland*
	Kati Borgers	*Espoo City*
	Salla Ahonen	*VP Sustainability, Neste*
	Robert From	*COO, MaaS Global Ltd*

The latest IPCC report in March 2022 made it clear – climate change is moving faster than we are. Pandemic, war, political instability, forced migration and increasingly unpredictable weather are simply a dress rehearsal for the future impacts of climate change. But the same report still underscored the potential to change course and accelerate mitigation and adaptation.

This panel will explore what is beyond the well-intended net zero and other climate targets and discuss what the necessary strategies and concrete actions are from different parties to reach the goals.

Virtual Panel: 3rd VTC Workshop on Diversity

Moderator:	**Carmela Cozzo**	*Principal Engineer and Standards Expert, Samsung, USA*
	Sarah Kate Wilson	*Professor of EE, Santa Clara University, USA*
Panelists:	**Alan Gatherer**	*CTO and Co-Founder, Cirrus360, USA*
	James Irvine	*Head of Comms Research Group, PNDC, University of Strathclyde*
	Syliva Lu	*Head of Technology Strategy, u-blox; Board Member of 5G-ACIA*
	Eve Riskin	*Professor of ECE, University of Washington, USA*

This panel discusses the ways we experience diversity in the working place and how we can improve our workplace environment. It is well known that diversity in the workplace improves the final product because more aspects are considered in the design process. However, diversity of background and culture can also lead to differences in wording that can lead to misunderstanding. This panel promises to be a frank, entertaining and enlightening discussion on how we can all work together productive.

Carmela Cozzo is a Principal Engineer and Standards Expert at Samsung. She has over 20 years of experience in research and standardization of wireless communications systems in leading telecommunications companies. She has been actively contributing to the 3GPP standardization of 5G/4G/3G systems as RAN1 and RAN delegate and rapporteur representing Samsung and earlier Futurewei. She was with Ericsson Research where she focused on algorithm design of advanced receivers for HSPA systems. She holds a Ph.D. in EE from North Carolina State University, and a Laurea degree in EE from the University of Rome, Italy. She is a Senior Member of IEEE. She is the IEEE VTS Liaison to Women in Engineering Committee, and Chair of the IEEE VTS Committee on Women in VTS and Diversity.

Sarah Kate Wilson earned her A.B. in Mathemathics from Bryn Mawr College and her Ph.D. in Electrical Engineering at Stanford University. She has worked in both academia and industry and is currently a Professor of Electrical Engineering at Santa Clara University. Her research area includes wireless radio frequency communications, visible light communications and underwater acoustic communications.

She served as the Editor-in-Chief of IEEE Communications Letters from 2009-2011, and was the IEEE ComSoc Director of Journals 2012-2013 and VP Publications 2014-2015. She has received the IEEE Education Society Harriett Rigas Award, the IEEE Women in Communications Engineering Service Award, the IEEE Communications Society Joseph LoCicero Award for Exemplary Service to Publications and is a Fellow of the IEEE. She was the co-general chair (with Andrea Goldsmith) of the IEEE Wireless Communications and Networking Conference (WCNC) in 2017 in San Francisco which was awarded the IEEE iCon award for the best IEEE Conference of 2017.

Alan Gatherer is currently the CTO of Cirrus360 and a Fellow of the IEEE. He is responsible for R&D and strategy for Cirrus360 modem development platforms. From January 2010 to January 2021 he was with Futurewei technologies where he was a Senior Technical Vice President in charge R&D efforts in the US to develop next generation baseband chips and software for 4G and 5G basestation modems. He led development of new technologies for baseband SoC in the areas of multimode modems as a Service, interconnect and memory fabric, CPU/DSP clusters and virtualization, focusing on 5G deployment. Prior to that he was a TI Fellow and CTO at Texas Instruments where he led the development of high performance, multicore DSP at TI and worked on various telecommunication standards. Alan has authored over 50 journal and conference papers. In addition, he holds over 80 awarded patents and is author of the book "The Application of Programmable DSPs in Mobile Communications." Alan holds a bachelor of engineering in microprocessor engineering from Strathclyde University in Scotland. He also attended Stanford University in California where he received a master's in electrical engineering in 1989 and his doctorate in electrical engineering in 1993.

Sylvia Lu is an award-winning Chartered Engineer and a Non-Executive Director. Sylvia has over a decade of experience in the Telecom industry for four mobile generations (2G ~ 5G) with chipset vendors and was recognised as one of the UK's Top 50 Women in Engineering. Sylvia is Head of Cellular Technology Strategy at u-blox, where she leads cellular technology strategy, global standards and industry alliances.

Sylvia serves on several national and global industry Boards: she is an elected board director of CW (Cambridge Wireless) Ltd, and serves on the Advisory Board of UK5G, co-chairs UK5G Manufacturing Working Group, and provides independent advice to the UK government and national 5G networks on future plans for 5G deployment. She serves on the Board of 5G-ACIA (5G Alliance for Connected Industries and Automation), joins forces with global industry stakeholders to influence 5G development and deployment in line with industrial imperatives to accelerate Industry 4.0.

Sylvia operates on an international stage as a keynote speaker on 5G, 6G, emerging technologies, global standards, trust, and D&I for a wide range of stakeholders across the UK, US, Barcelona, China, Baltic counties, France, Germany. She contributes to industry magazines and journals.

Sylvia holds a first BEng degree in Electronic Engineering from Birmingham City University, a Master of Science degree in Communications and Signal Processing from the University of Bristol, and Masters in Strategy and Innovation from the University of Oxford.

Eve Riskin received her BS degree in Electrical Engineering from M.I.T. and her graduate degrees in EE from Stanford. Since 1990, she has been in the EE Department at the University of Washington where she is Professor of Electrical & Computer Engineering and Faculty Directors of UW STARS and UW ADVANCE. She was awarded a National Science Foundation Young Investigator Award, a Sloan Research Fellowship, the 2006 Hewlett-Packard Harriett B. Rigas Award, and a 2020 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring. She is a Fellow of the IEEE.

James Irvine is a Reader at the University of Strathclyde in Glasgow, where he heads the Communications: Systems, Integration and Security theme of the Power Networks Demonstration Centre. He received his bachelors and doctorate from University of Strathclyde in 1989 and 1994 respectively. His research focuses on radio resource management and cryptography, with applications to transport and power networks. He was active for many years in the UK Mobile VCE research programme, as Academic Co-ordinator of three work programmes. Prior to this, he led the system architecture work on the EU MOSTRAIN project, for communications to high speed trains. A co-author of two books, seven patents and over 200 technical papers, James has given evidence in the UK High Court in six cases involving 2G, 3G and 4G technology disputes, as well as in the US, The Netherlands and Germany. He was General Co-chair of IEEE VTC2015-Spring and of IEEE WCNC2023.

James is VP Publications of IEEE VTS, and was President 2008-9. More broadly within IEEE, James has served on three of the major Boards of the IEEE: Technical Activities, Publications and Educational Activities. He is currently chairs the TAB/PSPB Products and Services Committee.

TUTORIALS & WORKSHOPS
SUNDAY 19 June

	Europaea	Nordia	Nautica	Press Room	Baltica	Compass	Commodore	Eliel	Lars	Meeting Room 1	Meeting Room 3	Meeting Room 4
7:00-17:30	Registration (Europaea Foyer)											
9:00-10:30	W16: Workshop on Edge-based AI Applications over B5G/6G Evolution	W21: 2nd Workshop on Intelligent IoT Connectivity, Automation and Applications (ICA)	W13: Technologies and Proof-of-Concept Activities for 6G 2022 (TPoC6G 2022)	W2: 1st IEEE Workshop on Sustainable and Intelligent Green Internet of Things for 6G and Beyond	T3: OTFS and Delay Doppler Communications	W11: Integration of Sensing, Computing, and Communication in 6G Networks	W1: 1st IEEE International Workshop on Artificial Intelligence enabled Autonomous Networks and Systems (IWAANETS 2022)	W7: Distributed/Cell-Free Massive MIMO for Beyond 5G Networks	W9: ExpCCAM: Experimental Approaches for Evaluating and Showcasing Low-Latency CCAM Applications	T1: Non-Terrestrial Networks: Fundamentals, Standards, Performance, and Practice	T5: Semantic Communications: Transmission beyond Shannon Paradigm	T7: 6G Wireless Channel Measurements and Modeling for All Frequency Bands and All Scenarios
10:30-11:00	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)
11:00-12:30	Refreshments (Europaea Foyer)											
12:30-14:00	Lunch on your own											
14:00-15:30	W16: Workshop on Edge-based AI Applications over B5G/6G Evolution	W21: 2nd Workshop on Intelligent IoT Connectivity, Automation and Applications (ICA)	W19: Workshop on Mission Critical Communications	W5: Data Driven Optimization for 6G Wireless Networks	W18: Workshop on Machine Learning and Artificial Intelligence for Communications: Air Interface Design in 6G	W10: Integrated Vehicular Sensing and Communications	W6: Digital-twin-assisted AI for 6G Wireless Networking	W8: Enabling Technologies for Terahertz Communications (ETTCOM)	W12: Localization and Sensing with Intelligent Surfaces for 6G Networks	T2: AI/ML-based Solutions for Automating Security in Future 6G Networks		T9: 6G Software-Defined Radio Access Networks with Intelligent Reconfigurable Surfaces and UAV Communications
15:30-16:00	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)	(cont)		(cont)
16:00-17:30	Refreshments (Europaea Foyer)											
18:00-20:00	Welcome Reception (Europaea Foyer)											

		Nordia (A)	Nautica (B)	Press Room (C)	Baltica (D)	Compass (E)	Europaea (F)
		SUNDAY 19 June					
7:00–17:30		Registration (Europaea Foyer)					
9:00–17:30		TUTORIALS and WORKSHOPS (see separate program)					
18:00–20:00		Welcome Reception (Europaea Foyer)					
		MONDAY 20 June					
7:00–17:30		Registration (Europaea Foyer)					
8:30–9:00		Welcome and opening (VTC2022-Spring General and TPC chairs; VTS President) (Europaea)					
9:00–9:45		Keynote: **A Glimpse at 6G** (Hannu Kauppinen, Nokia)					
9:45–10:30		Keynote: **6G – The Next Hyper-Connected Experience for All** (Juho Lee, Samsung)					
10:30–11:00		Refreshments (Europaea Foyer)					
11:00–12:30	(1)	Machine Learning 1	Estimation & Synchronization 1	AMMS 1	IoT & IoV	Cooperative Systems	Industry Panel: Connecting Intelligence in 6G
12:30–14:00		Lunch (Fennia I & II)					
14:00–15:30	(2)	RIS 1	Positioning 1	MIMO 1	VLC & Optical 1	Equalization	EVVEIC 1
15:30–16:00		Refreshments (Europaea Foyer)					
16:00–17:30	(3)	NOMA 1	Radio Access	Mobile Networks	Antennas	Satellite Communications	
18:00–19:00		**Federated Learning With Efficiency and Privacy Considerations in Wireless Networks** (Rose Hu, Utah State Uni) (Europaea)					
		TUESDAY 21 June					
8:00–17:30		Registration (Europaea Foyer)					
9:00–10:30	(4)	Machine Learning 2	Positioning 2	MIMO 2	VLC & Optical 2	Green Communications	Mobile Systems
10:30–11:00		Refreshments (Europaea Foyer)					
11:00–12:30	(5)	RIS 2	Estimation & Synchronization 2	Sensing 1	Cell Free Systems	Coding	Industry Panel: Perspectives on Sustainable Strategies
12:30–14:00		Lunch (Fennia I & II)					
14:00–14:45		Keynote: **Building the Mega Constellation Satellite Network: 6G-NTN** (Wen Tong, Huawei)					
14:45–15:30		Plenary Panel: **Global View on 6G**					
15:30–16:00		Refreshments (Europaea Foyer)					
16:00–17:30	(6)	NOMA 2	Autonomous Vehicles	AMMS 2	Security 1	Resource Allocation 1	Vehicular Cooperation & Control
18:30–22:00		Banquet (Fennia I & II)					
		WEDNESDAY 22 June					
8:00–17:30		Registration (Europaea Foyer)					
9:00–10:30	(7)	Machine Learning 3	Detection	Vehicular Networks	Performance Evaluation	URLLC	EVVEIC 2
10:30–11:00		Refreshments (Europaea Foyer)					
11:00–12:30	(8)	THz Systems	Positioning 3	Emerging Systems	Security 2	Propagation & Channel Modeling	
12:30–14:00		Lunch (Fennia I & II)					
14:00–14:45		Virtual Keynote: **Reconfigurable Intelligent Surfaces for Wireless Communications** (Marco Di Renzo, CentraleSupelec)					
14:45–15:30		Virtual Plenary Panel: **On the Road to Quantum Communications**					
15:30–16:00		Refreshments (Europaea Foyer)					
16:00–17:30	(9)	Intelligent Systems	Energy Systems	Sensing 2	Low Latency	Resource Allocation 2	

VTC2022-Spring Technical Program

Monday 20 June 2022

1A: Machine Learning 1

1 A GAN-LSTM Based Framework for 6G Wireless Channel Prediction
Zheao Li, Cheng-Xiang Wang, Jie Huang, WenQi Zhou, Southeast University; Chen Huang, Purple Mountain Laboratory

2 AI-Assisted Network Traffic Prediction Without Warm-Up Periods
Amin Bolakhrif, Mustafa Ozger, KTH Royal Institute of Technology; David Sandberg, Ericsson AB; Cicek Cavdar, KTH Royal Institute of Technology

3 Intra-RAN Online Distributed Reinforcement Learning For Uplink Power Control in 5G Cellular Networks
Jian Song, István Z. Kovács, M. Majid Butt, Jens Steiner, Nokia Bell Labs; Klaus Pedersen, Nokia

4 Multi-Agent Deep Reinforcement Learning in Vehicular OCC
Amirul Islam, Leila Musavian, Nikolaos Thomos, University of Essex

5 Risk-Aware Multi-Armed Bandits for Vehicular Communications
Maximilian Wirth, Technische Universität Darmstadt; Anja Klein, Andrea Ortiz, TU Darmstadt

1B: Estimation & Synchronization 1

1 A Novel Pilot Design and Channel Estimation in 5G Multi-Numerology Systems
Hyunsoo Son, Korea Advanced Institute of Science and Technology (KAIST); Girim Kwon, Massachusetts Institute of Technology (MIT); Hyuncheol Park, Korea Advanced Institute of Science and Technology (KAIST); JooSung Park, Samsung Electronics

2 Attention Based Neural Networks for Wireless Channel Estimation
Dianxin Luan, John Thompson, University of Edinburgh

3 Rayleigh Channel Statistics Estimation Using SINR Samples Under Single Interference
David Jia, CentraleSupelec; Xavier Leturc, Thales SIX GTS France; Mohamad Assaad, CentraleSupelec; Christophe Le Martret, Thales Communications & Security

4 Recast Subspace Pursuit-based Channel Estimation for Hybrid Beamforming NarrowBand Millimeter-Wave Massive MIMO Systems
Olutayo O. Oyerinde, University of the Witwatersrand

1C: AMMS 1

1 Design and Evaluation of Optimum Receiver for Turbulent Underwater Optical Wireless Channel
Kenzo Yamada, Chedlia Ben Naila, Hiraku Okada, Masaaki Katayama, Nagoya University

2 LoRa Based Indoor Localization
Dany Merhej, ISSAE-CNAM Liban Lebanese University; Iness Ahriz, Samuel Garcia, Michel Terré, CEDRIC Laboratory, CNAM

3 On the Performance of Handover Mechanisms for Non-Terrestrial Networks
Yusuf Islam Demir, Istanbul University-Cerrahpasa, Istanbul Medipol University; Muhammad Sohaib J. Solaija, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

4 Predictive Equalization for Underwater Optical Camera Communication
Asako Shigenawa, Yukito Onodera, Erina Takeshita, Tokyo University of Agriculture and Technology; Daisuke Hisano, Osaka University; Kazuki Maruta, Tokyo University of Science; Yu Nakayama, Tokyo University of Agriculture and Technology

5 UAV-Based FSO Communication Under Jamming
Isha Chauhan, Indian Institute of Technology Delhi; Manav R Bhatnagar, IIT Delhi

1D: IoT & IoV

1 Benefits of DCC Facilities in ITS-G5 Networks - First Simulated Results
Edmir Xhoxhi, Leibniz University Hannover; Florian Alexander Schiegg, Robert Bosch GmbH

2 Energy-Efficient Multi-Task Allocation for Antenna Array Empowered Vehicular Fog Computing
Xinlei Xie, Beijing Institute of Technology

3 Impact of Access Barring Schemes for Delay Tolerant MTC Devices on Energy Consumption
Julian Popp, Friedrich-Alexander Universität Erlangen-Nürnberg; Elke Roth-Mandutz, Fraunhofer Institute for Integraded Circuits; Joerg Robert, FAU Erlangen-Nuernberg

4 Run-time Per-Class Routing of AVB Flows in In-Vehicle TSN via Composable Delay Analysis
Weijiang Kong, Majid Nabi, Kees Goossens, Eindhoven University of Technology

5 Trajectory Planning for Data Collection in Multi-UAV Assisted WSNs
Ilham Benmad, Université de Moncton; Elmahdi Driouch, Université du Québec à Montréal; Mustapha Kardouchi, Université de Moncton

1E: Cooperative Systems

1 Adaptive and Stabilized Streaming for Edge-Assisted Connected Vehicles under Heterogeneous Computing Constraints
Rhoan Lee, Ewha Womans University; Haemin Lee, Soohyun Park, Joongheon Kim, Korea University

2 Communication Outages Mitigation through Mutual Assistance for Cellular V2X-Based Platooning
Kyeongnam Park, Hyogon Kim, Korea University

3 Content Sharing in Pedestrian-based Micro Clouds
Marco Rapelli, Politecnico di Torino; Gurjashan Singh Pannu, Paderborn University; Falko Dressler, TU Berlin; Claudio Casetti, Politecnico di Torino

4 Performance analysis of adaptive K for weighted K-nearest neighbor based indoor positioning
Siyang Liu, Universite Paris-Saclay, CNRS, CentraleSupelec, L2S

5 Improving the Latency of 5G V2N2V Communications in Multi-MNO Scenarios using MEC Federation
Baldomero Coll-Perales, Mª Carmen Lucas Estañ, Miguel Hernández University of Elche; Takayuki Shimizu, Toyota Motor North America, Inc.; Javier Gozálvez, Universidad Miguel Hernandez de Elche (UMH); Takamasa Higuchi, Sergei S. Avedisov, Onur Altintas, Toyota Motor North America R&D; Miguel Sepulcre, Universidad Miguel Hernandez de Elche (UMH)
Paper on USB stick at DATA/P1002.PDF

2A: RIS 1

1 Machine Learning for IRS-Assisted MU-MIMO Communications with Estimated Channels
Zhizhou He, Fabien Heliot, Yi Ma, University of Surrey

2 On the Behavior of the Near-Field Propagation Matrix between two Antenna Arrays, with Applications to RIS-Based Over-the-Air Beamforming.
Krishan Kumar Tiwari, Giuseppe Caire, Technical University of Berlin

3 RIS-Assisted Vehicular Network with Direct Transmission over Double-Generalized Gamma Fading Channels
Chapala Vinay Kumar, Arsalan Malik, Syed Mohammad Zafaruddin, BITS Pilani

4 Secrecy Capacity Maximization for a Hybrid Relay-RIS Scheme in mmWave MIMO Networks
Edson Nobuyuki Egashira, Diana Pamela Moya Osorio, University of Oulu; Nhan Thanh Nguyen, Uiniversity of Oulu; Markku Juntti, University of Oulu

Monday, 20 June 2022 14:00-15:30 Nautica

2B: Positioning 1

1 An Interacting Multiple Model Estimator of LEO Satellite Clocks for Improved Positioning
Zak (Zaher) Kassas, Nadim Khairallah, University of California, Irvine

2 Distributed Network Formation for Moving Wireless Nodes with Limited Location Information
Veselin Rakocevic, Milan Cvjetkovic, City University of London

3 Drone localization based on 3D-AoA signal measurements
Mehari Meles, Lauri Mela, Akash Rajasekaran, Kalle Ruttik, Riku Jäntti, Aalto University

4 Indoor Positioning via Gradient Boosting Enhanced with Feature Augmentation using Deep Learning
Ashkan Goharfar, Jaber Babaki, Mehdi Rasti, Amirkabir University of Technology; Pedro J. H. Nardelli, Lappeenranta University of Technology

5 RAIL: Robust Acoustic Indoor Localization for Drones
Alireza Famili, Angelos Stavrou, Haining Wang, Jung-Min (Jerry) Park, Virginia Tech

Monday, 20 June 2022 14:00-15:30 Press Room

2C: MIMO 1

1 Deep Unfolding-based Detection for Quantized Massive MU-MIMO-OFDM Systems
Changjiang Liu, John Thompson, Tughrul Arslan, University of Edinburgh

2 Massive MIMO Codebook Design in Sub-6 GHz 5G NR
Ryan Dreifuerst, University of Texas at Austin; Robert W. Heath Jr., North Carolina State University; Ali Yazdan, Facebook Inc.

3 Measurement-Based Validation of Z3RO Precoder to Prevent Nonlinear Amplifier Distortion in Massive MIMO Systems
Thomas Feys, KU Leuven

4 MIMO Hybrid Beamforming for Line-of-Sight Interference Channels
Benjamin W. Domae, MIT Lincoln Laboratory; University of California, Los Angeles; Danijela Cabric, University of California Los Angeles; David W. Browne, MIT Lincoln Laboratory

5 Performance of Limited Feedback for Best Companion Grouping in Multi-user MIMO System
Leechun Kim, Kwonyeol Park, Sanghyun Lee, Min-Ho Shin, Jonghan Kim, Samsung Electronics

Monday, 20 June 2022 14:00-15:30 Baltica

2D: VLC & Optical 1

1 Adaptive Energy Saving Technique with Saturation Avoidance for Outdoor VLC
Antonio Costanzo, Inria; Valeria Loscri, Inria Lille - Nord Europe

2 DarkSLAM: GAN-assisted Visual SLAM for Reliable Operation in Low-light Conditions
Alena Savinykh, Mikhail Kurenkov, Evgeny Kruzhkov, Evgeny Yudin, Andrei Potapov, Pavel Karpyshev, Dzmitry Tsetserukou, Skolkovo Institute of Science and Technology

3 Optical Wireless Transmissions over Multi-layer Underwater Channels with Generalized Gamma Fading
Suhrid Das, Jalpaiguri Government Engineering College; Ziyaur Rahman, Syed Mohammad Zafaruddin, BITS Pilani

4 Optimum LED semiangle and the receiver FOV selection for Indoor VLC System with Human Blockages
Anand Singh, Anand Srivastava, Vivek Bohara, IIIT-Delhi

5 Simultaneous Data Transmission and Sensor Interrogation in a Fiber Optical Sensor Network
Jasmeet Singh, Marek Götten, Andreas Ahrens, Steffen Lochmann, University of Applied Sciences Wismar

Monday, 20 June 2022 14:00-15:30 Compass

2E: Equalization

1 Characterisation and Cancellation of Interference with Multiple Phase-coded FMCW Dual-Function RADAR Communication Systems
François De Saint Moulin, Claude Oestges, Luc Vandendorpe, Université catholique de Louvain

2 Effective Equalization for Overlapped Chirp-based Communications Systems
Thuy Pham, Andre Noll Barreto, Sayed Hossein Dokhanchi, Gerhard Fettweis, Barkhausen Institut

3 Hybrid Multi-User Equalization and Analog Precoder for Uplink mmWave Cell Free Systems
Joumana Kassam, Daniel Castanheira, Adão Silva, Universidade de Aveiro; Rui Dinis, Universidade Nova de Lisboa; Atilio Gameiro, Universidade Aveiro

4 Inter-Numerology Interference Pre-Equalization for 5G Mixed-Numerology Communications
Buğra Alp Çevikgibi, Murat Demirtas, Tolga Girici, TOBB University of Economics and Technology; Hüseyin Arslan, University of South Florida

5 On Estimating the Autoregressive Coefficients of Time-Varying Fading Channels
Julia Vinogradova, Gabor Fodor, Peter Hammarberg, Ericsson Research

Monday, 20 June 2022 14:00-15:30 Europaea

2F: EVVEIC 1

1 Analysis of Vehicular Scenarios and Mitigation of Cell Overload due to Traffic Congestions
Martín Trullenque Ortiz, i2CAT Foundation; Oriol Sallent, Universitat Politècnica de Catalunya (UPC); Daniel Camps-Mur, Josep Escrig Escrig, Carlos Herranz, i2CAT Foundation

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2 Empirical Evaluation of the Performance of Electric Vehicles for Taxi Operation
João Neves, Ana Loureiro, Pedro M. d'Orey, Vera Miguéis, Álvaro Costa, University of Porto; Michel Ferreira, Universidade do Porto

3 On the effectiveness of BSM communications in V2V emergency scenarios
Francesco Pollicino, Dario Stabili, Mirco Marchetti, Università di Modena e Reggio Emilia

4 S-LDM: Server Local Dynamic Map for Vehicular Enhanced Collective Perception
Francesco Raviglione, Politecnico di Torino; Carlos Mateo Risma Carletti, CNIT - Politecnico di Torino; Claudio Casetti, Politecnico di Torino; Filippo Stoffella, Centro Ricerche FIAT; Girma Mamuye Yilma, NEC Laboratories Europe GmbH; Filippo Visintainer, Centro Ricerche FIAT

3A: NOMA 1
1 Backscatter-Aided NOMA V2X Communication under Channel Estimation Errors
Wali Ullah Khan, University of Luxembourg; Muhammad Ali Jamshed, University of Glasgow; Asad Mahmood, Eva Lagunas, Symeon Chatzinotas, Bjorn Ottersten, University of Luxembourg

2 DNN-based Active User Detection for an NB-IoT Compatible Grant Free NOMA System
Praveen Kumar N, Naveen Mysore Balasubramanya, Indian Institute of Technology Dharwad

3 Transmit Beamforming Designs for Secure Transmission in MISO-NOMA Networks
Yanbo Zhang, Fujian Normal University; Zheng Yang, Southwest Jiaotong University; Jingjing Cui, University of Southampton; Yi Wu, Fujian Normal University; Jun Zhang, Nanjing University of Posts and Telecommunications; Chao Fang, Beijing University of Technology; Zhiguo Ding, UMIST

4 Uplink Performance Analysis of Grant-Free NOMA Networks
Canjian Zheng, Harbin Institute of Technology (Shenzhen); Fu-Chun Zheng, Harbin Institute of Technology (Shengzhen) & The University of York; Jingjing Luo, Xiaogang Xiong, Harbin Institute of Technology (Shenzhen); Daquan Feng, Shenzhen University

3B: Radio Access
1 A Measurement Study on the Application-level Performance of NSA-NR
Lukas Prause, Mark Akselrod, Leibniz Universität Hannover

2 Analysis and Performance Evaluation of Mobility for Multi-Panel User Equipment in 5G Networks
Subhyal Bin Iqbal, Nokia Solutions and Networks, Munich, Technische Universität Dresden; Ahmad Awada, Nokia Bell Labs; Umur Karabulut, Ingo Viering, Nokia Solutions and Networks, Munich, Germany; Philipp Schulz, Technische Universität Dresden; Gerhard Fettweis, TU Dresden

3 On the Value of Context Awareness for Relay Activation in Beyond 5G Radio Access Networks
Jordi Pérez-Romero, Universitat Politècnica de Catalunya; Oriol Sallent, Universitat Politecnica de Catalunya (UPC)

4 Rethinking Buffer Status Estimation to Improve Radio Resource Utilization in Cellular Networks
Flavien Ronteix-Jacquet, Orange Innovation; Xavier Lagrange, IMT Atlantique, IRISA; Isabelle Hamchaoui, Orange; Alexandre Ferrieux, Orange Labs

5 Root Cause Analysis of Low Throughput Situations Using Boosting Algorithms and the TreeShap Analysis
Madalena Cilínio, Instituto Superior Técnico; David Duarte, Instituto de Telecomunicacoes and CELFINET; Pedro Vieira, Instituto de Telecomunicações and ISEL; António J. Rodrigues, IT and Instituto Superior Técnico; Maria Paula Queluz, Instituto Superior Técnico

3C: Mobile Networks
1 Benchmarking of Mobile Communications in High-Speed Scenarios: Active vs. Passive Modifications in High-Speed Trains
Sonja Tripkovic, Philipp Svoboda, Markus Rupp, TU Wien

2 Energy- and Cost-Efficient Transmission Strategy in Networked UAV Control System with ADP Trajectory Tracking Control
Minkai Zhang, Harbin Institute of Technology (Shenzhen); Shaohua Wu, Harbin Institute of Technology; Ying Wang, Jian JIAO, Harbin

Institute of Technology (Shenzhen); Ning Zhang, University of Windsor; Zhang Qinyu, Harbin Institute of Tech.

3 Less Complex Algorithm to Max-Min the Resource Allocation for Unmanned Aerial Vehicles Networks
Hamzih Alsmadi, Huda Y. Alsheyab, Malek Alsmadi, Salama Ikki, Lakehead University

4 Measurement of 60 GHz Communication Network and Ray Tracing Comparison for Intra-Wagon
Randy Verdecia-Peña, María A. Serrano, Jorge Alvarez-Casado, José I. Alonso, Universidad Politécnica de Madrid

5 The epsilon-stable region analysis in dynamic downlink cellular networks
Qiong Liu, Jean-Yves Baudais, Philippe Mary, INSA Rennes

3D: Antennas
1 Antenna Array Configuration for Reliable Communications in Maritime Environments
Michiel Sandra, Guoda Tian, Xuesong Cai, Anders J Johansson, Lund University

2 Compressive-Sampling Spectrum Scanning with a Beamforming Receiver for Rapid, Directional, Wideband Signal Detection
Petar Barac, Matthew Bajor, Peter Kinget, Columbia University

3 Enable SDRs for real-time MIMO Channel Sounding featuring parallel coherent Rx channels
Daniel Stanko, Fraunhofer Institute for Integrated Circuits IIS; Gerd Sommerkorn, Technische Universität Ilmenau; Alexander Ihlow, Institute for Information Technology, Technische Universität Ilmenau; Giovanni Del Galdo, Fraunhofer Institute for Integrated Circuits IIS

4 Fast 5G Beam Tracking at The User Equipment with Analog Beamformer
Edoardo Casarin, Riccardo Bersan, Daniele Piazza, Alberto Zecchin, Adant Technologies; Stefano Tomasin, University of Padova

5 Field Study on Multi-Antenna Radio Technologies for Future Railway Communications at 1.9 GHz
Bernd Holfeld, Moritz Lossow, Maksym Tyrskyy, Deutsche Bahn; Said Mehira, Rohde & Schwarz; Lourdes Garcia, Simon Biemond, Christoph Bach, Ericsson

3E: Satellite Communications
1 Area-Power Analysis of FFT Based Digital Beamforming for GEO, MEO, and LEO Scenarios
Rakesh Palisetty, University of Luxembourg

2 Capacity Study for a 5G Satellite System to support Railway FRMCS Critical service over Europe
Cristian Iacurto, Tommaso Catuogno, Alessandro Brizzi, Luca Pandolfi, Alessia Miglietta, Thales Alenia Space; Carl-Herbert Rokitansky, Kurt Eschbacher, University of Salzburg; Vincenzo Pellegrini, EikonTech; Nikolaos Toptsidis, European Space Agency

3 Interference Suppression by Directivity Control Towards Frequency Sharing for Space-Air-Ground Integrated Networks in Internet of Things
Akinori Matsushita, Yuichi Kawamoto, Nei Kato, Tohoku University

4 Location-Based Handover Triggering for Low-Earth Orbit Satellite Networks
Enric Juan, Aalborg University; Mads Lauridsen, Nokia; Jeroen Wigard, Nokia Bell Labs; Preben Mogensen, Aalborg University

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4A: Machine Learning 2

1 Actor-Critic Scheduling for Path-Aware Air-to-Ground Multipath Multimedia Delivery
Achilles Machumilane, University of Pisa; Alberto Gotta, Pietro Cassarà, ISTI-CNR; Claudio Gennaro, Giuseppe Amato, Information Science and Technologies (ISTI), CNR, Pisa

2 Deep Learning-based Multi-Connectivity Optimization in Cellular Networks
Juan Jesús Hernandez, Jordi Pérez-Romero, Oriol Sallent, Irene Vilà Muñoz, F. Casadevall, Universitat Politecnica de Catalunya (UPC)

3 FWSResNet: An Edge Device Fingerprinting Framework Based on Scattering and Convolutional Networks
Tiantian Zhang, Pinyi Ren, Zhanyi Ren, Dongyang Xu, Xi'an Jiaotong Uinversity

4B: Positioning 2

1 Multi-User Position Estimation and Performance Trade-offs in IEEE 802.11az WLANs
Varun Amar Reddy, Qualcomm Wireless Research; Gordon Stüber, Georgia Tech

2 Transfer Learning to adapt 5G AI-based Fingerprint Localization across Environments
Maximilian Stahlke, Fraunhofer IIS; Tobias Feigl, Fraunhofer IIS, Fraunhofer Institute for Integrated Circuits IIS; Mario H. Castañeda Garcia, Richard A. Stirling-Gallacher, Huawei Technologies Duesseldorf GmbH; Jochen Seitz, Christopher Mutschler, Fraunhofer IIS, Fraunhofer Institute for Integrated Circuits IIS

3 Unified Multi-Modal Data Aggregation for Complementary Sensor Networks
Maximilian Berndt, Dennis Krummacker, Christoph Fischer, German Research Center for Artificial Intelligence (DFKI); Hans D.Schotten, Technical University of Kaiserslautern

4 Urban Navigation with LTE using a Large Antenna Array and Machine Learning
Russ Whiton, Volvo Cars; Junshi Chen, Lund University; Tobias Johansson, Volvo Car Corporation; Fredrik Tufvesson, Lund University

5 Vehicular Positioning and Tracking in Multipath Non-Line-of-Sight Channels
Zhicheng Ye, University of Aalto; Julia Vinogradova, Gabor Fodor, Peter Hammarberg, Ericsson Research

4C: MIMO 2

1 Data-Driven Beamforming Codebook Design to Improve Coverage in Millimeter Wave Networks
Mustafa Furkan Özkoç, Caglar Tunc, Shivendra Panwar, New York University

2 Neural Network-Based Optimization of Progressive Image Transmission in MIMO systems
Jiyoung Pyo, Konkuk University; Sang-Hyo Kim, Sungkyunkwan University; Seok-Ho Chang, Konkuk University

3 Overlap-Save FBMC receivers for massive MIMO systems under channel impairments
Fatima Hamdar, IMT- Atlantique; Jeremy Nadal, Polytechnique Montréal; Charbel Abdel Nour, IMT Atlantique; Amer Baghdadi, IMT Atlantique/Lab-STICC

4 Performance-Complexity Trade-Off for Low-Complexity MIMO Detection: simplified BP vs. EP Receivers
Adam Mekhiche, INP Toulouse - ENSEEIHT; Antonio Maria Cipriano, Thales Communications and Security; Charly Poulliat, INP Toulouse - ENSEEIHT

5 Spectral Efficiency Optimization for mmWave Wideband MIMO RIS-assisted Communication
Pooja Nuti, Elyes Balti, Brian Evans, The University of Texas at Austin

4D: VLC & Optical 2

1 A Hybrid Wavelength Allocation Framework for Fiber-Wireless Based Vehicle-to-Infrastructure Communication Network
Mehreen, Akshita Gupta, Vivek Bohara, Anand Srivastava, Indraprastha Institute of Information Technology (IIIT- Delhi)

2 A Dualâ€"hop Optical Underwater Wireless Relay Communications System
Mohammad Furqan Ali, National Research Tomsk Polytechnic University; Dushantha Nalin K. Jayakody, University Autónoma de Lisboa; Piyaruwan Terence Palihakkara Gamage, Basic Technical Education Centre; Rui Dinis, Universidade Nova de Lisboa

3 Experimental Validation of Optical Wireless Receiver using Solar Panel with Bandwidth Enhancement Circuit
Rahul, Abhijit Mitra, Anand Srivastava, Vivek Bohara, IIIT-Delhi; Deepak Solanki, Velmenni R&D

4 INVISIBLE: Enhanced Handover technique for Vehicular Visible Light Networks
Meysam Mayahi, Inria Lille-Nord Europe; Valeria Loscri, Inria Lille - Nord Europe; Antonio Costanzo, Inria

5 Joint Pre- and Post-Equalization in Optical MIMO Systems using Multi-Level Signaling
Jasmeet Singh, Marek Götten, Andreas Ahrens, Steffen Lochmann, University of Applied Sciences Wismar

4E: Green Communications

1 Application of Feedforward Compensation in the Design of Active Front-End Converters
Mahda Jahromi, Simon Fraser University

2 Autonomous Reconfigurable Intelligent Surfaces Through Wireless Energy Harvesting
Konstantinos Ntontin, University of Luxembourg; Alexandros Boulogeorgos, University of Piraeus; Emil Björnson, KTH Royal Institute of Technology; Dimitrios Selimis, National Centre for Scientific Research "Demokritos"; Wallace Alves Martins, University of Luxembourg; Sergi Abadal, Universitat Politècnica de Catalunya; Angeliki Alexiou, University of Piraeus; Fotis Lazarakis, National Centre for Scientific Research "Demokritos"; Steven Kisseleff, Symeon Chatzinotas, SnT, University of Luxembourg

3 Energy-Efficient Federated Learning for Wireless Computing Power Networks
Zongjun Li, Haibin Zhang, Xidian University; Qubeijian Wang, Wen Sun, Northwestern Polytechnical University; Yan Zhang, University of Oslo

4F: Mobile Systems

1 A VP-AltMin based Hybrid Beamforming in Integrated Sensing and Communication Systems for Vehicular Networks
Shenghui Dong, Xi'an Jiaotong University; Yanzhao Su, Jin Huang, Tsinghua University; Xinmin Luo, Jiancun Fan, Xi'an Jiaotong University; Hengfeng Zuo, Tsinghua University

2 Joint Ambiguity and Migration Mitigation for Enhanced High-Speed Moving Target Detection
Luzhou, Xu; Jaime Lien, Google; Jian Li, University of Florida

3 Measurement-based Evaluation of Uplink Throughput Prediction
Mate Boban, Huawei Technologies Duesseldorf GmbH; Chunxu Jiao, Huawei Technologies Co., Ltd.; Mohamed Gharba, Huawei Technologies Duesseldorf GmbH

4 Mitigation of Doppler Effect in High-speed Trains through Relaying
Pavel Mach, Zdenek Becvar, Jan Plachy, Czech Technical University in Prague

5A: RIS 2

1 Fine-Grained Analysis of Reconfigurable Intelligent Surface-Assisted mmWave Networks
Le Yang, Xiao Li, Southeast University; Shi Jin, Southern University; Michail Matthaiou, Queen's University Belfast; Fu-Chun Zheng, Southeast University

2 On LSTM Autoencoder-Based Hybrid Precoding for Reconfigurable Intelligent Surface-Aided Multiuser Millimeter-Wave Massive MIMO 6G Systems
Yi-Hsien Lu, Kai-Hao Ou, Hong-Yunn Chen, Meng-Hsun Wu, Ta-Wei Yang, Hsin-Han Tsai, Cheng-Fu Chou, National Taiwan University

3 Reconfigurable Intelligent Surface Empowered Multi-Hop Transmission over Generalized Fading
Chapala Vinay Kumar, BITS Pilani India; Syed Mohammad Zafaruddin, BITS Pilani

4 Symbiotic Radio based Spectrum Sharing in Cooperative UAV-IRS Wireless Networks
Sourabh Solanki, Université du Luxembourg; Sumit Gautam, Indian Institute of Technology - Indore; Vibhum Singh, Shree K. Sharma, Symeon Chatzinotas, SnT, University of Luxembourg

5B: Estimation & Synchronization 2

1 Channel-Estimation-Aware Joint Radar-Communications Designs
Xueyun Gu, Yunfei Chen, University of Warwick

2 Delay-Doppler Channel Estimation in OTFS Systems Using DoA Estimation Techniques
Jobin Francis, Vemireddy Phanindra Reddy, Indian Institute of Technology Palakkad

3 Estimation of Receiver Frequency Deviations in Multifunction Frequency-Modulating Transceivers
Micael Bernhardt, Jaakko Marin, Taneli Riihonen, Tampere University

4 Exploiting Implicit OVSF Structure in DM-RS for Improved Channel Estimation in 5G-NR Systems
Preethi, Abhay Mohan M V, K Giridhar, Indian Institute of Technology Madras

5 Signature Estimation of Dual Wideband Systems
Chandrashekhar Rai, Debarati Sen, Indian Institute of Technology Kharagpur

5C: Sensing 1

1 Correction of I/Q Imbalance in FMCW Radar System Using Geometric Sequence Decomposition
Jaehoon Jung, Sohee Lim, Jihye Kim, Jeong-Hoon Park, Seong-Cheol Kim, Seoul National University

2 Deep-Learning Based Multi-Object Detection and Tracking using Range-Angle Map in Automotive Radar Systems
Ji-He Kim, Ming-Chun Lee, Ta-Sung Lee, National Yang Ming Chiao Tung University

3 Disentangled Bad Weather Removal GAN for Pedestrian Detection
Hanting Yang, Alexander Carballo, Kazuya Takeda, Nagoya University

4 Evaluating the Impact of Map Inaccuracies on Path Discrimination Behind Railway Turnouts
Wendi Löffler, Mats Bengtsson, Royal Institute of Technology, Stockholm

5 Experimental Evaluation of Mutual Interference inAutomotive Radars
Gianluca Ciattaglia, Linda Senigagliesi, Deivis Disha, Adelmo de Santis, Ennio Gambi, Marche Polytechnic University

5D: Cell Free Systems

1 A Low Complexity Sequential Resource Allocation for Panel-Based LIS Surfaces
Andreia Pereira, Instituto de Telecomunicações - University of Coimbra; Fredrik Rusek, Lund University; Marco Gomes, Instituto de Telecomunicações - University of Coimbra; Rui Dinis, Universidade Nova de Lisboa

2 Cell-Free mMIMO Systems with Dynamic TDD
Hanwoong Kim, Hakkeon Lee, Taehyung Kim, Daesik Hong, Yonsei University

3 Design of Generalized Superimposed Training for Uplink Cell-free Massive MIMO Systems
Hanxiao Ge, Navneet Garg, Tharmalingam Ratnarajah, University of Edinburgh

4 Enhancing Physical Layer Security in Large Intelligent Surface-aided Cooperative Networks
Madi Makin, Nazarbayev University; Sultangali Arzykulov, Abdulkadir Çelik, Ahmed M. Eltawil, King Abdullah University of Science and Technology (KAUST); Galymzhan Nauryzbayev, Nazarbayev University

5 User Fairness in Radio Stripes Networks using Meta-Heuristics Optimization
Filipe conceição, Carlos Henggeler, Marco Gomes, Instituto de Telecomunicações - University of Coimbra; Vitor Silva, University of Coimbra; Rui Dinis, Universidade Nova de Lisboa

5E: Coding

1 A Scalable LDPC Coding Scheme for Adaptive HARQ Techniques
João Madeira, Universidade Nova de Lisboa - Faculdade de Ciências e Tecnologias; Joseanne Viana, Instituto Universitário de Lisboa; João Guerreiro, FCT-Universidade Nova de Lisboa, Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa

2 Applicability of Space-Time Block Codes for Distributed Cooperative Broadcasting in MANETs with High Node Mobility
Mus'ab Yüksel, University of Applied Sciences Darmstadt; Raphael T. L. Rolny, Armasuisse Science and Technology; Marc Kuhn, ZHAW; Michael Kuhn, University of Applied Sciences Darmstadt

3 Early Stopping of BP Polar Decoding Based on Parity-Check Sums
Alireza Hasani, Lukasz Lopacinski, Eckhard Grass, IHP - Leibniz-Institut fur innovative Mikroelektronik

4 HARQ Based Optimal Scheduling Strategy for Multi-Loop WNCS
Minghan Zhang, Harbin Institute of Technology (Shenzhen); Shaohua Wu, Harbin Institute of Technology; Yifei Qiu, Jian JIAO, Harbin Institute of Technology (Shenzhen); Ning Zhang, University of Windsor; Zhang Qinyu, Harbin Institute of Tech.

5 Phase Synchronization for Non-Binary Coded CCSK Short Frames
Kassem Saied, UBS (LabSTICC); Ali Chamas Al Ghouwayel, EFREI Paris; Emmanuel Boutillon, UBS (LabSTICC)

6A: NOMA 2

1 Impact of Channel Correlation on Subspace-Based Activity Detection in Grant-Free NOMA
Bashar Tahir, Stefan Schwarz, Markus Rupp, TU Wien

2 Low-Complexity Dynamic Channel Estimation in Multi-Antenna Grant-Free NOMA
Antoine O Berthet, CentraleSupélec, Université Paris-Saclay; Frederic Lehmann, Telecom SudParis; Fakher Sagheer, SAMOVAR, Télécom SudParis, Institut Polytechnique de Paris

3 **On Asymmetric Game for NOMA-ALOHA under Fading**
Jinho Choi, Deakin University; Youngwook Ko, University of York

4 **Waveform Design for Power-Domain Asynchronous NOMA**
Martin Sigmund, Roberto Bomfin, Technische Universität Dresden; Marwa Chafii, NYU Abu Dhabi; Ahmad Nimr, Technische Universität Dresden; Gerhard Fettweis, TU Dresden

Tuesday, 21 June 2022 16:00-17:30 Nautica
6B: Autonomous Vehicles
1 **An Analysis of Distributional Shifts in Automated Driving Functions in Highway Scenarios**
Oliver De Candido, Xinyang Li, Technical University of Munich; Wolfgang Utschick, Technische Univesitat Munchen

2 **An Inter-operable and Multi-protocol V2X Collision Avoidance Service based on Edge Computing**
Raul Parada, CTTC; Francisco Vázquez-Gallego, i2CAT Foundation; Roshan Sedar, Ricard Vilalta, CTTC

3 **LiDAR-Camera Fusion for Depth Enhanced Unsupervised Odometry**
Naida Fetic, Eren Aydemir, Mustafa Unel, Sabanci University

4 **Synchronization of Hybrid Models in the Automated Driving Simulation**
Wojciech Baron, Friedrich-Alexander-Universität Erlangen-Nürnberg; Christoph Sippl, Audi AG; Kai-Steffen Hielscher, Friedrich-Alexander-Universität Erlangen-Nürnberg; Reinhard German, University of Erlangen-Nürnberg

5 **Traffic-Aware Multi-View Video Stream Adaptation for Teleoperated Driving**
Markus Hofbauer, Technical University of Munich; Christopher B. Kuhn, BMW Group; Mariem Khlifi, Technical University of Munich; Goran Petrovic, BMW Group; Eckehard Steinbach, Technical University of Munich

Tuesday, 21 June 2022 16:00-17:30 Press Room
6C: AMMS 2
1 **Distributed Deployment of Aerial Base Stations with RF Energy Harvesting**
Shunya Kida, Tatsuaki Kimura, Tetsuya Takine, Osaka University

2 **K-Means Clustering-Based Dynamic Antenna Control for HAPS in Multi-Cell Configuration**
Siyuan Yang, Mondher Bouazizi, Tomoaki Ohtsuki, Keio University; Yohei Shibata, Wataru Takabatake, Kenji Hoshino, Atsushi Nagate, SoftBank Corp.

3 **Experimental UAV-Aided RSSI Localization of a Ground RF Emitter in 865 MHz and 2.4 GHz Bands**
Stefano Moro, Vineeth Teeda, Davide Scazzoli, Luca Reggiani, Maurizio Magarini, Politecnico di Milano

4 **Optimal offloading of computing-intensive tasks for edge-aided maritime UAV systems**
Huanran Li, Harbin Institute of Technology (Shenzhen); Shaohua Wu, Harbin Institute of Technology; Dongqing Li, Shenzhen Graduate School, Harbin Institute of Technology; Jian JIAO, Harbin Institute of Technology (Shenzhen); Ning Zhang, University of Windsor; Zhang Qinyu, Harbin Institute of Tech.

5 **SwarmHive: Heterogeneous Swarm of Drones for Robust Autonomous Landing on Moving Robot**
Ayush Gupta, Ahmed Baza, Ekaterina Dorzhieva, Mert Alper, Mariia Makarova, Stepan Perminov, Aleksey Fedoseev, Dzmitry Tsetserukou, Skolkovo Institute of Science and Technology

Tuesday, 21 June 2022 16:00-17:30 Baltica
6D: Security 1
1 **ART: An Adaptive and Rotated Transmission for Physical Layer Security**
Kwonyeol Park, Samsung Electronics; Leechun Kim, Samsung electronics; Min-Ho Shin, Jonghan Kim, Woonhaing Hur, Samsung Electronics

2 **Secure Channel-Dependent Code Allocation in Downlink MC-CDMA System**
Hanadi Salman, Sanaz Naderi, Istanbul Medipol University; Hüseyin Arslan, University of South Florida

3 **A Framework for CAN Communication and Attack Simulation**
Jo Laufenberg, Thomas Kropf, Oliver Bringmann, University of Tuebingen

4 **Secret Key Generation Rates over Frequency Selective Channels**
Miroslav Mitev, Andre Noll Barreto, Thuy Pham, Gerhard Fettweis, Barkhausen Institut

5 **Spatial Degrees of Freedom for Physical Layer Security in XL-MIMO**
Gonzalo J. Anaya-López, Universidad de Málaga; Jose Gonzalez-Coma, University of A Coruna; F. Javier Lopez-Martinez, Universidad de Malaga

Tuesday, 21 June 2022 16:00-17:30 Compass
6E: Resource Allocation 1
1 **Dynamic-Structure Resource Block Allocation Based Scheduling for 5G Systems**
Ahmad M. Jaradat, Istanbul Medipol University; Mehmet Izzet Saglam, Turkcell Teknoloji Arastirma ve Gelistirme Anonim Sirketi; Hüseyin Arslan, University of South Florida; Mesut Kartal, Istanbul Technical University

2 **Flexible Resource Allocation for Differentiated QoS Provisioning in Beam-Hopping Satellite Communications System**
Zhenguo Wu, Pinyi Ren, Dongyang Xu, Xi'an Jiaotong University

3 **On The Design of Resilient and Reliable Wireless Backhaul Networks**
Ahmed Abdelmoaty, École de Technologie Supérieure , University of Quebec; Ghassan Dahman, École de technologie supérieure (ETS); Diala Naboulsi, École de Technologie Supérieure , University of Quebec; Gwenael Poitau, Ultra Electronics, TCS; Francois Gagnon, Ecole de Technologie Superieure

4 **Q-Learning-based Setting of Cell Individual Offset for Handover of Flying Base Stations**
Aida Madelkhanova, Zdenek Becvar, Czech Technical University in Prague; Thrasyvoulos Spyropoulos, EURECOM

5 **Radio Access Control of Access Points and Intelligent Reflecting Surfaces for Data Rate Improvement in Joint Transmission**
Tatsuya Nakazato, Yuichi Kawamoto, Nei Kato, Tohoku University

Tuesday, 21 June 2022 16:00-17:30 Europaea
6F: Vehicular Cooperation & Control
1 **Cooperative Path Planning Using Responsibility-Sensitive Safety (RSS)-based Potential Field with Sigmoid Curve**
Pengfei Lin, The University of Tokyo; Manabu Tsukada, the University of Tokyo

2 **Multi-Agent Reinforcement Learning for Channel Assignment and Power Allocation in Platoon-Based C-V2X Systems**
Van Hung Vu, Huawei Technologies Canada; Mohammad Farzanullah, Zheyu Liu, McGill University; Duy Nguyen, San Diego State University; Robert Morawski, Tho Le-Ngoc, McGill University

3 **Simulating Realistic Rain, Snow, and Fog Variations For Comprehensive Performance Characterization of LiDAR Perception**
Sven Teufel, Georg Volk, Alexander von Bernuth, Oliver Bringmann, University of Tübingen

4 **The Impact of Partial Packet Recovery on the Inherent Secrecy of Random Linear Coding**
Ioannis Chatzigeorgiou, Lancaster University

5 **Towards Safe and Efficient Modular Path Planning using Twin Delayed DDPG**
Marawan Azmy, The German International University; Ahmed Hussein, Intelligent Systems Functions Department, IAV GmbH; Amr El Mougy, German University in Cairo

Wednesday 22 June 2022

2 Optimal lifetime management strategy for Self-Reconfigurable Batteries
Jérôme Blatter, Vincent Heiries; Rémy Thomas, Ghislain Despesse, CEA-Leti, Université Grenoble Alpes

3 Real-time and multi-layered energy management strategies for fuel cell electric vehicle overview
Matthieu Matignon, Azib Toufik, Mehdi Mcharek, ESTACA; Ahmed Chaibet, University of Bourgogne

4 Voltage Stability of Automotive Power Supplies During Tripping Events of Melting and Electronic Fuses
Michael Gerten, Stephan Frei, TU Dortmund University; Michael Kiffmeier, Oliver Bettgens, CARIAD SE

Wednesday, 22 June 2022 11:00-12:30 Nordia
8A: THz Systems
1 Double-directional Multipath Data at 140 GHz Derived from Measurement-based Ray-launcher
Mar Francis De Guzman, Katsuyuki Haneda, Pasi Koivumäki, Aalto University

2 Dual-Beam Intelligent Reflecting Surface for Millimeter and THz Communications
Wei Jiang, German Research Center for Artificial Intelligence; Hans Schotten, University of Kaiserslautern

3 Overcoming Directional Deafness in High Frequency Sidelink Communications
Ashutosh Srivastava, New York University; Sanjay Goyal, Umer Salim, Interdigital Communications; Pei Liu, New York University; Ravi Pragada, Interdigital; Shivendra Panwar, New York University

4 Performance Analysis of Cooperative Relaying for Multi-Antenna RF Transmissions over THz Wireless Link
Pranay Bhardwaj, Syed Mohammad Zafaruddin, BITS Pilani

5 Virtualized terminal utilizing terahertz band radio waves for Beyond 5G : Link budget analysis
Yoshio Kunisawa, Yoshiaki Amano, KDDI Research, Inc.

Wednesday, 22 June 2022 11:00-12:30 Nautica
8B: Positioning 3
1 A Cluster-Based Weighted Feature Similarity Moving Target Tracking Algorithm for Automotive FMCW Radar
Rongqian Chen, University of Pennsylvania

2 Assessment of Feature Selection for Context Awareness RF Sensing Systems
Ricardo Cruz, Universidade Nova de Lisboa/Instituto de Telecomunicações; António Furtado, Instituto de Telecomunicações / Nova University of Lisbon; Rodolfo Oliveira, Universidade Nova de Lisboa/Instituto de Telecomunicações

3 Countrywide Basestation Localization with Timing Advance Measurements from Crowdsourcing
Lukas Eller, Vaclav Raida, Philipp Svoboda, Markus Rupp, TU Wien

4 Location-Aided Beamforming in Mobile Millimeter-Wave Networks
Sara Khosravi, Hossein Shokri-Ghadikolaei, Jens Zander, Marina Petrova, KTH, Royal Institute of Technology

5 Would Future mmWave Wireless Networks Be an Alternative Positioning Technique to GNSS-Based High Precision Positioning?
Sharief Saleh, Queen's University; Abdelsatar Elmezayen, Royal Military College of Canada; Qamar Bader, Queen's University; Mohamed Elhabiby, Ain Shams University; Aboelmagd Noureldin, Queen's University

Wednesday, 22 June 2022 11:00-12:30 Press Room
8C: Emerging Systems
1 A Novel Cell-Sweeping based Base Stations Deployment for Coverage, Throughput, and Energy Efficiency Enhancement
Ruben Borralho, Atta Quddus, University of Surrey; David Duarte, Instituto de Telecomunicacoes and CELFINET; Pedro Vieira, Insituto Superior de Engenharia de Lisboa; Abdelrahim Mohamed, Rahim Tafazolli, University of Surrey

2 Lightweight Digital Twin and Federated Learning with Distributed Incentive in Air-Ground 6G Networks
Sijia Lian, Haibin Zhang, Xidian University; Wen Sun, Northwestern Polytechnical University; Yan Zhang, University of Oslo

3 Performance of Uplink Coverage Enhancement Schemes for 5G NR in 3GPP
Junyung YI, Youngbum Kim, Hyunseok Ryu, Samsung Research, Samsung Electronics

4 Physical Layer Abstraction Model for RadioWeaves
R. Sarvendranath, Indian Institute of Technology Guwahati; Unnikrishnan Kunnath Ganesan, Zakir Hussain Shaik, Linkoping University; Erik G., Larsson

5 Uplink Tranmission Schemes for 5G NR Unlicensed: Design Principles and Achievable Performance
Elena Peralta, Nokia Bell Labs; Rafael Paiva, Nokia; Mikko Valkama, Tampere University

Wednesday, 22 June 2022 11:00-12:30 Baltica
8D: Security 2
1 Cross-locking Enabled Multi-route Fountain Coding for Secure Transmission
Liwei Huang, Pinyi Ren, Dongyang Xu, Xi'an Jiaotong University

2 Physical Layer Security of Buffer-Aided Hybrid Virtual Full-Duplex and Half-Duplex Relay Selection
Gan Srirutchataboon, Shinya Sugiura, The University of Tokyo

3 Re-Defining Secure Distance for CSI-based Key Generation Protocols
Chrysanthi Paschou, Oliver Johnson, University of Bristol; Ziming Zhu, Toshiba Europe Ltd; Angela Doufexi, University of Bristol

4 Robust secret key generation for frequency-selective channels
Magnus Sandell, Toshiba Europe Ltd

Wednesday, 22 June 2022 11:00-12:30 Compass
8E: Propagation & Channel Modeling
1 Angle-Resolved THz Channel Measurements at 300 GHz in an Industrial Environment
Alper Schultze, Fraunhofer Heinrich Hertz Institute; Mathis Schmieder, Fraunhofer HHI; Sven Wittig, Fraunhofer Heinrich Hertz Institute; Henrik Klessig, Robert Bosch GmbH; Michael Peter, Heinrich-Hertz-Institut; Wilhelm Keusgen, Technische Universität Berlin

2 Comparisons of Channel Characteristics and Capacities of Three 5G/B5G Wireless Channel Models
Yue Yang, Cheng-Xiang Wang, Jie Huang, Southeast University

3 Experimental Validation of Time Reversal Multiple Access for UWB Wireless Communications Centered at the 273.6 GHz Frequency
Mokh Ali, ESPCI Paris, PSL Research University, CNRS, Institut Langevin, France; Julien de Rosny, ESPCI Paris; George C. Alexandropoulos, National and Kapodistrian University of Athens; Mohamed Kamoun, Huawei Technologies; Abdelwaheb Ourir, ESPCI Paris; Ramin Khayatzadeh, Huawei Paris research center; Arnaud Tourin, Mathias Fink, ESPCI Paris

4 From 3D Point Cloud Data to Ray-tracing Multi-band Simulations in Industrial Scenario
Han Niu, Diego Dupleich, Yanneck Völker-Schöneberg, Alexander Ebert, Robert Mueller, Technische Universität Ilmenau; Joseph Eichinger, Huawei Technologies Duesseldorf GmbH; Alexander Artemenko, Robert Bosch GmbH; Giovanni Del Galdo, Reiner Thomä, Technische Universität Ilmenau

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5 Measurement-based characterization for polarimetric channel hardening in outdoor environments
Silvi Kodra, Xuefeng Yin, Tongji University; Ziming Yu, Huawei Technology Company

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9A: Intelligent Systems
1 Assessment of V2X Communications For Enhanced Vulnerable Road Users Safety
Mouna Karoui, Vincent Berg, Sylvie Mayrargue, CEA-Leti, Universite Grenoble Alpes

2 Autonomous miniature vehicle for testing 5G intelligent traffic weather services
Toni Perälä, Timo Sukuvaara, Kari Mäenpää, Finnish Meteorological Institute

3 DogTouch: CNN-based recognition of surface textures by quadruped robot with high density tactile sensors
Weerakkodi Mudalige Nipun Dhananjaya, Skolkovo Institute of Science and Technology

4 Effective Charging Strategies for Rental BEVs
Otto Piramuthu, Matthew Caesar, University of Illinois at Urbana-Champaign

9B: Energy Systems
1 Differential Chaos Shift Keying-based Wireless Power Transfer over a Frequency Selective Channel
Priyadarshi Mukherjee, Constantinos Psomas, Ioannis Krikidis, University of Cyprus

2 Optimum Constellation for Symbol-Error-Rate to PAPR Ratio Minimization in SWIPT
Manuel José López Morales, Kun Chen-Hu, Ana García-Armada, Universidad Carlos III de Madrid

9C: Sensing 2
1 An Integrated Reward Function of End-to-End Deep Reinforcement Learning for the Longitudinal and Lateral Control of Autonomous Vehicles
Sung-Bean Jo, Pyo-Sang Kim, Han-You Jeong, Pusan National University

2 Novel Approach for Gesture Recognition Using mmWave FMCW RADAR
Yanhua Zhao, IHP, Germany and HU, Berlin; Vladica Sark, Leibniz-Institut für innovative Mikroelektronik; Milos Krstic, IHP - Leibniz-Institut für innovative Mikroelektronik; Eckhard Grass, IHP, Germany and HU, Berlin

3 Road Markings and Road Edges Mapping With Inverse Visual Detector Model
Oleg, Evocargo LLC

4 Two-stage estimation algorithm based on interleaved OFDM for a cooperative bistatic ISAC scenario
Leonardo Leyva Lamas, University of Aveiro and Intituto de Telecomunicações; Daniel Castanheira, University of Aveiro; Adão Silva, DETI / Instituto de Telecomunicações / University of Aveiro; Atilio Gameiro, Universidade Aveiro

5 WiFi-Based Low-Complexity Gesture Recognition using Categorization
Jisoo Kim, Wha Sook Jeon, Seoul National University; Dong Geun Jeong, Hankuk University of Foreign Studies

9D: Low Latency
1 5G-NR Latency Field Performance for Immersive Live Videos
Jin Yang, Verizon Communications Inc.; Andreas Andersson, Ericsson; Susan Sanders, Verizon Communicaitons

2 Low-Latency MAC Design for Pairwise Random Networks
Irshad Ahmad Meer, KTH Royal Institute of Technology; Woong-Hee Lee, Korea University, South Korea; Mustafa Ozger, Cicek Cavdar, Ki Won Sung, KTH Royal Institute of Technology

3 Performance Evaluation of 5G Multi-Connectivity with Packet Duplication for Reliable Low Latency Communication in Mobility Scenarios
Prabodh Kumar Mishra, Snigdhaswin Kar, Clemson University

4 Proactive Resource Scheduling for 5G and Beyond Ultra-Reliable Low Latency Communications
Lam Ngoc Dinh, Mickael Maman, Emilio Calvanese Strinati, CEA-LetiI

5 Scaling Dense NB-IoT Networks to the Max: Performance Benefits of Early Data Transmission
Pascal Jörke, Tim Gebauer, Stefan Boecker, Christian Wietfeld, TU Dortmund University

9E: Resource Allocation 2
1 Markov Analysis of C-V2X Resource Reservation for Vehicle Platooning
Xin Gu, Jun Peng, Central South University; Lin Cai, University of Victoria; Xiaoyong Zhang, Zhiwu Huang, Central South University

2 Precoded Non-Orthogonal Frequency Division Multiplexing with Subcarrier Index Modulation
Prakash Chaki, Takumi Ishihara, Shinya Sugiura, The University of Tokyo

3 MIX-MAB: A Reinforcement Learning-based Resource Allocation Algorithm for LoRaWAN
Farzad Azizi, Benyamin Teymuri, Rojin Aslani, Mehdi Rasti, Amirkabir University of Technology; Jesse Tolvanen, Lappeenranta-Lahti University of Technology; Pedro J. H. Nardelli, Lappeenranta University of Technology

4 Spatial-Interference Aware Cooperative Resource Allocation for 5G V2V Communications
Silvia Mura, Francesco Linsalata, Marouan Mizmizi, Maurizio Magarini, Politecnico di Milano; Majid Nasiri Khormuji, Huawei Technologies Sweden; Peng Wang, Huawei Technologies, Sweden AB; Alberto Perotti, Huawei Technologies Sweden; Umberto Spagnolini, Politecnico di Milano

Virtual Only Papers

11 **Re-planning Optimization of Cooperative Vehicle Coordination at Road Intersections**
Chunsheng Chen, Jiping Luo, Tianhao Liang, Tingting Zhang, Harbin Institute of Technology (Shenzhen)

12 **Risk Avoidance by Vehicular Knowledge Networking**
Seyhan Ucar, Takamasa Higuchi, Onur Altintas, Toyota Motor North America R&D

13 **Vehicle Width Detection Based on Millimeter-Wave FMCW Radar for Autonomous Driving**
Wang Qiang, Shaoyi Xu, Beijing Jiaotong University

14 **Beam Prediction for mmWave Massive MIMO using Adjustable Feature Fusion Learning**
Sicheng Yang, Jianpeng Ma, Shun Zhang, Hongyan Li, Xidian University

15 **Cooperative Friendly Jamming in Swarm UAV-assisted Communications with Wireless Energy Harvesting**
Hanh Dang-Ngoc, University of Technology Sydney; Khuong Ho-Van, HoChiMinh City University of Technology; Diep Nguyen, Dinh Thai Hoang, Eryk Dutkiewicz, University of Technology Sydney

16 **Traffic Flow Estimation using Machine Learning and 4G/5G Radio Frequency Counters**
Armin Catovic, EQT Partners; Forough Yaghoubi, Ericsson; Arthur Gusmao, TRIQ Triathlon

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V4: Emerging Technologies, 6G and Beyond
1 **A Successive Deep Q-Learning Based Distributed Handover Scheme for Large-Scale LEO Satellite Networks**
Haotian Liu, Xi'an Jiaotong University; Yichen Wang, Yixin Wang, Xi'an Jiaotong University

2 **Doppler Diversity Reception for OTFS Modulation**
Zhihan Gong, Shengheng Liu, Yongming Huang, Southeast University

3 **Robust Beamforming Design for RIS-Aided NOMA Networks With Imperfect Channels**
Fengming Yang, Jianxin Dai, Nanjing University of Posts and Telecommunications; Cunhua Pan, Queen Mary University of London; Sheng Hong, Nanchang University; Hong Ren, Southeast University; Kezhi Wang, Northumbria University

4 **Multiuser Scheduling with Enhanced Greedy Techniques for Multicell and Cell-Free Massive MIMO Systems**
Saeed Mashdour, Pontifical Catholic University of Rio de Janeiro (PUC-Rio)

5 **Performance Evaluation of Unsourced Multiple Access with Polarization-Adjusted Convolutional Coding**
Zhuangzhuang Sun, Yue Xiao, Dengsheng Lin, Xinwei Xu, University of Electronic Science and Technology of China

6 **Reinforcement Learning based Multi-Attribute Slice Admission Control for Next-Generation Networks in a Dynamic Pricing Environment**
Victor da Cruz Ferreira, Universidade Federal do Rio de Janeiro; Haitham H. Esmat, Beatriz Lorenzo, University of Massachusetts; Sandip Kundu, University of Massachusetts Amherst; Felipe M. G. França, Federal University of Rio de Janeiro

Online
V5: Green Communications and Networks
1 **Energy and Spectrum Efficient Radio Frequency Fingerprint Intelligent Blind Identification**
Mingqian Liu, Zhiwen Yan, Junlin Zhang, Xidian University

2 **Performance Analysis of an STBC-MIMO LoRa System over Nakagami and Ricean Fading Channels with Imperfect Channel State Information**
Huan Ma, Guofa Cai, Yi Fang, Guangdong University of Technology; Huihui Wu, Huawei Technologies Co., Ltd.; Dr Shahid Mumtaz, Institute of Telecommunication, Aveiro

3 **Resource Allocation Strategy for UAV-assisted Non-linear Energy Harvesting MEC System**
Ximei He, Yisheng Zhao, Zhihong Xu, Yong Chen, Fuzhou University

4 **Throughput and Energy Aware Range Maximization in Cooperative Backscatter Communication Systems**
Amus Chee Yuen Goay, Deepak Mishra, YuFan Shi, University of New South Wales; A. Seneviratne, UNSW Sydney

5 **Resource Allocation and Offloading Strategy in Mobile Edge Computing Considering Mobility and Inter-user Relevance**
Suyun Kang, Fanghe Lu, Wanming Hao, Shouyi Yang, Zhengzhou University

6 **Detection Schemes for Integrated SWIPT Receivers with Non-Linear Energy Harvesting**
Goudeli Elleni, Constantinos Psomas, Ioannis Krikidis, University of Cyprus; Hamza Kiani, Symeon Nikolaou, Frederick University; David Chatzichristodoulou, RF and Microwave Solutions LTD

Online
V6: IoV, IoT, M2M, Sensor Networks, and Ad-Hoc Networking
1 **A Fairness-tunable Strategy for Intelligent Energy Balancing in UAV-IoT Systems**
Xiaohui Lin, Suzhi Bi, Shenzhen University; Nan Cheng, Xidian University; Mingjun Dai, Shenzhen University; Hui Wang, Shenzhen Institute of Information Technology

2 **A Stackelberg Game and Federated Learning Assisted Spectrum Sharing Framework for IoV**
Yuntao Zhu, Dou Hu, Bo Qian, Kai Yu, Nanjing University; Tingting Liu, Nanjing Institute of Technology; Haibo Zhou, Nanjing University

3 **A Station Grouping Method Considering Heterogeneous Traffic and Multiple Data Rates for IEEE 802.11ah Networks with Non-uniform Station Deployment**
Ren Nishida, Maki Shimokawa, Kosuke Sanada, Hiroyuki Hatano, Kazuo Mori, Mie University

4 **Age of Information in Wireless Sensor Networks with Non-linear Energy Harvesting and Outdated Channel Information**
Zhenchao Hao, Xiangdong Jia, Jin Xu, Northwest Normal University

5 **Blockchain-assisted D2D Data Sharing in Fog Computing**
Yi Peng, Taiping Cui, Bin Shen, Feng Lin, Chongqing University of Posts and Telecommunications; Huang Xiaoge, Qianbin Chen, University of Posts and Telecommunications

6 **Blockchain-enabled FD-NOMA based Vehicular Network with Physical Layer Security**
Ferheen Ayaz, Zhengguo Sheng, University of Sussex; Ivan Wang-Hei Ho, The Hong Kong Polytechnic University; Daxin Tian, Beihang University; Zhiguo Ding, UMIST

7 **Bulk Transmissions for S-ALOHA Systems**
Yangqian Hu, Hanyang University; Jun-Bae Seo, Gyeongsang National University; Hu Jin, Hanyang University

8 **Collision-Aware Random Access Control with Preamble Reuse for Industrial IoT**
Ziming Guo, Xu Zhu, Harbin Institute of Technology (Shenzhen); Zhongxiang Wei, Tongji University; Yufei Jiang, Harbin Institute of Technology (Shenzhen); Yuanchen Wang, University of Liverpool

9 **Delay-Minimized Routing for Full-Duplex Vehicular Ad-Hoc Networks**
Momiao Zhou, Hefei University of Technology

10 **Dynamic Game-based Caching Replacement in Edge Networks**
Huixian Gu, Xidian University; Weiwen Cai, China Mobile Group Guangdong Co., Ltd; Liqiang Zhao, Xidian University; Weimin Luo, China Mobile Group Guangdong Co., Ltd; Guorong Zhou, Xidian University; Qiming Chen, China Mobile Group Guangdong Co., Ltd; Haiyan Tu, Xidian University; Zhigang Wang, Shuchun Li, Guangdong Communications and Networks Institute

11 **Enhanced Preamble Based MAC Mechanism for IIoT-oriented PLC Network**
Kai Song, Biqian Feng, Yongpeng Wu, Wenjun Zhang, Shanghai Jiao Tong University

12 FD-M2MMAC: A Full-Duplex Many-to-Many MAC Protocol for Wireless Ad Hoc Networks
Wilton Pereira Santos Santana, Universidade Federal de Pernambuco; Renato Mariz de Moraes, Federal University of Pernambuco (UFPE)

13 Federated Deep Reinforcement Learning-Based Task Allocation in Vehicular Fog Computing
Jinming Shi, Jun Du, Jian Wang, Jian Yuan, Tsinghua University

14 GBHO: A Gain-Based Heuristic Offloading Algorithm in Vehicular Edge Computing
Tzung-Ren Kuo, Dou Li, Peking University

15 Global Edge Bandwidth Cost Gradient-based Heuristic for Fast Data Delivery to Connected Vehicles under Vehicle Overlaps
Akshaj Gupta, Joseph John Cherukara, Deepak Gangadharan, International Institute of Information Technology, Hyderabad; BaekGyu Kim, DGIST; Oleg Sokolsky, Insup Lee, University of Pennsylvania

16 Index Coded - NOMA in Vehicular Ad Hoc Networks
Sreelakshmi P., Jesy Pachat, National Institute of Technology, Calicut; Anjana A. Mahesh, Indian Institute of Science, Bangalore; Deepthi P.P., National Institute of Technology, Calicut; B. Sundar Rajan, Indian Institute of Science, Bangalore

17 Index Coded Modulation in Network to Vehicle (N2V) Communication
Jesy Pachat, Deepthi P.P., National Institute of Technology, Calicut; B. Sundar Rajan, Indian Institute of Science, Bangalore

18 IntelligentChain: Blockchain and Machine Learning based Intelligent Security Application for Internet of Vehicles (IoV)
Amritesh Kumar, Debasis Das, Indian Institute of Technology Jodhpur Rajasthan

19 MAB-Based 3-Way Neighbor Discovery for Wireless Networks Using Directional Antennas
Wenliang Sun, Yichen Wu, Yu Zhang, Tsinghua University

20 Optimal Update for Energy Harvesting Sensor with Reliable Backup Energy
Lixin Wang, Tsinghua University; Fuzhou Peng, Xiang Chen, Sun Yat-sen University; Shidong Zhou, Tsinghua University

21 Path-Aware OMP Algorithms for Provenance Recovery in Wireless Networks
Shilpi Mishra, IIT Delhi; Harshan Jagadeesh, IIT Delhi, India; Ranjitha Prasad, Indraprastha Institute of Information Technology Delhi

22 Proof-of-Communication-Capability Based Authentication in Blockchain-enabled Wireless Autonomous Vehicular Networks
Ali Hussain Khan, Lahore University of Management Sciences; Chuadhry Mujeeb Ahmed, University of Strathclyde, Glasgow; Naveed Ul Hassan, Lahore University of Management Sciences; Zartash Afzal Uzmi, LUMS University

23 QoS-Guarantee Access Management for Massive MTC Networks
Ting Qi, Nanjing University of Posts and Telecommunications; Wei Feng, Tsinghua University; Yunfei Chen, University of Warwick

24 RIS-Assisted Over-the-Air Computation in Millimeter Wave Communication Networks
Lin Hu, Zhibin Wang, Hongbin Zhu, Yuanming SHI, Yong Zhou, ShanghaiTech University

25 Scheduling to Minimize Control Cost in Multi-loop Wireless Networked Control with Imperfect Sensors
HE MA, Lixin Wang, Shidong Zhou, Tsinghua University

26 Wake-up Control for Energy-Efficient Anomaly Detection in Wireless Sensor Networks
Hitoshi Kawakita, Hiroyuki Yomo, Kansai University

27 Workflow Scheduling Using Hybrid GA-PSO Algorithm in Serverless Edge Computing for the Internet of Things
Renchao Xie, Dier Gu, Qinqin Tang, Tao Huang, Beijing University of Posts and Telecommunication; F. Richard Yu, Carleton University

28 Age of Information Optimization in Heterogeneous Multi-access Cognitive Radio Networks
Junyan Wang, Zhenchao Hao, Jiaxiang Yin, Northwest Normal University

29 Design and Implementation of Adaptive-Bitrate-Streaming-based Edge Caching
Yinxin Li, Haiyan Tu, Guorong Zhou, Xidian University; Ting Li, China Mobile Research Institute; Yunfeng Wang, Kai Liang, Xidian University; Zhigang Wang, Guangdong Communications and Networks Institute; Liqiang Zhao, Xidian University

30 V2E Association and Resource Allocation via Deep Reinforcement Learning in MEC-based HetVNets
Yuying Wu, Zhengming Zhang, Southeast University; Paul Zheng, Yulin Hu, Anke Schmeink, RWTH Aachen University

31 Power Delay Profile Estimation for 5G NR via Learning-based Advantage Actor-Critic (A2C)
Hyukjoon Kwon, Samsung

32 Performance Analysis of IRS-assisted Backscatter Communications Under Hardware Imperfections
Ahmad Massud Tota Khel, Khaled Altuwairgi, Khairi Hamdi, University of Manchester

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V7: Machine Learning and AI for Communications

1 A Deep Reinforcement Learning based Analog Beamforming Approach in Downlink MISO Systems
hang zhou, Xiaoyan Wang, Ibaraki University; Masahiro Umehira, Nanzan University; Yusheng Ji, National Institute of Informatics

2 A Neural-Network-Based Uplink Interference Identification Algorithm for Ultra-Dense networks
Ganyuan Duan, Yichen Guo, Tao Peng, Wenbo Wang, Beijing University of Posts and Telecommunications

3 Adaptive Function Placement with Distributed Deep Reinforcement Learning in RAN Slicing
Yu Tsukamoto, Haruhisa Hirayama, Seung Il Moon, Hiroyuki Shinbo, KDDI Research, Inc.

4 An Improved Automatic Modulation Classification Scheme Based on Adaptive Fusion Network
Hao Shi, Qi Peng, Yiqi Zhuang, Xidian University

5 Automatic Modulation Classification for Cognitive Radio Systems using CNN with Probabilistic Attention Mechanism
Abhishek Gupta, Xavier Fernando, Ryerson University

6 Beamforming and resource allocation in multi-cell OFDMA systems based on deep transfer reinforcement learning
Gaoxiang Sun, Xiaoming Wang, Rui Jiang, Youyun Xu, Nanjing University of Posts and Telecommunications

7 Clustering Optimization and HOG Feature Extraction based Primary User Activity Scene Recognition Scheme
Yu Wang, Xin Wang, Bin Shen, Taiping Cui, Chongqing University of Posts and Telecommunications

8 Compressed beam selection for single/multi-cell beam management
Xia Li, Bo Gao, Yongcheng Wang, Qingkai Luo, Shijia Shao, Xikun Yang, Wenjun Yan, Hao Wu, Bingtao Han, ZTE Corporation

9 Deep Learning for Fast Beam Tracking using RSRP in Millimeter Wave MIMO Systems
Jiankun Zhang, Guanglong Du, Hongxiang Xie, Hao Wang, Huawei Technologies

10 Deep Learning-Based Time-varying Channel Prediction for MIMO Systems
Shiyu Zhang, Yuxiang Zhang, Zhen Zhang, Zhang Jianhua, Beijing University of Posts and Telecommunications; Liang Xia, Tao Jiang, China Mobile Research Institute

11 **Deep Reinforcement Learning-Based Task Scheduling in Heterogeneous MEC Networks**
Ying Shang, Jinglei Li, Xidian University; Meng Qin, Peking University; Qinghai Yang, Xidian University

12 **Joint Fine Time Synchronization and Channel Estimation Using Deep Learning for Wireless Communication Systems**
Chin-Liang Wang, Cheng-Chieh Hsieh, National Tsing Hua University

13 **Joint Weighted and Truncated Nuclear Norm Minimization for Matrix Completion-Assisted mmWave Massive MIMO Channel Estimation**
Yunyi Li, Jianxun Liu, Chaoyang Chen, Hunan University of Science and Technology; Guan Gui, Nanjing University of Posts and Telecommunications; Tomoaki Ohtsuki, Keio University; Hikmet Sari, Nanjing University of Posts and Telecommunications

14 **MAB-based Joint Optimization of Wireless LAN and Machine Learning for Communication-efficient Distributed Inference in Lossy Networks**
Kojin Yorita, Tokyo Institute of Technology; Sohei Itahara, Kyoto University; Takayuki Nishio, Tokyo Institute of Technology; Daiki Yoda, Toshiba; Toshihisa Nabetani, Toshiba Corporation

15 **Machine Learning based Interference Whitening in 5G NR MIMO Receiver**
Shailesh Chaudhari, Hyukjoon Kwon, Samsung

16 **Millimeter-wave Received Power Prediction Using Point Cloud Data and Supervised Learning**
Shoki Ohta, Takayuki Nishio, Tokyo Institute of Technology; Riich Kudo, NTT Corporation; Kahoko Takahashi, NTT

17 **Modeling and Analysis of Intermittent Federated Learning Over Cellular-Connected UAV Networks**
Chun-Hung Liu, Mississippi State University; Di-Chun Liang, Rung-Hung Gau, National Chiao Tung University; Lu Wei, Texas Tech University

18 **Reinforcement Learning for Standards Design**
Shahrukh Khan Kasi, University of Oklahoma; Sayandev Mukherjee, Lin Cheng, Bernardo Huberman, CableLabs

19 **ResNet-Based Top-N Transmit Antenna Selection Algorithm for Massive MIMO Systems**
Yunfei Zheng, Yuxiang Zhang, Zhang Jianhua, Beijing University of Posts and Telecommunications; Liang Xia, China Mobile Research Institute; Tao Jiang, China Mobile Research Institution

20 **SNR-aware Automatic Modulation Recognition based on Modified Deep Residual Networks**
JingyaYang, Yan Peng, University of Chinese Academy of Sciences; Yiqing Zhou, Ling Liu, Yanli Qi, Institute of Computing Technology, Chinese Academy of Sciences

21 **User Scheduling in Massive MIMO: A Joint Deep Learning and Genetic Algorithm Approach**
Mostafa Mohammadkarimi, Delft University of Technology; Mostafa Darabi, The University of British Columbia; Behrouz Maham, Nazarbayev University

22 **Wireless Channel Prediction for Multi-user Physical Layer with Deep Reinforcement Learning**
Man Chu, Shenzhen MSU-BIT University; An Liu, Zhejiang University; Chen Jiang, DJI Creative Studio LLC; Vincent K. N. Lau, The Hong Kong University of Science and Technology; Tingting Yang, Dalian Maritime University

23 **A Novel Probe Selection Algorithm based on Standard FR1 MIMO OTA Testing Solutions**
Xiaohang Yang, CAICT

24 **A Scheme for Uplink NOMA Communication with Intelligent Resource Allocation for mMTC Traffic over eMBB Traffic**
Xiangyu Zhu, Southeast University; Jie Wang, southeast university of China; Jiamin Li, Southeast University; Hua Lu, Guangdong Communication and Networks Institute; Qiuyu Lai, Xinpeng Luo, Southeast University

25 **Delivery with UAVs: a simulated dataset via ATS**
Giulio Rigoni, University of Florence; Bhumika, Indian Institute of Technology, Jodhpur; Cristina M. Pinotti, University of Perugia; Debasis Das, Indian Institute of Technology Jodhpur Rajasthan; Sajal K. Das, Missouri Univ. of Science and Technology

26 **Ensemble-Based Distributed Learning for Generative Adversarial Networks**
Chonghe Liu, Jinke Ren, Guanding Yu, Zhejiang University

27 **Using Optimized Focal Loss for Imbalanced Dataset on Network Intrusion Detection System**
Mulyanto, Setya Widyawan Prakosa, Muhamad Faisal, Jenq-Shiou Leu, National Taiwan University of Science and Technology

28 **Compression of Channel Coefficients with Neural Networks for NR and LTE**
Ramin Soltani, Samsung Semiconductor Inc; Hyukjoon Kwon, Samsung; Mu-Sheng Lin, Samsung Semiconductor Inc; Jungwon Lee, Samsung Electronics; Inyup Kang, Samsung Semiconductor Inc

29 **Distributed Finite-Sum Constrained Optimization subject to Nonlinearity on the Node Dynamics**
Mohammadreza Doostmohammadian, Aalto University,; Maria Vrakopoulou, University of Melbourne; Alireza Aghasi, Georgia State University; Themistoklis Charalambous, Aalto University

Online

V8: Multiple Antennas and Cooperative Communications

1 **A Novel Hybrid Duplex Scheme for Two-hop Relaying System**
Siling Liu, University of Chongqing; Zhengchuan Chen, Yunjian Jia, Chongqing University; Min Wang, Chongqing University of Posts and Telecommunications; Tony Q.S. Quek, Singapore University of Technology and Design

2 **A Novel Partial Joint Processing Architecture for distributed Massive MIMO**
Supuni Gunasekara, Rajitha Senanayake, University of Melbourne; Peter Smith, Victoria University of Wellington; Margreta Kuijper, University of Melbourne

3 **A Recursive Solution of Optimal Joint Transmit-receive Diversity Weight Vectors**
Fumiyuki Adachi, Ryo Takahashi, Tohoku University

4 **A Two-Stage Adaptive Channel Estimation Scheme for Millimeter-Wave Massive MIMO Communication**
Pengyuan Cheng, Min Li, Jiayu Zhang, Zhejiang University

5 **A WMMSE Approach to Distortion-Aware Beamforming Design for Millimeter-Wave Massive MIMO Downlink Communication**
Mengyu Wu, Min Li, Ming-Min Zhao, Minjian Zhao, Zhejiang University

6 **Achieving Constant Rate Covert Communication via Multiple Antennas**
Xiang Wanyu, Jianquan Wang, Sa Xiao, Wanbin Tang, University of Electronic Science and Technology of China

7 **Beam Selection and Tracking for Amplify-and-Forward Repeaters**
Adrian Schumacher, Ruben Merz, Swisscom (Switzerland) Ltd.; Andreas Burg, EPFL

8 **Beamforming, Antenna Selection, and Power Allocation Factor Design for Downlink Two-User MISO-NOMA Systems**
Hao Tse Chiu, Fumiaki Maehara, Waseda University

9 **Intelligent Feedback Overhead Reduction (iFOR) in Wi-Fi 7 and Beyond**
Mrugen Deshmukh, Zinan Lin, InterDigital, Inc.; hanqing Lou, InterDigital; Mahmoud Kamel, Rui Yang, InterDigital, Inc.; Ismail Guvenc, North Carolina State University

10 **LSTM-based Spectral Efficiency Prediction by Capturing Wireless Terminal Movement in IRS-Assisted Systems**
Yoshihiko Tsuchiya, Tokyo University of Science; Norisato Suga, Shibaura Institute of Technology; Kazunori Uruma, Kogakuin University; Masaya Fujisawa, Tokyo University of Science

11 **On the Performance of HARQ in IoT Networking with UAV-mounted Reconfigurable Intelligent Surfaces**
Dimitrios Tyrovolas, Prodromos-Vasileios Mekikis, Sotiris A. Tegos, Panagiotis D. Diamantoulakis, Aristotle University of Thessaloniki; Christos K. Liaskos, University of Ioannina; George Karagiannidis, Aristotle University of Thessaloniki

12 **Outage Probability of Opportunistic Self-Backhauled Millimeter Wave Mobile Networks**
Behrouz Maham, Nazarbayev University

13 **Reconfigurable Meta-surface Reflectors: Practical Phase Adjustment Method and Experimental Validation**
Takuya Ohto, Hiromi Matsuno, Yoshiaki Amano, KDDI Research, Inc.; Mitsutaka Okita, Daiichi Suzuki, Kazuki Matsunaga, Japan Display Inc; Shinichiro Oka, Japan Display Inc.

14 **Space-time coding design for multiple source nodes full-duplex cooperative communication**
Ligang Liu, Qing Qu, Bin Zhou, Yu Zhao, Zhiyong Bu, Shanghai Institute of Microsystem and Information Technology CAS

15 **Spectral Efficiency of Full-Duplex MIMO Systems under the effects of Hardware Impairments**
Emad Saleh, Malek Alsmadi, Salama Ikki, Lakehead University

16 **Suppressing Pilot Contamination for Massive Access in User-centric Cell-free Massive MIMO Systems**
Manobendu Sarker, Abraham O. Fapojuwo, University of Calgary

17 **Two-Step Beamforming Scheme for Large-Dimension Reconfigurable Intelligent Surface**
Xiang Li, Xin Wang, Xiaolin Hou, Chen Lan, DOCOMO Beijing Communications Lab; Satoshi Suyama, NTT DOCOMO, INC.

18 **Uplink Power Allocation Scheme for User-Centric Cell-free Massive MIMO Systems**
Manobendu Sarker, Abraham O. Fapojuwo, University of Calgary

19 **Characteristic Analysis and Modeling of Underground Space Wireless Communication Channels**
Xingyu Ji, Cheng-Xiang Wang, Southeast University; Hengtai Chang, Shandong University

20 **On Relay-Based Subcarrier Allocation and Power Management in 5G Multicellular Networks**
Konstantinos Psilopanagiotis, Ioannis Bartsiokas, National Technical University of Athens; Panagiotis Gkonis, National and Kapodistrian University of Athens; Dimitra I. Kaklamani, National Technical University of Athens

21 **Reliability of Cooperative Communication over Correlated and Hybrid V2X Channels**
Xian Liu, University of Arkansas at Little Rock

22 **Throughput Based Adaptive Beamforming in 5G Millimeter Wave Massive MIMO Cellular Networks via Machine Learning**
Spyros Lavdas, Neapolis Universit Pafos; Panagiotis Gkonis, National and Kapodistrian University of Athens; Zinon Zinonos, Department of Computer Science, Neapolis University; Panagiotis Trakadas, Lambros Sarakis, National and Kapodistrian University of Athens

23 **Experimental Trial aboard Shinkansen Test Train Running at 360 km/h for 5G Evolution**
Nobuhide Nonaka, Satoshi Suyama, Tatsuki Okuyama, Yuto Hama, Daisuke Kitayama, Takahiro Asai, NTT DOCOMO, INC.; Shoji Itoh, Ericsson Japan; Anders Carlsson, Johan Furuskog, Magnus Wikström, Qiang Zhang, Ericsson AB; Kenichiro Kamohara, Fumitoshi Abe, Reiji Ishima, East Japan Railway Company

Online
V9: Positioning, Navigation, and Sensing

1 **A Convex Optimization Approach to Satellite Selection for Global Navigation Satellite System (GNSS) Receivers**
Natnael S. Zewge, Korean Advanced Institute of Science and Technology

2 **Bayesian Optimisation-Assisted Neural Network Training Technique for Radio Localisation**
Xingchi Liu, University of Sheffield; Peizheng Li, University of Bristol; Ziming Zhu, Toshiba Europe Ltd

3 **CSI Ratio with Coloring-Assisted Learning for NLoS Motionless Human Presence Detection**
Chia-Che Hsieh, National Yang Ming Chiao Tung University; An-Hung Hsiao, Chun-Jie Chiu, National Chiao Tung University; Kai-Ten Feng, National Yang Ming Chiao Tung University

4 **Detection and Exclusion of Incipient Fault for GNSS-based Train Positioning under Non-Gaussian Assumption**
Xuan Yang, Jiang Liu, Bai-gen Cai, Jian Wang, Debiao Lu, Beijing Jiaotong University

5 **Dynamic Target Acceleration Estimation Using CSI**
JC Wang, Zengshan Tian, Xiaolong Yang, Mu Zhou, Jiamin Huang, Chongqing University of Posts and Telecommunications; Dusit Niyato, Nanyang Technological University

6 **Fast Acquisition and Accurate Vital Sign Estimation with Deep Learning-Aided Weighted Scheme Using FMCW Radar**
Hsin-Yuan Chang, Chih-Hsuan Hsu, Wei-Ho Chung, National Tsing Hua University, Taiwan, R.O.C.

7 **Hybrid RSS-TDOA Measurements Based Directional Target Localization in NLOS Environments**
zplzpl88, Beijing Electronic Science and Technology Institute; Han Zhang, Xidian University; Haoliang Li, Boya Liu, Beijing Electronic Science and Technology Institute; Hua Jiang, Beijing Institute of Electronic Science and Technology

8 **Indoor Pedestrian Localization Methods Using Contact Information from Bluetooth Low Energy Beacons Between Smartphones**
Shino Shiraki, Aoi Suzuki, Takuhiro Uehara, Yuto Ohashi, Shigeo Shioda, Chiba University

9 **Indoor Single Station 3D Localization Based on L-shaped Sparse Array**
Xiaodong Wu, Shuliang Gui, Liangcai Zhou, Yunqiang Wu, Fei Yan, Zengshan Tian, Chongqing University of Posts and Telecommunications

10 **Location Drift Detection Method for Monocular Vision based Indoor Positioning**
Shuang Jia, Lin Ma, Shouming Wei, Harbin Institute of Technology; Yunhai Fu, Wuhan Maritime Communication Research Institute

11 **Positioning Error Analysis and Experiments on Underwater Optical Wireless Communication Induced by Light Beam Bending**
Yingying Jiang, Weijie Liu, Zhengyuan Xu, University of Science and Technology of China

12 **Robust Target Detection, Position Deducing and Tracking Based on Radar Camera Fusion in Transportation Scenarios**
Jiayin Deng, Boning Zhu, Xinghe Chu, Luhan Wang, Zhaoming Lu,Beijing University of Posts and Telecommunications; Zhiqun Hu, Hubei university

13 **Self-Attention based Semi-Supervised Learning for Time-varying Wi-Fi CSI-based Adjoining Room Presence Detection**
Kai-Jui Chen, National Yang Ming Chiao Tung University; An-Hung Hsiao, Chun-Jie Chiu, National Chiao Tung University; Kai-Ten Feng, National Yang Ming Chiao Tung University

14 **The Synthetic Off-road Trail Dataset for Unmanned Motorcycle**
Tinghai Yan, Xudong Zheng, Weiqiang Liu, Bin Liang, Zhang Chen, Tsinghua University

15 **A Location Matching for IoT Devices Using Polarizations and RSSI Distributions**
Daisuke Uchida, Toshiba Corporation; Yuki Yonezawa, Yukako Tsutsumi, Takafumi Sakamoto, Koji Akita, Toshiba Corp.

16 **Deep Reinforcement Learning Based Load Balancing Routing for LEO Satellite Network**
Peiliang Zuo, Chen Wang, Beijing Institute of Electronic Science and Technology; Zhanzhen Wei, Zhaobin Li, Hong Zhao, Hua Jiang, Beijing Institute of Electronic Science and Technology

17 Implementation of Dynamic Radius Outlier Removal (DROR) Algorithm on LiDAR Point Cloud Data with Arbitrary White Noise Addition
Makhluk Hossain Prio, Sahil Patel, Goutam Koley, Clemson University

18 Index Coded PSK Modulation with Rotated Constellation for Prioritized Receivers
Anna Elizabeth Tom, B. Sundar Rajan, Indian Institute of Science, Bangalore

19 Toward Multiple Integrated Sensing and Communication Base Station Systems: Collaborative Precoding Design with Power Constraint
Wangjun Jiang, Zhiqing Wei, Feng Zhiyong, Beijing University of Posts and Telecommunications

Online
V10: Recent Results

1 A Joint Time-Varying Channel Estimation based on Compressive Sensing and LSTM
Xiaodong Han, Zihan Jiao, Peizhe Liang, Jiancun Fan, Xi'an Jiaotong University

2 Adaptive Beam Alignment Based on Deep Reinforcement Learning for High Speed Railways
Lei Wang, Beijing jiaotong university; Bo Ai, Yong Niu, Beijing Jiaotong University; Meilin Gao, Tsinghua University; Zhangdui Zhong, Beijing Jiaotong University

3 Adaptive C-V2X Sidelink Communications for Vehicular Applications Beyond Safety Messages
Yu-Jen Ku, Bryse Flowers, Samuel Thornton, University of California, San Diego; Sabur Baidya, University of Louisville; Sujit Dey, University of California, San Diego

4 Beam Domain Based Fingerprinting Indoor Localization with Multiple Antenna Systems
Chia-Hsing Yang, Ming-Chun Lee, Chia-Hung Lin, Ta-Sung Lee, National Yang Ming Chiao Tung University

5 BP MIMO Detection with MMSE Pre-cancellation Sub-matrix Switching
Takashi Imamura, Yukitoshi Sanada, Keio University

6 DeepMCTS: Deep Reinforcement Learning Assisted Monte Carlo Tree Search for MIMO Detection
Tz-Wei Mo, Ronald Y. Chang, Te-Yi Kan, Academia Sinica

7 Distance-Aware Precoding for Near-Field Capacity Improvement in XL-MIMO
Zidong Wu, Tsinghua University

8 Experiments and Observations of 5G NSA Reliability and Latency Performance in Metro Train Environment
Ta-Sheng Lin, Jing-You Yan, Hung-Yu Wei, National Taiwan University

9 Hybrid Beamforming in mmWave MIMO-OFDM Systems via Deep Unfolding
Kuan-Yuan Chen, Hsin-Yuan Chang, National Tsing Hua University; Ronald Y. Chang, Academia Sinica; Wei-Ho Chung, National Tsing Hua University

10 On the Design of Offset Spatial Modulation with Low PAPR
Yuanjie Hu, Lilin Dan, Tingmin Jiang, Yue Xiao, University of Electronic Science and Technology of China

11 Performance of V2N Communication System with Mixed RF and Hybrid FSO/RF Transmissions
VSV Sandeep, Devendra Singh Gurjar, National Institute of Technology Silchar; Yuming Jiang, Norwegian University of Science and Technology (NTNU), Norway; Suneel Yadav, Indian Institute of Information Technology Allahabad; Prabina Pattanayak, National Institute of Technology Silchar

12 Spectral and Energy Efficient User Pairing for RIS-assisted Uplink NOMA Systems with Imperfect Phase Compensation
Kusuma Priya Pulavarty, Pavan Kumar Reddy Manne, Abhinav Kumar, Indian Institute of Technology Hyderabad

13 When Federated Learning and Mobile Intelligent Reflecting Surfaces Assist V2V Communications
Mutasem Q. Hamdan, Khairi Hamdi, University of Manchester

14 Wireless Powered Opportunistic Cooperative Backscatter Communications: To Relay or Not?
Rui Xu, Yinghui Ye, Xi'an University of Posts and Telecommunications; Haijian Sun, University of Wisconsin-Whitewater; Guangyue Lu, Xi'an University of Posts and Telecommunications

15 MetoidS: Hybrid K-Medoids-Meta Heuristic Clustering-Based Routing Optimization in Vehicular Ad-Hoc Networks
Ankur Nahar, Indian Institute of Technology(IIT) Jodhpur, Rajasthan, India.; Lokendra Vishwakarma, Bhumika, Indian Institute of Technology, Jodhpur; Debasis Das, Indian Institute of Technology Jodhpur Rajasthan

16 Performance Analysis of IRS-assisted Multi-tag Ambient Backscatter Communications
Khaled Altuwairgi, Ahmad Massud Tota Khel, Khairi Hamdi, University of Manchester

17 Age of Information and Energy Harvesting Tradeoff for Joint Packet Coding in Downlink IoT Networks
Zijing Zou, The Chinese University of Hong Kong; Tse-Tin Chan, The Hang Seng University of Hong Kong; Haoyuan Pan, Shenzhen University; Tat-Ming Lok, The Chinese University of Hong Kong

Online
V11: Signal Processing for Wireless Communications

1 Characterization of multi-TRP wireless propagation Channel in the Industrial Environment with Modeling of Robotic Arms
Jianyao Zhao, Huawei Technologies Co., Ltd.; Qibo Qin, Huawei; Zhimeng Zhong, Huawei Technologies Co., Ltd.

2 Intelligent Reflecting Surface Joint Uplink-Downlink Optimization for NOMA Network
Mostafa Samy, Mohammed Abo Zahhad, Egypt-Japan University of Science and Technology; Osamu Muta, Kyushu University; Adel Bedair, Maha Elsabrouty, Egypt-Japan University of Science and Technology

3 Pre-Calibration Techniques for Transmitter-Side RF Imbalance and Spectrum Distortion
Juinn-Horng Deng, Yuan Ze University

4 Repetition Using Cyclic Frequency Diversity in UL-PD-NOMA and Its Hardware Experiment
Atsushi Kurosawa, Masafumi Moriyama, National Institute of Information and Communications Technology; Takashi Matsuda, NICT; Takeshi Matsumura, National Institute of Information and Communications Technology

5 Signal Separation of Collided AIS Packets Employing Iterative Channel Parameter Estimation in Space-based AIS
Kohei Nozaki, Yuyuan Chang, Kazuhiko Fukawa, Tokyo Institute of Technology; Daichi Hirahara, Japan Aerospace Exploration Agency

6 Sparse Recovery Algorithms Implementations for Short Packet Communications
Ahlam Alshukaili, The University of Manchester; Khairi Hamdi, University of Manchester

7 A Novel Scheme to Mitigate the RNTI-FA in blind detection of 5G Polar Codes
Kuangda Tian, Huawei Technologies Co., Ltd.; Hao Wang, Huawei Technologies; Mingxu Zhang, Xing Yang, Huawei Technologies Co. Ltd.

8 Complex-valued Reinforcement Learning Based Dynamic Beamforming Design for IRS Aided Time-Varying Downlink Channel
Mengfan Liu, Imperial College London; Rui Wang, Zhe Xing, Tongji University

Online

V12: Spectrum Management, Radio Access Technology, Services and Security

Workshops

All workshops are on Sunday 19 June 2022.

Sunday, 19 June 2022 9:00-12:30 Commodore (Papers marked [V] will be presented virtually)

W1: 1st IEEE International Workshop on Artificial Intelligence enabled Autonomous Networks and Systems (IWAANETS 2022)

Keynote[V] : Distributed Edge Intelligence for & over wireless
Mehdi Bennis, University of Oulu

1 Analyzing Convergence Aspects of Federated Learning: More Devices or More Network Layers?
Fazal Muhammad Ali Khan, Syed Ali Hassan, National University of Sciences and Technology, Islamabad; Rafay Ansari, Northumbria University; Haejoon Jung, Kyung Hee University

2 Data-Driven Precoder Codebook Design for SU-MIMO Systems
K Satyanarayana, Onur Sahin, InterDigital; Mehmet Necip Kurt, NO

3 Two methods for Jamming Identification in UAVs Networks using New Synthetic Dataset
Joseanne Viana, Instituto Universitário de Lisboa; Hamed Farkhari, ISCTE - Instituto Universitário de Lisboa; Miguel Campos, PDM FC; Pedro Sebastiao, Francisco Cercas, ISCTE-IUL / Instituto de Telecomunicações; Luis Bernardo, Universidade Nova de Lisboa / Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa

4[V] Deep Learning Based MAC via Joint Channel Access and Rate Adaptation
Jiantao Xin, Wensen Xu, Yucheng Cai, Taotao Wang, Shengli Zhang, Shenzhen University; Peng Liu, Ziyang Guo, Jiajun Luo, Huawei

Coffee Break 10:30-11:00

Keynote[V] : Do we need 6G for building AI Native Networks?
Mérouane Debbah, Technology Innovation Institute

5 Knowledge-Embedded Deep Reinforcement Learning for Autonomous Network Decision-Making Algorithm
Yalin Zhang, Chongqing University of Posts and Telecommunications; Hui Gao, Beijing University of Posts and Telecommunications; Xin Su, Bei Liu, Tsinghua University

6[V] Novel Reinforcement Learning based Power Control and Subchannel Selection Mechanism for Grant-Free NOMA URLLC-Enabled Systems
Duc Dung Tran, Vu Nguyen Ha, Symeon Chatzinotas, SnT, University of Luxembourg

7 Open-RAN and Future Intelligent Networks
Pranav Madadi, Samsung Research America

Sunday, 19 June 2022 9:00-12:30 Press Room (Papers marked [V] will be presented virtually)

W2: 1st IEEE Workshop on Sustainable and Intelligent Green Internet of Things for 6G and Beyond

1[V] Age of Information for Preemptive Transmission in Dual-Sensor Networks with Energy Harvesting
Mangang Xie, Sun Yat-sen University; Qi Cao, Shandong Earthquake Agency; Meng Zhou, Zhejiang University; Xiangdong Jia, Northwest Normal University

2[V] An Improved Design of Concatenated Code Scheme for Massive Random Access
Yuanjie Li, Chao Dong, BUPT; Shiqiang Suo, CICT Mobile Communication Technology Co., Ltd.; Kai Niu, Jiaru Lin, Beijing University of Posts and Telecommunications

3 Connected Vehicles and Motor Factories of the Future Adopting 5G Technology for Vehicle-to-Factory Communications
Samuel Lear Rogers, BMW; Ghazanfar Ali Safdar, University of Bedfordshire; Tahera Kalsoom, University of West of Scotland; Masood Ur-Rehman, University of Glasgow

4 Downlink Independent Throughput Optimisation in LoRaWAN
Bruno Citoni, Shuja Ansari, Qammer Abbasi, Muhammad Ali Imran, Sajjad Hussain, University of Glasgow

5[V] Fog Computing based Router-Distributor Application for Sustainable Smart Home
Sundas Iftikhar, Muhammed Golec, Queen Mary University, London; Deepraj Chowdhury, International Institute of Information Technology, Naya Raipur; Sukhpal Singh Gill, Steve Uhlig, Queen Mary University, London

6 Industrial IoT: Role of IEEE 802.11be WLANs
Yazdan Ahmad Qadri, Yeungnam University; Ali Nauman, Yeungnam University, Republic of Korea; Zulqarnain, Sung Won Kim, Yeungnam University

7 Mixed RIS-Relay NOMA-Based RF-UOWC Systems
Mohamed Elsayed, Ahmed Samir, Benha University, Egypt; Ahmad El-Banna, Shengzhen University; Wali Ullah Khan, Symeon Chatzinotas, SnT, University of Luxembourg; Basem M. ElHalawany, Benha University

8 NB-IoT Performance Analysis and Evaluation in Indoor Industrial Environment
Muhammad Dangana, Shuja Ansari, Sajjad Hussain, Muhammad Ali Imran, University of Glasgow

9[V] On Performance of multi-user MIMO for 5G and Beyond
Muhammad Farhan Khan, Dirk Pesch, University College Cork

10 Performance Analysis of THz Enabled HetNets in Diverse Building Densities
Muhammad Hassaan, Muhammad Bin Azhar, Kamran Naveed Syed, Syed Ali Hassan, National University of Sciences and Technology; Haris Pervaiz, Lancaster University; Haejoon Jung, Kyung Hee University

11[V] Resource Optimization via Markov Approximation in Cloud Radio Access Networks
Shuai Zhang, Jinglei Li, Qinghai Yang, Xidian University; Kyung Sup Kwak, Inha University; Zijia Huang, The 20th Research Institute of China Electronics Technology

12 When RIS Meets GEO Satellite Communications: A New Sustainable Optimization Framework in 6G
Wali Ullah Khan, Eva Lagunas, Asad Mahmood, University of Luxembourg; Basem M. ElHalawany, Benha University; Symeon Chatzinotas, Bjorn Ottersten, University of Luxembourg

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Sunday, 19 June 2022 Virtual

W3: 4th International Workshop on Decentralized Technologies and Applications for IoT (D'IoT) 2022

1 A Compact CPW-fed Multiband Bow-tie Slot Antenna for IoT Smart Healthcare Wireless Communication Applications
Zaheer Ahmed Dayo, Muhammad Aamir, Huanggang Normal University; Shoaib Ahmed Dayo, University of Salerno; Ziaur Rahman, Huanggang Normal University; Imran A Khoso, Gulab Shah, Nanjing University of Aeronautics and Astronautics; Permanand Soothar, NJUST China; Zhihua Hu, Yurong Guan, Huanggang Normal University

2 Energy Neutral Operation based Adaptive Duty Cycle MAC Protocol for Solar Energy Harvesting Wireless Sensor Networks
Sohail Sarang, University of Novi Sad

3 Linear TDOA-based Measurements for Distributed Estimation and Localized Tracking
Mohammadreza Doostmohammadian, Themistoklis Charalambous, Aalto University

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4 Resource Allocation Method for Minimizing Total Computation Time in Multi-Task Mobile Edge Computing Systems
Yong Chen, Yisheng Zhao, Ximei He, Zhihong Xu, Fuzhou University

5 Towards a Novel Framework for Reinforcing Cybersecurity using Digital Twins in IoT-based Healthcare Applications
Sandeep Pirbhulal, Habtamu Abie, Norwegian Computing Center; Ankur Shukla, Norwegian University of Science and Technology

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Sunday, 19 June 2022 Virtual
W4: 4th Workshop on Connected Intelligence for IoT and Industrial IoT Applications- C3IA

1 6G Enabled Smart Environments and Sustainable Cities: An Intelligent Big Data Architecture
El Mehdi Ouafiq, Rachid Saadane, Hassania School of Public Works; Abdellah Chehri, University of Ottawa; Mohamed Wahbi, Hassania School of Public Works

2 A Real-Time IoT and Image Processing based Weeds Classification System for Selective Herbicide
Awais Adnan, Misbah Ahmad, Institute of Management Sciences; Peshawar Pakistan; Abdellah Chehri, University of Ottawa

3 An LSTM-based Intent Detector for Conversational Recommender Systems
Mourad Jbene, Hassania School of Public Works; Smail Tigani, Euro-Med Research Center Euro-Med University Fes 51, Morocco; Saadane Rachid, SIRC/LAGES-EHTP Hassania School of Public Works; Abdellah Chehri, University of Ottawa

4 Security Assurance in Modern IoT Systems
Nicola Bena, Ruslan Bondaruc, Antongiacomo Polimeno, Università degli Studi di Milano

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Sunday, 19 June 2022 14:00-17:30 Press Room (Papers marked V will be presented virtually)
W5: Data Driven Optimization for 6G Wireless Networks

Sunday 19 June 2022 14:00-15:30 Press Room
Session I

1 Keynote: Learn to Optimize for Wireless Communications
Wei Yu, University of Toronto

2 Random Access Protocol Learning in LEO Satellite Networks via Reinforcement Learning (Invited paper)
Ju-Hyung Lee, Korea University; Hyowoon Seo, Kwangwoon University; Jihong Park, Deakin University; Mehdi Bennis, University of Oulu; Joongheon Kim, Young-Chai Ko, Korea University

3 Channel Charting Assisted Beam Tracking
Parham Kazemi, Hanan Al-Tous, Aalto University; Christoph Studer, ETH Zürich; Olav Tirkkonen, Aalto University

Sunday 19 June 2022 16:00-17:30 Press Room
Session II

1 Collision Resolution with Deep Reinforcement Learning for Random Access in Machine-Type Communication
Muhammad Jadoon, Adriano Pastore, CTTC; Monica Navarro, Centre Tecnologic Telecomunicacions Catalunya

2 Swish-Driven GoogleNet for Intelligent Analog Beam Selection in Terahertz Beamspace MIMO
Hosein Zarini, Amirkabir University of Technology; Mohammad robatmilli, Sharif University of Technology; Mehdi Rasti, Amirkabir University of Technology; Sergey Andreev, Tampere University of Technology; Pedro Henrique Juliano Nardeli, Lapeenranta University of Tehcnology

3 Heuristic Inspired Precoding for Millimeter-Wave MIMO Systems with Lens Antenna Subarrays
Sinasi Cetinkaya, University of South Florida; Liza Afeef, Istanbul Medipol University; Gokhan Mumcu, Hüseyin Arslan, University of South Florida

4V Attacker Identification In LoRaWAN Through Physical Channel Fingerprinting
Sobhi Alfayoumi, Xavier Vilajosana,Open University of Catalonia

5 Scalable Joint Learning of Wireless Multiple-Access Policies and their Signaling
Mateus Pontes Mota, Nokia Bell Labs France; Alvaro Valcarce Rial, Nokia Bell Labs; Jean-Marie Gorce, INSA Lyon

6 Three-Dimensional Scrambling Code for Multi-User MIMO Systems
Wei Gao, Xiaodong Ji, Xiqing Liu, Mugen Peng, Beijing University of Posts & Telecommunications

7V AoI and Throughput Optimization for Hybrid Traffic in Cellular Uplink Using Reinforcement Learning
Chien-Cheng Wu, Zheng-Hua Tan, Cedomir Stefanovic, Aalborg University

8V Control-Aware Scheduling Optimization of Industrial IoT
Pedro Maia de Sant Ana, Bosch; Beatriz Soret, Petar Popovski, Aalborg University; Nikolaj Marchenko, Bosch

9V Intermodulation Interference Detection in 6G Networks: A Machine Learning Approach (Invited paper)
Faris B. Mismar, Bell Labs Consulting

Sunday, 19 June 2022 14:00-17:30 Commodore (Papers marked V will be presented virtually)
W6: Digital-twin-assisted AI for 6G wireless networking

1V A Digital Twin enabled Maritime Networking Architecture
Zhen Wang, Bin Lin, Dalian Maritime University

2V An Efficient Digital Twin Assisted Clustered Federated Learning Algorithm for Disease Prediction
Xiaoming Yuan, Jialin Zhang, Jingqi Luo, Jiahui Chen, Northeastern University; Zhiguo Shi, Zhejiang University; Mingwei Qin, Southwest University of Science and Technology

3V Digital Twin Enabled Multi-task Federated Learning in Heterogeneous Vehicular Networks
Yilong Hui, Gaosheng Zhao, Zhisheng Yin, Nan Cheng, Tom H. Luan, Xidian University

4V Digital Twin-Assisted Efficient Reinforcement Learning for Edge Task Scheduling
Xiucheng Wang, Longfei Ma, Haocheng Li, Zhisheng Yin, Tom H. Luan, Nan Cheng, Xidian University

5 Digital-Twin Enabled Range Modulation Strategy for V2V Safety Messaging Considering Human Reaction Time
Mason Parrish, Miao Wang, Ran Zhang, Miami University

6 Edge-assisted human-to-virtual twin connectivity scheme for human digital twin frameworks
Samuel Okegbile, Jun Cai, Concordia University

7V Energy Efficient Digital Twin with Federated Learning via Non-orthogonal Multiple Access Transmission
Tianshun Wang, Ning Huang, Minghui Dai, Yuan Wu, University of Macau; Liping Qian, Zhejiang University of Technology; Bin Lin, Dalian Maritime University

W7: Distributed/Cell-Free Massive MIMO for Beyond 5G Networks

1 Closed-form max-min power control for some cellular and cell-free massive MIMO networks
Lorenzo Miretti, Renato L. G. Cavalcante, Fraunhofer HHI; Slawomir Stanczak, Fraunhofer Heinrich Hertz Institute; Martin Schubert, Ronald Boehnke, Huawei Technologies; Wen Xu, IMEC

2 Fronthaul Load-Reduced Scalable Cell Free massive MIMO by Uplink Hybrid Signal Processing
Issei Kanno, Masaaki Ito, Takeo Ohseki, Kosuke Yamazaki, Yoji Kishi, KDDI Research, Inc.; Thomas Choi, Wei Yu Chen, Andreas F. Molisch, University of Southern California

3 Opportunistic AP Selection in Cell-Free Massive MIMO-OFDM Systems
Wei Jiang, German Research Center for Artificial Intelligence; Hans Schotten, University of Kaiserslautern

4 Optimal User Load and Energy Efficiency in User-Centric Cell-Free Wireless Networks
Fabian Göttsch, Technical University of Berlin; Noboru Osawa, Takeo Ohseki, Kosuke Yamazaki, KDDI Research, Inc.; Giuseppe Caire, Technical University of Berlin

5 Transceiver Design and Mode Selection for Secrecy Cell-Free Massive MIMO with Network-Assisted Full Duplexing
Xinjiang Xia, Southeast University; Zhenqi Fan, State Grid Electric Power Research Institute; Wuyang Luo, Southeast University; An Lu, State Grid Electric Power Research Institute; Dongming Wang, Xinsheng Zhao, Xiaohu You, Southeast University

W8: Enabling Technologies for Terahertz Communications (ETTCOM)

1 GITz: Graphene-assisted IRS Design for THz Communication
Bhupendra Sharma, Anirudh Agarwal, The LNM Institute of Information Technology, Jaipur, India; Deepak Mishra, University of New South Wales; Soumitra Debnath, The LNM Institute of Information Technology, Jaipur, India

2[V] Modified Gerchberg-Saxton Iterative Algorithm for Reflectarray Metasurface Multibeam Pattern Synthesis
Xiaomin Meng, Rupert Young, Maziar Nekovee, University of Sussex

3 Phase Noise Robust Terahertz Communications
Christian Forsch, Friedrich-Alexander-Universität Erlangen-Nürnberg; Osama Alrabadi, Stefan Brueck, Qualcomm CDMA Technologies; Wolfgang Gerstacker, Universität Erlangen-Nürnberg

W9: ExpCCAM: Experimental Approaches for Evaluating and Showcasing Low-Latency CCAM Applications

1 Quantitative Assessment of CCAM Applications on Greenhouse Gas Emissions
Sanket Partani, Anjie Qiu, Raja Sattiraju, Shruti Tayade, Hans Schotten, University of Kaiserslautern

2 ROS2-based Small-Scale Development Platform for CCAM Reserach Demonstrators
Joshwa Pohlmann, Maximilian Matthé, Tobias Kronauer, Barkhausen Institut

W10: Integrated Vehicular Sensing and Communications

1 Detection Probability Maximization Scheme in Integrated Sensing and Communication Systems
Mateen Ashraf, Bo Tan, Tampere University

2[V] Energy Efficiency of Cooperative Spectrum Sensing Under Sensing Delay Constraint for CUAVNs
Jia Zhang, Jun Wu, Jipeng Gan, Ze Chen, Jiangtao He, Zehao Chen, Hangzhou Dianzi University

3[V] Passive Motion Detection via mmWave Communication System
Jie Li, Chao Yu, Yan Luo, Yifei Sun, Rui Wang, Southern University of Science and Technology

4[V] Peak-to-Average Power Ratio Reduction via Symbol Precoding in OTFS Modulation
Jingyi Su, Shengheng Liu, Yongming Huang, Southeast University; Jinhong Yuan, University of New South Wales

5 Performance Model of Terahertz Joint Radar-Communication Systems Under Random Mobility
Zile Liu, Chuang Yang, Tianhang Zhou, Mugen Peng, Beijing University of Posts & Telecommunications

W11: Integration of Sensing, Computing, and Communication in 6G Networks

1[V] A Downlink Pilot Based Signal Processing Method for Integrated Senging and Comunication Towards 6G
Liang Ma, Chengkang Pan, China Mobile Research Institute

2[V] A Robust Joint Sensing and Communications Waveform against Eavesdropping and Spoofing
Yu-ge Zhang, Hui-Ming Wang, Xi'an Jiaotong University; Peng Liu, Huawei; Xian-hui Lu, University of Chinese Academy of Sciences

3[V] DRL Based Beam Management for Joint Sensing and Communications in HSR mmWave Wireless Networks
Li Yan, Xuming Fang, Saifei Li, Southwest Jiaotong University; Yi Li, China Academy of Railway Sciences; Qing Xue, Chongqing University of Posts and Telecommunications

4[V] Error-Compensated Adaptive Modulation and Coding for Uplink NOMA Systems
Kaijie Wang, Ting Zhou, Shanghai Advanced Research Institute; Tianheng Xu, Chinese Academy of Sciences; Honglin Hu, Shanghai Advanced Research Institute

5[V] Integrated Sensing, Communication, and Caching for Content Delivery in SAGIVNs
Yi Qiu, Rubinshteyn Renata, Yilong Hui, Rui Chen, Zhisheng Yin, Nan Cheng, Xidian University

6 Joint Subcarrier and Phase Shifts Optimization for RIS-aided Localization-Communication System
Mingan Luan, Bo Wang, Jilin University; Zheng Chang, Timo Hämäläinen, University of Jyväskylä; Zhuang Ling, Fengye Hu, Jilin University

7 Multimodal Fusion-GMM based Gesture Recognition for Smart Home by WiFi Sensing
Jianyang Ding, Yong Wang, Hongyan Si, Shang Gao, Jiannan Ma, Jiwei Xing, Xidian University

8 Successive Interference Cancellation for Communication and Radar Coexistence
Zhaoqi Wang, Liliang Xiong, Xiqing Liu, Mugen Peng, Beijing University of Posts & Telecommunications

W12: Localization and Sensing with Intelligent Surfaces for 6G Networks

1[V] A self-adaptive RIS that estimates and shapes fading rich-scattering wireless channels

Chloé Saigre-Tardif, CNRS, IETR - Univ Rennes; Philipp del Hougne, CNRS

2[V] Constrained RIS Phase Profile Optimization and Time Sharing for Near-field Localization

Moustafa Rahal, French Alternative Energies and Atomic Energy Commission (CEA); Benoît Denis, CEA-Leti Minatec; Kamran Keykhosravi, Chalmers University of Technology; Furkan Keskin, Chalmers University; Bernard Uguen, IETR / CNRS / Université Rennes-I; Henk Wymeersch, Chalmers University of Technology

3[V] Positioning and Tracking using Reconfigurable Intelligent Surfaces and Extended Kalman Filter

Mustafa Ammous, Shahrokh Valaee, University of Toronto

4[V] Reconfigurable Intelligent Surfaces: A Joint Localization and Communication Perspective

Silvia Palmucci, University of Siena; Anna Guerra, University of Bologna; Andrea Abrardo, University of Siena; Davide Dardari, University of Bologna

5[V] Wideband Localization with Reconfigurable Intelligent Surfaces

Ziyi Wang, Zhenyu Liu, Massachusetts Institute of Technology; Yuan Shen, Tsinghua University; Andrea Conti, University of Ferrara; Moe Z. Win, Massachusetts Institute of Technology

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W13: Technologies and Proof-of-Concept Activities for 6G 2022 (TPoC6G 2022)

1 Aquatic Fronthaul for Underwater-Ground Communication in 6G Mobile Communications

Ayano Higuchi, Erina Takeshita, Tokyo University of Agriculture and Technology; Daisuke Hisano, Yoshiaki Inoue, Osaka University; Kazuki Maruta, Tokyo University of Science; Takayuki Nishio, Yuko Hara-Azumi, Tokyo Institute of Technology; Yu Nakayama, Tokyo University of Agriculture and Technology

2 Elevated LiDAR based Sensing for 6G - 3D Maps with cm Level Accuracy

Madhushanka Padmal, Uppsala University; Dileepa Marasinghe, Vijitha Isuru, University of Oulu; Nalin Jayaweera, University of oulu; Samad Ali, Nandana Rajatheva, University of Oulu

3[V] Evaluation of Indoor Area Improvement in the High Frequency Band Using Metasurface Lenses, FSS Technology and Relay Stations

Jun Tsuboi, NTT DOCOMO, INC.; Takeshi Motegi, Osamu Kagaya, AGC INC.; Daisuke Kitayama, NTT Corporation; Kensuke Miyachi,

Tatsuki Okuyama, Satoshi Suyama, Takahiro Asai, NTT DOCOMO, INC.

4[V] Outdoor Experimental Trials on Deployments of Multiple Base Station Antennas for 28 GHz-Band Cooperated Digital Beamforming

Tatsuki Okuyama, Satoshi Suyama, Nobuhide Nonaka, Takahiro Asai, NTT DOCOMO, INC.

5[V] Scalable and Reconfigurable Distributed MU-MIMO System

Ryo Takahashi, Hidenori Matsuo, Fumiyuki Adachi, Tohoku University

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W14: The 11th International Workshop on High Mobility Wireless Communications (HMWC) 2022

1 Chunked BATS Codes under Time-invariant and Time-variant Channel

Shiheng Wang, Southwest Jiaotong University; Heng Liu, Key Lab of Information Coding and Transmission; Zheng Ma, Southwest Jiaotong University; Ming Xiao, KTH

2 Co-existence Analysis of OTFS and OFDM Waveforms for Multi-mobility Scenarios

Yuchen Wu, Zhengquan Zhang, Southwest Jiaotong University

3 Dependency-aware Task Scheduling and Cache Placement in Vehicular Networks

Lintao Zhang, Caijin Zhao, Yuanyu Wang, Tang Yuliang, Xiamen University; Bo Yang, Shanghai Jiao Tong University

4 Hybrid Multi-Dimensional Modulation in Non-Orthogonal Spatial-Delay-Doppler Domains for Beyond 5G, and 6G Communications

Thakshanth Uthayakumar, Jie Mei, Xianbin Wang, Western University

5 OTFS with Generalized Spatial Modulation

Xianbing Zou, Shiwen Fan, Hao Chen, Yue Xiao, University of Electronic Science and Technology of China; Chengliang Di, Jinwei Ji, The 54th research institute of CETC

6 Pilot-Aided Channel Estimation Scheme Based on Frank Array for OTFS under Rapidly Time-Varying Channels

Yu Liang, Qianli Wang, Pingzhi Fan, Southwest Jiaotong University

7 Simulation Investigation of Propagation Channel inside and outside of the High-Speed Trains

Jingzhe Wang, Beijing Jiaotong University; Yuanxuan Li, China Academy of Railway Science; Ruiqi Yang, Siyu Lin, Beijing Jiaotong University

8 Uplink Time Synchronization Method and Procedure in Release-17 NR NTN

Wenjia Liu, Xiaolin Hou, Jing Wang, Chen Lan, DOCOMO Beijing Communications Lab; Shohei Yoshioka, NTT DOCOMO, INC.

W16: Workshop on Edge-based AI Applications over B5G/6G Evolution

Morning session

Welcome

Tarik Taleb, University of Oulu; Kei Sakaguchi, Tokyo Institute of Technology; Haris Gačanin, RWTH Aachen University; Tareq Amin, Rakuten Mobile

Keynote I : Towards AI-Native Wireless 6G Systems

Walid Saad, Virginia Tech

1[V] Task Scheduling with Collaborative Computing of MEC System Based on Federated Learning

Tianyi Shi, Beijing University of Posts and Telecommunications; Hongfeng Tian, Publising House of Electronics Industry; Tiankui Zhang, Beijing University of Posts and Telecommunications; Jonathan Loo, University of West London; Jiangtao Ou, Chengyuan Fan, AI Sensing Technology; Dingcheng Yang, Nanchang University

2 Structured Sparse Ternary Compression for Convolutional Layers in Federated Learning

Alessio Mora, Luca Foschini, Paolo Bellavista, University of Bologna

3[V] Towards Deep Learning-Guided Multiuser SNR and Doppler Shift Detection for Next-Generation Wireless Systems
Shun Kojima, Utsunomiya University; Yi Feng, Aptiv; Kazuki Maruta, Tokyo University of Science; Kanemitsu Ootsu, Takashi Yokota, Utsunomiya University; Chang-Jun Ahn, Chiba University; Vahid Tarokh, Duke University

4 Proof-of-Concept of Distributed Optimization of Micro-Services on Edge Computing for Beyond 5G
Jin Nakazato, Mitsuhiro Kuchitsu, Anil Pawar, Soh Masuko, Rakuten Mobile, Inc.; Keishi Tokugawa, Keiichi Kubota, Tokyo Institute of Technology; Kazuki Maruta, Tokyo University of Science; Kei Sakaguchi, Tokyo Institute of Technology

5 Mobile User Trajectory Prediction Based on Machine Learning
Ya Liu, Hongwen Yang, Beijing University of Posts and Telecommunications; Rui Huang, Next Generation Standard

Sunday 19 June 2022 14:00-16:50 Europaea
Afternoon session
Keynote II
Tareq Amin, Rakuten Mobile

1 Object Recognition Network using Continuous Roadside Cameras
Gunhee Cho, Yusuke Shinyama, Tokyo Institute of Technology; Jin Nakazato, Rakuten Mobile, Inc.; Kazuki Maruta, Tokyo University of Science; Kei Sakaguchi, Tokyo Institute of Technology

Coffee Break 15:30-16:00
Keynote III
Dario Sabella, Intel

Closing Speech

Sunday, 19 June 2022 Virtual
W17: 1st IEEE Workshop on Electromagnetic Information Theory towards 5G-Advanced (5.5G EIT)

1 An Electromagnetic Information Methodology for Fast MIMO Deterministic Channel Analysis
Xianjin Li, Huawei Technologies CO., Ltd; Wang Guangjian, Hua Cai, Huawei Technologies Co., LTD; Jia He, Huawei Technologies; Ziming Yu, Huawei Technology Company

2 Characteristics of 5.3 GHz MIMO Channels with an Extremely Large Antenna Array in Urban Marco Scenarios
Chao Wang, Chao Li, Shanghai Huawei Technologies Co., Ltd.; Zhimeng Zhong, Huawei Technologies Co., Ltd.; Li Fan, Shanghai Huawei Technologies CO.; Wei Han, Huawei, Shanghai; Qibo Qin, Huawei; Cheng-Xiang Wang, Southeast University

3 Extensions to COST 2100 Channel Model for Extremely Large-Scale MIMO
Li Fan, Shanghai Huawei Technologies CO.; Zhimeng Zhong, Huawei Technologies Co., Ltd.; Chao Wang, Shanghai Huawei Technologies Co., Ltd.; Qibo Qin, Huawei; Wei Han, Huawei, Shanghai; Tengjiao Wang, Huawei Technologies

4 Joint Transmitter and Receiver Design for Uplink MU-MIMO Systems with Dynamic Metasurface Antennas
Hanqing Wang, Huawei Technologies Co. Ltd.

5 Line-of-Sight MIMO via Reflection From a Smooth Surface
Andrea Pizzo, Universitat Pompeu Fabra

6 Reconfigurable MIMO towards Electro-magnetic Information Theory: Capacity Maximization Pattern Design
Haonan Wang, Ang Li, Xi'an Jiaotong University; Ya-Feng Liu, Chinese Academy of Sciences; Qibo Qin, Huawei; Lingyang Song, Peking University; Yonghui Li, University of Sydney

7 Robust and Outage-Constrained Energy Efficiency Optimization in RIS-Assisted NOMA Networks
Xyanan, Yongjun Xu, Qilie Liu, Chongqing University of Posts and Telecommunications; Chongwen Huang, Zhejiang University; Dong huang, Guizhou University; Jihua Zhou, Chongqing University of Posts and Telecommunications

8 Some Notes on Electromagnetic Processing at the Deep Physical Layer Level
Marco Donald Migliore, Universitá di Cassino e del Lazio Meridionale,

9 Spatial Correlations of Measured MIMO Channels with an Extremely Large Aperture Array (ELAA)
Yiling Yuan, Chao Wang, Chao Li, Zhimeng Zhong, Wei Han, Huawei; Cheng-Xiang Wang, Southeast University

10 The Near-Field Capacity Analysis for Large Antenna Array
Lun Cui, Shigang Zhou, Jian-Ying Li, Lian-Wei Zhu, Song Li, Northwestern Polytechnical University

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Sunday, 19 June 2022 14:00-17:30 Baltica (Papers marked [V] will be presented virtually)
W18: Workshop on Machine Learning and Artificial Intelligence for Communications: Air Interface Design in 6G

1 Deep Learning-Based Signal-to-Noise Ratio Prediction for Realistic Wireless Communication
Qiuheng Zhou, Wei Jiang, German Research Center for Artificial Intelligence; Donglin Wang, Technical University of Kaiserslautern; Hans Schotten, University of Kaiserslautern

2[V] Diffraction Characteristics Aided Blockage and Beam Prediction for mmWave Communications
Xiaogang Li, Li Yu, Yuxiang Zhang, Zhang Jianhua, Baoling Liu, Beijing University of Posts and Telecommunications; Tao Jiang, Liang Xia, China Mobile Research Institute

3[V] Object Detection for Connected and Autonomous Vehicles using CNN with Attention Mechanism
Abhishek Gupta, Kandasamy Illanko, Xavier Fernando, Ryerson University

4[V] Online Compressive Channel Learning Using Untrained Deep Generative Model
Ben Wang, Lixiang Lian, ShanghaiTech University

5[V] QoE-driven Link Quality Prediction for Video Streaming in Mobile Networks
Yitu Wang, Riich Kudo, NTT Corporation; Yuya Aoki, NTT DOCOMO, INC.; Yoshifumi Morihiro, NTT DOCOMO; Kahoko Takahashi, NTT; Hisashi Nagata, NTT Corporation

6 Removing Power Amplifier Distortions at the Receiver using Deep Learning
Samad Ali, Oskari Tervo, Esa Tiirola, Nokia; Kari Pajukoski, Rauli Jarvela, Nokia Bell Labs

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Sunday, 19 June 2022 14:00-17:30 Nautica (Papers marked [V] will be presented virtually)
W19: Workshop on Mission Critical Communications

1 Detection range of signal measurement equipment in HELPS
Sunsik Min, Hichan Moon, Hanyang University

2 Evaluation of RF Fingerprinting-Aided RSS-Based Target Localization for Emergency Response
Halim Lee, Taewon Kang, Suhui Jeong, Jiwon Seo, Yonsei University

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3 Multipath Mitigation of 5G Signals via Reinforcement Learning for Navigation in Urban Environments
Zak (Zaher) Kassas, Ali Abdallah, Mohamad Orabi, University of California, Irvine

4 Performance of Routing Protocols over TDMA MAC for Robotic Swarms in Space Exploration
Fin Christensen, Kai Kientopf, OVGU Magdeburg; Emanuel Staudinger, German Aerospace Center (DLR); Mesut Gunes, University of Magdeburg

5[V] Resource Allocation Strategy of UAV-Aided WPCN Based on Magnetic Coupling Resonance Wireless Power Transfer
Zhihong Xu, Yisheng Zhao, Ximei He, Yong Chen, Fuzhou University

6 Using Real-Time Kinematics algorithm in mission critical communication for accurate positioning, time correction and synchronization purposes over 5G and beyond networks
Mutasem Q. Hamdan, Chuan Heng Foh, Atta Quddus, University of Surrey

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Sunday, 19 June 2022 9:00-17:30 Nordia (Papers marked [V] will be presented virtually)

W21: 2nd Workshop on Intelligent IoT Connectivity, Automation and Applications (ICA)

1[V] An Improved Packet Head Detection Method in Massive Access
Yuchen Ji, Beijing University of Posts and Telecommunications

2 Autonomous Tethered Drone Cell for IoT Connectivity in 6G Communications
Shinnosuke Kondo, Kaori Ota, Erina Takeshita, Tokyo University of Agriculture and Technology; Naoto Yoshimoto, Chitose Institute of Science and Technology; Yu Nakayama, Tokyo University of Agriculture and Technology

3 Combinatorial Data Augmentation for Real-Time Indoor Positioning: Concepts and Experiments
Seung Min Yu, Korea Railroad Research Institute; Jihong Park, Deakin University; Seung-Woo Ko, Inha University

4 Energy-balanced routing protocol based on data priority for lung terahertz nanosensor networks
Juan Xu, Hongmin Huang, Jiali Kan, Ruofan Wang, Tongji University

5 Impact of Fading on Association Probability in UAV-Enabled IoT Networks
Nishant Gupta, IIT Ropar; Satyam Agarwal, IIT Guwahati; Deepak Mishra, University of New South Wales

6 Insights on Smart Farming with Low Orbit Satellite
Ashritha Srikande, Mohammad Belayet Hossain, Jinho Choi, Shiva Pokhrel, Deakin University

7[V] Intelligent-Meta-Surfaces-Aided Wireless Communications in 6G
Mahyar Nemati, Jinho Choi, Deakin University

8 IoT-based Analysis for Smart Energy Management
Guang-Li Huang, Adnan Anwar, Seng W. Loke, Arkady Zaslavsky, Jinho Choi, Deakin University

9[V] On Network Coding Design for URLLC over Fading Channels
Jinho Choi, Mahyar Nemati, Deakin University

10 Stochastic Image Transmission with CoAP for Extreme Environments
Erina Takeshita, Asahi Sakaguchi, Tokyo University of Agriculture and Technology; Daisuke Hisano, Yoshiaki Inoue, Osaka University; Kazuki Maruta, Tokyo University of Science; Yuko Hara-Azumi, Tokyo Institute of Technology; Yu Nakayama, Tokyo University of Agriculture and Technology

11 Understanding Uncertainty of Edge Computing: New Principle and Design Approach
Sejin Seo, Seong-Lyun Kim, Sujin Kook, Yonsei University; Seung-Woo Ko, Inha University

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Sunday, 19 June 2022 Virtual

W22: The Ninth IEEE International Workshop on Security and Privacy for Internet of Things and Cyber-Physical systems (IoT/CPS-Security 2022)

1 A load balancing routing method based on real time traffic in LEO satellite constellation space networks
Liming Hou, Shaoli Kang, China Information And Communication Technology Mobile Co., Ltd; Sun shaohui, Miao Deshan, Han bo, Liu Shenghao, CICTmobile

2 A Pilot Contamination Attacker-Defender Model for Wireless Networks Under Stackelberg Game
Zhangnan Wang, Yichen Wang, Xi'an Jiaotong University

3 An Experience Report on the Suitability of a Distributed Group Encryption Scheme for an IoT Use Case
Thomas Prantl, Simon Engel, André Bauer, Ala Eddine Ben Yahya, Stefan Herrnleben, Lukas Iffländer, Alexandra Dmitrienko, Samuel Kounev, University of Würzburg

4 Automated Data Format Identification and Processing for Security Analysis
Timothy D. Bernard, Houbing H. Song, Embry-Riddle Aeronautical University

5 Evaluation of Automotive Event Data Recorder towards Digital Forensics
Ryo Kurachi, Nagoya University

6 Exploring Realistic VANET Simulations for Anomaly Detection of DDoS Attacks
Hamideh Baharlouei, Dalhousie University; Tokunbo Makanju, New York Institute of Technology; Nur Zincir-Heywood, Dalhousie University

7 Physical Layer Key Generation from Wireless Channels with Non-ideal Channel Reciprocity: A Deep Learning Based Approach
Cheng Feng, Li Sun, Xi'an Jiaotong University

8 Resilience Network Controller Design for Multi-Domain SDN: A BDI-based Framework
Yanbo Song, Xidian University; Xianming Gao, Academy of Military Science; Pengcheng Li, Chungang Yang, Xidian University

9 Secure Transmission and Key Exchange Design Using Artificial Noise Injection in OFDM Systems
Mehmet Yazgan, Hüseyin Arslan, University of South Florida

10 Transmit Antenna Selection and Artificial Noise Design for Secure STBC-SM Transmission
Yuan Zhong, Yue Xiao, Hong Niu, University of Electronic Science and Technology of China

11 UAV-Enabled Cooperative Jamming for Covert Communications based on Geometric Method
Hangmei Rao, Sa Xiao, University of Electronic Science and Technology of China; Shihao Yan, Edith Cowan University; Jianquan Wang, Wanbin Tang, University of Electronic Science and Technology of China

12 XANDAR: A holistic Cybersecurity Engineering Process for Safety-critical and Cyber-physical Systems
Fahad Siddiqui, Rafiullah Khan, Sakir Sezer, Queen's University Belfast
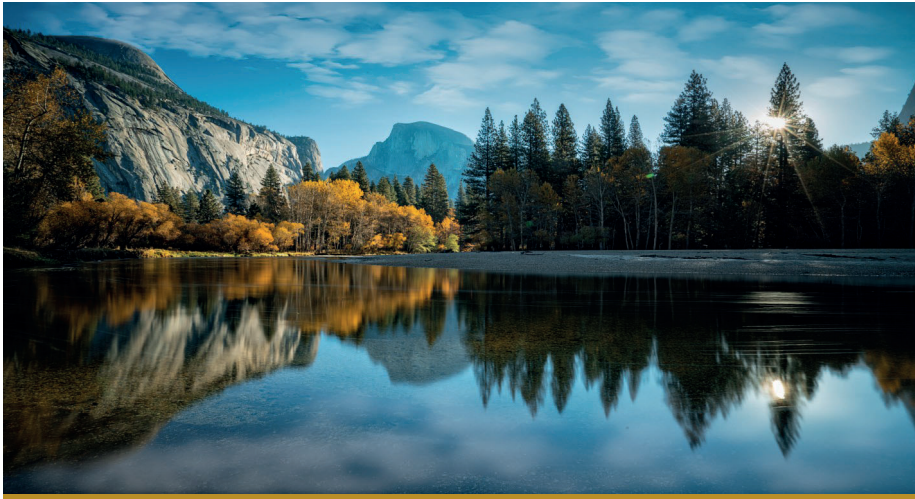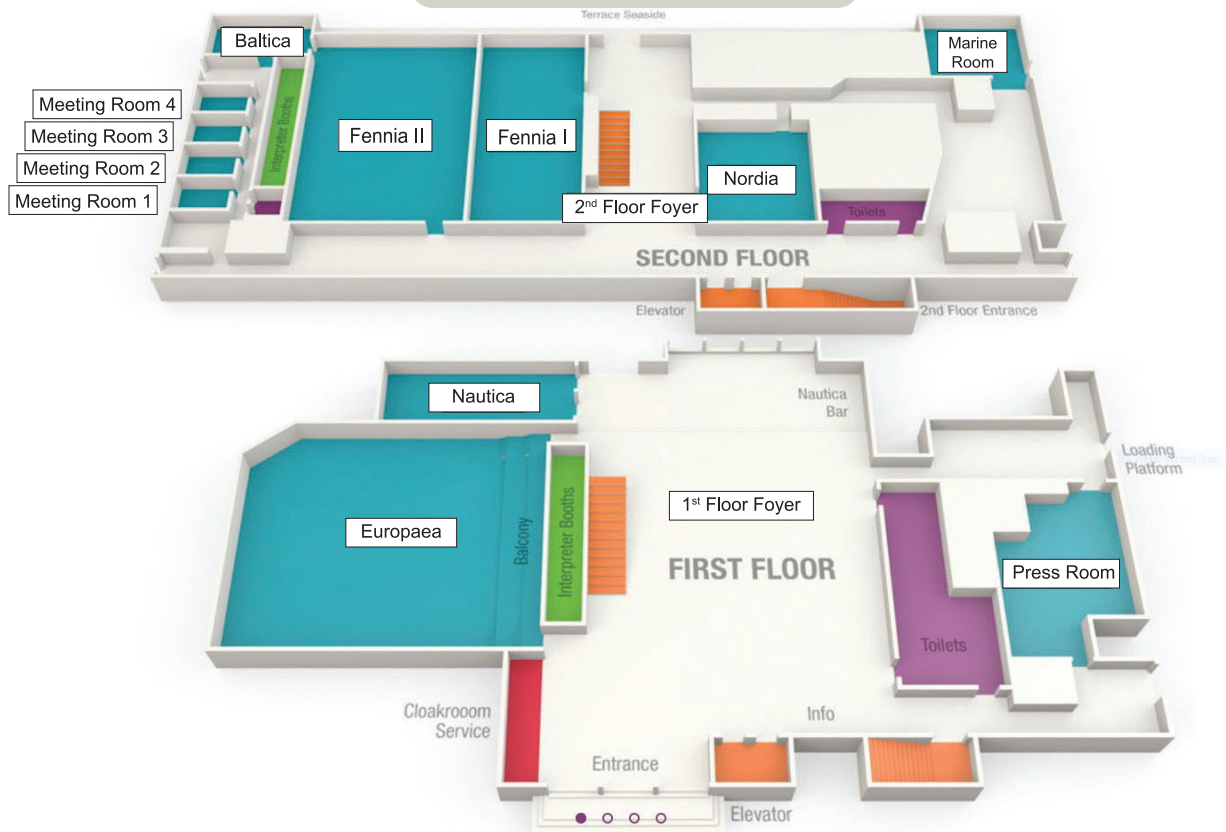
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Merced, CA, USA
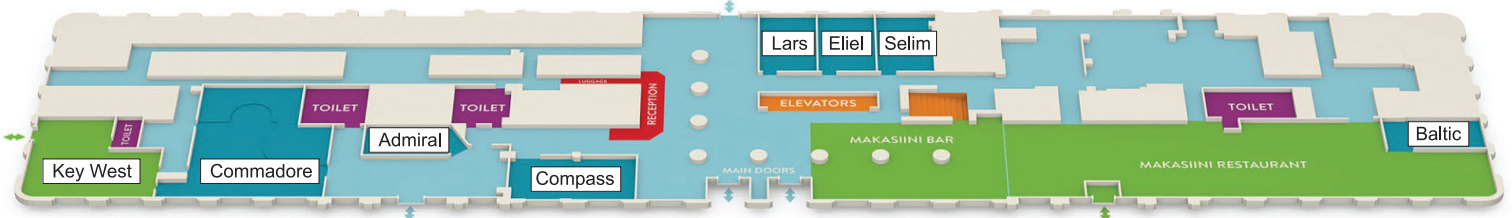For additional information, please visit:
https://events.vtsociety.org/vppc2022/

Floor Plans

SCANDIC MARINA CONGRESS CENTER

VIEW TO WATERFRONT

Terrace Seaside

Baltica

Marine Room

Meeting Room 4
Meeting Room 3
Meeting Room 2
Meeting Room 1

Fennia II

Fennia I

Nordia

2nd Floor Foyer

Toilets

SECOND FLOOR

Elevator

2nd Floor Entrance

Nautica

Nautica Bar

Loading Platform

Europaea

1st Floor Foyer

FIRST FLOOR

Press Room

Toilets

Cloakrooom Service

Info

Entrance

Elevator

SCANDIC GRAND MARINA

Lars Eliel Selim

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