



*2019 90th IEEE
Vehicular Technology Conference*

Final Program



22 – 25 September 2019

Honolulu, Hawaii, USA

Welcome from the General Co-chairs

On behalf of the organization committee, we would like welcome you to the 2019 IEEE 90th Vehicular Technology Conference (IEEE VTC2019-Fall), scheduled for September 22 to 25, 2019 in Honolulu, Hawaii, USA.

IEEE VTC is the flagship conference of the IEEE Vehicular Technology Society. The field of vehicular technology has substantially expanded recently. In particular, vehicular communications is an enabling technology of intelligent transportation, a critical component of 5G and beyond wireless networks. IEEE VTC2019-Fall will promote intelligent connection and transportation.

IEEE VTC2019-Fall features six very interesting and timely keynote talks by leading experts. The conference consists of nearly 500 high-quality technical papers in 10 technical tracks including recent results papers, in addition to an industry sessions track running throughout the conference, 8 tutorials and 9 workshops (including a first-ever diversity workshop). The 2019 IEEE 2nd Connected and Automated

Vehicles Symposium (IEEE CAVS 2019) is also collocated with the IEEE VTC2019-Fall. Without a doubt, you will find IEEE VTC2019-Fall an ideal place for learning new topics, exchanging exciting ideas, and meeting friends both new and old.

We would like to thank all members of the Organizing Committee and the Technical Program Committee. Their dedicated efforts as a legion of conscientious volunteers have made this conference possible. We are also grateful to the hundreds of technical experts in our research community who have involved themselves in the paper review process. Finally, we extend a special thanks to all paper authors for submitting their contributions to IEEE VTC2019-Fall.

We are looking forward to seeing you in Honolulu at IEEE VTC2019-Fall.

Sincerely,

Gordon L. Stüber and Geoffrey Ye Li
General Co-chairs, IEEE VTC2019-Fall

Welcome from the TPC Co-chairs

On behalf of the Technical Program Committee, we sincerely welcome you to the IEEE 90th Vehicular Technology Conference (VTC). We have the pleasure of hosting you in Honolulu – the urban epicenter and capital city of Hawaii. We hope that you will have an enjoyable experience both from the city as well as the rich technical program. IEEE VTC2019-Fall brings together academics and industry experts from all over the world to discuss and exchange ideas in the fields of wireless, mobile, and vehicular technology.

The Technical Program of VTC2019-Fall consists of thirteen tracks. We received a total of 804 paper submissions, out of which 376 papers have been accepted for presentation. Every paper went through a rigorous review process, in which each article received at least three expert reviews. Accepted papers will be presented in 72 oral sessions and seven interactive sessions.

It takes a lot of effort and sacrifice from many individuals to prepare a program at this scale. We sincerely thank the Track Co-Chairs who dedicated so much time and energy to manage hundreds of submissions and the Technical Program Committee members who shared their technical expertise and assisted us in reviewing papers. We would also like to express our gratitude to the Workshop Chairs, Industry Sessions Chairs, and Tutorial Chairs for their invaluable work in shaping the Technical Program.

We hope you will appreciate the unique combination of a cutting-edge technical program with the wonderful experience of an urban city with scenic beaches. Please enjoy the IEEE 90th VTC in Honolulu.

Mahalo!

Li-Chun Wang and Murat Uysal
TPC Co-chairs, IEEE VTC2019-Fall

Welcome from the VTS President

On behalf of the IEEE Vehicular Technology Society, it is truly an honor and a pleasure to welcome all of you to our society's flagship conference: the 2019 IEEE 90th Vehicular Technology Conference (VTC2019-Fall)!

VTC2019-Fall is a wonderful opportunity to learn about the latest advances in vehicular technology from the world's leading experts, including topics such as 5G communications, millimetre wave, connected and autonomous vehicles, machine learning for communications and networking, Internet of Things, and drone networking. This year's conference will provide attendees with a superb collection of technical presentations, tutorials, keynote talks, special sessions, and other activities that will facilitate the seamless exchange of knowledge, enable professional development and growth, and support numerous networking opportunities with other conference attendees from our global vehicular technology community.

Given the impressive range of technical and networking activities offered by VTC2019-Fall, we are very fortunate to have an extraordinary city serving as the host for this conference – Honolulu, HI, USA.

Referred to as the crossroads of the Pacific, Honolulu is a vibrant metropolitan area that possesses a rich collection of cultures from around the Pacific and the world. With numerous attractions to visit around the city, as well as being a convenient home base while exploring the rest of the Hawaiian archipelago, Honolulu is truly an excellent place to stay!

Organizing a world-class conference event such as VTC2019-Fall involves a large and highly dedicated team of volunteers, and we are very thankful to everyone for making this conference an outstanding success! I would like to sincerely thank General Co-Chairs Geoffrey Ye Li and Gordon Stüber, Technical Program Co-Chairs Li-Chun Wang and Murat Uysal, and the rest of the conference organizing team for their time, effort, dedication, and commitment for making VTC2019-Fall one of the premier international conference events in vehicular technology!

Looking forward to meeting all of you here at VTC2019-Fall in Honolulu this September 2019!

With warmest regards,
Alex Wyglinski, *President*
IEEE Vehicular Technology Society

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Neelesh Mehta	Suat Ozdemir	Michele Rondinone	Murat Simsek	Paul Tourniaire	Jian-Jia Weng	Ye Yu
Alberto Mengali	Mustafa Ozger	Arnau Rovira	Keshav Singh	Paul Toyoda	Risto Wichman	Yu Chih-Min
Michela Meo	Bin Pan	Shengzhen Ruan	Simran Singh	Hoangduy Trinh	W. Dhammika	Danni Yuan
Arvind Merwaday	Chunyu Pan	Sushmita Ruj	Vibhram Singh	Dung Phuong Trinh	Widanage	Hang Yuan
Oussama Messadi	Cunhua Pan	Laura Ruotsalainen	Mojtaba Soltanalian	Micaela Troglia	David Tung Chong	Jiantao Yuan
ayoub messoud	Jing Pan	Cristian Rusu	Christoph Sommer	Gamba	Wong	Lei Yuan

Quan Yuan
Fatih Yucel
Chau Yuen
Miyake Yuji
Melda Yuksel
Xie Yuncong
Spyridon
Zafeiropoulos
Alenka Zajic
Anna Zakrzewska
Alessio Zappone
Sheyda Zarandi

Xiong Zehui
Dmitry Zelenchuk
Ming Zeng
Tengchan Zeng
Arooba Zeshan
Daosen Zhai
Qiqing Zhai
Zhonghao Zhai
Jinlong Zhan
Chao Zhang
Di Zhang
Haijun Zhang

Hanshuo Zhang
Jiachi Zhang
Jian Zhang
Jiankang Zhang
Jiayi Zhang
Jiayin Zhang
Jiliang Zhang
Jing Zhang
Jun Zhang
Lei Zhang
Miao Zhang
Ning Zhang

Ran Zhang
Shuhang Zhang
Siwei Zhang
Wensheng Zhang
Xiaoxu Zhang
Xinruo Zhang
Yi-Ming Zhang
Yixin Zhang
Yongmin Zhang
Yu Zhang
Yuli Zhang
Yunliang Zhang

Yuxiang Zhang
Zhaoji Zhang
Zitian Zhang
Ziyao Zhang
Chengcheng Zhao
Donglai Zhao
Lei Zhao
Li Zhao
Lian Zhao
Ming-Min Zhao
Nan Zhao
Xiaodong Zhao

Yue Zhao
Zhongyuan Zhao
Beixiong Zheng
Gan Zheng
Ling Zheng
Mengfan Zheng
Qiming Zheng
Tongxing Zheng
Ting Zhi
Zhiyang
Caijun Zhong
Bo Zhou

Haibo Zhou
Liang Zhou
Tao Zhou
He Zhu
Jianyue Zhu
Kai Zhu
Lipeng Zhu
Yongxu Zhu
Nikola Zlatanov
Nizar Zorba
Tommaso Zugno

Social Events

Lunches are included as part of the full registration and will be served in the Kona Moku Ballroom. The welcome reception will be conducted on Sunday evening, 22 September 2019 in the Mohala Gardens on the first floor starting at 18:00.

The Vehicular Technology Society Non-Member Complimentary Breakfast will be held at Wolfgang Puck Express restaurant located at 2570 Kalakaua Ave., on Monday, 23 September 2019 at 7:30am, only 100 places available. This is for IEEE members and all non-members that have not joined the VTS as a member.

The IEEE VTS Panel Discussion on UAV to UAV Communications will be held on Monday, 23 September 2019 from 16:00 - 18:00 in Kona Moku Ballroom Salon B.

The Vehicular Technology Society Member Complimentary Breakfast will be held at Wolfgang Puck Express restaurant located at 2570 Kalakaua Ave., on Tuesday, 24 September 2019 at 7:30am, only 75 places available. This is for VTS members only.

The banquet on the evening of 24 September 2019 will be an Hawaiian Luau held at the Waikiki Aquarium. It will begin at 18:00 and the entertainment will include a Polynesian Show. Participants will have the opportunity to tour the Aquarium.

Lunches, the reception and banquet require admission tickets and these are included in your registration packet to gain entry. Be sure to present the correct day's lunch ticket or you will not be served. You also may purchase tickets for these events at the registration desk.

Registration

Registration will take place in the Lania area. Opening times are:

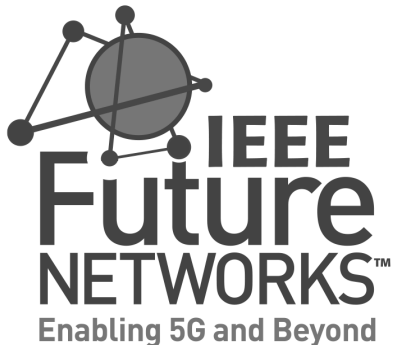
- Sunday 22 September 2019 7:00 - 17:30*
- Monday 23 September 2019 7:00 - 17:30
- Tuesday 24 September 2019 8:00 - 17:30
- Wednesday 25 September 2019 8:00 - 17:30

* After 18:00 on Sunday, you may pick up your badge and tickets at the reception – bags can be picked up on Monday. **(Your registration receipt is required to pick up your registration at the reception.)**

Breaks

Coffee breaks will take place in the Lania area.

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Monday Plenaries

Monday 23 September 2019 9:00–10:30 Kona Moku Ballroom

Cognitive Dynamic System for Cyber Physical Systems and Cybersecurity

Simon Haykin, Distinguished University Professor, McMaster University, Canada

The starting point of this talk is Cognitive Dynamic System (CDS), the ideas of which go back to 2006. However in today's new world, CDS consists of two major items:

- CDS-I, which simulates certain features of the brain.
- CDS-II, which goes deeper in the brain.

Under these two brief introductions, we now introduce the following statement: *The Principle of Predictive Adaptation is for new practical applications*. To elaborate, we will be focusing on the following pair of related but different topics, simply stated as follows:

- Cyber Physical Systems, which are internal.
- Cybersecurity, which is external.

As different as they are, they do nevertheless settle on the same end result: *Risk Sensitive Cognitive Action*.

Simon Haykin received his B.Sc., Ph.D., and D.Sc., all in Electrical Engineering from the University of Birmingham, England. He is a Fellow of the Royal Society of Canada, and a Fellow of the Institute of Electrical and Electronics Engineers. He is the recipient of the Henry Booker Gold Medal from URSI, 2002, the Honorary Degree of Doctor of Technical Sciences from ETH Zentrum, Zurich, Switzerland, 1999, and many other medals and prizes.

He is a pioneer in adaptive signal processing with emphasis on applications in radar and communications, an area of research that has occupied much of his professional life. In the mid-1980s, he shifted the thrust of his research effort in the direction of Neural Computation, which was re-emerging at that time. All along, he had the vision of revisiting the fields of radar and communications

from a brand new perspective. That vision became a reality in the early years of this century with the publication of two seminal journal papers: "Cognitive Radio: Brain-empowered Wireless communications", which appeared in IEEE JSAC Feb. 2005 and "Cognitive Radar: A Way of the Future", which appeared in the IEEE Journal on Signal Processing, Feb. 2006.

Cognitive Radio and Cognitive Radar are two important parts of a much wider and integrative field: Cognitive Dynamic Systems, research into which has become his passion. His current research exploits the Principle of Predictive Adaptation to achieve the following objective:

Risk Sensitive Cognitive Action, the purpose of which is to control Cognitive Dynamic Systems as if the presence of uncertainties do not exist.

Vehicular Communications – C-V2X is Driving it Forward

Edward G. Tiedemann, Jr., Senior VP Engineering & Qualcomm Fellow, Qualcomm Technologies, USA

For many years, the automobile industry and multiple governments developed standards, conducted tests, and were planning to deploy V2X communications using IEEE 802.11p. 802.11p was chosen as the PHY and MAC layers for DSRC (Dedicated Short Range Communications) in the United States, and ITS G5 in Europe. In the two years since the completion of 3GPP Release 14 supporting cellular based vehicle-to-vehicle communications (C-V2V), the industry direction has been rapidly changing. Several factors, including the better performance of 3GPP Release 14, synergies with cellular radios already going into many automobiles, new energy, and timing, are leading to the choice of C-V2X and to its commercial deployment.

This keynote will provide the current status of V2X communications, including its readiness for commercialization, in multiple regions of the world. It will describe the performance benefits of C-V2X communications, the reuse of the upper layer protocols developed for DSRC and ITS-G5, and the various testing and certification programs. The presentation will conclude with a vision for future V2X communications and will describe the work now underway in 3GPP to bring a second generation of C-V2X communications based upon NR..

Edward G. Tiedemann, Jr. is a Qualcomm Fellow and a Senior Vice President of Engineering of Qualcomm Technologies, Inc. He leads Qualcomm's worldwide standardization and industry organization activities. Dr. Tiedemann was instrumental in the design and development of the TIA/EIA/IS-95 CDMA system, also called cdmaOne™. He led Qualcomm and much of the industry's efforts in the design and development of the third-generation cdma2000® system. Dr. Tiedemann holds over 200 US patents and has participated in many papers, conference lectures, and industry panels. He currently sits on the board of several industry organizations. He is interested in multiple topics in communications including 5G, IoT, and V2x.

Dr. Tiedemann holds the Ph.D. degree from MIT where he worked in the areas of queueing theory and communications networks. He holds the Master of Science degree from Purdue University and a Bachelor of Science degree from Virginia Polytechnic Institute and State University (Va Tech).

Dr. Tiedemann is past chairman of the Advisory Board of the College of Engineering at Virginia Polytechnic Institute and State University (Va Tech). He currently sits on the Advisory Board of the Purdue University School of Electrical and Computer Engineering. Dr. Tiedemann was General Chair of GLOBECOM 2015. He is also a member of the Board of Overseers of the Peabody Essex Museum.

Monday Industry Track: 5G

Monday 23 September 2019 11:00–12:30 Kona Moku Ballroom, Salon B

Panel: Topics in 5G Technology and Standards

Moderator:	Amitabha Ghosh	<i>Nokia</i>
Panelists:	Takehiro Nakamura	<i>NTT DoCoMo</i>
	Antti Toskala	<i>Nokia Bell Labs</i>
	Anthony C.K. Soong	<i>Futurewei Technologies</i>
	Rath Vannithamby	<i>Intel</i>

The first phase of 3GPP 5G New Radio (NR) Rel-15 standardization has been completed and the commercial deployment of 5G system is already underway both at sub 6GHz and mmWave band. In this session we will cover the 5G NR Rel-15 features and what component technologies will be covered in Rel-16 and Rel-17 of 3GPP NR. Further, we will also address the first hand 5G NR deployment experience from a major operator. The session will comprise of two to three keynote talks followed by a short panel session.

Amitabha (Amitava) Ghosh is a Nokia Fellow and Head, Radio Interface Group at Nokia Bell Labs. He joined Motorola in 1990 after receiving his Ph.D in Electrical Engineering from Southern Methodist University, Dallas. Since joining Motorola he worked on multiple wireless technologies starting from IS-95, cdma-2000, 1xEV-DV/1XTREME, 1xEV-DO, UMTS, HSPA, 802.16e/WiMAX and 3GPP LTE. He has 60 issued patents, has written multiple book chapters and has authored numerous external and internal technical papers. He is currently working on 3GPP LTE-Advanced and 5G technologies. His research interests are in the area of digital communications, signal processing and wireless communications. He is the recipient of 2016 IEEE Stephen O. Rice and 2017 Neal Shephard prize, member of IEEE Access editorial board and co-author of the book “Essentials of LTE and LTE-A”.

Antti Toskala is responsible for Nokia’s 5G radio standardization. He has his MSc in Electrical Engineering from Tampere University of Technology. He has been the author and editor on the many books in the field, including recent books on HSPA+, VoLTE, LTE-Advanced and LTE Small Cell Optimization. He participates to 3GPP RAN standardization, and has also chaired 3GPP TSG RAN WG1 during HSPA development until 2003. As part of the 2010 LTE World Summit LTE Awards, he received the “Award for Individual Contribution for LTE Development” recognizing his contribution to both LTE standardization and LTE knowledge spreading in the industry. Currently he is Bell Labs Fellow, leading radio 5G and C-IoT standardization, as well as spectrum regulation.

Takehiro Nakamura joined NTT Laboratories in 1990. He is now SVP and General Manager of the 5G Laboratories in NTT DOCOMO, Inc. He has been engaged in the standardization activities for the W-CDMA, HSPA, LTE/LTE-Advanced and 5G at ARIB in Japan since 1997. He has been the Acting Chairman of Strategy & Planning Committee of 5G Mobile Communications Promotion Forum(5GMF) in Japan since October 2014. Mr. Nakamura has also been contributing to standardization activities in 3GPP since 1999, including as a contributor to 3GPP TSG-RAN as chairman from April 2009 to March 2013. He is also very active in standardization of C-V2X/Connected Car in ARIB and ITS Info-communications Forum in Japan. He is now a leader of Cellular System Application Task Group of ITS Info-communications Forum.

Anthony C. K. Soong (S’88-M’91-SM’02-F’14) received the Ph.D. degree in electrical and computer engineering from the University of Alberta. He is currently the Chief Scientist for Wireless Research and Standards at Huawei Technologies Co. Ltd, in the US. He currently serves on the Engineering College Industrial Advisory Board of The University of North Texas. He

served as Secretary and the founding board member of OPNFV (2014-2016), the chair for 3GPP2 TSG-C NTAH (the next generation radio access network technology development group) from 2007-2009 and vice chair for 3GPP2 TSG-C WG3 (the physical layer development group for CDMA 2000) from 2006-2011. Prior to joining Huawei, he was with the systems group for Ericsson Inc and Qualcomm Inc. His research group is actively engaged in the research, development and standardization of the next generation cellular system. His research interests are in statistical signal processing, robust statistics, wireless communications, spread spectrum techniques, multicarrier signaling, multiple antenna techniques, network virtualization, SDN and physiological signal processing.

Dr. Soong is a Fellow of the IEEE. He has published more than 100 scientific papers and has more than 100 patents granted or pending. He received the 2017 IEEE Vehicular Technology Society James R. Evans Avant Garde Award, the 2013 IEEE Signal Processing Society Best Paper Award and the 2005 award of merit for his contribution to 3GPP2 and cdma2000 development. He is the Industrial Chair for VTC2019-Fall and Industrial Co-Chair for VTC2019-Spring.

Rath Vannithamby received his BS, MS, and PhD degrees in EE from the University of Toronto, Canada. He is a senior research scientist in Intel Labs, USA responsible for 5G research. He is a recipient of Top Inventor award at Intel in 2015. Previously, he was a researcher at Ericsson, USA. He is a Senior Member of IEEE. He is an IEEE Communications Society Distinguished Lecturer for 2014-2017. He has published over 50 journal/conference papers and has over 200 patents granted/pending. He is an editor of a couple of books: (i) "Towards 5G: Applications, Requirements and Candidate Technologies" by Wiley and (ii) "Design and Deployment of Small Cell Networks" by Cambridge Press. He has also authored chapters of 3 books on 4G. Dr. Vannithamby has been an associate editor for Journal of IEEE Communications Surveys and Tutorials since 2012, and he was an editor for IEEE Internet of Things Journal in the past. He was the lead-chair for two workshops at IEEE ICC 2014; and co-chair for "5G HetNets" workshop in GC’16, and “Main Trends in 5G Networks” workshop in ICC’17. He has given tutorials and hosted panels on 3G/4G/5G topics in numerous venues in IEEE conferences. He was a Guest Editor for EURASIP JWCN SI on RRM for 3G+ Systems. He was a TPC symposium co-chair for PIMRC’11. He is a member and the Standards Liaison for IEEE ComSoc Signal Processing and Communications Electronics Technical Committee (SPCE-TC). He has also served on TPC for IEEE ICC, GC, VTC, WCNC, and PIMRC. His research interests are in the area of 5G RAN, 5G IoT, ultra-dense networking, Autonomous Driving, and ICN.

Monday 23 September 2019 14:00–15:30 Kona Moku Ballroom, Salon B

Panel: Challenges and Technologies for building the 5G network Edge

Moderator: Alan Gatherer *Futurewei*
Panelists: Gregory Wright *Nokia*
Gajinder Panesar *UltraSoC*
Marcus Wong *Futurewei*
K. Kiran Mukkavilli *Qualcomm*

The purpose of this session is to outline the key technologies in hardware, software and systems that we are, as an industry, developing in order to support the promised performance of 5G networks. This session will not, as is often the case with a 5G panel session, focus on the algorithm challenges, though there are many of those, but will instead focus on the difficulties in realizing these algorithms in hardware at the challenging cost, power and flexibility goals that the 5G network demands.

Alan Gatherer is a Senior Technical Vice President at Futurewei Technologies, USA and Fellow of the IEEE. He is responsible for R&D efforts in the US to develop next generation baseband chips and software for 4G and 5G basestation modems. His group is presently developing 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. Alan joined Futurewei in January 2010. 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.

Gregory Wright received his bachelor's degree in physics from Harvard University, his M.A. in mathematics from Cambridge University and his Ph.D. in physics from Princeton University. He did his postdoctoral studies at Bell Labs in millimeter wave astronomy, developing receiver systems operating at 230, 492 and 810 GHz. He was a researcher at Bell Labs from 1994 until 2001, after which he co-founded startups in network performance measurement and RFID systems. He joined Alcatel-Lucent Bell Labs (now Nokia Bell Labs) in 2010 as a member of wireless communication research, where he has worked on new approaches for antenna arrays, reconfigurable signal processing and wide dynamic range radios.

One of Europe’s leading SoC architects, **Gajinder Panesar’s** experience includes senior architecture definition and design roles within both blue-chip and start-up environments. He holds more than 20 patents and is the author of more than 20 published works. Prior to joining UltraSoC, he served at NVIDIA (NASDAQ:NVDA). As Chief Architect at Picochip he created the architecture of the company’s market-defining small-cell SoCs,

and continued in this capacity after the company’s acquisition by Mindspeed Inc (NASDAQ:MSPD). His previous experience includes roles at STMicroelectronics, INMOS, and Acorn Computers. He is a former Research Fellow at the UK’s Southampton University, and a former Visiting Fellow at the University of Amsterdam.

Marcus Wong has over 20 years of experience in the wireless network security field with AT&T Bell Laboratories, AT&T Laboratories, Lucent Technologies, and Samsung’s Advanced Institute of Technology. He is CISSP certified.

Marcus has concentrated his research and work in many aspects of security in wireless communication systems. Marcus joined Futurewei Technologies (a subsidiary of Huawei Technologies) in 2007 and continued his focus on research and standardization. Marcus has held elected official positions in both WWRF and 3GPP. He also served as guest editor in the IEEE Vehicular Technology magazine. As an active contributor, author, and publisher, he has shared his security research on a variety of whitepapers, book chapters, and speaking engagements.

K. Kiran Mukkavilli is a Principal Engineer/Manager in Qualcomm Research. He joined Qualcomm in 2003, holds 102 granted U.S.patents, and has been involved in system design, standardization, implementation and commercialization of a variety of projects at Qualcomm. He was one of the principal architects of MediaFLO, a mobile broadcast solution from Qualcomm, and was heavily involved in the product development, standardization and commercialization efforts. He was also the systems design lead responsible for commercialization of the UMTS modem in Qualcomm Snapdragon 800/801 products. In his current role, he is responsible for R&D efforts for PHY/MAC system design, standardization and prototyping for Sub 6GHz aspects of 5G NR. He successfully led Qualcomm’s effort to set up industry’s first end to end Rel 15 spec compliant 5G NR call with the leading infra vendors using proto UE implementation. Dr. Mukkavilli received his Ph.D. in electrical engineering from Rice University in 2003 and also holds M.S. from Rice University and Bachelor of Technology from Indian Institute of Technology, Madras.

Monday 23 September 2019 16:00–17:30 Kona Moku Ballroom, Salon B

Panel: Conquering New Application Frontiers with 5G

Moderator: K. Kiran Mukkavilli *Qualcomm*
Panelists: Antti Toskala *Nokia*
Jin Yang *Verizon*
Siva Subramani *Futurewei Technologies*
Wanshi Chen *Qualcomm and RAN 1 chair*

This session will focus on new consumer and industrial use cases uniquely enabled by 5G with requirements based on throughput, latency and reliability. Example applications include XR (AR/VR, cloud gaming, edge compute), Industrial IOT, enhanced V2X among others. The session will comprise of invited talks followed by a panel discussion.

K. Kiran Mukkavilli's biography appears above.

Antti Toskala's biography appears on the previous page.

Jin Yang is a Fellow at Verizon Communications Inc., responsible for wireless technology and strategy. She is leading next generation wireless network architecture and technologies, including 5G NR, Evolved LTE, Internet of Things (IoT), Multi-access Edge Computing, network virtualization, and Self-Organizing Network. She has played a key role in the development and commercialization of 5G NR in 2019, LTE networks in 2010 and various CDMA networks since 1995 at Verizon, Vodafone and AirTouch Communications.

Dr. Yang received the B.Sc. (Honors), and Ph.D. degrees from Tsinghua University. She has more than 50 granted patents and 20 pending patents on wireless communications. She has published numerous papers, and co-authored 3 books on mobile communications.

Siva Subramani is a Senior Standards Expert with Futurewei Technologies. He is actively involved in 3GPP RAN standardization, particularly on 5G physical layer developments, LTE / LTE-A enhancements and features. He was with Vodafone Group as a Standards Strategy Manager with responsibility for

Radio Access Network (RAN) standardization in 3GPP and developing features related to vertical industry. He was the rapporteur of NB-IoT and instrumental for NB-IoT technology delivery from innovation to commercialization. He also contributed to design scoping of cellular vehicular communication (V2V and V2X) in LTE and NR. He is a Senior Member of IEEE. He holds a Ph.D. in Electrical and Electronics Engineering from the University of Bristol, UK.

Wanshi Chen is currently 3GPP TSG RAN1 Chairman, where under this position, he has successfully managed a wide range of 3GPP TRG RAN1 Long Term Evolution (LTE) and New Radio (NR) sessions. He has over 20 years of experiences in telecommunications in leading telecom companies including operators, infrastructure vendors, and chipset vendors. He has been with Qualcomm since 2006 and is responsible for LTE and NR research, design, and standardization. From 2000 to 2006, he was with Ericsson for 3GPP2 related system design, integration, and standardization. He also worked for China Mobile between 1996 and 1997 for wireless network maintenance and optimization. He received a Ph.D. degree in electrical engineering from the University of Southern California, Los Angeles, CA, USA.

Monday Evening Panel

Monday 23 September 2019 18:00–20:00 Salon B

Panel: UAV to UAV Communications: Options, Challenges, and Standards

Moderator:	Kamesh Namuduri	<i>University of North Texas</i>
Panelists:	Arup Bhuyan	<i>Idaho National Laboratory</i>
	Gürkan Gür	<i>Zurich University of Applied Sciences</i>
	Ravi Pragada	<i>InterDigital</i>
	Stephen Hayes	<i>Ericsson</i>
	Dallas Brooks	<i>Mississippi State University</i>
	Alistair Munro	<i>Digital Catapult</i>

Before unmanned air transportation can become a reality, there are several technical challenges that need to be addressed by the research community. The most important among them is the need for enhanced situational awareness for UAVs in the airspace. UAV-to-UAV Communications is the key for enhanced situational awareness. It facilitates Beyond Radio-Line-of-Sight Communications, Deconfliction strategies, and sharing of situational awareness information between the UAVs. The panel discusses the options for UAV-to-UAV communications including satellite, cellular, and aerial communications. Standardization efforts including IEEE P1920.1, IEEE 1920.2, 3GPP, ASTM, RTCA, and EUROCAE will be covered.

Kamesh Namuduri is a Professor of Electrical Engineering and the director of Autonomous Systems Laboratory at the University of North Texas (UNT). He received his B.S. degree in Electronics and Communication Engineering from Osmania University, India, in 1984, M.S. degree in Computer Science from University of Hyderabad in 1986, and Ph.D. degree in Computer Science and Engineering from University of South Florida in 1992. Over the past eleven years, his research is focused on aerial networking and communications. He co-organized a series of workshops on “Airborne Networking and Communications” in conjunction with IEEE, AIAA, AUVSI, and ACM Conferences. He is serving as the chair for two Standards Working Groups (IEEE 1920.1: Aerial Communications and Networking and IEEE 1920.2: Vehicle-to-Vehicle Communications for Unmanned Aircraft Systems). He is serving as the Chair for the IEEE Vehicular Technology Society’s Ad Hoc Committee on Drones. He is a co-editor for the book titled “UAV Networks and Communications” published by the Cambridge University Press in 2017. He is leading the Smart and Connected Community project on “Deployable Communication Systems” in collaboration with the government, public, and private organizations. This living laboratory project was demonstrated thrice during the Global City Teams Challenge hosted jointly by

the National Institute of Standards and Technology and US Ignite in 2015, 2016, 2017, and 2018. He contributed to the development of research agenda, requirements and blueprints highly deployable communications systems led by the National Institute of Standards and Technology and National Public Safety Telecommunications Council.

Arupjyoti (Arup) Bhuyan is a wireless researcher in the Idaho National Laboratory (INL) and the Technical Director of the INL Wireless Security Institute. The focus of his research is on secure implementation of future generations of wireless communications with scientific exploration and engineering innovations across the fields of wireless technology, cybersecurity, and computational science. Specific goals are to assure communications among critical infrastructure systems supporting control of the electric grid, emergency response, and nationwide unmanned aerial systems. Arup has extensive industry experience in wireless communications from his work before he joined INL in October, 2015. He received his Ph.D. in Engineering and Applied Sciences from Yale University. He is a senior member of IEEE.

Gürkan Gür is a senior researcher at Zurich University of Applied Sciences (ZHAW) InIT Information Security Group in

Switzerland. He received his B.S. degree in electrical engineering in 2001 and Ph.D. degree in computer engineering in 2013 from Bogazici University in Istanbul, Turkey. His research interests include Future Internet, 5G networks, information security, and information-centric networking. He has two patents (one in US, one in TR) and published more than 50 academic works. He has been involved in various European 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.

Ravi Pragada is a Senior Principal Engineer at InterDigital where he is responsible for leading next generation air-interface and system technologies. He has broad expertise covering incubation, pre-standards R&D, standardization, technology, product development and prototyping. He has actively contributed to and held leadership positions in various next generation wireless system projects viz., ultra-low power communications, AI/ML applied to wireless, sub-THz systems, unmanned aerial systems, millimeter wave air-interface/backhaul design and development, device-to-device communications, and beyond 5G architectures. Ravi is a prolific inventor with 180+ granted or pending international patent applications. He is a recipient of numerous innovation awards including InterDigital's Chairman's award, President's award, multiple CTO awards as well as Lucy Mahjobian distinguished publication award. Prior to InterDigital he was part of Tier 1 OEM team that developed RNC and NodeB infrastructure for 3GPP UMTS system. He is currently serving as vice-chair for the IEEE 1920.1: Aerial Communications and Networking Standards Working Group.

Stephen Hayes is the Director of Standards for Ericsson in North America. He has worked on various cellular issues over the last 20 years and been heavily involved in the evolution of the 3GPP family of technologies. His current focus includes the ATIS committees and 3GPP. He is also involved in several US advisory groups such as the FCC TAC (Technical Advisory Committee) where he chairs the subgroup on UAS spectrum issues. Stephen is currently the Vice-Chair of 3GPP TSG-RAN. Stephen was chairman of the 3GPP systems group (3GPP-SA) from 2006- 2011. Before that, Stephen was the chair of the Core Network group in 3GPP. Stephen is also the chair of the 3GPP group on working procedures.

Dallas Brooks is the Director, Raspet Flight Research Laboratory at Mississippi State University and the Associate Director of the ASSURE FAA UAS Center of Excellence. As the Raspet Director, he is responsible for MSU's broad spectrum of government and commercial manned and unmanned aviation research, development, test and engineering programs. As the Associate Director for ASSURE, he develops and coordinates research strategies and focus areas for over 20 of the nation's leading universities specializing in unmanned systems integration, safety, operations and policy. He also directs ASSURE's UAS Safety Research Center, a national-level research facility that focuses on enhancing the safety and efficiency of UAS operations in a broad range of environments. Mr. Brooks is the Immediate Past Chairman of the Board of Directors for the Association of Unmanned Vehicle Systems International (AUVSI), the world's largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. He also serves as co-chair of the Federal UAS Science and Research Panel, supporting 8 Federal agencies including the FAA, the DoD, NASA and DHS to identify and solve key UAS integration technical challenges.

Alistair Munro is currently Senior Expert Advisor on 5G at the Digital Catapult in London, UK. He worked previously at Airbus Defense and Space where he was Technical Lead for communications, spectrum management and security in the UK ASTRAEA project, which was concerned with the integration of unmanned aircraft systems into non-segregated airspace. Before that he held the Toshiba Chair in Communications Networks at Bristol University, UK. Having obtained his B.S. in Mathematics from Imperial College, London and PhD from University of Manchester, UK in 1983, he has over 30 years' experience in the specification, design and implementation, and performance analysis of distributed computing systems.

He has collaborated widely with industry and academia in the UK, Europe, the USA and Japan, mainly on communications standards and also in regulatory aspects of UAS operation. He is co-Chair of the EUROCAE WG-105 Communications, Spectrum and Security sub-group and is editor of the IEEE P.1920 draft standard for networking services to support UAS operations. He is an Advisor to the UK CAA in the ICAO RPAS Panel.

Tuesday Plenaries

Tuesday 24 September 2019 9:00–10:30 Kona Moku Ballroom

Delivering 5/6G Performance: mmWave Spectrum Opportunities and Challenges

Reinaldo A. Valenzuela, *Director, Nokia Bell Labs, USA*

The insatiable demand for media rich content and the increasing availability of advanced devices such as smart phones, tablets, etc., has forced the mobile communications eco system to consider the next generation solutions to address these needs. 5G, already in early commercial deployment, is responding to these needs with options such as Small Cells, HetNets, Carrier Aggregation, Internet-of-Things, Relays, Device-to-Device, massive MIMO and operation in the vast spectrum available in the millimeter wave range, among others. In this talk, I will review some of the opportunities and challenges inherent to these higher bands, such as increased propagation loss, maintaining antenna gain, beam spreading, channel dynamics and how they can be best addressed to deliver practical solutions to the challenges facing 5G and beyond.

Reinaldo A. Valenzuela: Member NAE. Fellow IEEE. IEEE Eric E. Sumner Award. Bell Labs Fellow. WWRF Fellow, 2014 IEEE CTTC Technical Achievement Award, 2015 IEEE VTS Avant Garde Award. B.Sc. U. of Chile, Ph.D. Imperial College. Director, Communication Theory Department, Distinguished Member of Technical Staff, Bell Laboratories. Engaged in propagation

measurements and models, MIMO/space time systems achieving high capacities using transmit and receive antenna arrays, HetNets, small cells and next generation air interface techniques and architectures. He has published 210 papers and 44 patents. He has over 29,000 Google Scholar citations and is a 'Highly Cited Author' In Thomson ISI and a Fulbright Senior Specialist.

Cooperative Automated Driving: Overview, Design, and Technical Challenges

Gaurav Bansal, *Principal Engineer, Airbus A³ Labs, USA*

Connected Automated driving is an important emerging field and attendees would be able to gain technical and policy knowledge in this field by attending the talk. Background on vehicular safety communications and current deployments in various parts of the world will be provided. Vehicular communication will enable sensor data sharing between vehicles which could be the key for achieving higher levels of automation. Novel artificial intelligence techniques exploiting sensor data (camera, radar, GPS etc.) from neighboring cars can be used for designing perception and mapping functionalities for automated vehicles. Results demonstrating the advantages of connected automated driving will also be presented.

Gaurav Bansal is a Principal Engineer at the Airbus A³ Labs where he is currently leading initiatives in Artificial Intelligence to enable self-piloted aircraft operation and flying autonomous vehicles. Previously, Gaurav worked as a Principal Researcher at the Toyota InfoTechnology Center in Mountain View, CA, where he led several research efforts on the design of communication systems for Automated Driving. Gaurav is an expert in Vehicular Communications, pioneering contributions in Dedicated Short Range Communications (DSRC) congestion control and in innovative use-cases to leverage connectivity in vehicles. His

research interests also include millimeter wave & full-duplex wireless communications. Gaurav represented Toyota in the Automakers' Vehicle Safety Communication Consortium and in the SAE, ETSI standardization bodies. Gaurav's paper on DSRC Congestion Control received the Best Paper Award at the IEEE WiVEC Symposium. He also holds several patents in the field. Gaurav serves on the editorial board of IEEE Vehicular Technology Magazine and IEEE Connected Vehicles Initiative. Gaurav holds Electrical Engineering degrees from Indian Institute of Technology, Kanpur and The University of British Columbia.

Tuesday Industry Track: Machine Learning

Tuesday 24 September 2019 11:00–12:30 Kona Moku Ballroom, Salon B

Panel: An intelligent 5G network for a Variety of Services

Moderator: **Jin Yang** *Fellow, Verizon*
Panelists: **Murali Ranganathan** *Head of SON Business Product Management, Nokia*
Pingping Zong *Sr Principal Engineer, Intel*
Bo Hagerman *Principal Researcher, Ericsson*
Kazuaki Takeda *Manager, AI and Service Innovation, NTT DOCOMO INC.*

5G wireless network is evolving from a connectivity-based network to an intelligent service delivery platform. The 5G service based network architecture, radio and core network virtualization allow more flexible network function placement and broad ecosystem. The 5G supports end-to-end network slicing and differentiated Quality of Services (QoS) from radio, transport to core and application server. An intelligent multiple-access edge network is needed to support massive Internet of Things, ultra-reliable and low-latency communications (URLLC) on top of enhanced mobile broadband (eMBB). Dynamic new radio access with sophistic beam management and further densified radio nodes increase the complexity of network operation beyond human-being can handle. Thus, artificial intelligent and machine learning are essential for autonomous network operations to enable a fully connected world with communications of everything.

Jin Yang's bio appears on Page 15.

Murali Ranganathan is responsible for worldwide SON business product management at Nokia Software. As Head of SON Business Product management, his responsibilities include roadmap management, customer liaison and long term technology and strategy positioning of SON for 5G and beyond. Murali works closely with his counterparts at Nokia Bell Labs to define SON simulations and standardization needs. Murali has been working on SON related projects since 2010 and has over 20 years of experience in product management, systems engineering, simulations and network performance optimization of satellite and terrestrial wireless technologies along with 10 patents.

Pingping Zong is a Senior Principal Engineer in Next Generation and Standards (NGS) group Wireless Technology team in Intel Corporation. She leads 5G technology prototyping and ecosystem engagement, focusing on TSN over 5G, URLLC enhancement and private/local networking. Prior to her current role, Pingping has led the technology development team in NGS 3GPP standards team, contributed to the early development of 5G network architecture and protocol design, as well as 3GPP standardization strategy and

operations work. Dr. Zong received her BS degree from Beijing University of Post and Telecommunications, and her MS and Ph.D. degrees from New Jersey Institute of Technology, all in Electrical Engineering.

Bo Hagerman is a Principal Researcher with Ericsson Research, and he currently holds a position as 5G Network Strategy Evolution Leader North America. Dr. Hagerman has more than 30 years of experience in radio network system research and development. He received the M.Sc. EE, Lic. Tech. EE and Ph.D. degrees, in Radio Communication Systems, from Royal Institute of Technology (KTH), Stockholm, Sweden in 1987, 1993 and 1995, respectively. Since Dr. Hagerman joined Ericsson Research in 1987, he has held various leading technical positions in research and development working on pre-2G cellular systems and onward. Dr. Hagerman has focused his professional carrier on aspects of radio network deployment, multi-antenna and spatial processing including the challenges of hardware architectures, algorithms, protocols, deployment and benefits in the radio network. Dr. Hagerman is named inventor on more than 340 granted patents globally, and he is a Senior Member of IEEE.

Kazuaki Takeda received his B.E., M.S. and Dr. Eng. degrees in communications engineering from Tohoku University, Sendai, Japan, in 2003, 2004 and 2007 respectively. Since 2005, he has been a Japan Society for the Promotion of Science (JSPS) research

fellow. In 2008, he joined NTT DOCOMO INC. He has been the rapporteur for New Radio (NR) in 3GPP TSG-RAN since March 2016. His research interests include new radio access technologies for LTE, LTE-Advanced, and NR.

Tuesday 24 September 2019 14:00–15:30 Kona Moku Ballroom, Salon B

Panel: Artificial Intelligence Paradigms for Designing Wireless Systems

Moderator: **Haris Gaćanin** *Nokia*
Panelists: **Peiyong Zhu** *Huawei Technologies*
Nageen Himayat *Intel*
Klaus Doppler *Nokia*
Shugong Xu *Shanghai University*

The aim of this panel is to bring different dimensions in addition to the traditional wireless network (technology)-centric thinking on network design and operation, and focus to outline the associated research challenges related to positioning and importance of advancements in network management and operations in 5G. This panel gathers industry experts to discuss future research directions related to application of artificial intelligence and machine learning in 5G network design with respect to connectivity, autonomous operation, services and optimization. The above addressed issues provoke new coming challenges and unveil necessary future directions across multi-disciplinary research areas highlighting operator/technology and service requirements with necessary architecture and supporting infrastructure.

Haris Gaćanin received his Dipl.-Ing. degree in Electrical engineering from the University of Sarajevo in 2000. In 2005 and 2008, respectively, he received MSc and PhD from Tohoku University in Japan. He was with Tohoku University from 2008 until 2010 first as Japan Society for Promotion of Science postdoctoral fellow and later, as Assistant Professor. In 2010, he joined Alcatel-Lucent (now Nokia), where he is currently Department Head at Nokia Bell Labs. He is adjunct professor at University of Leuven (KU Leuven). His professional interests are related to applications of artificial intelligence with machine learning in autonomous wireless networks. He has 200+ scientific publications (journals, conferences and patent applications) and invited/tutorial talks. He is senior member of the Institute of Electrical and Electronics Engineers (IEEE) and the Institute of Electronics, Information and Communication Engineering (IEICE). He is a recipient of 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 Japan Society for Promotion of Science (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. He was awarded by Japanese Government (MEXT) Research Scholarship in 2002.

Peiyong Zhu is an IEEE Fellow and Huawei Fellow. She is currently leading 5G wireless system research in Huawei. The focus of her research is advanced wireless access technologies with more than 200 granted patents. She has been regularly giving talks and panel discussions on 5G vision and enabling technologies. She served as the guest editor for IEEE Signal processing magazine special issue on the 5G revolution and IEEE JSAC on Deployment Issues and Performance Challenges for 5G. She co-chaired various 5G workshops in IEEE GLOBECOM. She is actively involved in 3GPP and IEEE 802 standards development. She is currently a WiFi Alliance Board member. Prior to joining Huawei in 2009, Peiyong was a Nortel Fellow and Director of Advanced Wireless Access Technology in the Nortel Wireless Technology Lab. She led the team and pioneered research and prototyping on MIMO-OFDM and Multi-hop relay. Many of these technologies

developed by the team have been adopted into LTE standards and 4G products. Peiyong Zhu received the Master of Science degree and Doctor Degree from Southeast University and Concordia University in 1985 and 1993 respectively.

Nageen Himayat is a Principal Engineer with Intel, where she conducts research on next generation (5G/5G+) of mobile broadband systems, and applications of machine learning for wireless. She has authored over 250 technical publications (peer-reviewed publications, 3GPP/IEEE standards contributions and patent filings), with contributions on multi-radio heterogeneous networks, mm-wave communication, cross layer design, and non-linear signal processing techniques. Prior to Intel, Nageen was with Lucent Technologies and General Instrument, where she developed systems for both wireline and wireless networks. Nageen received her BSEE degree from Rice University, MBA from University of California, Berkeley, and Ph.D. from the University of Pennsylvania.

Klaus Doppler is heading the Indoor Networks Research group in Nokia Bell Labs. His research focus is on enabling ubiquitous Gigabit connectivity and on developing technologies for smart buildings, enterprises and factories. In the past, he has been responsible for the wireless research and standardization in Nokia Technologies, incubated a new business line and pioneered research on Device-to-Device Communications underlying LTE networks. Klaus received several inventor awards in Nokia for 100+ pending and granted patent applications. He has published 40+ scientific publications, received his PhD. from Aalto University, Finland in 2010 and his MSc. from Graz University of Technology, Austria in 2003.

Shugong Xu is an IEEE Fellow, a specially-appointed professor at Shanghai University, head of the Shanghai Institute for Advanced Communication and Data Science (SICS). In his 20+ years career in research (over 15 years in industrial research labs), he had over 40 issued US/WO/CN patents and published more than 100 peer-reviewed research papers. He was awarded "National Innovation Leadership Talent" from China government in 2013, IEEE Fellow in 2015. Shugong also won 2017 Award for Advances in Communication from IEEE Communication Society. His current research interests include V2X, wireless communication systems, and machine learning etc.

Tuesday 24 September 2019 16:00–17:30 Kona Moku Ballroom, Salon B

Panel: AI for Autonomous Driving Networks

Moderator: David Soldani *Huawei*
Panelists: Kamesh Namuduri *UNT*
Haris Gačanin *Nokia*
Wanshi Chen *3GPP RAN 1 Chair and Qualcomm*
Kazuaki Takeda *NTT DOCOMO*
Petri Mähönen *RWTH Aachen University*

In the 5G era, network operation and management (O&M), resources and (micro-)services orchestration, performance and security improvement, and service diversity have reached an unprecedented level of complexity. Numerous communication service providers need to handle co-existing radio access technologies (2/3/4/5G), exploit more than 15 spectrum bands (from 400 MHz up to 52.6 GHz), configure more than 50 types of sites, and activate thousands of features with thousands of parameters to set. The performance of massive MIMO and heterogeneous networks affect more than 20 categories of devices and a large range of services – from voice over LTE and New Radio (NR) to AR/VR, air fiber, smart manufacturing, connected cars, smart buildings, smart energy, etc. This complexity is calling for Self Driving Networks, shifting from solutions where decisions and service experience are still subject to human intervention to highly and even fully autonomous networks by means of adaptive and self-learning policies and self-evolution.

David Soldani received a M.Sc. degree, Laura Vecchio Ordinamento, in Electronic Engineering with magna cum laude from Università degli Studi di Firenze, Italy, in 1994; and a D.Sc. degree in Technology with distinction from Helsinki University of Technology (Aalto University), Finland, in 2006. In 2014, 2016 and 2018 he was appointed Visiting Professor, Industry Professor, and Adjunct Professor at University of Surrey, UK, University of Technology Sydney, Australia, and University of New South Wales, respectively.

Dr. Soldani has been active in the ICT industry for more than 20 years, successfully working on 500+ research, innovation and customer services projects for 2G, 3G, 4G and 5G ICT systems and services. He is currently at Huawei Technologies, serving as Chief Technology and Cyber Security Officer (CTO) in Australia and ICT Expert within the Southern Pacific Region. Prior to that, he was at Nokia, as Head of 5G Technology, e2e, global, and in various technical and research management positions. Before rejoining Nokia in 2016, he was for eight years at Huawei European Research Centre, Germany, serving as Head of IP Transformation Research Centre (IPTRC), Head of Network Solution R&D and, subsequently, Head of Central Research Institute (CRI) and VP Strategic Research and Innovation, in Europe; and represented Huawei in the Board of Directors of The 5G Infrastructure Association (5G-IA).

Petri Mähönen is a full professor and a founding director of the institute for networked systems at RWTH Aachen University,

Germany. He joined RWTH Aachen as the holder of Ericsson endowed chair of wireless networks in 2002. Before joining to RWTH Aachen he was a professor and research director at the Centre for Wireless Communications in Finland. He is a recipient of Telenor Research prize and a co-recipient of IEEE VTC Jack Neubauer Memorial Award. He has given invited talks in a number of different conferences, universities, and industry. Apart of academic publishing, he has been a part of teams who have invented and successfully technology transferred several patent families for industrial use. His former students have been responsible for launching five different startup companies. He served as co-TPC chair and as a general chair for IEEE DySPAN conferences, the major IEEE conference in the area of cognitive radios and dynamic spectrum access. His group has been in forefront on developing machine learning based cognitive radio technologies since 2001. His other research interests include dynamic spectrum access techniques, novel access methods, and earlier in his career he was a project lead for development and implementation for one of the first 40 GHz wireless broadband systems. In general, and foremost, he likes to tinker with cool technology and interesting problems.

Kamesh Namuduri biography appears on Page 15.

Kazuaki Takeda's biography appears on Page 18.

Wanshi Chen's biography appears on Page 15.

Haris Gačanin's biography appears on Page 18.

Wednesday Plenaries

Wednesday 25 September 2019 9:00–10:30 Kona Moku Ballroom

Distributed Machine Learning in Automotive

Jim Brown, Chief Technology Officer, CloudMade, USA

The presentation will discuss a robust and resilient framework to enable the application of Machine Learning to Automotive vehicles, clouds and phone touch points with the consumer. The touch points may, or may not, include direct user interaction and the frameworks examined will span cloud only, vehicle/phone only and distributed models. The scope of the discussion will include the requirements, potential solutions and how to manage/minimize technical debt in their deployment and operation. Also covered will be examples of the application of machine learning and the role it plays in the use cases discussed.

Jim Brown, CloudMade's CTO, has been working in the field of telecommunications, geo-spatial data, database/ERP and retail industries for over 25 years. He began his career in the early 1980s at General Motors / EDS where he deployed cell controllers for the

Truck and Bus group and Kmart where he deployed the first distributed Unix systems into over 2,200 store locations and was responsible for international systems, R&D, and strategic planning at various times. He subsequently ran the technical architecture

group at Oracle UK and was part of the founding team at Symbian. Jim has spent most of this time on creating new products and building/running technical groups and consulting practices. At

CloudMade this has included creating and driving the architecture of CloudMade's products for distributed machine learning and the application of the same at different OEMs.

Communications Perspective in Vehicular Cooperation

Onur Altintas, *InfoTech Labs Fellow, Toyota InfoTech Labs, USA*

In this talk, we will look into V2X communications starting with the terminology and operational basics and delve into status updates from the aspects of standards, deployment and regional differences. We will next talk about connected vehicles and 'automotive big data' eco-system including entities in the cloud and vehicles as edges. We will show ways and examples of collaborative functions using V2X communications to extend the line of sight of sensors thus contributing to improve situational awareness, provide redundancy, and improve safety and mobility. From generic examples that require data and resource sharing, we will conclude with the need to explore millimeter wave communications, integrating radar and communications, using micro clouds and value anticipatory networking.

Onur Altintas is the InfoTech Labs Fellow at Toyota R&D InfoTech Labs in Mountain View, California. He has been with the Toyota group in various positions in New Jersey, Tokyo and California since 1999. He is the co-founder and general co-chair of

the IEEE Vehicular Networking Conference (IEEE VNC) since 2009. He serves as an associate editor for IEEE ITS Magazine and IEEE Transactions on Intelligent Vehicles. He is an IEEE VTS Distinguished Speaker.

Wednesday Industry Track: 5G Verticals

Wednesday 25 September 2019 11:00–12:30 Kona Moku Ballroom, Salon B

Panel: Challenges and Opportunities in Industrial Networks

Moderator: **Rath Vannithamby** *Intel*
Panelists: **Amitabha Ghosh** *Nokia*
Jin Yang *Verizon*
Anthony C.K. Soong *Futurewei Technologies*
Wanshi Chen *3GPP RAN 1 Chair and Qualcomm*

Previous generations of networks have been designed as general-purpose connectivity platforms with limited differentiation capabilities across use cases; a one size fit all approach. 5G networks, however, are going to be different. It will demand customizable mobile network. 5G is also coming in the era of unprecedented computer power and the new concept of cloudification. One of the major enhancements for 5G is the slicing feature. This together with other novel innovations allow for the network to be sliced in different ways to dynamically optimize the mobile network for the applications of different industries. In this panel discussion, we will cover how 5G will enable a customized experience. In particular, we will explore a) applications and usages of Industrial vertical, b) a set of key metrics for these usages and their corresponding target requirements, and c) potential network architectures and enabling technologies to meet the requirements.

Rath Vannithamby's biography appears on Page 13, **Wanshi Chen's** on Page 15, **Amitabha (Amitava) Ghosh's** on Page 13,

Jin Yang's on Page 15 and finally **Anthony C. K. Soong's** biography appears on Page 13.

Wednesday 25 September 2019 14:00–15:30 Kona Moku Ballroom, Salon B

Panel: Opportunities and Challenges in Drones, HAPS and Non-terrestrial Networks

Moderator: **Siva Subramani** *Futurewei Technologies*
Panelists: **Nicolas Chuberre** *Thales Alenia*
Stephen Hayes *Ericsson*
Shengli Fu *University of North Texas*
Ravi Pragada *Interdigital*

Technologies to provide cellular connectivity from High Altitude Platforms (HAPS) and Satellites are gaining momentum. Especially, with significant reduction in cost of satellite launch, entry of big players like Amazon, Google, Facebook etc. to provide connectivity from higher altitude are all very promising. However, the technical challenges, spectrum regulatory and ecosystem-related issues to take the aerial connectivity services to commercial level remain. Ongoing 3GPP study item on Non-terrestrial Networks explore the possibilities of 5G networks to support cellular connectivity from aerial platforms. In this panel session, we will look at the opportunities and technical challenges for the non-terrestrial connectivity. Providing cellular connectivity to drone as a terminal will also be briefly discussed.

Siva Subramani's biography appears on Page 15.

Nicolas Chuberre graduated from "Ecole Supérieure d'Ingénieur en Electronique et Electrotechnique" in Paris in 1988. Previously

with Nokia & Alcatel Mobile phones to design signal processing algorithms, Medium Access Control protocols and integration test tools for 2G cellular handsets & systems, he joined Thales Alenia

Space to manage the development of satellite payload equipment and the design of advanced Satellite Communication Systems (Geo stationary and constellation). Currently he is managing a project developing a Satellite Solution for 5G. He has successfully initiated and led several European projects in F6, FP7 and H2020 context. He has been chairing the SatCom Working Group of ISI and Network2020 technology platforms during 9 years and as such was member of the partnership board of the 5G Infrastructure Association. Nicolas has published several papers on innovative Satellite System concepts. Since 2006, he chairs Satellite Communication and Navigation working group at ETSI. He is the lead representative of Thales in 3GPP TSG RAN where he leads the standardisation effort on satellite in 5G.

Shengli Fu received the B.S. and M.S. degrees in telecommunication engineering from the Beijing University of Posts and Telecommunications, Beijing, China, in 1994 and 1997, respectively, the M.S. degree in computer engineering from Wright State University, Dayton, OH, USA, in 2002, and the Ph.D. degree in electrical engineering from the University of Delaware, Newark, DE, USA, in 2005. He is currently a Professor and the Chair of the Department of Electrical Engineering, University of North Texas, Denton, TX, USA. His research interests include coding and information theory, wireless communications and sensor networks, and aerial networks.

Stephen Hayes is the Director of Standards for Ericsson in North America. He has worked on various cellular issues over the last 20 years and been heavily involved in the evolution of the 3GPP

family of technologies. His current focus includes the ATIS committees and 3GPP. He is also involved in several US advisory groups such as the FCC TAC (Technical Advisory Committee) where he chairs the subgroup on UAS spectrum issues. Stephen is currently the Vice-Chair of 3GPP TSG-RAN. Stephen was chairman of the 3GPP systems group (3GPP-SA) from 2006- 2011. Before that, Stephen was the chair of the Core Network group in 3GPP. Stephen is also the chair of the 3GPP group on working procedures.

Ravi Pragada is a Principal Engineer at InterDigital Labs where he is currently research related to unmanned systems and related technologies. He has actively contributed to and held leadership positions in various next generation cellular system projects viz., millimeter wave air-interface design and development, device-to-device communications, millimeter wave backhaul and beyond 4G architectures. He also held engineering positions in product development including lead software architect for HSPA/UMTS and LTE protocol stack development projects covering handset and infrastructure products. He is a recipient of numerous innovation awards and Lucy Mahjoubian distinguished publication award. Prior to InterDigital he has part of Motorola team (Arlington Heights, IL) that has developed RNC and NodeB infrastructure for 3GPP UMTS system. He received his M.S. in computer science and engineering from the State University of New York at Buffalo (1999) and B.E. from Andhra University, India.

Wednesday 25 September 2019 16:00–17:30 Kona Moku Ballroom, Salon B

Panel: AI for Autonomous Vehicles

Moderator: **Gaurav Bansal** *Airbus A³ Labs*
Panelists: **Dinesh Bharadia** *UCSD*
Hongsheng Lu *Toyota North America*

Dinesh Bharadia is faculty in ECE at the University of California San Diego. He received his Ph.D. from Stanford University in 2016 and was a Postdoctoral Associate at MIT. Specifically, in his dissertation, he built a prototype of a radio, that invalidated a long-held assumption in wireless is that radios cannot transmit and receive at the same time on the same frequency. From 2013 to 2015, he was a Principal Scientist for Kumu Networks, where he worked to commercialize his research on full-duplex radios, building a product that underwent successful field trials at Tier 1 network providers. This product is currently under deployment. His research interests include advancing the theory and design of modern wireless communication systems, wireless imaging, sensor networks, and data-center networks. Recently, he has been actively involved in the design of cooperative autonomous systems, specifically in autonomous perception. In recognition of his work, Dinesh was named to Forbes 30 under 30 for the science

category worldwide list. Dinesh was also named a Marconi Young Scholar for outstanding wireless research and awarded the Michael Dukakis Leadership award. He was also named as one of the top 35 Innovators under 35 in the world by MIT Technology Review in 2016. Dinesh is also the recipient of the Sarah and Thomas Kailath Stanford Graduate Fellowship.

Hongsheng Lu is a Principal Researcher in Toyota Motor North America InfoTech Labs. He leads innovations on connected and automated vehicle, building solution to enable cooperative perception and V2X-assisted sensor fusion. He was recognized for contribution to DSRC congestion control and vehicle to pedestrian communications. He represents Toyota in standard development organizations and industry groups including SAE, ETSI and C2C-CC and has a Ph.D degree from the University of Notre Dame.

Gaurav Bansal's biography appears on Page 17.

Tutorials

A range of tutorials will be held on Sunday 22 September given by experts from industry and academia.

Sunday 22 September 2019 9:00–12:30 Milo 1

T1: Learning-based Wireless Positioning and Wireless Sensing: from Meter to Centimeter Precision

Kai-Ten Feng, Po-Hsuan Tseng, National Taipei University of Technology

This tutorial aims at providing the fundamental limits of wireless positioning, including non-line-of-sight path, multi-path attenuation, lack of map information, and time-varying interferences caused by environmental changes and/or people blocking. We discuss how signal

processing and machine/deep learning techniques enhance the positioning performance from meter to centimeter precision. The tutorial focuses on the general positioning/sensing problems using channel state information and received signal strength measurements. The described algorithms/implementations can be directly applied to the wireless localization and sensing for the in-car, roadside, and drone landing applications.

Kai-Ten Feng received the B.S. degree from the National Taiwan University, Taipei, Taiwan, in 1992, the M.S. degree from the University of Michigan, Ann Arbor, MI, USA, in 1996, and the Ph.D. degree from the University of California—Berkeley, Berkeley, CA, USA, in 2000. Since

August 2011, he has been a Full Professor with the Department of Electrical and Computer Engineering, National Chiao Tung University (NCTU), Hsinchu, Taiwan, where he was an Associate Professor and Assistant Professor from August 2007 to July 2011 and from February 2003 to July 2007, respectively. He served as the Associated Dean of Electrical and Computer Engineering College, NCTU, starting from February 2017. From July 2009 to March 2010, he was a Visiting Research Fellow with the Department of Electrical and Computer Engineering, University of California at Davis. Between 2000 and 2003, he was an In-Vehicle Development Manager/Senior Technologist with OnStar Corporation, a subsidiary of General Motors Corporation, where he worked on the design of future telematics platforms and in-vehicle networks. His research interests include broadband wireless networks, cooperative and cognitive networks, smartphone and embedded system designs, wireless location technologies, and intelligent transportation systems. Dr. Feng was the recipient of the Best Paper Award from the Spring 2006 IEEE Vehicular Technology Conference. He was also the recipient of the Outstanding Youth Electrical Engineer Award in 2007 from the Chinese Institute of Electrical Engineering, and the Distinguished Researcher Award from NCTU in 2008, 2010, and 2011. Since 2018, he has been serving as the Technical Advisor for IEEE-HKN Honor Society and National Academy of Engineering Grand Challenges Scholars Program at NCTU. He has also served on the technical program committees in various international conferences.

Po-Hsuan Tseng received the B.S. and Ph.D. degrees in communication engineering from the National Chiao Tung University, Hsinchu, Taiwan, in 2005 and 2011, respectively. Since Feb. 2017, he has been an Associate Professor with the Department of Electronic Engineering, National Taipei University of Technology, Taipei, Taiwan, where he was an Assistant Professor from Aug. 2012 to Jan. 2017. His current research focuses on signal processing for networking and communications, including location estimation and tracking, and mobile broadband access system design

Sunday 22 September 2019 14:00–17:30 Milo 1

T2: Communication Networks Design: Model-Based, Data-Driven, or Both?

Alessio Zappone, CentraleSupélec; Marco Di Renzo, Paris-Saclay University; Merouane Debbah, Huawei R&D

The tutorial will provide the audience with a solid understanding of the fundamentals of deep learning and its use for the design of wireless communications. Artificial neural networks, which are the distinctive feature of deep learning as compared to other machine learning methods, will be introduced. The main artificial neural networks architectures will be described, focusing in particular on feedforward networks and of the problem of their supervised training. The most widely used methods for neural network training will be described and tips and tricks to improve the training process will be explained.

After introducing the fundamentals of deep learning, the tutorial will address how deep learning can be merged with more traditional model-based approaches to perform wireless networks design, exploiting the frameworks of transfer learning and reinforcement learning. Several relevant applications will be described, quantifying the advantages of embedding expert knowledge coming from theoretical models, into data-driven methods, considering diverse system scenarios, such as dense heterogeneous cellular networks, energy-efficient networks, network-slicing systems, and chemical-based communication systems. A main conclusion drawn by the tutorial is the embedding expert knowledge into traditional neural network design can significantly reduce the amount of data that is necessary to use for training purposes, thus significantly simplifying the overall system design.

Alessio Zappone is currently an experienced Marie Curie Fellow at CentraleSupélec, France, working in the field of resource allocation for 5G wireless networks and beyond. He is an IEEE Senior Member, an Associate Editor of the IEEE Signal Processing Letters, and has been a Guest Editor of the IEEE JSAC Special issue on “Energy-Efficient Techniques for 5G Wireless Communication Systems”. He was appointed exemplary reviewer for both the IEEE Transactions on Communications and IEEE Transactions on Wireless Communications in 2017.

Marco Di Renzo is Associate Professor with the Laboratory of Signals and Systems of Paris-Saclay University – CNRS, CentraleSupélec, Univ Paris Sud, France. He is a Distinguished Visiting Fellow of the Royal Academy of Engineering (UK), and co-founder of the university spin-off company

WEST Aquila s.r.l., Italy. He serves as associate Editor-in-chief of the IEEE Communication Letters, and editor of the IEEE Transactions on Communications, (Heterogeneous Networks Modeling and Analysis) and Transactions on Wireless Communications. He is an IEEE Senior Member, an EURACON Member, and a Distinguished Lecturer of the IEEE Communications and IEEE Vehicular Technology Societies.

Merouane Debbah is Vice-President of the Huawei France R&D center and director of the Mathematical and Algorithmic Sciences Lab, as well as full professor at CentraleSupélec. He is an IEEE Fellow, a WWRF Fellow and a member of the academic senate of Paris-Saclay. He received several awards, among which the 2015 IEEE Communications Society Leonard G. Abraham Prize, the 2015 IEEE Communications Society Fred W. Ellersick Prize, the 2016 IEEE Communications Society Best Tutorial paper award, the 2016 European Wireless Best Paper Award, the 2017 Euraspip Best Paper Award and the 2018 IEEE Marconi Prize Paper Award, the Mario Boella award in 2005, the IEEE Glavieux Prize Award in 2011, and the Qualcomm Innovation Prize Award in 2012.

Sunday 22 September 2019 9:00–12:30 Milo 2

T3: 5G New Radio (NR) Protocols and Architecture

Icaro Leonardo Da Silva, Gunnar Mildh, Paul Schliwa-Bertling, and Magnus Stattin, Ericsson Research

In this tutorial the authors explain the fundamentals of the 5th Generation (5G) New Radio (NR) protocols and architecture, recently standardized by the 3rd Generation Partnership Project (3GPP). The focus of the tutorial is on the higher layer protocols (i.e. almost everything on the radio network, except the physical layer). More emphasis will be given to the Radio Resource Control (RRC) protocol, which is the protocol responsible for fundamental functions in the user equipment (UE) such as state model (e.g. IDLE, CONNECTED, INACTIVE states), connection control procedures (e.g. state transitions like IDLE to CONNECTED, INACTIVE to CONNECTED, etc.), measurement configuration and reporting (different types of measurements the UE performs, impact due to beamforming, etc.), mobility, dual connectivity with 4G (first version of the 5G standard), etc.

Icaro Da Silva received his M.Sc. in electrical engineering from the Universidade Federal of Ceara (UFC), Fortaleza, Brazil in 2009. In 2010, he joined Ericsson Research, Ericsson AB, Stockholm, and has since been working on standardization and concept development for LTE and 5G NR, in particular driving control plane topics in 3GPP RAN2. He has also worked as a 3GPP delegate in RAN2 and actively participated in the draft of the 5G NR RRC specifications (TS 38.331). His focus areas has been on 5G NR radio network architecture and protocols, in particular the control plane design and RRC protocol. Icaro has lead the 5G control plane in the EU project on 5G RAN architecture METIS-II, part of the 5G-PPP framework. He has also participated as panelist on 5G design and 5G architecture in VTC and EuCNC. He is currently a senior researcher in radio network architecture and protocols, Ericsson Research.

Magnus Stattin graduated and received his Ph.D. degree in radio communication systems from the Royal Institute of Technology, Stockholm, Sweden in 2005. He joined Ericsson Research in Stockholm, Sweden, in June 2005. At Ericsson Research he has been working with research in the areas of radio resource management and radio protocols of various wireless technologies. He is active in concept development and 3GPP standardization of LTE, NB-IoT, NR and future wireless technologies.

Gunnar Mildh received his M.Sc. in electrical engineering from the Royal Institute of Technology (KTH), Stockholm, Sweden, in 2000. In the same year, he joined Ericsson Research, Ericsson AB, Stockholm, and has since been working on standardization and concept development for GSM/EDGE, HSPA, LTE(-A) and 5G NR. His focus areas has been on radio network architecture and protocols, and recently on 5G architecture including RAN and Packet Core. He is currently an expert in radio network architecture at Ericsson Research.

Paul Schliwa-Bertling received his B.Sc. in electrical engineering from the University of Duisburg-Essen, Essen, Germany. He joined Ericsson Research, Ericsson AB, Stockholm, and has since been working on standardization and concept development for GSM/EDGE, HSPA, LTE(-A) and 5G NR. He has also worked many years as a 3GPP delegate in SA2.

His focus areas has been on radio network architecture and protocols, and recently on 5G architecture including RAN and Packet Core. He is currently an expert in mobile network architecture and signaling at Ericsson Research.

Sunday 22 September 2019 14:00–17:30 Milo 2

T4: Networking and Communications for Autonomous Driving

Jiajia Liu, Northwestern Polytechnical University; Nei Kato, Tohoku University

The development of LIDAR, Radar, camera, and other advanced sensor technologies inaugurated a new era in autonomous driving. However, due to the intrinsic limitations of these sensors, autonomous vehicles are prone to making erroneous decisions and causing serious disasters. At this point, networking and communication technologies can greatly make up for sensor deficiencies, and are more reliable, feasible and efficient to promote the information interaction, thereby improving autonomous vehicle's perception and planning capabilities as well as realizing better vehicle control. We provide in this tutorial a comprehensive review of recent research works concerning the networking and communication technologies in autonomous driving from two aspects: intra- and inter-vehicle. The intra-vehicle network as the basis of realizing autonomous driving connects the on-board electronic parts. The inter-vehicle network is the medium for interaction between vehicles and outside information. In addition, we present the new trends of communication technologies in autonomous driving, as well as investigate the current mainstream verification methods and emphasize the challenges and open issues of networking and communications in autonomous driving.

Jiajia Liu (SM'15) received his Ph.D. degree in information sciences from Tohoku University in 2012. Since Jan. 2019, he has been a full professor at the School of Cybersecurity, Northwestern Polytechnical University. He has published more than 130 peer-reviewed papers in many high quality publications, including prestigious IEEE journals and conferences. He received IEEE ComSoc Asia-Pacific Outstanding Young Researcher Award in 2017, IEEE TVT Top Editor Award in 2017, the Best Paper Awards from IEEE GLOBECOM in 2016, IEEE WCNC in 2012 and 2014, IEEE IC-NIDC in 2018. He was the recipient of the prestigious 2012 Niwa Yasujiro Outstanding Paper Award and also a recipient of the Tohoku University President Award 2013, Professor Genkuro Fujino Award 2012. He is the Secretary of IEEE AHSN TC, and is a Distinguished Lecturer of IEEE ComSoc.

Nei Kato (F'13) is a full professor (Deputy Dean) with Graduate School of Information Sciences(GSIS) and the Director of Research Organization of Electrical Communication(ROEC), Tohoku University, Japan. He has been engaged in research on computer networking, wireless mobile communications, satellite communications, ad hoc & sensor & mesh networks, smart grid, AI, IoT, Big Data, and pattern recognition. He has published more than 400 papers in prestigious peer-reviewed journals and conferences. He is the Vice-President (Member & Global Activities) of IEEE Communications Society(2018-2019), the Editor-in-Chief of IEEE Transactions on Vehicular Technology(2017-), and the Chair of IEEE Communications Society Sendai Chapter. He served as the Editor-in-Chief of IEEE Network Magazine (2015-2017), a Member-at-Large on the Board of Governors, IEEE Communications Society(2014-2016), a Vice Chair of Fellow Committee of IEEE Computer Society(2016), and a member of IEEE Communications Society Award Committee (2015-2017). Nei Kato is a Distinguished Lecturer of IEEE Communications Society and Vehicular Technology Society. He is also a fellow of The Engineering Academy of Japan and IEICE.

Sunday 22 September 2019 9:00–12:30 Kuo

T5: Towards UAV-Based Airborne Computing: Applications, Design, and Prototype

Kejie Lu, U Puerto Rico; Yan Wan, U Texas; Shengli Fu, U North Texas; Junfei Xie, Texas A&M U

In recent years, unmanned aerial vehicles (UAVs) have attracted significant attention from industry, federal agencies, and academia. To design and implement future UAV systems and applications, many researchers and engineers have been working on different UAV functions

in various domains, such as control, communications, networking, etc. While all these UAV functions require advanced on-board computing capabilities, they are usually designed separately and there is a lack of a general framework to exploit airborne computing for all on-board UAV functions. In this tutorial, our objective is to address this timely and important issue by exploring a new and cross-disciplinary area: UAV-based airborne computing.

To this end, we will first systematically analyze existing and emerging UAV applications and then use case studies to demonstrate how airborne computing can help to facilitate advanced UAV functions and UAV applications. Based on such analysis, we will discuss and summarize important design guidelines for future generations of UAV systems with airborne computing capabilities. We will then introduce our recent design of a general UAV-based airborne computing platform and the latest version of our UAV-based airborne computing prototype. Finally, using our prototype, we will explain and demonstrate a number of advanced UAV functions, including reinforcement-learning based antenna heading control, image-processing based 3D mapping, and deep-learning based object detection. Finally, we will invite audience to participate in some hands-on exercises using our prototype, and we will discuss open issues and important future directions before concluding the tutorial.

Kejie Lu is a professor in the Department of Computer Science and Engineering, University of Puerto Rico at Mayagüez (UPRM). He received his Ph.D. degree in Electrical Engineering from the University of Texas at Dallas in 2003. Since July 2005, he has been a faculty member in UPRM. His research interests include architecture and protocol design for computer and communication networks, cyber-physical system, network-based computing, and network testbed development.

Yan Wan is currently an Associate Professor in the Electrical Engineering Department at the University of Texas at Arlington. She received her Ph.D. degree in Electrical Engineering from Washington State University in 2009. From 2009 to 2016, she was an assistant professor and then an associate professor at the University of North Texas. Her research interests lie in developing fundamental theories and tools for the modeling, evaluation, and control tasks in large-scale dynamic networks and cyber-physical systems.

Shengli Fu is currently a professor and the Chair in the Department of Electrical Engineering, University of North Texas (UNT), Denton, TX. He received his Ph.D. degree in Electrical Engineering from the University of Delaware, Newark, DE, in 2005, before he joined UNT. His research interests include coding and information theory, wireless communications and sensor networks, aerial networks, and drone systems design.

Junfei Xie is an Assistant Professor at the Department of Computing Sciences of Texas A&M University - Corpus Christi. She received her Ph.D. degree in Computer Science and Engineering in 2016 from University of North Texas. Her current research interests include airborne networks, unmanned systems, spatiotemporal data mining, dynamical system modeling and control, and complex information systems.

Sunday 22 September 2019 9:00–12:30 Honolulu

T7: Orbital Angular Momentum for Wireless Communications: Theory, Challenges, and Progress

Wenchi Cheng, Xidian University; Wei Zhang, University of New South Wales

It is now very difficult to use the traditional plane-electromagnetic (PE) wave based wireless communications to satisfy the ever-lasting capacity demand growing. Fortunately, the electromagnetic (EM) wave possesses not only linear momentum, but also angular momentum, which includes the orbital angular momentum (OAM). The orbital angular momentum (OAM), which is a kind of wave front with helical phase and has not been well studied yet, is another important property of EM wave. The OAM-based vortex wave has different topological charges, which are independent and orthogonal to each other, bridging a new way to significantly increase the capacity of wireless communications. This proposal will be discussing the fundamental theory of using orbital angular momentum (OAM) for wireless communications. This proposal would start with the background introduction on what is OAM based wireless communication and how OAM is important in current and future wireless

communications. Then, the fundamental theory of OAM will be elaborated on in details, including OAM versus MIMO, OAM signal generation/reception, and OAM beam converging. Moreover, we would also like to share our latest research progress regarding how to apply OAM into wireless communications, including mode modulations, OAM mode convergence, mode hopping, OAM based MIMO, orthogonal mode division multiplexing, concentric UCAs based low-order OAM transmission, degree of freedom in mode domain as well as orthogonality of OAM mode. More important, the new results regarding how to solve the beam-hollow problem and support the misaligned UCA transceiver will also be studied. Finally, the applications of OAM based wireless communication are also discussed.

Wenchi Cheng (M'14-SM'18) received the B.S. and Ph.D. degrees in telecommunication engineering from Xidian University, Xian, China, in 2008 and 2014, respectively, where he is an Associate Professor. He was a Visiting Scholar with Networking and Information Systems Laboratory, Department of Electrical and Computer Engineering, Texas A&M University, College Station, TX, USA, from 2010 to 2011. His current research interests include 5G wireless networks and orbital-angular-momentum based wireless communications. He has published more than 70 international journal and conference papers in *IEEE Journal on Selected Areas in Communications*, *IEEE Magazines*, *IEEE INFOCOM*, *GLOBECOM*, and *ICC*, etc. He received the Young Elite Scientist Award of CAST, the Best Paper Award for *IEEE/CIC ICC* 2018, the Best Paper Nomination for *IEEE GLOBECOM* 2014, and the Outstanding Contribution Award for Xidian University. He has served or serving as the Associate Editor for *IEEE Access*, the IoT Session Chair for *IEEE 5G Roadmap*, the *Wireless Communications Symposium Co-Chair* for *IEEE GLOBECOM* 2020, the *Publicity Chair* for *IEEE ICC* 2019, the *Next Generation Networks Symposium Chair* for *IEEE ICC* 2019, the *Workshop Chair* for *IEEE ICC* 2019 *Workshop on Intelligent Wireless Emergency Communications Networks*, the *Workshop Chair* for *IEEE ICC* 2017 *Workshop on Internet of Things*.

Wei Zhang (S'01-M'06-SM'11-F'15) received the Ph.D. degree in electronic engineering from the Chinese University of Hong Kong, Hong Kong, in 2005. In May 2008, he joined the School of Electrical Engineering and Telecommunications, The University of New South Wales, Sydney, NSW, Australia, where he is currently a full Professor. His current research interests include cognitive radio, energy harvesting communications, and massive multiple-input multiple-output. He is the Editor-in-Chief of the *IEEE Wireless Communications Letters* from January 2016. He is an Editor of the *IEEE Transactions on Communications* and an Editor for the *IEEE Transactions on Cognitive Communications and Networking*. He is currently the Chair of the *IEEE Communications Society Wireless Communications Technical Committee*. He is the Vice-Director of the *IEEE Communications Society Asia Pacific Board*. He is also an Elected Member of *IEEE Signal Processing Society SPCOM Technical Committee*. He is a Distinguished Lecturer of the *IEEE Communications Society*. He is a Fellow of the *IET*.

Sunday 22 September 2019 14:00–17:30 Honolulu
T8: V2X Communications and Security
Yi Qian, University of Nebraska-Lincoln

A wide variety of work has been done in vehicle-to-everything (V2X) communications to enable various applications for road safety, traffic efficiency and passenger infotainment. Although IEEE 802.11p used to be considered as the main technology for V2X, new research trends nowadays are considering cellular technology as the future of V2X due to its rapid development and ubiquitous presence. This tutorial surveys the recent development and challenges on 4G LTE and 5G mobile wireless networks to support efficient V2X communications & security for V2X communications. In the first part, we highlight the 4G LTE V2X architecture and operating scenarios for V2X communications. In the second part, we discuss the challenges and the new trends in 4G and 5G for supporting V2X communications such as physical layer structure, synchronization, resource allocation, multimedia broadcast multicast services (MBMS), as well as possible solutions to these challenges. In the third part, we survey the state-of-the-art solutions for security in V2X communications. Finally, we discuss some open research issues for future 5G based V2X communications and security.

Yi Qian received a Ph.D. degree in electrical engineering from Clemson University, South Carolina. He is currently a professor in the Department of Electrical and Computer Engineering, University of Nebraska-Lincoln (UNL). Prior to joining UNL, he worked in the telecommunications industry, academia, and government. Some of his previous professional positions include serving as a senior member of scientific staff and a technical advisor at Nortel Networks, a senior systems engineer and a technical advisor at several startup companies, an assistant professor at the University of Puerto Rico at Mayaguez, and a senior researcher at the National Institute of Standards and Technology. His research interests include communications and systems, and information and communication network security.

Prof. Yi Qian is a Fellow of IEEE. He was previously Chair of the IEEE Technical Committee for Communications and Information Security. He was the Technical Program Chair for IEEE International Conference on Communications 2018. He serves on the Editorial Boards of several international journals and magazines, including as the Editor-in-Chief for *IEEE Wireless Communications*. He was a Distinguished Lecturer for *IEEE Vehicular Technology Society*. He is currently a Distinguished Lecturer for *IEEE Communications Society*.

Prof. Qian received the Henry Y. Kleinkauf Family Distinguished New Faculty Teaching Award in 2011, the Holling Family Distinguished Teaching Award in 2012, Holling Family Distinguished Teaching Award for Innovative Use of Instructional Technology in 2018, and Holling Family Distinguished Teaching/Advising/Mentoring Award in 2018, all from University of Nebraska-Lincoln. In the recent years, he has been a frequent speaker on many topics in his research areas in various venues and forums, as a keynote speaker, a tutorial presenter, and an invited lecturer.

Sunday 22 September 2019 14:00–17:30 Kuo
T10: Reinforcement Learning for Optimization of Wireless Systems: Methods, Exploration and Sensing
Haris Gacanin, Nokia Bell Labs

This tutorial discusses technology and opportunities to embrace artificial intelligence (AI) in the design of autonomous wireless systems. We aim to provide readers with motivation and general AI methodology of autonomous agents in the context of self-organization in real time unifying sensing, perception, reasoning and learning. We discuss differences between training-based and training-free AI methodology for both matching and dynamic problems, respectively. Finally, we introduce the conceptual functions of autonomous agent with knowledge management. Finally, a practical case study is given to illustrate the application and potential gains.

Haris Gacanin received his Dipl.-Ing. degree in Electrical engineering from University of Sarajevo, Bosnia and Herzegovina, in 2000. In 2005 and 2008, he received M.E.E. and Ph.D. from Tohoku University, Japan. He was with Tohoku University from April 2008 until May 2010 first as Japan Society for Promotion of Science postdoctoral fellow and then, as Assistant Professor. Since 2010, he is with Alcatel-Lucent (now Nokia), where he is currently Department Head at Nokia Bell Labs leading research activities related to application of artificial intelligence in network optimization with focus on mobile/wireless/wireline physical (L1) and media access (L2) layer technologies and network architectures. He has more than 200+ publications (journals, conferences and patents) and invited/tutorial talks. He organized and hosted several tutorials and industry panels at IEEE conferences. He is senior member of the Institute of Electrical and Electronics Engineers (IEEE) and the Institute of Electronics, Information and Communication Engineering (IEICE).

The following tutorials have been cancelled:
T6: Modelling, Analysis, and Simulation of Non-Stationary Mobile Radio Channels with Applications
Matthias Pätzold, University of Agder; Carlos A. Gutierrez, Autonomous University of San Luis Potosi
T9: Recent Development on NOMA: Signal Processing Advances and Emerging Applications
Lajos Hanzo, University of Southampton; Zhiguo Ding, Lancaster University
Yuanwei Liu, Queen Mary University

2019 IEEE 2nd Connected and Automated Vehicles Symposium

With the advances in computing and communication technologies, vehicle technology has entered a new era of connected and automated vehicles (CAVs). The host of technologies that are required to enable CAVs are many and span several engineering and science disciplines. This symposium aims to bring together researchers who are working on different aspects of CAVs. IEEE CAVS is a symposium for reporting advances in all aspects of CAVs, including theory, tools, protocols, networks, applications, systems, test-beds and field deployments.

General Co-chairs

Javier Gozalvez, Universidad Miguel Hernandez de Elche, Spain
Yaser .P. Fallah, University of Central Florida, USA
Cem Seraydar, General Motors, USA

Technical Program Co-chairs

David W. Matolak, University of South Carolina, USA
Panagiotis Tsiotras, Georgia Tech, USA

Technical Program Committee

Alejandro Correa, Universidad Miguel Hernandez de Elche, Spain
Alvin Chin, BMW Technology Corporation, USA
Amin Tahmasbi, Optimus Ride, USA
Amir Khajepour, University of Waterloo, Canada
Andre Weimerskirch, Lear Corporation, USA
Antonella Molinaro, University “Mediterranea” of Reggio Calabria, Italy
Behzad Dariush, Honda Research Institute, USA
Bhaskar Krishnamachari, USC, USA
Christoph Sommer, University of Paderborn, Germany
Omid Semiari, Georgia Southern University, USA
Ehsan Moradi Pari, Honda R&D, USA
Hariharan Krishnan, General Motors Research & Dev, USA
Hongsheng Lu, TOYOTA InfoTechnology Center, USA
Hossein Pishro-Nik, University of Massachusetts, Amherst, USA
Javad Mohammadpour Velni, University of Georgia, USA
Jayanthi Rao, Ford Motor Company, USA
Jérôme Härri, EURECOM, France
Jiajia Liu, Northwestern Polytechnical University, China
Jianbo Lu, Ford Motor Company, USA
Jim Sayer, UM-Ann Arbor, UMTRI, USA
John Dolan, Carnegie Mellon University, USA
Jonathan Petit, OnBoard Security
Kaan Inal, University of Waterloo, Canada
Leyre Azpilicueta, Tecnológico de Monterrey, Mexico
Marcello Canova, Ohio State University, USA

Mate Boban, Huawei European Research Center, Germany
Matthias Schmid, Clemson University
Mauro Fusco, TNO, Netherlands
Michele Rondinone, Hyundai Motor Europe Technical Center, Germany
Miguel Sepulcre, Universidad Miguel Hernandez de Elche, Spain
Peter Steenkiste, Carnegie Mellon University, USA
Pierluigi Pisu, Clemson University, USA
Prachi Joshi, General Motors R&D, USA
Praveen Palanisamy, General Motors R&D, USA
Raghvendra V. Cowlagi, Worcester Polytechnic Institute, USA
Raj Rajkumar, Carnegie Mellon University, USA
Ramesh Govindan, USC, USA
Rui Guo, Toyota Motors North America, USA
Ryan M. Gerdes, Virginia Tech, USA
Samuel Coogan, Georgia Tech, USA
Somak Datta Gupta, Ford Motor Co., USA
Sushanta Das, Ford Motor Company
Vinod Kulathumani, West Virginia University, USA
Vuk Marojevic, Mississippi State University, USA

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J.R. Cruz, VP Conferences, IEEE Vehicular Technology Society

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Jim Budwey, ICTS Group, USA
Cerry Leffler, IEEE Vehicular Technology Society

CAVS2019 Keynotes

Sunday 22 September 2019 11:00-12:45 Kona Moku Ballroom Salon C

We all want V2X – how can we finally get it?

John Kenney, Director and Sr. Principal Researcher, Toyota InfoTech Labs, USA

The automotive industry has sought to harness the potential of direct vehicle-to-everything (V2X) communication since the early days of the wireless revolution. Lives saved. Crashes prevented. Commuting hours reduced to minutes. Like most new things it is partly real and partly hype. But, the real part is compelling. As the years of research and standardization and testing and pilot deployments unfolded, key stakeholders who usually compete found a way to work together toward a common goal: widespread deployment of a single communication technology that would allow every car to talk to every other car. As technical barriers were overcome, creative thinkers found even more uses for V2X. The most important new entrant is Cooperative Automated Driving (CAD). So, why don't we have this in our cars yet? This talk will explore the complex factors that govern V2X deployment, and what we can do to get back on track to reach our goal of widespread, interoperable, direct, vehicle-to-everything communication.

Dr. John Kenney is Director of networking research and a Principal Researcher at the Toyota InfoTech Labs in Mountain

View, California. He represents Toyota in international standards organizations and industry research consortia, including SAE,

IEEE, ETSI and the Car2Car Communications Consortium. He also represents Toyota in DSRC Spectrum Sharing discussions with the US Government, European regulators, and the Wi-Fi industry. Prior to his work with Toyota, John was a member of the

Tellabs Research Center and an Adjunct Professor at the University of Notre Dame. He has graduate degrees from Stanford and Notre Dame.

Towards Semantic Understanding of Traffic Scenes

Behzad Dariush, *Chief Scientist, Honda Research Institute, USA*

Semantic understanding of complex traffic scenes is an important area of research for ubiquitous deployment of advanced driving assistance and automated driving technologies in urban environments. Although recent breakthroughs in machine learning and deep neural networks have accelerated progress for visual scene recognition, technologies that enable higher level reasoning, interpretation, and forecasting of complex events in urban environments is a challenging and unsolved problem. To address these challenges and advance the state-of-art in visual understanding of traffic scenes, this talk presents research challenges explored at Honda Research Institute, USA. In particular, we present activities in 3D understanding and knowledge representation in traffic scenes, focusing on creation of benchmark datasets, automatic generation of semantic description of 3D scenes, and machine learning research for traffic scene classification and prediction of participant behaviors.

Dr. Behzad Dariush is a Chief Scientist at Honda Research Institute, USA (HRI-US) in San Jose California. At HRI-US, he manages research activities in machine learning and intelligent data analytics to support Honda's next generation mobility systems. The primary focus of his team's research at HRI-US is to advance the state of the art in semantic understanding of traffic

scenes from video and other sensing modalities in order to create unique value for automated and advanced driver assistance systems. His past research activities include humanoid robotics, human assist and wearable-technologies, and human motion analysis and synthesis. He holds graduate degrees in Electrical Engineering from The Ohio State University.

CAVS2019 Panel

Monday 23 September 2019 16:00-18:00 Kona Moku Ballroom Salon C

Panel: Standardization of Connected and Automated Vehicles

Moderator:	Ricardo de Castro	<i>German Aerospace Center (DLR)</i>
Panelists:	Hermann Brand	<i>European Standards Affairs Director, IEEE Standards Association</i>
	Justin McNew	<i>JMC Rota Inc</i>
	Fei Richard Yu	<i>Carleton University</i>

Connected and Automated Vehicles (CAVs) pose great opportunities to improve safety, efficiency and energy consumption of transportation systems. However, this technology is still in its infancy. There is a lack of standardized best practices on how to develop, test and validate CAVs, how to ensure interoperability and how to guarantee safety and reliability. In this session, speakers from standards developing organizations, industry, research centers and academia will provide an overview of some ongoing standardization efforts of CAVs.

Hermann Brand has held many different positions in the industry. He started his professional carrier as a SW developer and system designer in telecommunications. He then worked as a researcher in the semiconductor business, investigating novel manufacturing processes and developing new microstructures. Back in telecommunications he managed several international R&D teams in mobile communications including researchers, system engineers and a group of delegates to different standards developing organizations. While his employer evolved into a diversified IT service provider, Dr. Brand also worked as technology manager, innovation manager and business developer.

Hermann Brand joined ETSI in 2008. Until 2012 he was responsible for various institutional services of ETSI, including new initiatives, partnership management, membership care, and meeting support. Since 2012, as Director Innovation, he has worked closely with members and other stakeholders to setup new standardization committees/groups covering e.g. machine communication, network function virtualisation and edge computing.

In June 2017 Hermann Brand joined IEEE as European Standards Affairs Director. His responsibilities include European standardisation policy, technology policy, co-operations and standards related services for industry, research organizations, and academia.

Justin McNew has over 20 years of experience in communications systems engineering, standards development and product development. In addition to developing and deploying infrastructure solutions for cellular, WiFi, and location services, Justin has been very active in the development of connected vehicle technologies. He has led the development of a variety of connected vehicle technical standards, while also embodying those standards with the industry's first commercially available V2X platforms. In 2013 McNew founded JMC Rota Inc., where he is engaged in various projects ranging from healthcare technologies to continued development of V2X standards and solutions, and he is now providing expertise in the field of cooperative automated vehicles and automated driving.

Justin began his career with Motorola where he worked on the development and deployment of digital cellular. At JMC Rota, Justin is leading the development of V2X standards and solutions. He serves as Vice Chair of the IEEE 1609 standards Working Group, Vice Chair of the SAE Infrastructure Applications Technical Committee, and he is the sponsor and technical editor of SAE J2945/1, the V2V safety applications standard. Justin is deeply involved in developing a variety of other standards for vehicle mobility and safety, as well as the SAE definitions and taxonomy for connected automated vehicles.

Justin earned a Master of Science in Electrical Engineering at the home of the National College Football Champions, Clemson

University, and his Bachelor of Science in Physics. He has 15 patents and several publications related to wireless networks, location technologies and transportation systems.

Ricardo de Castro received the Licenciatura and Ph.D. degrees in electrical and computers engineering from University of Porto, Faculty of Engineering, Portugal, in 2006 and 2013, respectively. During 2007-2008 he was an entrepreneur with the WeMoveU project, targeting the development of powertrain control solutions for lightweight electric vehicles. Since 2013, he has been with the German Aerospace Center (DLR), Institute of System Dynamics and Control (SR), where he is developing enabling technologies for electric mobility and autonomous driving. His research interests include vehicle dynamics, tire-road friction estimation, trajectory control, torque blending, platooning and battery-supercapacitor hybridization.

He has been an expert evaluator for the European Union, Editor of IEEE Transactions on Vehicular Technology, Associate Editor of

IEEE Access, and chair of technical tracks on vehicular electronics and intelligent transportation systems, IEEE Vehicle Power and Propulsion Conference (VPPC 2017-2018). Ricardo de Castro is also a Senior Member of the IEEE and the author of three patents and 60 papers in international journals, conferences and book chapters.

Fei Richard Yu is a Professor at Carleton University, Canada. His research interests include artificial intelligence, connected autonomous vehicles, cybersecurity, and wireless systems. He has published 530+ papers, 7 books and 28 granted patents, with 13,000+ citations and an H-index of 67. He has received several professional awards, including the Ontario Early Researcher Award, Carleton Research Achievement Award, and several Best Paper Awards from some first-tier conferences. He is an IEEE Distinguished Lecturer of both Veh. Tech. Society (VTS) and Comm. Society. He is an IEEE Fellow, an IET Fellow, and a registered Professional Engineer in Ontario.

**Sunday 22 September 2019 8:30-10:30 Kona Moku Ballroom Salon C
Opening and Session 1: V2X networks**

Chair: Javier Gozalvez, Universidad Miguel Hernandez de Elche

- 1 Latency Analysis of LTE Networks for Vehicular Communications Based on Experiments and Computer Simulation**
Tomoki Maruko, Shinpei Yasukawa, Atsushi Matsumoto, Junichi Abe, Mikio Iwamura, NTT DOCOMO INC.
- 2 Spatio-temporal Dynamics of Cellular V2X Communication in Dense Vehicular Networks**
Behrad Toghi, Md Saifuddin, Ozair Mughal, Yaser Fallah, University of Central Florida
- 3 C-V2X Assisted mmWave V2V Scheduling**
Alejandro Molina-Galan, Baldomero Coll-Perales, Javier Gozalvez, Universidad Miguel Hernandez de Elche
- 4 VRLS: A Unified Reinforcement Learning Scheduler for Vehicle-to-Vehicle Communications**
Taylan Sahin, Ramin Khalili, Mate Boban, Huawei Technologies Duesseldorf GmbH, German Research Center; Adam Wolisz, Technische Universität Berlin
- 5 Investigating Value of Information in Future Vehicular Communications**
Marco Giordani, Andrea Zanella, University of Padova; Takamasa Higuchi, Onur Altintas, InfoTech Labs, Toyota Motor North America, Inc.; Michele Zorzi, University of Padova
- 6 Real-Time Hardware-In-the-Loop Emulation Framework for DSRC-based Connected Vehicle Applications**
Ghayoor Shah, Rodolfo Valiente, Nitish Gupta, S M Osman Gani, Behrad Toghi, Yaser P. Fallah, University of Central Florida; Somak Gupta, Ford Motor Company

**Sunday 22 September 2019 14:15-15:30 Kona Moku Ballroom Salon C
Session 2: CAVs Traffic and Mobility**

Chair: G. G. Md. Nawaz Ali, University of Charleston

- 1 Meta-Deep Q-Learning for Eco-Routing**
Xin Ma, Yuanchang Xie, Chunxiao Chigan, University of Massachusetts Lowell
- 2 On calendar-based scheduling for user-friendly charging of plug-in electric vehicles**
Karl Schwenk, Karlsruhe Institute of Technology; Manuel Faix, Daimler AG; Ralf Mikut, Veit Hagenmeyer, Riccardo Remo Appino, Karlsruhe Institute of Technology

3 Alternative Intersection Designs with Connected and Automated Vehicle

Zijia Zhong, Earl E. Lee, University of Delaware

4 Coordinating AV Dispatch with Smart Remote Parking

Paul Seymer, Chaitanya Yavvari, Duminda Wijsekera, Cing-Dao Kan, George Mason University

**Sunday 22 September 2019 16:00-17:50 Kona Moku Ballroom Salon C
Session 3: V2X Propagation & Channel Modelling**

Chair: David Matolak, University of South Carolina

- 1 Geometrical Modeling of Non-Stationary Polarimetric Vehicular Radio Channels**
Carlos A. Gutierrez, Juan C. Ornelas-Lizcano, Universidad Autonoma de San Luis Potosi; Matthias Pätzold, University of Agder
- 2 Multi-band Vehicle to Vehicle Channel Measurements from 6 GHz to 60 GHz at “T” Intersection**
Diego Dupleich, Robert Mueller, Christian Schneider, Sergii Skoblikov, Technische Universität Ilmenau; Jian Luo, Mate Boban, Huawei Technologies Duesseldorf GmbH; Giovanni Del Galdo, Reiner Thomä, Technische Universität Ilmenau
- 3 Path Loss Analysis and Modeling for Vehicle-to-Vehicle Communications in Convoys in Safety-Related Scenarios**
Pan Tang, University of Southern California and Beijing University of Posts and Telecommunications; Rui Wang, University of Southern California and Samsung Research America; Andreas F. Molisch, University of Southern California; Chen Huang, University of Southern California and Beijing Jiaotong University; Jianhua Zhang, Beijing University of Posts and Telecommunications
- 4 Path Loss Models for V2V mmWave Communication: Performance Evaluation and Open Challenges**
Marco Giordani, University of Padova; Takayuki Shimizu, InfoTech Labs, Toyota Motor North America, Inc.; Andrea Zanella, University of Padova; Takamasa Higuchi, Onur Altintas, InfoTech Labs, Toyota Motor North America, Inc.; Michele Zorzi, University of Padova
- 5 Modeling V2X Communications Across Multiple Road Levels**
Alexander Brummer, Reinhard German, Anatoli Djanatliev, University of Erlangen-Nürnberg
- 6 Experimental Analysis of DSRC for Radio Signaling at Grade Crossings**
Junsung Choi, KAIST; Vuk Marojevic, Mississippi State University; Christopher Anderson, US Naval Academy; Carl Dietrich, Virginia Tech

	Kaimuki 1 (A)	Kaimuki 2 (B)	Kaimuki 3 (C)	Milo 1 (D)	Milo 2 (E)	Milo 3 (F)	Kou (G)	Honolulu (H)	Salon 1 (P)	Salon 2 (Industry Track)
	SUNDAY 22 September									
7:00–17:30	Registration (Lania)									
9:00–17:30	TUTORIALS and WORKSHOPS (see separate program)									
18:00–20:00	Welcome Reception (Mohala Gardens, first floor)									
	MONDAY 23 September									
7:00–17:30	Registration (Lania)									
8:30–9:00	Welcome and opening (Gordon Stuber, VTC2019-Fall Chair, VTC2019 Co-Chair, CAVS2019 Co-Chair) (Kona Moku Ballroom)									
9:30–9:45	Keynote: Cognitive Dynamic System for Cyber Physical Systems and Cybersecurity (Simon Haykin, Distinguished University Professor, McMaster University, Canada)									
9:45–10:30	Keynote: Vehicular Communications – C-V2X is Driving it Forward (Edward G. Tiedemann, Jr., Senior VP Engineering and Qualcomm Fellow, Qualcomm Technologies, USA)									
10:30–11:00	Refreshments (Lania)									
11:00–12:30 (1)	NOMA Systems	mmWave and 5G	AI and Machine Learning Approach	IoT Applications	Channel Measurements and Modeling I	Resource Management I	V2X Performance Analysis I	Positioning I	Radio Access	Topics in 5G Technology and Standards
12:30–14:00	Lunch (Kona Moku Ballroom)									
14:00–15:30 (2)	Coding	MIMO I	NOMA	Fog and Edge Computing	Channel Measurements and Modeling II	Security I	V2X Performance Analysis II	Positioning and Satellite	Physical Layer I	Challenges and Technologies for Building the 5G Network Edge
15:30–16:00	Refreshments (Lania)									
16:00–17:30 (3)	Massive MIMO I	Multiple Antennas	High-Density Networks and Large-Scale Antenna Systems	Multiple Access	mmWave I	Resource Management II	UAV Channel Models	Positioning II	Physical Layer II	Conquering New Application Frontiers with 5G
18:00–20:00	UAV to UAV Communications: Options, Challenges, and Standards (Kona Moku Ballroom Salon B)									
	TUESDAY 24 September									
8:00–17:30	Registration (Lania)									
9:00–9:45	Keynote: Delivering 5G Performance: mmWave Spectrum Opportunities and Challenges (Reinaldo A. Valenzuela, Director, Nokia Bell Labs) (Kona Moku Ballroom)									
9:45–10:30	Keynote: Cooperative Automated Driving: Overview, Design, and Technical Challenges (Gaurav Bansal, Principle Engineer, Airbus A ³ Labs)									
10:30–11:00	Refreshments (Lania)									
11:00–12:30 (4)	Fading and Diversity	Massive MIMO II	Ultra-Reliable Communications in Heterogeneous Networks	IoT Networks	Antenna Systems	Wireless Networks	Multi-UAV Networks	Positioning III	Network Layer	An intelligent 5G network for a Variety of Services
12:30–14:00	VTC2019-Fall and VTS Awards Luncheon (Kona Moku Ballroom)									
14:00–15:30 (5)	Signal Processing I	Massive MIMO III	Fog-RAN and Virtualization	Resource Allocation for M2M & Sensor Networks	Channel Estimation and Evaluation	Security II	Machine Learning and Simulation	Physical Layer III	MIMO II	Artificial Intelligence Paradigms for Designing Wireless Systems
15:30–16:00	Refreshments (Lania)									
16:00–17:30 (6)	Signal Processing II	Cooperative Communications I	State-of-the-Art WiFi Technologies	Wireless Sensor Networks	Localization	Deployment and Relay	Vehicular Applications	Physical Layer IV	Vehicular Networks I	Challenges and Opportunities in Industrial Networks
18:00–21:30	VTC2019-Fall Banquet (Waikiki Aquarium)									
	WEDNESDAY 25 September									
8:00–17:30	Registration (Lania)									
9:00–9:45	Keynote: Distributed Machine Learning in Automotive (Jim Brown, Chief Technology Officer, CloudMade, USA) (Kona Moku Ballroom)									
9:45–10:30	Keynote: Communications Perspective in Vehicular Cooperation (Onur Altintas, InfoLabs Fellow, Toyota Info Tech Labs, USA)									
10:30–11:00	Refreshments (Lania)									
11:00–12:30 (7)	Multicarrier Transmission	Cooperative Communications II	Resource Management for mmWave & 5G Systems	Communication and Machine Learning in ITS	Cognitive Radio and Novel Channel Access	Energy Harvesting Communications	Channel Estimation	Channel Modelling	IoT	Challenges and Opportunities in Industrial Networks
12:30–14:00	Lunch (Kona Moku Ballroom)									
14:00–15:30 (8)	MIMO and Beamforming Techniques	Radio Resource Management	MIMO III	Navigation, Tracking and Simulation	Spectrum Management and Sensing Techniques	Energy-Efficient Communications	Emerging Technology I	mmWave II		Opportunities and Challenges in Drones, HAPS and Non-terrestrial Networks
15:30–16:00	Refreshments (Lania)									
16:00–17:30 (9)	Industry 4.0 and Low-Latency	Edge Cloud and Computing	Vehicular to Everything Communications	Vehicle Electronics, Batteries and Service Efficiency	Mobility	Emerging Technology II	Vehicular Networks II	Aerial Networks		AI for Autonomous Vehicles

Monday 22 September 2019 11:00-12:30 Kona Moku Ballroom Salon C

Session 4: Cooperative and Automated Driving

Chair: Vuk Marojevic, Mississippi State University

- 1 A Probabilistic Framework for Trajectory Prediction in Traffic utilizing Driver Characterization**
Jaspri Singh Gill, Pierluigi Pisu, Matthias J. Schmid, Clemson University
- 2 Clustering Strategies of Cooperative Adaptive Cruise Control: Impacts on Human-driven Vehicles**
Zijia Zhong, Mark Nejad, Earl E. Lee, University of Delaware; Joyoung Lee, New Jersey Institute of Technology
- 3 Safety Planning Using Control Barrier Function: A Model Predictive Control Scheme**
Zahra Marvi, Bahare Kiumarsi, Michigan State University
- 4 Correct-by-Construction Advanced Driver Assistance Systems based on a Cognitive Architecture**
Francisco Eiras, FiveAI Inc; Morteza Lahijanian, University of Colorado Boulder; Marta Kwiatkowska, University of Oxford
- 5 Driver Drowsiness Detection through a Vehicle's Active Probe Action**
Sen Yang, Junqiang Xi, Beijing Institute of Technology; Wenshuo Wang, Carnegie Mellon University

Monday 23 September 2019 14:00-15:30 Kona Moku Ballroom Salon C

Session 5: Connected and Automated Vehicles

Chair: Pierluigi Pisu, Clemson University

- 1 Towards bridging the gap between modern and legacy automotive ECUs: A Software-based Security Framework for Legacy ECUs**
Ashok Samraj Thangarajan, Mahmoud Ammar, Bruno Crispo, Danny Hughes, KU Leuven
- 2 Location Anomalies Detection for Connected and Autonomous Vehicles**
Xiaoyang Wang, Ioannis Mavromatis, Andrea Tassi, Raul Santos-Rodriguez, Robert Piechocki, University of Bristol
- 3 Analysis of the Effects of Communication Trust and Delay on Consensus of Multi-Agent Systems**
Jonathan Sumpter, Christopher Thomas, Sun Yi, Alan Kruger, North Carolina A&T State University
- 4 Subjective Logic-based Identification of Markov Chains and Its Application to CAV's Safety**
Johannes Müller, Thomas Griebel, Ulm University; Michael Gabb, Robert Bosch GmbH; Michael Buchholz, Ulm University
- 5 Cooperative Perception in Connected Vehicle Traffic under Field-of-View and Participation Variations**
DoHyun Yoon, Nawaz Ali, Beshah Ayalew, Clemson University

Workshops

W1: 5G and Beyond* Technologies for Ultra-Dense Environments

Due to an increase in the number of mobile devices and mobile traffic, 5G and beyond architecture should include new requirements: scalability and flexibility. New 5G techniques like software-defined networks and network function virtualization will enable this 5G architecture, allowing us to deploy the network more flexibly. 5G and beyond networks will be more flexible than all predecessors, and these systems will lead a shift to ultra-dense small cell deployments; flexible network deployment and operation; multi-connectivity; dynamic traffic steering and resource management; intelligent use of network data; user participation in storage, relaying, content delivery and computation within the network; coexistence of heterogeneous networks and local standalone 5G systems; and the use of smart antennas for higher capacity, interference mitigation, and operations in higher frequencies. To address the increasing need for high target requirements in ultra-dense environments that adapt to 5G network needs, this workshop covers topics in crowded environments, is the outcome of close collaborations between EU and Japan, and is organized by the EU-Japan Joint funded project 5G-Enhance under the 5GPPP initiative.

Workshop Organisers

Kim Haesik, VTT, Finland

Kenta Umebayashi, Tokyo University of Agriculture and Technology, Japan

Program

Sunday 22 September 2019 9:00-10:30 Kona Moku Ballroom Salon B

Session I

Chair: Xiaoming Chen, Xi'an Jiaotong University

Welcome

Haesik Kim, VTT

Keynote: Enhancing The Physical Layer of 5G Networks Through Knowledge-Aware Deep Learning

Yuanzhang Xiao, University of Hawaii

- 1 Game Theoretical Approach of Blockchain-based Spectrum Sharing for 5G-enabled IoTs in Dense Networks**
YeJin Choi, Il-Gu Lee, Sungshin University
- 2 Clustering of Signal Power Distribution Toward Low Storage Crowdsourced Spectrum Database**
Yoji Uesugi, Keita Katagiri, The University of Electro-Communications; Koya Sato, Tokyo University of Science; Kei Inage, Tokyo Metropolitan College of Industrial Technology; Takeo Fujii, The University of Electro-Communications

Sunday 22 September 2019 11:00-12:30 Kona Moku Ballroom Salon B

Session II

Chair: Kenta Umebayashi, Tokyo University of Agriculture and Technology

- 1 Analysis of RF Energy Harvesting in Uplink-NOMA IoT-based Network**
Zhou Ni, Ziru Chen, Qinbo Zhang, Chi Zhou, Illinois Institute of Technology
- 2 Partial Non-Orthogonal Multiple Access (P-NOMA) with respect to User Fairness**
Beomju Kim, Jehyun Heo, Daesik Hong, Yonsei University
- 3 Sensor Selection Based on Dempster-Shafer Evidence Theory Under Collaborative Spectrum Sensing in Cognitive Radio Sensor Networks**
Ying Gao, Ming Diao, Harbin Engineering University; Takeo Fujii, The University of Electro-Communications

4 Distributed User Pairing and Transmission Mode Selection in a Single Cell Full Duplex Network

Yao-Yuan Chang, Hsuan-Jung Su, National Taiwan University

5 Coded Caching for Energy Efficient HetNets with Bandwidth Allocation and User Association

Fangfang Yin, Minyin Zeng, Zhilong Zhang, Danpu Liu, Beijing University of Posts and Telecommunications

Sunday 22 September 2019 14:00-15:30 Kona Moku Ballroom Salon B Session III

Panel: 5G and Beyond Technologies for Ultra-dense Environments: Perspectives and Key Challenges

Moderator Haesik Kim, VTT

Panelists: Yuanzhang Xiao, University of Hawaii

Amitabha Ghosh, Nokia Bell Labs

Takehiro Nakamura, NTT DoCoMo

Takeo Fujii, The University of Electro-Communications

Kenta Umebayashi, Tokyo University of Agriculture and Technology

Sunday 22 September 2019 16:00-17:30 Kona Moku Ballroom Salon B Session IV

Chair: Takeo Fujii, The University of Electro-Communications

1 An Efficient Algorithm for Dense Network Flow

Maximization with Multihop Backhauling and NFPS

Abdullateef Almohamad, Mazen O. Hasna, Tamer Khattab, Qatar University; Mohamed Haouari, Old Dominion University

2 Integrated Access Backhauled Networks

Oumer Teyeb, Ajmal Muhammad, Gunnar Mildh, Erik Dahlman, Filip Barac, Behrooz Makki, Ericsson

3 Opportunistic Routing Protocol For Ad-Hoc Networks Using mmWave and Random Beamforming

Mustafa Aljumaily, Husheng Li, University of Tennessee

4 Angular-Based 3D Hybrid Precoding for URA in Multi-User Massive MIMO Systems

Asil Koc, Ahmed Masmoudi, Tho Le-Ngoc, McGill University

5 Hybrid Beamforming in Massive-MIMO mmWave Systems Using LU Decomposition

Mustafa Aljumaily, University of Tennessee

Closing Talk

Kenta Umebayashi, Tokyo University of Agriculture and Technology

W2: Swarm Intelligence: Autonomous & Connected Unmanned Aircraft Systems

As small Unmanned Aircraft Systems (UAS) are integrated into the National Airspace (NAS) around the world, there is a need for enhanced situational awareness, traffic management, autonomy, human-autonomy teaming, safety and security of people and infrastructure. The UAS Science and Research Panel (SARP) has emphasized the importance of vehicle-to-vehicle communications and human-machine teaming in the operational context of multiple UAS deployment.

Standardization efforts and regulations are in progress to support UAS Traffic Management (UTM), over-the-air communications between UAS, Beyond Radio Line-of-Sight (BRLOS) communications, and UAS navigation and command and control using satellite, cellular, and ad hoc networks. NASA leads the standardization efforts for UTM, and IEEE leads the standardization efforts for Self-organized Aerial Communications and Networking of UAS. IEEE VTS recently created an ad hoc committee on drones to promote research in this important discipline, which is working towards a roadmap for promoting research in related topics including UAS connectivity, navigation, command and control, autonomy, reliability, safety, security, and regulatory aspects.

General Chair:

Kamesh Namuduri, University of North Texas, USA

Organizing Committee

Helka-Liina Määtänen, Ericsson, Finland

Rui Zhang, National University of Singapore, Singapore

Program

Sunday 22 September 2019 9:00-9:50 Kona Moku Ballroom Salon A Keynote

From the Ground Up: Physical Layer and Reliability Considerations for Air-Ground and Air-Air Networking

David Matolak, University of South Carolina

Sunday 22 September 2019 9:50-10:40 Kona Moku Ballroom Salon A Session I

1 Secure mmWave Cellular Network for Drone Communication (Invited Paper)

Arupiyoti Bhuyan, Idaho National Laboratory; Ismail Guvenc, Huaiyu Dai, Yavuz Yap?c?, Ali Rahmati, Sung Joon Maeng, North Carolina State University

2 Drone Swarms, Communications Performance and Big Data (Invited Paper)

Alistair Munro, Gary Clayton, Wyenor Ltd.

Ismail Guvenc, North Carolina State University, USA

David W. Matolak, University of South Carolina, USA

H. Jin Kim, Seoul National University, Korea

Uwe-Carsten Fiebig, German Aerospace Center (DLR), Germany

Sunday 22 September 2019 11:00-12:40 Kona Moku Ballroom Salon A Session II

1 Decentralized Control Strategies for Unmanned Aircraft System Pursuit and Evasion (Invited Paper)

Gilbert Peterson, Air Force Institute of Technology

2 Caching and D2D Sharing for Content Delivery in Software-Defined UAV Networks (Invited Paper)

Gurkan Gur, Zurich University of Applied Sciences

3 An Experimental Research Platform Architecture for UAS Communications and Networking

Vuk Marojevic, Mississippi State University; Ismail Guvenc, Mihail L. Sichitiu, Rudra Dutta, North Carolina State University

4 Inclination of Flying Drones in Aerial Wireless Relay Networks

Hiraku Okada, Jyo Suzuki, Hiroki Yanai, Kentaro Kobayashi, Masaaki Katayama, Nagoya University

Sunday 22 September 2019 13:40-15:20 Kona Moku Ballroom Salon A
Session III

- 1 Interference Mitigation Scheme in 3D Topology IoT Network with Antenna Radiation Pattern**
Sung Joon Maeng, Mrugen Deshmukh, Ismail Guvenc, North Carolina State University; Arupjyoti Bhuyan, Idaho National Laboratory
- 2 A Novel Method for Non-Stationary CFO Estimation and Tracking in Inter-UAV OFDM Links**
Subhankar Banerjee, Giridhar.K, IIT Madras
- 3 Trajectory Optimization for Physical Layer Secure Buffer-Aided UAV Mobile Relaying**
Lingfeng Shen, Zhengyu Zhu, Ning Wang, Xiang Ji, Xiaomin Mu, Zhengzhou University; Lin Cai, University of Victoria

4 Impact of Mobility on Consensus Building in the Leader-Follower Model

Roya Norouzi Kandalan, Sindhu Alla, Nima Hassan Rezaeian, Student
Sunday 22 September 2019 15:50-16:30 Kona Moku Ballroom Salon A
Session IV

- 1 A Game Approach for Distributed Channel Selection in UAV Communication Networks**
Na Xing, Qing Wang, Liping Teng, Tianjin University, China
- 2 Wrap-up**

W3: Machine Learning for Wireless Communications

During the last decade, tremendous research efforts have been put into machine learning (ML) which led to breakthroughs in many fields such as computer vision, natural language processing, pattern recognition, and game play. Recently, there has been a growing interest in ML also for communication systems. Motivated by encouraging preliminary results and the game changing progress observed in other domains, it is believed that ML could lead to significant advances in communication systems with a long-lasting impact. Moreover, ML enables novel data-driven approaches to system design which render accurate models – when available – less relevant. Despite the recent vivid interest for ML in communications, the full potential and limitations of ML in this domain have not been yet fully understood.

Organizers

Fayçal Ait Aoudia, Nokia Bell Labs France
Elisabeth de Carvalho, Aalborg University, Denmark

Jakob Hoydis, Nokia Bell Labs France
Marios Kountouris, Huawei Technologies, France

Program

Sunday 22 September 2019 9:00-10:30 Kaimuki 2, Kealahilani Tower
Keynotes

- 1 Future Indoor Networks with a 6th Sense**
Klaus Doppler, Nokia Bell Labs, USA
- 2 Wireless Networks Design in the Era of Deep Learning: Model-Based, AI-Based, or Both?**
Marco di Renzo, Centrale Supélec, France

Sunday 22 September 2019 11:00-12:30 Kaimuki 2, Kealahilani Tower
Session

- 1 An Adaptive Machine Learning Based Approach for the Cancellation of Second-Order-Intermodulation Distortions in 4G/5G Transceivers**
Oliver Ploder, Oliver Lang, Thomas Paireder, Mario Huemer, Johannes Kepler University Linz

- 2 Deep Neural Network based Cell Sleeping Control and Beamforming Optimization in Cloud-RAN**
Gehui-Du, Luhan Wang, Qing Liao, Haoxiang Hu, Beijing University of Posts and Telecommunications
- 3 Democratized Radio Tomography: Using Consumer Equipment to See Through Walls**
Lucy Bowen, Robert Hulbert, Jason Fong, Zachary Rentz, Bruce DeBruhl, California Polytechnic State University
- 4 Learning the Wireless V2I Channels Using Deep Neural Networks**
Tian-Hao Li, Muhammad RA Khandaker, Heriot-Watt University; Faisal Tariq, University of Glasgow; Kai-Kit Wong, University College London; Risala Tasin Khan, Jahangirnagar University

W4: Network-assisted Collaborative Automated Driving

As driving becomes increasingly automated, how to design a robust ADAS that operates reliably across the entire spectrum of driving environments attracts tremendous attention from both industry and academia. One promising way of approaching this goal is to take advantage of vehicular wireless communications. By connecting with other vehicles and/or to the roadside, a vehicle collects information regarding its surrounding environment from multiple angles and with diverse granularities. Such information is expected to augment ADAS's perception, location, and mapping functionalities., resulting in a more smooth and confident navigation. However, many challenges exist in this promising area.

This dedicated full-day workshop concerns the most recent advancements in wireless communications, sensory technologies and information processing. It aims to compile a refreshed view on the solutions combing the power of wireless communications and traditional ADAS for a safer, more efficient automated/autonomous vehicle. Challenges, opportunities and benefits of performing research in this interdisciplinary domain will be analyzed and highlighted.

General Chairs:

Hongsheng Lu, Toyota Motor North America, USA
Rui Guo, Toyota Motor North America, USA

Hendrik-Jörn Günther, VOLKSWAGEN
Ivan Wang-Hei Ho, The Hong Kong Polytechnic University
Malik Khan, Cohda Wireless
Seng W. Loke, Deakin University
Miguel Sepulcre, Universidad Miguel Hernandez de Elche (UMH)
Zhe Xuanyuan, BNU - BUHK united international college
Seung R. Yang, LG Electronics

Technical Program Committee

Bin Cheng, WINLAB at Rutgers University
Ehsan Moradi Pari, Honda US R&D

Program

Sunday 22 September 2019 13:30-15:30 Kaimuki 2, Kealohilani Tower

Session I

1 Welcome

Hongsheng Lu, Rui Guo, Toyota Motor North America

2 Keynote

Hao Zhang, Colorado School of Mines

3 Towards Emergency Braking as a Fail-Safe State in Platooning: A Simulative Approach

Shahriar Hasan, Ali Balador, Svetlana Girs, Elisabeth Uhlemann, Mälardalen University

4 In Vehicle Resource Orchestration for Multi-V2X Services

Mohammad Irfan Khan, Eurecom; Stefania Sesia, Renault Software Labs; Jérôme Härrri, EURECOM

5 A New Distributed Mobility-Based Multi-Hop Clustering Algorithm for Vehicular Ad Hoc Networks in Highway Scenarios

Ke Huang, South China University of Technology, China

Sunday 22 September 2019 15:45-17:30 Kaimuki 2, Kealohilani Tower

Session II

1 Network driven performance analysis in connected vehicular networks

Manveen Kaur, G. G. Md. Nawaz Ali, Anjan Rayamajhi, Beshah Ayalew, Jim Martin, Clemson University

2 A Light-Weight Smartphone GPS Error Model for Simulation

Ali Rostami, Bin Cheng, WINLAB, Rutgers University; Hongsheng Lu, John B. Kenney, Toyota InfoTechnology Center; Marco Gruteser, WINLAB, Rutgers University

3 Experimental Evaluation of Floating Car Data Collection Protocols in Vehicular Networks

Ion Turcanu, University of Luxembourg; Florian Adamsky, Hof University of Applied Sciences; Thomas Engel, University of Luxembourg

4 Panel: Challenges in collaborative automated driving

Moderator: Gaurav Bansal, Anchor, Airbus A³ Labs

W5: Reliable Ubiquitous Navigation in Smart Cities

Reliable and ubiquitous positioning and navigation is a key enabler for a variety of applications in smart cities. Outdoors, global navigation satellite systems (GNSSs) offer reliable and accurate positioning information in open sky conditions. In urban environments, the accuracy of GNSS positioning reduces drastically; and in indoor environments, GNSS positioning is typically unavailable altogether. To circumvent the limitations of GNSS in smart cities, and with the proliferation of the massively connected world of "Internet of Things," alternative reliable and accurate positioning and navigation systems are sought to enable future applications, such as self-driving cars, semi-autonomous vehicles, unmanned aerial vehicles (UAVs), and location-based services. In this regard, cellular communication systems could prove to be attractive. In 3GPP, this was considered at an early stage, and it is expected that beyond 5G solutions will deliver a significant improvement over current solutions. Through the discussion at the workshop, it is expected to promote the exchange of new ideas among researchers.

Workshop Chairs

Christian Gentner, German Aerospace Center (DLR), Germany

Ronald Raulefs, German Aerospace Center (DLR), Germany

Zak M. Kassas, University of California, Irvine, USA

Fabio Dovis, Politecnico di Torino - DET, Italy

Workshop Organizers

Christian Gentner, German Aerospace Center (DLR), Germany

Ronald Raulefs, German Aerospace Center (DLR), Germany

Zak M. Kassas, UC Irvine, USA

Fabio Dovis, Politecnico di Torino - DET, Italy

Gonzalo Seco Granados, UAB, Spain

Henk Wymeersch, Chalmers, Sweden

Norbert Franke, Fraunhofer, Germany

Technical Program Committee

Jose Antonio del Peral Rosado, UAB, Spain

Mohammed Khider, Google, USA

Patrick Henkel, TUM, Germany

Di Qiu, Polaris Wireless, USA

Jerome Haerri, Eurecom, France

Benoit Denis, CEA, France

Giuseppe Abreu, Jacobs University, Germany

Richard Martin, AFIT, USA

Felix Antreich, ITA, Brazil

Marco Pini, ITA, LINKS foundation, Italy

Bernard Fleury, Aalborg, Denmark

Florian Meyer, MIT, USA

Nicola Linty, FGI, Finland

Davide Dardari, Univ. of Bologna, Italy

Florin Grec, ESA/ESTEC, Netherlands

Rafael Toledo Moreo, UPCT, Spain

Laura Ruotsalainen, University of Helsinki, Finland

Program

Sunday 22 September 2019 9:00-10:30 Kaimuki 1, Kealohilani Tower

Session I

1 Processed 5G Signals Mathematical Models for Positioning considering a Non-Constant Propagation Channel

Anne-Marie Tobie, Axel Garcia-Pena, Paul Thevenon, French National Civil Aviation

2 Physical-Layer Abstraction for Hybrid GNSS and 5G Positioning Evaluations

José A. del Peral-Rosado, Olivier Renaudin, Universitat Autònoma de Barcelona; Christian Gentner, Ronald Raulefs, German Aerospace Center (DLR); Enrique Dominguez-Tijero, Alejandro Fernández-Cabezas, Fernando Blázquez-Luengo, Gema Cueto-Felgueroso, GMV;

Alexander Chassaingne, Telefónica I+D; David Bartlett, u-blox AG; Florin Grec, Lionel Ries, Roberto Prieto-Cerdeira, European Space Agency (ESA); José A. López-Salcedo, Gonzalo Seco-Granados, Universitat Autònoma de Barcelona (UAB)

3 Evaluation of Feedback and Feedforward Coupling of Synthetic Aperture Navigation with LTE Signals

Zaher Kassas, Ali Abdallah, University of California, Irvine

4 Data Association among Physical and Virtual Radio Transmitters with Visibility Regions

Markus Ulmschneider, Christian Gentner, Armin Dammann, German Aerospace Center (DLR)

Sunday 22 September 2019 11:00-12:30 Kaimuki I, Kealahilani Tower
Session II

Keynote: The Quest for Precise Indoor Location
Stan Chesnutt, Google

- 1 Multipath-Optimal UAV Trajectory Planning for Urban UAV Navigation with Cellular Signals**
Sonya Ragothaman, University of California Riverside; Mahdi Maaref, Zaher Kassas, University of California, Irvine
- 2 UAV Trajectory Design for Obstacle Avoidance Based on Cell-varying JPS in Smart Cities**
Yixue Feng, Jianjun Hao, Yijun Guo, Yi Zhang, Beijing University of Posts and Telecommunications

Sunday 22 September 2019 13:45-15:30 Kaimuki I, Kealahilani Tower
Session III

Keynote: Realizing Ubiquitous Indoor Positioning for First Responders
Jeb Benson, NIST

- 1 Enabling High-Integrity Vehicular Satellite Navigation Operations via Automatic Gain Control**
Nathan Levigne, Dennis Akos, Charles Puskar, University of Colorado Boulder

2 On the Trade-off Between Computational Complexity and Collaborative GNSS Hybridization

Alex Minetto, Politecnico di Torino; Gianluca Falco, LINKS Foundation; Fabio Dovis, Politecnico di Torino

- 3 A Vehicular GPS Error Prediction Model Based on Data Smoothing Preprocessed LSTM**
Sheng Liu, Vivekanandh Elangovan, Weidong Xiang, University of Michigan-Dearborn

Sunday 22 September 2019 16:00-17:30 Kaimuki I, Kealahilani Tower
Session IV

- 1 On the Cooperative Ranging between Android Smartphones Sharing Raw GNSS Measurements**
Neil Gogoi, Alex Minetto, Fabio Dovis, Politecnico di Torino

- 2 Precise Point Positioning with Kepler**
Patrick Henkel, German Aerospace Center (DLR)

Panel Discussion

Workshop organisers and keynote speakers

W6: Small Data Networks

“Small data” refers to information exchanged by a massive number of smart devices and sensors in the broad context of machine-type communications. Small data sets—metering data, status reports, remote commands, and information generated and transmitted within the IoT—are produced by myriad devices accessing the infrastructure sporadically, generating a massive amount of short packets that must be received with high reliability, exploiting the available spectrum resources efficiently even in absence of coordination.

Recent developments—physical layer network coding and various techniques based on successive interference cancellation (SIC), where interference is embraced and creatively utilized—have been proposed, opening a new perspective for uncoordinated multiple access protocols and dramatic performance improvements, and increased throughput of interference-limited channels. This calls for new studies on fundamental limits, optimal waveform design, signal-processing algorithms, error-correcting schemes and access protocols, and theoretical tools for system design. Research in the field is further buttressed by clearly defined and market-driven goals from the industry.

Workshop Chairs

Federico Clazzer, German Aerospace Center
Andrea Munari, German Aerospace Center
Enrico Paolini, University of Bologna

International Advisory Committee

Krishna Narayanan, Texas A&M University
Petar Popovski, Aalborg University
Marco Chiani, University of Bologna
Gianluigi Liva, German Aerospace Center

Technical Program Committee

Adnan Aijaz, Toshiba Research Europe Ltd
Leonardo Badia, University of Padova
Yan Chen, Huawei
Giuseppe Cocco, EPFL
Asaf Cohen, Ben-Gurion Univ. of the Negev
Lin Dai, City University of Hong Kong

Program

Sunday 22 September 2019 9:00-10:30 Milo 3

Keynote

Coding and Compressed Sensing for Unsourced Multiple Access
Jean-Francois Chamberland, Texas A&M

Karina Gomez, RMIT University
Sarah J. Johnson, University of Newcastle
Soung Liew, Chinese University of Hong Kong
Rongke Liu, Beihang University
Rockey Luo, Colorado State University
Stephan Pfletschinger, Offenburg University
Yury Polyanskiy, MIT
Tony Q.S. Quek, Singapore University of T&D
Laurent Reynaud, Orange Labs
Shirin Saeedi Bidokhti, University of Pennsylvania
Cedomir Stefanovic, Aalborg University
Stefano Tomasin, University of Padova
Laura Toni, University College London
Dejan Vukobratovic, University of Novi Sad
Peng Wang, KTH
Richard Wesel, UCLA
David T.C. Wong, Institute for Infocomm Res.
Zhaoyang Zhang, Zhejiang University

Sunday 22 September 2019 9:00-10:30 Milo 3

Session I

- 1 A Polar Code Based Unsourced Random Access for the Gaussian MAC**
Evgeny Marshakov, Gleb Balitskiy, Kirill Andreev, Alexey Frolov, Skolkovo Institute of Science and Technology

- 2 On the Design of Analog Fountain Codes for Short Packet Communications in 5G URLLC**
Wen Jun Lim, Mahyar Shirvanimoghaddam, Rana Abbas, Yonghui Li, Branka Vucetic, The University of Sydney
- 3 A Novel Non-Orthogonal Multiple Access with Space-Time Line Codes for Massive IoT Networks**
Ki-Hun Lee, Jeong Seon Yeom, Bang Chul Jung, Chungnam National University; Jingon Joung, Chung-Ang University
- 4 An Evolved Non-Orthogonal Multiple Access For User Multiplexing with Small-Data Transmission**
Qi Xiong, Chen Qian, Bin Yu, Chengjun Sun, Samsung Electronics
- 5 Efficient Concatenated Same Codebook Construction for the Random Access Gaussian MAC**
Daria Ustinova, Anton Glebov, Pavel Rybin, Alexey Frolov, Skolkovo Institute of Science and Technology

Sunday 22 September 2019 14:30-15:30 Milo 3

Keynote

Enabling IoT from Low Earth Orbit
Wen Cheng Chong, Kepler Communications

Sunday 22 September 2019 16:00-17:20 Milo 3

Session II

- 1 Low complexity energy efficient random access scheme for the asynchronous fading MAC**
Kirill Andreev, Skolkovo Institute of Science and Technology; Suhas S Kowshik, Massachusetts Institute of Technology; Alexey Frolov, Skolkovo Institute of Science and Technology; Yury Polyanskiy, MIT
- 2 Residual Energy Optimization for MIMO SWIPT Two-Way Relaying System**
Guanyi Chen, Ericsson (China) Communications Co.LTD; Jinlong Wang, Harbin Institute of Technology; Gang Wang, Yikun Zou, Communication Research Center, Harbin Institute of Technology; Donglai Zhao, Harbin Institute of Technology
- 3 On the Flexible and Performance-Enhanced Radio Resource Control for 5G NR networks**
Ahlem Khlass, Daniela Laselva, Rauli Jarvela, Nokia Bell Labs
- 4 New Results in Asynchronous Scrambled Coded Multiple Access: Multi-stream Transmission and Application to 5G Small Data Networks**
Mustafa Eroz, Neal Becker, Rohit Seshadri, Lin-nan Less, Hughes Network Systems

W7: Technology Trials and Proof-of-Concept Activities for 5G Evolution & Beyond 5G 2019 (TPoC5GE 2019)

The 5th generation (5G) cellular communication systems are going to be launched in 2019. New technology concepts for the next generation mobile communications including 5G Evolution and Beyond 5G (B5G) are about to be investigated in many research entities. On top of that, research and development activities are about to be initiated. In these regards, this workshop is aiming to provide opportunities to present the latest trials and the proof-of-concept activities for next generation mobile communications. Distinguished speakers from industry as well as from academia will present their latest research and development results and will prove their perspective regarding the new directions of mobile communications. Through the discussion at the workshop, it is also expected to promote the exchange of new ideas among researchers. This workshop is supported by the Technical Committee on Radio Communication Systems (RCS), IEICE.

General Co-Chairs:

Tomoaki Ohtsuki, Keio University

Erik Dahlman, Ericsson Research

TPC Co-Chairs:

Yukitoshi Sanada, Keio University

Shinsuke Ibi, Doshisha University

Publicity Chairs:

Fumiaki Maehara, Waseda University

Yuyuan Chang, Tokyo Tech.

Keynote Chairs:

Satoshi Suyama, NTT DOCOMO

Toshihiko Nishimura, Hokkaido University

Advisors:

Fumiyuki Adachi, Tohoku University

Seiichi Sampei, Osaka University

Mamoru Sawahashi, Tokyo City University

Satoshi Denno, Okayama University

Eisuke Fukuda, Fujitsu Lab.

Hidekazu Murata, Kyoto University

Program

Sunday 22 September 2019 14:00-15:30 Kaimuki 3, Kealohilani Tower

Session I

Chair: Tomoaki Ohtsuki, Keio University

Opening Address

Tomoaki Ohtsuki, Keio University

Keynote: Outcomes of Korea - Japan Joint 5G Collaboration

HyeonWoo Lee, DanKook University; Yukihiko Okumura, NTT DOCOMO

Technical Program Committee

Kazunori Hayashi, Osaka City University

Kenichi Higuchi, Tokyo University of Science

Naoto Ishii, NEC

Suguru Kameda, Tohoku University

Megumi Kaneko, National Institute of Informatics

Kazuki Maruta, Chiba University

Nobuhiko Miki, Kagawa University

Yuichi Miyaji, Toyohashi University of Technology

Akinori Nakajima, Mitsubishi Electric Corporation

Hiroshi Nishimoto, Mitsubishi Electric Corporation

Masakatsu Ogawa, Sophia University

Hiraku Okada, Nagoya University

Eiji Okamoto, Nagoya Institute of Technology

Stefan Parkvall, Ericsson

Takashi Seyama, Fujitsu Limited

Takumi Takahashi, Osaka University

Tetsuya Yamamoto, Panasonic Corporation

1 Performance Evaluation of Prefetching Algorithm for Real time Edge Content Delivery in 5G System

Makoto Nakamura, Hiroaki Nishiuchi, Khanh Tran Gia, Kei Sakaguchi, Tokyo Institute of Technology; Konstantin Koslowski, Julian Daube, Fraunhofer HHI; Ricardo Santos, Karlstad University

2 Field Trial Activities on 5G NR V2V Direct Communication Towards Application to Truck Platooning

Koichi Serizawa, Manabu Mikami, Kohei Moto, Hitoshi Yoshino, SoftBank Corp.

3 Field Experimental Evaluation on 5G V2N Low Latency Communication for Application to Truck Platooning

Kohei Moto, Manabu Mikami, Koichi Serizawa, Hitoshi Yoshino, SoftBank Corp.

4 Parameter Estimation for Block Diagonalization based Hybrid Beamforming in Massive MIMO Communications

Kenta Tsuge, Yuyuan Chang, Kazuhiko Fukawa, Tokyo Institute of Technology; Satoshi Suyama, Yukihiro Okumura, NTT DOCOMO, INC.

Sunday 22 September 2019 16:00-17:30 Kaimuki 3, Kealohilani Tower Session II

Chair: Yukitoshi Sanada, Keio University

5G, Current and Future?

Seiichi Sampei, Osaka University

1 Uplink Multi-User Massive MIMO using Gaussian BP in Highly Correlated Actual Environments

Tatsuki Okuyama, Kazushi Muraoka, Satoshi Suyama, NTT DOCOMO, INC.; Jun Mashino, NTT; Yukihiro Okumura, NTT DOCOMO, INC.; Shinsuke Ibi, Doshisha University; Takumi Takahashi, Seiichi Sampei, Osaka University

2 Indoor Experimental Trial in High SHF Wide-band Massive MIMO Hybrid Beamforming

Nobuhide Nonaka, Kazushi Muraoka, Satoshi Suyama, NTT DOCOMO, INC.; Jun Mashino, NTT; Kenichiro Kamohara, Mitsubishi Electric Corporation; Manabu Sakai, Mitsubishi Electric Corporation Information Technology R&D Center; Hiroki Iura, Mitsubishi Electric Corp.; Masayuki Nakazawa, Mitsubishi Electric Corporation; Yukihiro Okumura, NTT DOCOMO, INC.

3 Experimental Trials of 5G Ultra High-Density Distributed Antenna Systems

Shinya Kumagai, Takaharu Kobayashi, Teppei Oyama, Chiyoshi Akiyama, Masafumi Tsutsui, Daisuke Jitsukawa, Takashi Seyama, Takashi Dateki, Hiroyuki Seki, Morihiko Minowa, FUJITSU LIMITED; Tatsuki Okuyama, NTT DOCOMO, INC.; Jun Mashino, NTT; Satoshi Suyama, Yukihiro Okumura, NTT DOCOMO, INC.

4 Channel Extrapolation for FDD Massive MIMO: Procedure and Experimental Results

Thomas Choi, Francois Rottenberg, Jorge Gomez, Akshay Ramesh, Peng Luo, University of Southern California; Charlie Zhang, Samsung; Andreas F. Molisch, University of Southern California

W8: Vehicular Information Services for the Internet of Things (VISIT 2019)

Among the key enablers of the Internet of Things (IoT), smart vehicles promise solutions for providing on-road communication and ubiquitous information services. In-vehicle sensors, diversified communication modules, and an on-board unit with high computing and storage capabilities enable the smart vehicle to become a mobile resource provider. Expanding the smart vehicle-based services/applications beyond the intelligent transportation services requires new service scopes, innovative system architectures, and design enabling technologies. Enabling pervasive and diversified vehicular service provisioning in the IoT era requires the synergy of distributed cloud and fog computing, networking infrastructures, crowdsourcing, public sensing, information-centric networking, privacy and security techniques. Our main objective is to highlight ongoing efforts in this area, and to address issues that arise from smart vehicles such as resource and service discovery, data communication and delivery, quality of information assessment, resource recruitment, and incentive modelling.

Workshop Co-chairs:

Sherin Abdelhamid, Ontario Centres of Excellence, Canada
Khalid Elgazzar, University of Ontario Institute of Technology
Technical Program Committee
Damla Turgut, University of Central Florida
Aboelmagd Noureldin, Royal Military College of Canada
Hatem Abou-zeid, Ericsson Canada

Program

Sunday 22 September 2019 9:00-10:30 Kaimuki 3, Kealohilani Tower

Session I

Talk

David Michelson, The University of British Columbia

1 A Framework for Adaptive Resolution Geo-Referencing in Intelligent Vehicular Services

Amr El-Wakeel, Aboelmagd Noureldin, Queen's University; Nizar Zorba, Qatar University; Hossam S. Hassanein, Queen's University

2 Super-Resolution of Low-Quality Images Based on Compressed Sensing and Sequence Information

Ruofei Zhou, Gang Wang, Donglai Zhao, Yikun Zou, Tong Zhang, Harbin Institute of Technology

Amr El Mougny, German University in Cairo

Mervat AbuElkheir, Mansoura University

Karim Emara, Ain Shams University

Ala Abu Alkheir, University of Ottawa

Eslam AbdAllah, Ain Shams University

Tamer Abdelkader, Ain Shams University

Salimur Choudhury, Lakehead University

Sunday 22 September 2019 9:00-10:30 Kaimuki 3, Kealohilani Tower

Session II

Talk

Haris Gačanin, Nokia Bell Labs

1 An Improved D-S Based Vehicular Multi-sensors' Perceptual Data Fusion for Automated Driving Decision-making

Peng Wang, Xiangming Wen, Luhan Wang.; Zhaoming Lu, Lu Ma, Beijing University of Posts and Telecommunications

2 Coded Computing for Distributed Machine Learning in Wireless Edge Network

Sagar Dhakal, Saurav Prakash, Intel Labs; Yair Yona, Qualcomm Inc.; Shilpa Talwar, Intel Corporation; Nageen Himayat, Intel Labs

W9: Enhancing Diversity in the Engineering World: Experiences, Views, & Suggestions

The aim of this workshop is to enhance diversity in IEEE Vehicular Technology Society—and in the Engineering Community as a whole—by fostering the connection of women and other groups that represent minorities.

The workshop intends to create an opportunity for sharing experiences about the challenges faced by women and minorities in the engineering world, and views on how to enhance diversity and increase the presence of minorities at all stages of the engineering career. This pioneering workshop will be an onsite interactive discussion. We encourage everyone to attend and contribute their experiences and ideas. Please contact the organizer for further details, and to discuss contributions.

Organiser: *Carmela Cozzo*, Huawei Technologies, USA

Program

Sunday 22 September 2019 14:30-16:15 Milo 4 & 5

Session I

1 Opening remarks

Alex Wyglinski, VTS president

2 Reflections of a female wireless communications engineer

Katie Wilson, Santa Clara University

3 Talk

Olga Boric-Lubecke, University of Hawaii

4 We know what to do to increase diversity and inclusion in engineering; why don't we do it?

Laura Bottomley, North Carolina State University

Sunday 22 September 2019 16:45-18:30 Milo 4 & 5

Session II

Panel: A diverse engineering world

Panelists: Lajos Hanzo, Peiyang Zhu

VTC2019-Fall Program

Monday 23 September 2019

Monday, 23 September 2019 11:00-12:30 Kaimuki 1

1A: NOMA Systems

Chair: Rui Dinis Universidade Nova de Lisboa

1 An Efficient Message Passing Algorithm for Active User Detection and Channel Estimation in NOMA

Weijia Dai, University of Science and Technology of China; Haichao Wei, Dalian Maritime University; Jiayi Zhou, the 38th Research Institute of China ETGC; Zhou Wuyang, University of Science and Technology of China

2 Downlink NOMA in Multi-UAV Networks over Bivariate Rician Shadowed Fading Channels

Ernest Tan, A.S. Madhukumar, Rajendra Prasad Sirigina, Nanyang Technological University; Anoop Kumar Krishna, Airbus Group Singapore Pte Ltd

3 Group based spreading and symbol puncturing design for NOMA systems

Chanho Yoon, Young-Jo Ko, Taejoong Kim, ETRI

4 Nonlinear Effects in NOMA Signals: Performance Evaluation and Receiver Design

João Guerreiro, Universidade Autónoma de Lisboa, Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa; Paulo Carvalho, FCT- Universidade Nova de Lisboa; Mario Marques da Silva, Institute for Telecommunications

5 Power Allocation in PDMA Systems with Imperfect Channel State Information

Mingyao Peng, Chongqing University of Posts and Telecommunications; Jie Zeng, Xin Su, Bei Liu, Tsinghua University

Monday, 23 September 2019 11:00-12:30 Kaimuki 2

1B: mmWave and 5G

Chair: Dong In Kim, Sungkyunkwan University

1 3-D Position and Velocity Estimation in 5G mmWave CRAN with Lens Antenna Arrays

Jie Yang, Shi Jin, Yu Han, Southeast University; Michail Matthaiou, Queen's University Belfast; Yongxu Zhu, Loughborough University

2 BsNet: a Deep Learning-Based Beam Selection Method for mmWave Communications

Chia-Hung Lin, Wei-Cheng Kao, Shi-Qing Zhan, Ta-Sung Lee, National Chiao Tung University

3 On the System-level Performance of Coordinated Multi-point Transmission Schemes in 5G NR Deployment Scenarios

Siva Muruganathan, Sebastian Faxér, Simon Järmyr, Shiwei Gao, Mattias Frenne, Ericsson

4 Enhanced AoA Estimation Using Localized Hybrid Dual-Polarized Arrays

Hang Li, Qian Wang, Xiaojing Huang, Andrew Zhang, University of Technology Sydney

5 How Multi-Hop Relaying in mmWave Communications Improves Uplink Network Latency

Ziqi Chen, University of New South Wales; David Smith, CSIRO Data61

Monday, 23 September 2019 11:00-12:30 Kaimuki 3

1C: AI and Machine Learning Approach

Chair: Kevin Ong Shen Hoong, Nanyang Technological University

1 Traffic Forecast in Mobile Networks: Classification System using Machine Learning

Diogo Clemente, ISCTE-IUL/Instituto de Telecomunicações; Lúcio Studer Ferreira, Multivision, INESC-ID/Universidade Lusitana, ISTE; Gabriela Soares, Multivision - Consultoria; pedro sebastiao, ISCTE-IUL/Instituto de telecomunicações; Daniel Fernandes, Rodrigo Cortesão, ISCTE-IUL / Instituto de Telecomunicações

2 Deep Reinforcement Learning-Based Channel Allocation for Wireless LANs with Graph Convolutional Networks

Kota Nakashima, Shotaro Kamiya, Kazuki Ohtsu, Koji Yamamoto, Takayuki Nishio, Masahiro Morikura, Kyoto University

3 Distributed Caching Popular Services by Using Deep Q-Learning in Converged Networks

Yuzhe Fang, Jian Xiong, Shanghai Jiao Tong University; Peng Cheng, University of Sydney; Wei Zhang, Shanghai Jiao Tong University

4 Cognitive Radio Network Throughput Maximization with Deep Reinforcement Learning

Kevin Ong Shen Hoong, Zhang Yang, Dusit Niyato, Nanyang Technological University

5 AI-Enhanced Incentive Design for Crowdsourcing in Internet of Vehicles

Yanlin Yue, Xidian University; Wen Sun, Jiajia Liu, Northwestern Polytechnical University; Yuanhe Jiang, Xidian University

Monday, 23 September 2019 11:00-12:30 Milo 1

1D: IoT Applications

Chair: Scott Pudlewski, Air Force Research Laboratory

1 3-Stage Complexity- and Accuracy-Efficient Synchronization Scheme for Wireless IoT Systems

Kapseok Chang, Sang Ho Lee, ETRI

2 Application-Based Rate Control for Emerging Systems

Scott Pudlewski, Air Force Research Laboratory

3 ARTHost: Age-optimized Receiver-driven Transport Control Scheme in Datacenter Networks

Wei Zhao, Li Wang, Beijing University of Posts and Telecommunications; Bo Bai, Huawei Technologies Co., Ltd.; Mei Song, Beijing University of Posts and Telecommunications

4 Instantaneous Fuel Consumption Estimation Using Smartphones

Samuel Shaw, Yunfei Hou, California State University, San Bernardino; Weida Zhong, University at Buffalo; Qingquan Sun, California State University, San Bernardino; Tong Guan, Lu Su, University at Buffalo

5 Opportunistic Data Ferrying in Areas with Limited Information and Communications Infrastructure

Ihab Mohammad, Shadha Tabatabai, Ala Al-Fuqaha, Western Michigan University; Junaid Qadir, Information Technology University, Lahore

Monday, 23 September 2019 11:00-12:30 Milo 2

1E: Channel Measurements and Modeling I

Chair: David W. Matolak, University of South Carolina

1 A 3D Air-to-Air Wideband Non-Stationary Channel Model of UAV Communications

Zhangfeng Ma, Bo Ai, Ruisi He, Zhangdui Zhong, Beijing Jiaotong University

2 A Spatially Consistent Geometric D2D Small-Scale Fading Model for Multiple Frequencies

Stephan Jaeckel, Leszek Raschkowski, Fraunhofer Heinrich Hertz Institute; Frank Burkhardt, Fraunhofer Institute for Integrated Circuits; Lars Thiele, Fraunhofer Heinrich Hertz Institute

3 Directional Analysis of Vehicle-to-Vehicle Channels with Large Vehicle Obstructions

Mi Yang, Bo Ai, Ruisi He, Beijing Jiaotong University; Liang Chen, Xue Li, Huawei Technologies; Jianzhi Li, Zhangfeng Ma, Zhangdui Zhong, Beijing Jiaotong University

4 Empirical Radio Channel Characterization at 5.9 GHz for Vehicle-to-Infrastructure Communication

Abdellah Chehri, University of Ottawa

5 Millimeter-Wave Path Loss at 73 GHz in Indoor and Outdoor Airport Environments

Mahfuza Khatun, Boise State university; Changyu Guo, Boise State University; Letizia Moro, Boise State universit; David Matolak, University of South Carolina; Hani Mehrpouyan, Boise State University

Monday, 23 September 2019 11:00-12:30 Milo 3

1F: Resource Management I

Chair: Wen Mi, Shanghai University of Electric Power

1 5G New Radio for Rural Broadband: How to achieve long-range coverage on the 3.5 GHz band

Jialu Lun, Pal Frenger, Anders Furuskär, Elmar Trojer, Ericsson AB, Sweden

2 A Joint Jamming Detection and Link Scheduling Method Based on Deep Neural Networks in Dense Wireless Networks

Yang Ju, Ming Lei, Ming-Min Zhao, Min Li, Minjian Zhao, Yunlong Cai, Zhejiang University

3 An Efficient Multicast Scheme for Live Streaming Services in SC-PTM

T. H. Lee, Wei-Chieh Liu, National Chiao Tung University; Alex C.-C. Hsu, MediaTek Inc.

4 A New Real-Time Rate Control Friendly with TCP Hybla over Heterogeneous Networks

Asuka Ishii, Yuto Usuki, Kazushige Nakagawa, Satoshi Utsumi, Fukushima University; Salahuddin Zabir, National Institute of Technology, Tsuruoka College

5 Computation Offloading with Online Matching Algorithm in Mobile Edge Computing Networks

Chunxia Su, Fang Ye, Yuan Tian, Harbin Engineering University; Zhu Han, University of Houston

Monday, 23 September 2019 11:00-12:30 Kou

1G: V2X Performance Analysis I

Chair: Sau-Hsuan Wu, National Chiao Tung University

1 A Markov Perspective on C-V2X Mode 4

Geeth P. Wijesiri N.B.A., University of Oulu; Jussi Haapola, University of Oulu; Tharaka Samarasinghe, University of Moratuwa

2 An Analytical Model for Performance Analysis of an Active Signaling-based TDMA MAC Protocol in Vehicular Networks

Fouzi Boukhalifa, Mohamed Hadded, Vedecom; Paul Muhlethaler, Inria Paris; Oyunchimeg Shagdar, VEDECOM Institute

3 Empirical Analysis of Client-based Network Quality Prediction in Vehicular Multi-MNO Networks

Benjamin Sliwa, Christian Wietfeld, TU Dortmund University

4 Exploiting Multi-RAT Diversity in Vehicular Ad-hoc Networks to Improve Reliability of Cooperative Automated Driving Applications

Richard Jacob, TU Dresden; Joshwa Pohlmann, Barkhausen Institut; Waqar Anwar, Gerhard Fettweis, TU Dresden

5 Physical Layer Evaluation of V2X Communications Technologies: 5G NR-V2X, LTE-V2X, IEEE 802.11bd, and IEEE 802.11p

Waqar Anwar, Norman Franchi, Gerhard Fettweis, TU Dresden

Monday, 23 September 2019 11:00-12:30 Honolulu

1H: Positioning I

Chair: Chin-Ya Huang National Taiwan University of Science and Technology

1 Fingerprint-based Localization using Commercial LTE Signals: A Field-Trial Study

Heng Zhang, Zhichao Zhang, Shunqing Zhang, shugong xu, shan cao, Shanghai University

2 Applying Long Short-Term Memory (LSTM) Mechanisms for Fingerprinting Outdoor Positioning in Hybrid Networks

Getaneh Berie Tarekegn, Hsin-Piao Lin, Abebe Belay Adege, Yirga Yayeh, National Taipei University of Technology; Shiann-Shiun Jeng, National Dong Hwa University

3 Device-free CSI-based Wireless Localization for High Precision Drone Landing Applications

Kuan-I Lu, Chun-Jie Chiu, Kai-Ten Feng, National Chiao Tung University; Po-Hsuan Tseng, National Taipei University of Technology

4 Device-Free Multiple Presence Detection using CSI with Machine Learning Methods

Yu Ming Huang, An-Hung Hsiao, Chun-Jie Chu, Kai-Ten Feng, National Chiao Tung University; Po-Hsuan Tseng, National Taipei University of Technology

5 Performance Analysis and Mitigation Method for I/Q Imbalance-Impaired Time Reversal-based Indoor Positioning Systems

Trung-Hien Nguyen, OPERA department, Universite libre de Bruxelles; Sidney Golstein, Universite libre de Bruxelles; Jerome Louveaux, ICTEAM institute, Universite Catholique de Louvain; Philippe De Doncker, Francois Horlin, Université Libre de Bruxelles

Monday, 23 September 2019 11:00-12:30 Salon 1

1P: Radio Access

1 Opportunites and Challenges for NR RAT-dependent based Positioning

Ryan Keating, Daejung Yoon, Howard Huang, Nokia Bell Labs; Tao Tao, Bell Labs, Nokia Shanghai Bell

- 2 **Performance Evaluation on Resource Allocation with Carrier Aggregation in LTE Cellular Networks**
Nakrop Jinaporn, Simon Armour, Angela Doufexi, University of Bristol
- 3 **Spatial Multiplexing based NR-U and WiFi Coexistence in Unlicensed Spectrum**
Qimei Chen, Wuhan University
- 4 **Cross Link Interference Mitigation Schemes in Dynamic TDD Systems**
Hyejin Kim, Kwonjong Lee, Yonsei University; Hano Wang, Sangmyung University; Daesik Hong, Yonsei University
- 5 **Adaptive C-RAN Architecture for Smart City with Crowdsourced Radio Units Mounted on Parked Vehicles**
Yu Nakayama, Tokyo University of Agriculture and Technology; Kazuki Maruta, neko 9 Laboratories
- 6 **Enhancement of User Perceived Throughput in Sub-6 GHz Integrated Access and Backhaul with Dynamic Full-duplex**
Kyoya Teramae, Keiichi Mizutani, Kyoto University; Takeshi Matsumura, National Institute of Information and Communications Technology; Hiroshi Harada, Kyoto University
- 7 **Joint Resource Block and Power Allocation in NOMA Based Fog Radio Access Networks**
Binghong Liu, Mugen Peng, Yaqiong Liu, Beijing University of Posts and Telecommunications
- 8 **Layered-division Multiplexing Multicell Cooperative Multicast-Broadcast Beamforming**
Tao Fang, Dazhi He, Shanghai Jiao Tong University
- 9 **Outer code-based HARQ Retransmission for Multicast/Broadcast Services in 5G**
Jeongho Yeo, Jonghyun Bang, Hyoungju Ji, Younsun Kim, Juho Lee, Samsung Electronics

- 10 **A Novel Design of Cost-Efficient Long-Reach Survivable Wireless-Optical Broadband Access Network**
jitendra gupta, IIT Patna; Aneek Adhya, Indian Institute of Technology Kharagpur
- 11 **RAN Slicing in Multi-CU/DU Architecture for 5G Services**
Haruhisa Hirayama, Yu Tsukamoto, Shinobu Nanba, Kosuke Nishimura, KDDI Research, Inc.
- 12 **Performance of Physical Cell ID Detection Probability Considering Frequency Offset for NR Radio Interface**
Kyogo Ota, Aya Shimura, Mamoru Sawahashi, Tokyo City University; Satoshi Nagata, NTT DOCOMO, INC.
- 13 **Outdoor Experiments on 5G Radio Access in 5G Trial Site Using Core Network in 28-GHz Frequency Band**
Daisuke Kurita, Daisuke Kitayama, Kensuke Miyachi, Yoshihisa Kishiyama, NTT DOCOMO, INC.; Hideshi Murai, Ericsson Japan; Shoji Itoh, Ericsson; Peter Ökvist, Arne Simonsson, Ericsson Research; Jong-Kae (JK) Fwu, Intel Corp.; Xiangyang (Jeff) Zhuang, Kenneth Stewart, Intel Corporation
- 14 **Online Probabilistic Activation Control of Base Stations Considering Both Uplink and Downlink System Throughput**
Naoki Uji, Tokyo University of Science; Yoshihisa Kishiyama, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science
- 15 **Lightweight and Secure D2D Authentication & Key Management based on PLS**
Reem Melki, Hassan Noura, Ali Chehab, American University of Beirut

Monday, 23 September 2019 14:00-15:30 Kaimuki 1

2A: Coding

Chair: Mao-Chao Lin, National Taiwan University

- 1 **Length-Compatible Polar Codes as Compound Polar Codes**
Wen-Che Chang, Tofar C.-Y. Chang, Yu T. Su, National Chiao Tung University
- 2 **Low Complexity Decoding Scheme of Raptor-like LDPC Code in Sufficient SNR Scenarios**
Chao Zhang, Yin Xu, Shanghai Jiao Tong University; Na Gao, Shanghai Jiaotong University; Dazhi He, Ju Hao, Genning Zhang, Yizhe Zhang, Shanghai Jiao Tong University; Yu Zhang, Wei Xie, Academy of Broadcasting Science
- 3 **Offset min-sum Optimization for General Decoding Scheduling: A Deep Learning Approach**
Ahmed Abotabl, Jung Hyun Bae, Kee-Bong Song, Samsung Semiconductors Inc.
- 4 **A Curve Fitting Method to Construct Polar Coded OFDM Systems with Channel Side Information for the Transmitter**
Shih-Kai Lee, Yuan Ze University; Yung-Tsao Hsu, Bei-Hao Chang, Mao-Chao Lin, National Taiwan University; Huang-Chang Lee, Dept. of Electrical Engineering, Chang Gung University, Taiwan.
- 5 **Partial Enumerative Sphere Shaping**
Yunus Can Gultekin, Eindhoven University of Technology; W.J. van Houtum, Catena Radio Design; Arie Koppelaar, NXP Semiconductors; Frans M.J. Willems, Eindhoven University of Technology

Monday, 23 September 2019 14:00-15:30 Kaimuki 2

2B: MIMO I

Chair: Xiaodai Dong, University of Victoria

- 1 **ADMM Enabled Hybrid Precoding in Wideband Distributed Phased Arrays Based MIMO Systems**
Yu Zhang, Southeast University; Yiming Huo, University of Victoria; Jinlong Zhan, University of Victoria; Dongming Wang, Southeast

University; Xiaodai Dong, University of Victoria; Xiaohu You, Southeast University

- 2 **Blind Classification of MIMO Wireless Signals**
Tejashri Kuber, Rutgers University; Dola Saha, University at Albany, SUNY; Ivan Seskar, Rutgers University
- 3 **Enabling Ultra Reliable Wireless Communications for Factory Automation with Distributed MIMO**
Gianluca Casciano, University of Cassino and Southern Lazio, Italy; Paolo Baracca, Bell Labs, Nokia; Stefano Buzzi, University of Cassino and Southern Lazio, Italy
- 4 **Performance Comparison of Non-linear Precoding Schemes for Multi-user MIMO Broadcast Channels**
Rui Chen, Hong Zhou, Xidian University; Marco Moretti, University of Pisa
- 5 **A New Divide and Conquer based SVD Algorithm for Beamforming Matrix for MIMO Systems**
Minki Ahn, Wookbong Lee, Eunsung Jeon, Sungsoo Kim, Joonsuk Kim, Samsung Electronics
- 6 **Beam-steering with 5.75 GHz Dual Polarized Optically Transparent Patch Antenna Arrays**
Jean L. Kubwimana, Nicholas J. Kirsch, Cyle Ziegler, University of New Hampshire; George Kontopidis, Brough Turner, Netblazr Inc

Monday, 23 September 2019 14:00-15:30 Kaimuki 3

2C: NOMA

Chair: Jianfeng Lv, Xidian University

- 1 **Resource allocation for NOMA networks under alternative outage constraints**
Fangyu Cui, Zhejiang University; Zhijin Qin, Queen Mary University of London; Yunlong Cai, Minjian Zhao, Zhejiang University; Geoffrey Ye Li, Georgia Institute of Technology

2 Minimum Error Performance of Downlink Non-Orthogonal Multiple Access Systems

Yuan Wang, Jiaheng Wang, Southeast University; Lujuan Ma, Shandong Jianzhu University; Yongming Huang, Chunming Zhao, Southeast University

3 Adaptive Resource Allocation for ICIC in Downlink NOMA Systems

Chien-Hao Lee, National Taiwan University; Makoto Kobayashi, University of Osaka; Hung-Yu Wei, National Taiwan University; Shunsuke Saruwatari, University of Osaka; Takashi Watanabe, Osaka University

4 A Minimum Distance Criterion Based Constellation Design for Uplink NOMA

Hsuan-Po Liu, National Chiao Tung University; Shin-Lin Shieh, National Taipei University; Chia-Hung Lin, National Chiao-Tung University; Po-Ning Chen, National Chiao Tung University

5 Energy Efficient Power and Subcarrier Allocation for Downlink Non-Orthogonal Multiple Access Systems

Alemu Jorgi Muhammed, SouthWest Jiaotong University; Zheng Ma, Southwest Jiaotong University; Li Li, SouthWest Jiaotong University; Panagiotis D. Diamantoulakis, George Karagiannidis, Aristotle University of Thessaloniki

Monday, 23 September 2019 14:00-15:30 Milo 1

2D: Fog and Edge Computing

Chair: Vuk Marojevic Mississippi State University

1 A Cloud IoT Edge Framework for Efficient Data-driven Automotive Diagnostics

Alvin Chin, BMW Technology Corporation; Peter Wolf, BMW Group; Jilei Tian, BMW Technology Corporation

2 Distributed Computation Offloading in Resource Limited Fog Computing

Hongbin Zhu, ShanghaiTech University; Zhenghang Zhu, Shanghai Advanced Research Institute; Xiliang Luo, ShanghaiTech University, China; Hua Qian, Shanghai Advanced Research Institute, Chinese Academy of Sciences

3 Online Task Offloading with Bandit Learning in Fog-assisted IoT Systems

Xin Gao, Xi Huang, Ziyu Shao, ShanghaiTech University

4 Online Task Scheduling for Fog Computing with Multi-Resource Fairness

Simeng Bian, Xi Huang, Ziyu Shao, ShanghaiTech University

5 Smart Parking with Fine-grained Localization and User Status Sensing Based on Edge Computing

Cheonsol Lee, Soochang Park, Chungbuk National University; Taehun Yang, Chungnam National University; Sang-Hoon Lee, Chungbuk National University

Monday, 23 September 2019 14:00-15:30 Milo 2

2E: Channel Measurements and Modeling II

Chair: Xiaoming Chen, Xi'an Jiaotong University

1 Comparison of Empirical and Ray-tracing Models for Mobile Communication Systems at 2.6 GHz

Jakob Thrane, Darko Zibar, Henrik L. Christiansen, Technical University of Denmark

2 Long-Term LPWAN Sub-GHz Deep Indoor-to-Outdoor Channel Model

Sebastian Rauh, Friedrich-Alexander Universität Erlangen-Nürnberg; Thomas Lauterbach, Technische Hochschule Nürnberg, Georg Simon Ohm; Joerg Robert, Hendrik Lieske, Friedrich-Alexander Universität Erlangen-Nürnberg; Gerd Kilian, Fraunhofer Institute for Integrated Circuits IIS; Albert Heuberger, Friedrich-Alexander Universität Erlangen-Nürnberg

3 Path Loss Characterization of 7-GHz Terrestrial Propagation Channel in Urban Environment

Nadia Yoza-Mitsuishi, University of Colorado Boulder; Ruoyu Sun, Cable Television Laboratories

4 Path Loss Modeling and Ray-tracing Verification for 5/31/90 GHz Indoor Channels

Jinwen Liu, David Matolak, Mohanad Mohsen, Jinming Chen, University of South Carolina

5 Ray-Tracing Simulation of Cross-Road Scenarios Based on a Stochastic Model for Vehicular Traffic

Rakesh R T, Emanuele Viterbo, Monash University

Monday, 23 September 2019 14:00-15:30 Milo 3

2F: Security I

Chair: Wen Mi, Shanghai University of Electric Power

1 Achieve Revocable Access Control for Fog-based Smart Grid System

Shan Chen, Wen Mi, Shanghai University of Electric Power; Rongxing Lu, University of New Brunswick; Jinguo Li, Sijia Chen, Shanghai University of Electric Power

2 On Achieving High PHY-Layer Security of D2D-Enabled Heterogeneous Networks

Chun-Hung Liu, Mississippi State University; Di-Chun Liang, Rung-Hung Gau, National Chiao Tung University

3 Toward Large-Scale Rogue Base Station Attacks Using Container-Based Virtualization

Wan-Lin Hsieh, Bing-Kai Hong, Shin-Ming Cheng, National Taiwan University of Science and Technology

4 Secrecy Outage Performance Analysis of Massive MIMO Transmission with Multiple Non-colluding Eavesdroppers and Partial Legitimate User CSI

Tingnan Bao, University of Victoria; Hong-Chuan Yang, University of Victoria; Mazen O. Hasna, Qatar University

5 Semantic Multi-Keyword Search over Encrypted Cloud Data with Privacy Preservation

Fei-Ju Hsieh, Tai-Lin Chin, Chin-Ya Huang, Shan-Hsiang Shen, Chung-An Shen, National Taiwan University of Science and Technology

Monday, 23 September 2019 14:00-15:30 Kou

2G: V2X Performance Analysis II

Chair: Shin-Lin Shieh National Taipei University

1 Analysis of Distributed Congestion Control in Cellular Vehicle-to-everything Networks

Behrad Toghi, MD Saifuddin, Yaser P. Fallah, Muhammad Ozair Mughal, University of Central Florida

2 Millimeter Wave Coverage and Blockage Duration Analysis for Vehicular Communications

Caglar Tunc, Mustafa Furkan Özkoç, Shivendra Panwar, New York University

3 A SDN-based Pub/Sub middleware for geographic content dissemination in Internet of Vehicles

Léo Mendiboure, University of Bordeaux CNRS LaBRI Laboratory, UMR 5800; Mohamed-Aymen Chalouf, IRISA Lab, University of Rennes 1; Francine Krief, Bordeaux INP, CNRS LaBRI Laboratory, UMR 5800

4 Multi-Flow Congestion-Aware Routing in Software-Defined Vehicular Networks

Antonio Di Maio, University of Luxembourg; Maria Rita Palattella, Luxembourg Institute of Science and Technology (LIST); Thomas Engel, University of Luxembourg

5 Real-Time Multipath Multimedia Traffic in Cellular Networks for Command and Control Applications

Manlio Bacco, Pietro Cassarà, Alberto Gotta, ISTI-CNR; Vincenzo Pellegrini, IDS

Monday, 23 September 2019 14:00-15:30 Honolulu

2H: Positioning and Satellite

Chair: Po-Hsuan Tseng, National Taipei University of Technology

- 1 An Extensible Multi-layer Architecture Model Based on LEO-MSS and Performance Analysis**
Yitao Li, University of Science and Technology of China; Haichao Wei, Dalian Maritime University; Letian Li, Yuxi Han, University of Science and Technology of China; Jiayi Zhou, the 38th Research Institute of China ETGC; Zhou Wuyang, University of Science and Technology of China
- 2 Performance Analysis of Direct Sequence Spread Spectrum Aloha for LEO satellite IoT System**
Pansoo Kim, ETRI
- 3 Calculated Distance Error Improvement by Using Received Signal Power Mask in Relay Type GPS**
Norifumi Murai, Toshinari Hayakawa, University of Kogakuin; Takatoshi Sugiyama, Kogakuin University
- 4 GPS Calculated Distance Error Improvement by Planar Approximation of Pseudo Range in Many Skyscrapers Environments**
Toshinari Hayakawa, Norifumi Murai, University of Kogakuin; Takatoshi Sugiyama, Kogakuin University
- 5 PDOP-based Receiver Selection Algorithm for Target localization in PCL system**
Jaehyeok Lee, Jaekuk Baek, Youngnam Han, Korea Advanced Institute of Science and Technology; Hongsuk Shim, Sanghun Im, EW R&D Center, Hanwha Systems

Monday, 23 September 2019 14:00-15:30 Salon 1

2P: Physical Layer I

- 1 PAPR and BER Performances of Direct Spectrum Division Transmission Applied by Clipping and Filtering in ACI Environment**
Sumika Omata, Shirai Motoi, Takatoshi Sugiyama, Kogakuin University; Izumi Urata, Fumihiro Yamashita, NTT
- 2 Buffer-Aided DF Relaying Network with CCI**
B. R. Manoj, Ranjan K. Mallik, Manav R Bhatnagar, IIT Delhi
- 3 Full-duplex OFDM relaying systems with energy harvesting in multipath fading channels**
Jiaman Li, Le Chung Tran, Farzad Safaei, University of Wollongong
- 4 Channel Correlation Matrix based Tomlinson-Harashima Precoding for Downlink Multi-user Transmission**
Yu Zeng, Shu Fang, Xiaojuan Zeng, Hui Wang, Run Huang, University of Electronic Science and Technology of China, UESTC; Wenhong Chen, Yun Fang, OPPO Research Institute
- 5 Adjustable Soft List Decoding for Polar Codes**
Bowen Feng, Jian Jiao, Kexin Liang, Shaohua Wu, Ye Wang, Zhang Qinyu, Harbin Institute of Technology

Monday, 23 September 2019 16:00-17:30 Kaimuki 1

3A: Massive MIMO I

Chair: Sau-Hsuan Wu, National Chiao Tung University

- 1 Riemannian-Optimization-based Hybrid Precoder For Spatial Modulation Aided Millimeter Wave MIMO**
Hong-Yunn Chen, National Taiwan University; Cheng-Fu Chou, NTU; Leana Golubchik, University of Southern California
- 2 A Study on Replica Generation Using LUT based on Information Bottleneck for MF-GaBP in Massive MIMO Detection**
Liwen Wang, Takumi Takahashi, Osaka University; Shinsuke Ibi, Doshisha University; Seiichi Sampei, Osaka University

6 Computer Vision Based Pre-processing for Channel Sensing in Non-stationary Environment

Wei Gao, Weizhong University of Science and Technology; Jiajia Liu, Northwestern Polytechnical University; Zhifeng Nie, China Mobile Group, Hubei Company Limited

- 7 Improved Spinal codes: A Segmented CRC-aided Scheme**
Kai Zhang, Dongqing Li, Shaohua Wu, Jian Jiao, Ye Wang, Zhang Qinyu, Harbin Institute of Technology
- 8 DAS and UDN Solutions for Indoor Coverage at Millimeter Wave (mmWave) Frequencies**
Muhammad Usman Sheikh, Kalle Ruttik, Riku Jäntti, Aalto University
- 9 Design on Polarization Weight-based Polar Coded SCMA System over Fading Channels**
Jian Jiao, Kexin Liang, Bowen Feng, Yunyu Sun, Shaohua Wu, Ye Wang, Zhang Qinyu, Harbin Institute of Technology
- 10 Channel Estimation in Millimeter Wave Systems with Inter-Cell Interference**
Ahmed Mohammed, Florida Institute of Technology; Mohammed E. Eltayeb, California State University, Sacramento; Ivica Kostanic, Florida Institute of Technology
- 11 A Simple Approximation for the Sum of Fading Random Variables via a Nakagami-m Distribution**
Jose Vega, Luis Urquiza-Aguilar, Escuela Politécnica Nacional; Martha Cecilia Paredes Paredes, Diego Reinoso Chisaguano, Escuela Politécnica Nacional, Quito, Ecuador
- 12 Adaptive Feedback of the Channel Information for Beamforming in IEEE 802.11ax WLANs**
Eunsung Jeon, Minki Ahn, Wookbong Lee, Sungsoo Kim, Joonsuk Kim, Samsung Electronics
- 13 Joint Time and Angle Domain Sparse Code Multiple Access for mmWave Systems**
Xiaoxia Yu, Zhaoyang Zhang, Jue Wang, Xuran Song, Zhejiang University
- 14 Performance Analysis of Finite Length Non-Binary Raptor Codes under Ordered Statistics Decoder**
Jian Jiao, Lianqin Li, Ke Zhang, Yunyu Sun, Shaohua Wu, Ye Wang, Zhang Qinyu, Harbin Institute of Technology
- 15 Performance Analysis of Signal Pattern Reducing Techniques for Low probability of Detection**
Chryssalena Koumpouzi, Rutgers, The State University of NJ; Predrag Spasojevic, Rutgers University; Fikadu Dagefu, US Army Research Laboratory
- 16 Affine Precoding based A-Optimal Pilot Design for Channel Estimation in Single/Multicarrier (SC/MC) Block Transmission Systems**
Manjeer Majumder, Aditya K. Jagannatham, Vipul Singhal, Indian Institute of Technology Kanpur

3 LAS Receiver Exploiting Channel Hardening for Massive MIMO Systems

Mohamed Lassaad Ammari, Laval University; Issa Chihaoui, University of Sousse; Jean-Yves Chouinard, Université Laval

- 4 An Iterative Receiver for Polar-coded Massive MU-MIMO Systems**
Yi Sun, Ming Jiang, Chunming Zhao, Meng Ruan, Southeast University
- 5 Multi-Beam Multi-Stream Communications for 5G and Beyond Mobile User Equipment and UAV Proof of Concept Designs**
Yiming Huo, University of Victoria; Franklin Lu, St. Michaels University School; Felix Wu, University of British Columbia; Xiaodai Dong, University of Victoria

Monday, 23 September 2019 16:00-17:30 Kaimuki 2

3B: Multiple Antennas

Chair: Jacek Ilow, Dalhousie University

- 1 Optimal Sum Rate-Fairness Tradeoff for MISO Broadcast Communication Using Zero Forcing DPC**
Yu-ting Cheng, Hsiao-feng Lu, National Chiao Tung University
- 2 A Two-Ray Multipath Model for Frequency Diverse Array-Based Directional Modulation in MISOME Wiretap Channels**
Qian Cheng, National University of Defense Technology; Vincent Fusco, Queen's University Belfast; Shilian Wang, Jiang Zhu, National University of Defense Technology
- 3 On the potential of uplink beamforming in vehicular networks based on experimental measurements**
Tomasz Izydorczyk, Gilberto Berardinelli, Fernando Tavares, Madalina Bucur, Preben Mogensen, Aalborg University
- 4 Linear Precoder Design Maximizing Energy Harvesting in SWIPT Systems with Finite-Alphabet Inputs**
Bohang Fang, Xiaodong Zhu, University of Electronic Science and Technology of China
- 5 Generalized Beam Angle Channel Modulation with Space-Time Block Coding**
Javad Hoseyni, Jacek Ilow, Dalhousie University

Monday, 23 September 2019 16:00-17:30 Kaimuki 3

3C: High-Density Networks and Large-Scale Antenna Systems

Chair: Kevin Ong Shen Hoong, Nanyang Technological University

- 1 Prediction-Based User Plane Handover for TCP Throughput Enhancement in Ultra-Dense Cellular Networks**
Yan Peng, Yiqing Zhou, Ling Liu, Chinese Academy of Sciences; Jinhong Yuan, University of New South Wales; Jinglin Shi, Jintao Li, Chinese Academy of Sciences
- 2 Mobility Management for Ultra-dense Edge Computing: A Reinforcement Learning Approach**
Haibin Zhang, Northwestern Polytechnical University; Rong Wang, Xidian University; Jiajia Liu, Northwestern Polytechnical University
- 3 Downlink Channel Tracking for FDD Large-Scale Antenna Systems**
Qi Liu, Yu Han, Fan Cao, Jie Yang, Southeast University; Michail Matthaiou, Queen's University Belfast
- 4 Light weight wireless resource allocation method with distributed architecture and DB search algorithm for high density wireless access systems**
Keisuke Wakao, NTT
- 5 An Adaptive Clustering Scheme Based on Modified DBSCAN Algorithm in Ultra-Dense Networks**
Yuting Ren, Rongtao Xu, Beijing Jiaotong University

Monday, 23 September 2019 16:00-17:30 Milo 1

3D: Multiple Access

Chair: Luhan Wang, Beijing University of Posts and Telecommunications

- 1 A Real Fourier-related Transform Spreading OFDM Multi-user Shared Access System**
Yihua Ma, Zhifeng Yuan, Yuzhou Hu, Weimin Li, ZTE Corporation
- 2 Deep Learning Based Fast Multiuser Detection for Massive Machine-Type Communication**
Yanna Bai, Bo Ai, Wei Chen, Beijing Jiaotong University
- 3 Latency of Uplink Non-orthogonal Multiple Access Grant-Free Transmission with Multiuser Detection in Base Station**
Show Shiono, Yukitoshi Sanada, Keio University; Ryota Kimura, Hiroki Matsuda, Ryo Sawai, Sony Corporation

4 Low Power Consumption Cluster Scheduling and Power Control Design for Non-Orthogonal Multiple Access Aided Down-link IoT Networks

Furong Fang, Lin Zhang, Wenjun Chen, Jing Bian, Sun Yat-sen University

5 Non-Orthogonal Multiple Access in Cooperative UAV Networks: A Stochastic Geometry Model

Jingjing Li, Henan Polytechnic University; Yuanwei Liu, Queen Mary University of London; Xingwang Li, Henan Polytechnic University; Chao Shen, Beijing Jiaotong University; Yue Chen, Queen Mary University of London

Monday, 23 September 2019 16:00-17:30 Milo 2

3E: mmWave I

Chair: Nadia Yoza-Mitsuishi, University of Colorado Boulder

- 1 An Efficient Millimeter-wave MIMO Channel Estimation Scheme for Space Information Networks**
Qiwen Li, Jian Jiao, Yunyu Sun, Shaohua Wu, Ye Wang, Zhang Qinyu, Harbin Institute of Technology
- 2 Comparisons of Channel Emulation Methods for State-of-the-Art Multi-Probe Anechoic Chamber based Millimeter-Wave Over-the-Air Testing**
Huilin Pei, Xiaoming Chen, Xi'an Jiaotong University; Wei Fan, Aalborg University; Ming Zhang, Anxue Zhang, Xi'an Jiaotong University; Tommy Svensson, Chalmers University of Technology
- 3 Novel Over-the-Air Test Method for 5G Millimeter Wave devices, based on elliptical cylinder reflectors**
David Reyes, Mark Beach, University of Bristol; Moray Rumney, Rumney Telecom; John Haine, Evangelos Mellios, University of Bristol
- 4 Radiation Pattern Reconfigurable Mm-Wave Bow-Tie Array Integrated with PIFA Antenna**
Rocio Rodriguez-Cano, Shuai Zhang, Gert F. Pedersen, Aalborg University
- 5 Target Localization Using Approximate Maximum Likelihood for MIMO Radar System**
Abdullellah Almalki, Huaping Liu, Oregon State University; Yanbin Zou, University of Electronic Science and Technology of China

Monday, 23 September 2019 16:00-17:30 Milo 3

3F: Resource Management II

Chair: Jianfeng Lv, Xidian University

- 1 How To Dimension Radio Resources When Users Are Distributed on Roads Modeled by Poisson Line Process**
Jalal Rachad, Ridha Nasri, Orange Labs; Laurent Decreusefond, Telecom Paristech
- 2 Joint Task Offloading and Resource Configuration in Ultra-Dense Edge Computing Networks: A Deep Reinforcement Learning Solution**
Jianfeng Lv, Jingyu Xiong, Xidian University; Hongzhi Guo, Jiajia Liu, Northwestern Polytechnical University
- 3 Latency As A Service: Enabling Reliable Data Delivery Over Multiple Unreliable Wireless Links**
Stepan Kucera, Kariem Fahmi, Holger Claussen, Nokia Bell Labs
- 4 Multi-Hop Wake-up Radio Relaying for the Collection Tree Protocol**
Abhimanyu Venkatraman Sheshashayee, Stefano Basagni, Northeastern University
- 5 System Level Performance Analysis using Semi-Analytical Framework for Area-Averaged SINR distribution for OFDMA cellular systems**
Karthik Mohan K, Suvra Sekhar Das, Indian Institute of Technology Kharagpur

Monday, 23 September 2019 16:00-17:30 Kou

3G: UAV Channel Models

Chair: G G Md Nawaz Ali, University of Charleston

1 Analysis of Reliabilities Under Different Path Loss Models in Urban/Sub-urban Vehicular Networks

G. G. Md. Nawaz Ali, Beshah Ayalew, Ardalan Vahidi, Clemson University; Md. Noor-A-Rahim, Cork Institute of Technology

2 Energy Harvesting in Unmanned Aerial Vehicle Networks with 3D Antenna Radiation Patterns

Esma Turgut, M. Cenk Gursay, Syracuse University; Ismail Guvenc, North Carolina State University

3 Shadow Fading Spatial Correlation Analysis for Aerial Vehicles: Ray Tracing vs. Measurements

Melisa López Lechuga, Troels B. Sørensen, Preben Mogensen, Aalborg University; Jeroen Wigard, István Z. Kovács, Nokia Bell Labs

4 Validation of Large-scale Propagation Characteristics for UAVs within Urban Environment

Madalina Bucur, Troels B. Sørensen, Raphael Amorim, Melisa López Lechuga, Aalborg University; István Z. Kovács, Nokia Bell Labs; Preben Mogensen, Aalborg University, Nokia Bell Labs

5 Wireless Channel Modeling for UAV-based Radio Access Networks in Urban Environments

Jianqiao Cheng, Université libre de Bruxelles; Ke Guan, Beijing Jiaotong University; François Quitin, Université Libre de Bruxelles

Monday, 23 September 2019 16:00-17:30 Honolulu

3H: Positioning II

Chair: Takatoshi Sugiyama, Kogakuin University

1 Towards Practical Indoor Positioning Based on Massive MIMO Systems

Mark Widmaier, Maximilian Arnold, Sebastian Dörner, Sebastian Cammerer, Stephan ten Brink, University of Stuttgart

2 RSS-based Positioning in Distributed Massive MIMO Under Unknown Transmit Power and Pathloss Exponent

Surya Vara Prasad, Vijay Bhargava, University of British Columbia

3 Sparse Bayesian Inference based Direct Localization for Massive MIMO

Liu Guanying, An Liu, Zhejiang University; Lixiang Lian, Vincent Lau, Hong Kong University of Science and Technology; Minjian Zhao, Zhejiang University

4 Three-Dimensional Cooperative Positioning in VANETs with LOS/NLOS Ranging Measurements

Xianbo Jiang, Shengchu Wang, Beijing University of Posts and Telecommunications

5 Grid-Based Target Estimation Scheme for Passive Coherent Location system

Jaek Baek, Jaehyeok Lee, Youngnam Han, Korea Advanced Institute of Science and Technology; Hongsuk Shim, Sanghun Im, EW R&D Center, Hanwha Systems

Monday, 23 September 2019 16:00-17:30 Salon 1

3P: Physical Layer II

1 Beam Entropy of 5G Cellular Millimetre-Wave Channels

Krishan Kumar Tiwari, IHP - Leibniz-Institut für innovative Mikroelektronik; Eckhard Grass, IHP, Germany and HU, Berlin; John Thompson, University of Edinburgh; Rolf Kraemer, IHP

2 Carrier Phase Synchronization in Burst-Type CPM by Means of Expectation Maximization

Andreas Lang, Berthold Lankl, Bundeswehr University Munich

3 Cooperative Sensing With WIBA Energy Detection Under Rural Area Channel Conditions

Johanna Vartiainen, Heikki Karvonen, Marja Matinmikko-Blue, University of Oulu; Alexandre Matos Pessoa, Carlos Filipe Moreira e Silva, Federal University of Ceará

4 CSI Classification for 5G Via Deep Learning

Ankur Vora, Binghamton University; Pieter-Xavier Thomas, Rong Chen, Cadence System Design; Kyoung-Don Kang, Binghamton University

5 Decentralized Probabilistic Frequency-Block Activation Control for Inter-cell Interference Coordination and Traffic Load Balancing

Fumiya Ishikawa, Tokyo University of Science; Yoshihisa Kishiyama, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science

6 TDoA Positioning in Single Frequency Networks without Transmitter Identities

Ruiqi Liu, Chao Zhang, Peng Hou, Tsinghua University

7 The Application of NOMA on High-Speed Railway With Partial CSI

Jingyi Fan, Jiayi Zhang, Shuaifei Chen, Jiakang Zheng, Bo Ai, Beijing Jiaotong University

8 Measurement and Analysis of Radio Frequency Interference in the UWB Spectrum

Ramoni Adeogun, AAU; Gilberto Berardinelli, Ignacio Rodriguez, Aalborg University; Preben Mogensen, Aalborg University, Nokia Bell Labs; Mohammad Razzaghpour, Aalborg University, Denmark

9 Secrecy Analysis of PLC System with Channel Gain and Impulsive Noise

Vinay Mohan, Aashish Mathur, Vadde Aishwarya, Shubham Bhargav, Indian Institute of Technology Jodhpur

10 Spectral Efficiency Analysis of SEFDM Systems with ICI Mitigation

Zhisheng Yin, Min Jia, Harbin Institute of Technology; Feng Lyu, Wei Wang, University of Waterloo; Qing Guo, Harbin Institute of Technology; Xuemin (Sherman) Shen, University of Waterloo

11 Optimized Wireless Energy Harvesting Sensor Network with Backscatter Communication and Beamforming

Jonathan C. Kwan, Abraham O. Fapojuwo, University of Calgary

12 Potential Design for Modulation and Coding Scheme in mmWave Multicarrier HetNets

Fumiya Kemmochi, Kento Fujisawa, Hiroyuki Otsuka, Kogakuin University

13 Supervised Learning for Physical Layer based Message Authentication in URLLC scenarios

Andreas Weinand, Raja Sattiraju, Michael Karrenbauer, Hans Schotten, Technische Universität Kaiserslautern

14 Power-Efficient Uplink Resource Allocation for Ultra-Reliable and Low-Latency Communication

Xie Yuncong, Xi'an Jiaotong University; Pinyi Ren, Yichen Wang, Dongyang Xu, Qiang Li, Qinghe Du, Xi'an Jiaotong University

15 User Allocation with Round-Robin Scheduling Sequence for Distributed Antenna System

Go Otsuru, Yukitoshi Sanada, Keio University

16 Deep Learning Based Throughput Estimation for UAV-Assisted Network

Yirga Yayeh, Hsin-Piao Lin, Abebe Belay Adege, Getaneh Beric Tareegn, National Taipei University of Technology; Yun-Ruei Li, National Chiao Tung University; Shiann-Shiun Jeng, National Dong Hwa University

Tuesday 24 September 2019

Tuesday, 24 September 2019 11:00-12:30 Kaimuki 1

4A: Fading and Diversity

Chair: Khoa Le, Western Sydney University

- 1 A Narrow-band Coherent FSK Transmission System Using Phase Rotated Transmit Diversity with Suppression of Envelope Fluctuation**
Kanao Yamaguchi, Masatsugi Higashinaka, Hiroyasu Sano, Atsushi Okamura, Mitsubishi Electric Corporation; Takeo Ohgane, University of Hokkaido; Toshihiko Nishimura, Hokkaido University
- 2 Overlap FDE with Signal Extraction Based on SIR Considering Time/Frequency Selectivity of Fading Channels**
Akinori Nakajima, Mitsubishi Electric Corporation
- 3 Performance Analysis of Uplink NOMA-IoT Networks with Space-Time Line Code**
Jae Won Bae, KSA of KAIST; Ki-Hun Lee, Chungnam National University; Jong Min Kim, KSA of KAIST; Bang Chul Jung, Chungnam National University; Jingon Joung, Chung-Ang University
- 4 Multiuser-MIMO under equally-correlated generalised-Rician fading**
Khoa Le, Western Sydney University
- 5 Low Latency HARQ Method Using Early Retransmission Prior to Channel Decoding with Multistage Decision**
Kentarou Taniyama, Tokyo University of Science; Yoshihisa Kishiyama, NTT DOCOMO, INC.; Kenichi Higuchi, Tokyo University of Science

Tuesday, 24 September 2019 11:00-12:30 Kaimuki 2

4B: Massive MIMO II

Chair: Tomoaki Ohtsuki, Keio University

- 1 Low Complexity and High Accuracy Channel Interpolation with Dividing URA into Small URAs for 3D Massive MIMO**
Masumi Kuriyama, Tomoaki Ohtsuki, Keio University
- 2 Bias Analysis of MUSIC Estimator With Non-Zero Bandwidth in Massive Antenna Array Systems**
zhiqiang Wang, University of Electronic Science and Technology of China
- 3 Calibrated Beam Training for Millimeter-Wave Massive MIMO Systems**
Xingyi Luo, Wendong Liu, Zhaocheng Wang, Tsinghua University
- 4 Low Complexity Hybrid Precoder Design for mmWave Multi-User MIMO Systems: A Non-Iterative Approach**
Jhe-Yi Lin, Hsuan-Jung Su, Chen-Chieh Hong, National Taiwan University; Yasuhiro Takano, Kobe University
- 5 Hybrid Beamforming Based on Dictionary Learning for Millimeter Wave MIMO System**
zhu li, Jiang Zhu, Shilian Wang, Li Hu, Qian Cheng, National University of Defense Technology

Tuesday, 24 September 2019 11:00-12:30 Kaimuki 3

4C: Ultra-Reliable Communications in Heterogeneous Networks

Chair: Min Fu, Shanghai Tech University

- 1 On Parallel Retransmission for Uplink Ultra-Reliable and Low Latency Communications**
Te-Wei Chiang, Hung-Hsiang Liang, National Central University; Sheng-Shih Wang, Lunghwa University of Science and Technology; Shiann-Tsong Sheu, National Central University
- 2 On Network Deployment for Ultra-Reliable Communication Using Multi-connectivity**
Ali Haider Mahdi, Kedar Kulkarni, Norman Franchi, Gerhard Fettweis, TU Dresden

3 Blind Deconvolution Meets Phase Retrieval in Optical Wireless Communications

Min Fu, Yuanming Shi, ShanghaiTech University

4 Consideration on Physical Layer Aspects of NR Systems in HST Scenarios

Junghoon Lee, Juho Park, Jihyung Kim, JunHwan Lee, Electronics and Telecommunications Research Institute

5 Throughput Analysis between Unicast and MBSFN from Link Level to System Level

Chunmei Liu, National Institute of Standards and Technology (NIST); Chen Shen, George Washington University

Tuesday, 24 September 2019 11:00-12:30 Milo 1

4D: IoT Networks

Chair: Xiliang Luo, Shanghai Tech University

1 Control Vector Selection with State Clustering for Wireless Networked Control Systems

Keisuke Nakashima, Osaka University; Takahiro Matsuda, Tokyo Metropolitan University; Masaaki Nagahara, The University of Kitakyushu; Tetsuya Takine, Osaka University

2 Reliable Base Proposal for Header Compression

Mate Tomoskozi, Technische Universitaet Dresden; Daniel Enrique Lucani Rotter, Aarhus University; Frank H.P. Fitzek, Technische Universität Dresden; Peter Ekler, Budapest University of Technology and Economics

3 Reliable Mobile-Proximity Interaction Mechanism Based on BLE Beacon-initiated Notification

Sangwon Seo, Chungbuk National University; K. E. Jeon, Hong Kong University of Science and Technology; Soochang Park, Chungbuk National University

4 Supporting TCP-based Remote Managements of LoRa/LoRaWAN Devices

Shie-Yuan Wang, Chia-Hung Chang, National Chiao Tung University

5 Task Offloading Policy for Nodes with Energy Harvesting Capabilities

Yao Zhao, Xiliang Luo, ShanghaiTech University

Tuesday, 24 September 2019 11:00-12:30 Milo 2

4E: Antenna Systems

Chair: Rocio Rodriguez Cano, Aalborg University

1 A modified chicken swarm optimization algorithm for synthesizing linear, circular and random antenna arrays

Geng Sun, Xiaohui Zhao, Shuang Liang, Yanheng Liu, Xu Zhou, Jilin University; Qianao Ju, Ying Zhang, Georgia Institute of Technology

2 Bent Configurations of Waveguide Slot Arrays

Roshanak Zabihi, Maryam Razmhosseini, Rodney G. Vaughan, Simon Fraser University

3 Horizontally Polarized Array on a Mast-like Form for Azimuthal Beam Switching

Ying Chen, Simon Fraser University; Rodney G. Vaughan, Simon Fraser University

4 Parasitic Slot Elements for Bandwidth Enhancement of Slotted Waveguide Antennas

Maryam Razmhosseini, Roshanak Zabihi, Rodney G. Vaughan, Simon Fraser University

5 Wideband Endfire On-Glass Array for 5G Handset Applications

Jin Zhang, Aalborg University

Tuesday, 24 September 2019 11:00-12:30 Milo 3

4F: Wireless Networks

Chair: Chung-An Shen, National Taiwan University of Science

- 1 Detecting Community Structures based on an Improved Discrete Bat Algorithm**
Xu Zhou, Geng Sun, Yanheng Liu, Jilin University; Qianao Ju, Georgia Institute of Technology
- 2 Detecting Selective Modification in Vehicular Edge Computing**
Nalam Venkata Abhishek, Teng Joon Lim, Biplab Sikdar, National University of Singapore; Ben Liang, University of Toronto
- 3 Physical Link Maintenance and Logical Message Routing Integration for Robotic Network Connectivity**
Mustafa Ayad, Suny Oswego
- 4 Towards Data-driven Simulation of End-to-end Network Performance Indicators**
Benjamin Sliwa, Christian Wietfeld, TU Dortmund University

Tuesday, 24 September 2019 11:00-12:30 Kou

4G: Multi-UAV Networks

Chair: Kamesh Namuduri, University of North Texas

- 1 An Energy Efficient Cooperation Design for Multi-UAVs Enabled Wireless Powered Communication Networks**
Yuxuan Wei, Zhiqiang Bai, Yuesheng Zhu, Peking University
- 2 A UAV-Aided Selective Relaying with Cooperative Jammers for Secure Wireless Networks over Rician Fading Channels**
Tianji Shen, Hideki Ochiai, Yokohama National University
- 3 Backhaul-Constrained Resource Allocation and 3D Placement for UAV-Enabled Networks**
Marie Josepha Youssef, Charbel Abdel Nour, IMT Atlantique; Joumana Farah, Lebanese University; Catherine Douillard, IMT Atlantique
- 4 Beam-Pointing Algorithm for Contiguous High-Altitude Platform Cell Formation for Extended Coverage**
Steve Arum, David Grace, Paul Mitchell, University of York; Muhammad D. Zakaria, University of York and Universiti Sultan Zainal Abidin, Malaysia
- 5 Non-Orthogonal Multiple Access in Multi-UAV Networks**
Tianwei Hou, Beijing Jiaotong University; Yuanwei Liu, Queen Mary University of London; Xin Sun, Zhengyu Song, Beijing Jiaotong University; Yue Chen, Queen Mary University of London

Tuesday, 24 September 2019 11:00-12:30 Honolulu

4H: Positioning III

Chair: Antoine Courty, University of Rennes 1

- 1 Direction-Aided Indoor Positioning Leveraging Ultra-Wideband Radio**
Mamadou Diallo, Irisa; Antoine Courty, University of Rennes 1; Mickaël Le Gentil, Irisa; Olivier Berder, University of Rennes 1 / IRISA
- 2 A Novel Vehicle Detection Method Based on Geomagnetism and UWB Ranging**
Qiang Li, Shanghai Institute of Microsystem and Information Technology, CAS
- 3 A PDR-based Indoor Positioning System in a Nursing Cart with iBeacon-based Calibration**
Shao-Yung Huang, Jing-Wen Liu, Min-Chieh Yu, Jenq-Shiou Leu, National Taiwan University of Science and Technology
- 4 Hybrid Localization: A Low Cost, Low Complexity Approach Based on Wi-Fi and Odometry**
Letizia Moro, Timberline High School; Hani Mehrpouyan, Boise State University

5 Proxy Individual Positioning via IEEE 802.11 Monitor Mode and Fine-tuned Analytics

Myungsung You, Soochang Park, Sang-Hoon Lee, Chungbuk National University; Taehun Yang, Chungnam National University

6 Collaborative Localization for Occluded Objects in Connected Vehicular Platform

Rui Guo, Toyota Motors North America; Hongsheng Lu, Toyota InfoTechnology Center USA; Peng Gao, Ziling Zhang, Hao Zhang, Colorado School of Mines

Tuesday, 24 September 2019 11:00-12:30 Salon 1

4P: Network Layer

- 1 Implementation of C-RAN Architecture with CU-CP and CU-UP Separation Based on SDR/NFV**
Hang Yu, Beijing University of Posts and Telecommunications; Chunli Ye, China Mobile Research Institute; Boren Guo, Yihao Sun, Xin Zhang, Beijing University of Posts and Telecommunications
- 2 Evaluation of Skype Video Call with TCP Variants over Satellite Networks**
Takumi Kurosaki, Yuki Hozumi, Yuto Usuki, Fukushima University; Salahuddin Zabir, National Institute of Technology, Tsruoka College; Satoshi Utsumi, Fukushima University
- 3 An Efficient Joint Node and Link Mapping Approach based on Genetic Algorithm for Network Virtualization**
Chia-Wei Huang, Chung-An Shen, CHIN-YA HUANG, Tai-Lin Chin, Shan-Hsiang Shen, National Taiwan University of Science and Technology
- 4 A Flexible, Protocol-agnostic Latency Measurement Platform**
Francesco Raviglione, Marco Malinverno, Claudio Casetti, Politecnico di Torino
- 5 A Cost-and-Energy Aware Resource Scheduling Technique for Roadside Clouds**
Moumita Patra, Indian Institute of Technology Guwahati; Krishnendu CTI, GEC Idukki; Himshekhar Narayan Konwar, Sikkim Manipal University
- 6 Detection of missing CAN messages through inter-arrival time analysis**
Dario Stabili, Mirco Marchetti, Università di Modena e Reggio Emilia
- 7 Building cryptotokens based on permissioned blockchain framework**
Oleksandr Anyshchenko, Ivan Bohuslavskiy, Bitfury; Stanislav Kruglik, Yash Madhwal, Skolkovo Institute of Science and Technology; Alex Ostrovsky, Bitfury; Yury Yanovich, Skolkovo Institute of Science and Technology
- 8 Build Up A Real-Time LSTM Positioning Error Prediction Model for GPS Sensors**
Weidong Xiang, University of Michigan - Dearborn
- 9 Total Variation Regularized Turbo Decoder (TV-TD) For Reliable Image Transmission In Wireless Multimedia Sensor Networks**
Ankit Kudeshia, Indian Institute of Technology Kanpur; Abhishek K. Singh, Airports Authority of India, Bhavnagar; Aditya K. Jagannatham, Indian Institute of Technology Kanpur
- 10SMETO: Stable Matching for Energy-Minimized Task Offloading in Cloud-Fog Networks**
Yijun Zu, Southeast University; Fei Shen, Chinese Academy of Sciences; Feng Yan, Lianfeng Shen, Southeast University; Fei Qin, Chinese Academy of Sciences; Rong Yang, Shenzhen University
- 11 Privacy-preserved Cell Zooming with Distributed Optimization in Green Networks**
Masashi Wakaiki, Kobe University; Katsuya Suto, The University of Electro-Communications; Izumi Masubuchi, Kobe University

12 Deep Reinforcement Learning Framework for Joint Resource Allocation in Heterogeneous Networks

Yong Zhang, Canping Kang, Yinglei Teng, Sisi Li, Beijing University of Posts and Telecommunications; WeiJun Zheng, JingHui Fang, Jiaying Power Supply Company

13 Delay Optimized Computation Offloading and Resource Allocation for Mobile Edge Computing

Long Long, University of Chinese Academy of Sciences; Zichen Liu, Institute of Computing Technology; Yiqing Zhou, Ling Liu, Institute of Computing Technology, Chinese Academy of Sciences; Jinglin Shi,

Institute of Computing Technology, Chinese Academy of Sciences; Qian Sun, Chinese Academy of Sciences

14 Generalized Data Representation and Training-Performance Analysis for Deep Learning Based Communication Systems

Xiao Chen, Southeast University; Julian Cheng, University of British Columbia; Zaichen Zhang, Liang Wu, Jian Dang, Southeast University

15 Low-Complexity and High-Accuracy Positioning Protocol based on An Asynchronous Protocol

Wang Nan, Tran Thi Thao Nguyen, Yuhei Nagao, Leonardo Lanante, Masayuki Kurosaki, Hiroshi Ochi, Kyushu Institute of Technology

Tuesday, 24 September 2019 14:00-15:30 Kaimuki 1

5A: Signal Processing I

Chair: Shinya Sugiura, The University of Tokyo

1 An Efficient Detection Algorithm for PAM With 1-Bit Quantization and Time-Oversampling at the Receiver

Hyunsoo Son, Hyungsik Han, Namshik Kim, Hyuncheol Park, Korea Advanced Institute of Science and Technology (KAIST)

2 Dual Pulse Shaping Transmission with Complementary Nyquist Pulses

Xiaojing Huang, Hao Zhang, Andrew Zhang, Y. Jay Guo, University of Technology Sydney; Rui-Liang Song, The 54th Research Institute, CETC; Xiao-Fan Xu, CAEIT, China; Chun-Ting Wang, The 54th Research Institute, CETC; Zhou Lu, CAEIT, China; Wei Wu, The 54th Research Institute, CETC

3 Hybrid BP-EP Based Iterative Receiver for Faster-Than-Nyquist With Index Modulation

Yunsi Ma, Nan Wu, Beijing Institute of Technology; Weijie Yuan, University of New South Wales; Hua Wang, Beijing Institute of Technology

4 Optimal and Suboptimal Power Allocation for SVD-Precoded Faster-than-Nyquist Signaling

Takumi Ishihara, Tokyo University of Agriculture and Technology; Shinya Sugiura, The University of Tokyo

5 Performance of FDE Using Cyclic-Shifted CDM Based Pilot Signal Multiplexing for Single-Carrier LOS-MIMO

Kana Aono, Bin Zheng, Mamoru Sawahashi, Tokyo City University; Norifumi Kamiya, NEC Corporation

Tuesday, 24 September 2019 14:00-15:30 Kaimuki 2

5B: Massive MIMO III

Chair: Jules M. Moualeu, University of the Witwatersrand

1 Downlink Power Control in Cell-free Massive MIMO with Partially Distributed Access Points

Jobin Francis, Indian Institute of Technology Palakkad; Paolo Baracca, Stefan Wesemann, Bell Labs, Nokia; Gerhard Fettweis, TU Dresden

2 Spectral Efficiency Analysis of Network-Assisted Full Duplexing for Large-Scale Distributed Antenna Systems

Menghan Wang, Yuan Feng, Dongming Wang, Southeast University; Jiangzhou Wang, University of Kent; Xiaohu You, Southeast University

3 Uplink Pilot Allocation in Massive MIMO over Gauss-Markov Fading Channels

Fuqian Yang, Jun Zong, Xiliang Luo, ShanghaiTech University

4 Users Capacity Upper Bound of Multi-Pair Massive MIMO AF Relay System Under Pilot Contamination

Mohamed Soliman, Ahmed Hesham Mehana, Mohammed Nafie, Cairo University

5 Two-dimensional Pilot Allocation for Massive MIMO/TDD Systems

Osamu Muta, Kouki Matsuzaki, Kyushu University; Haris Gacanin, Nokia

Tuesday, 24 September 2019 14:00-15:30 Kaimuki 3

5C: Fog-RAN and Virtualization

Chair: Xiaodai Dong, University of Victoria

1 Deep Learning Tasks Processing in Fog-RAN

Sheng Hua, Xiangyu Yang, Kai Yang, Gao Yin, Yuanming Shi, Hao Wang, ShanghaiTech University

2 Minimizing delay in NFV 5G Networks by means of flexible split selection and scheduling

Luis Diez, Victor González, Ramón Agüero, University of Cantabria

3 Downlink Interference Alignment with Multi-User and Multi-Beam Diversity for Fog RANs

Janghyuk Yoon, Chungnam National University; Yongjae Kim, KAIST; Han Seung Jang, Chonnam National University; Bang Chul Jung, Chungnam National University

4 A Game-Theoretic Approach of Resource Allocation in NOMA-based Fog Radio Access Networks

Xueyan Cao, Mugen Peng, Beijing University of Posts & Telecommunications; Zhiguo Ding, UMIST

5 A Deep Reinforcement Learning Based Content Caching and Mode Selection for Slice Instances in Fog Radio Access Networks

Hongyu Xiang, Shi Yan, Mugen Peng, Beijing University of Posts & Telecommunications

Tuesday, 24 September 2019 14:00-15:30 Milo 1

5D: Resource Allocation for M2M & Sensor Networks

Chair: Guanding Yu, Zhejiang University

1 Accelerating Resource Allocation for D2D Communications Using Imitation Learning

Mengyuan Lee, Guanding Yu, Zhejiang University; Geoffrey Ye Li, Georgia Institute of Technology

2 A novel approach to Social-Behavioral D2D Trust Associations using Self-Propelled Voronoi

Subharthi Banerjee, University of Nebraska-Lincoln; Michael Hempel, University of Nebraska, Lincoln; Pejman Ghasemzadeh, Yi Qian, Hamid Sharif, University of Nebraska-Lincoln

3 A Resource Trading Scheme in Slice-Based M2M Communications

Sylvia Gendy, Yasser Gadallah, The American University in Cairo

4 Sparse Blind Demixing for Low-Latency Wireless Random Access with Massive Connectivity

Min Fu, Jialin Dong, Yuanming Shi, ShanghaiTech University

5 Uplink Sub-PRB Resource Allocation for Rel-15 LTE-M

Gerardo Agni Medina Acosta, Ericsson

Tuesday, 24 September 2019 14:00-15:30 Milo 2

5E: Channel Estimation and Evaluation

Chair: An Liu, Zhejiang University

- 1 Combining Measurements and Propagation Models for Estimation of Coverage in Wireless Networks**
Daniel Fernandes, ISCTE-IUL / Instituto de Telecomunicações; Lúcio Studer Ferreira, Multivision, INESC-ID/Universidade Lusíada, ISTE; Gabriela Soares, Multivision - Consultoria; Pedro Sebastiao, Francisco Cercas, ISCTE-IUL / Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa; Diogo Clemente, Rodrigo Cortesão, ISCTE-IUL / Instituto de Telecomunicações
- 2 Evaluation of Vehicle-in-the-Loop Tests for Wireless V2X Communication**
Markus Hofer, Laura Bernado, Benjamin Rainer, Zhinan Xu, Austrian Institute of Technology GmbH; Gerald Temme, Saifullah Khan, Danny Behnecke, Fabian Utesch, Mohamed Mahmood, German Aerospace Center (DLR); Thomas Zemen, AIT Austrian Institute of Technology
- 3 Experimental Validation of Massive MIMO Linearity Enhancement with DPD in Low-SHF-Band for 5G**
Tomohiro Kikuma, Takuji Mochizuki, Masaki Hirabe, Makoto Hayakawa, Daisuke Nose, NEC Corporation
- 4 Performance of Free Space Optical Communication System Under Jamming Attack and Its Mitigation Over Non-Gaussian Noise Channel**
Pratiti Paul, Manav R Bhatnagar, Anshul Jaiswal, Indian Institute of Technology Delhi
- 5 Self-energized Bidirectional Sensor Networks over Hoyt Fading Channels under Hardware Impairments**
Stefan Panic, Dushantha Nalin K. Jayakody, National Research Tomsk Polytechnic University; Sahil Garg, École de technologie supérieure, Montreal, Canada

Tuesday, 24 September 2019 14:00-15:30 Milo 3

5F: Security II

Chair: Chin-Ya Huang, National Taiwan University of Science and Technology

- 1 Efficient & Secure Physical Layer Cipher Scheme For VLC Systems**
Reem Melki, Hassan Noura, Ali Chehab, American University of Beirut
- 2 Anomalous Data Detection in Vehicular Networks Using Traffic Flow Theory**
Malith Ranaweera, A. Seneviratne, David Rey, Meead Saberi, Vinayak V. Dixit, UNSW
- 3 Optimal Full-Duplex Jamming for Safeguarding Two-Hop Relay Networks**
Qiang Li, Pinyi Ren, Qinghe Du, Dongyang Xu, Yuncong Xie, Xi'an Jiaotong University
- 4 Robust Chaos-based Information Masking Polar Coding Scheme for Wiretap Channel in Practical Wireless Systems**
Xiaoge Wu, Lin Zhang, Sun Yat-sen University
- 5 Security-Aware Resource Sharing for D2D Enabled Multiplatooning Vehicular Communications**
Xuesen Peng, Haibo Zhou, Bo Qian, Kai Yu, Nanjing University; Nan Cheng, Xuemin (Sherman) Shen, University of Waterloo

Tuesday, 24 September 2019 14:00-15:30 Kou

5G: Machine Learning and Simulation

Chair: Benjamin Sliwa, Technical University of Dortmund

- 1 Drone Detection and Classification Using Cellular Network: A Machine Learning Approach**
Muhammad Usman Sheikh, Fayeze Ghavimi, Kalle Ruttik, Aalto University; Riku Jäntti, Aalto University

- 2 Learning and Uncertainty-Exploited Directional Antenna Control for Robust Aerial Networking**
Mushuang Liu, Yan Wan, Songwei Li, Frank L. Lewis, University of Texas at Arlington

- 3 Lightweight Simulation of Hybrid Aerial- and Ground-based Vehicular Communication Networks**
Benjamin Sliwa, Manuel Patchou, Christian Wietfeld, TU Dortmund University

- 4 Noise Suppression Channel Estimation Method Using Deep Learning in IEEE 802.11p Standard**
Sangheon Lee, Jong-Gwan Yook, Yonsei University; Han-Shin Jo, Hanbat National University; Cheol Mun, National University of Transportation

Tuesday, 24 September 2019 14:00-15:30 Honolulu

5H: Physical Layer III

Chair: Yuyuan Chang, Tokyo Institute of Technology

- 1 Achievable Rate of Multi-User Mode-Division Multiplexing Using Orbital Angular Momentum**
Woong Son, Chungnam National University; Howon Lee, Hankyong National University; Bang Chul Jung, Chungnam National University
- 2 Interleaved Time-Frequency Multiple Access using OTFS Modulation**
Rose Mary Augustine, A. Chockalingam, Indian Institute of Science, Bangalore
- 3 Improving Spectrum Efficiency in D2D-assisted Cognitive Radio Networks: Application of NOMA and Performance Analysis**
Do Dinh Thuan, Eastern International University; Anh-Tu Le, Chi-Bao Le, Industrial University of Ho Chi Minh City
- 4 NOMA-Based Optimal Multiplexing Method for Downlink Service Channels to Maximize Integrated System Throughput**
Teruaki Shikuma, Tokyo University of Science; Yasuaki Yuda, Panasonic Corporation; Kenichi Higuchi, Tokyo University of Science
- 5 Phase Rotated Non-Orthogonal Multiple Access for 3-User Superposition Signals**
Yuyuan Chang, Kazuhiko Fukawa, Tokyo Institute of Technology
- 6 Experimental VLC Transmission Employing CAP Modulation with Low-Cost Components under Illumination Constraints**
Robin Le Priol, Sylvain Haese, University of Rennes, INSA Rennes, IETR, CNRS, UMR 6164; Maryline Helard, INSA de Rennes; Ahmad Jabban, University of Rennes, INSA Rennes, IETR, CNRS, UMR 6164; Sébastien Roy, University of Sherbrooke

Tuesday, 24 September 2019 14:00-15:30 Salon 1

5P: MIMO II

- 1 Bit Error Rate Analysis of MRC Precoded Massive MIMO-OFDM Systems with Peak Cancellation**
Tomoya Kageyama, Osamu Muta, Kyushu University
- 2 Fronthaul Functional Split of IRC-based Beamforming for Massive MIMO Systems**
Yezi Huang, Ericsson Research; Wanlu Lei, Ericsson AB; Chenguang Lu, Miguel Berg, Ericsson Research
- 3 Enhanced Semi-Blind Uplink Interference Suppression on Multicell Massive MIMO Systems for Multi Modulus Signals**
Kazuki Maruta, Chang-Jun Ahn, Chiba University
- 4 Sphere Decoding for Millimeter Wave Massive MIMO**
Mohamed Alouzi, University of Ottawa; Francois Chan, Royal Military College; Claude D'Amours, University of Ottawa

- 5 Robust Beam Tracking Algorithm for mmWave MIMO Systems in Mobile Environments**
Seonyong Kim, Hyungsik Han, Namshik Kim, Hyuncheol Park, Korea Advanced Institute of Science and Technology (KAIST)
- 6 Pre-Cancellation of Known Symbol Padding Interference on Single-Carrier Block Multiuser MIMO Systems**
Hayato Fukuzono, Keita Kuriyama, Toshio Ito, Masafumi Yoshioka, Tsutomu Tatsuta, NTT Corporation
- 7 Joint Precoding and User Scheduling for Full-Duplex Cooperative MIMO-NOMA V2X Networks**
Bicheng Wang, Ruoqi Shi, Chen Ji, Jianling Hu, Soochow University
- 8 Weighted Sum of Spectral Efficiency and Energy Efficiency in Spatial Modulation-MIMO Systems**
Ayush Chauhan, Adobe Inc.; Kunal Bansal, Samsung R&D Institute India, Bengaluru; A. K. Chaturvedi, Indian Institute of Technology Roorkee, Roorkee, India.
- 9 Performance Evaluation of MIMO Modulation Schemes for Indoor VLC Channels with Angular Detectors**
Murala Laxmi Naresh Kumar, Debarati Sen, Indian Institute of Technology Kharagpur; Parthajit Mohapatra, Indian Institute Of Technology Tirupati

- 10 Wideband SIW Horn Antenna with phase correction for New Generation Beam Steerable Arrays**
Carla Di Paola, Kun Zhao, Shuai Zhang, Gert F. Pedersen, Aalborg University
- 11 Secrecy Performance of Cognitive Radio Networks Using Arbitrary Transmit Antenna Selection and Threshold-Based MRC**
Shilpa Thakur, Research Scholar; Ajay Singh, Assistant professor
- 12 A hybrid optimization approach for suppressing sidelobe level and reducing transmission power in collaborative beamforming**
Geng Sun, Xiaohui Zhao, Shuang Liang, Yanheng Liu, Jilin University; Ying Zhang, Georgia Institute of Technology; Victor C. M. Leung, The University of British Columbia
- 13 Adaptive Beamforming for Mobile Satellite Systems Based on User Location/Waveform**
Dunmin Zheng, Santanu Dutta, Ligado Networks
- 14 Weighted Fair Precoding based on traffic demands for Multibeam Satellite Systems**
Zhengwei Luo, Dewei Yang, Hua Wang, Jingming Kuang, Beijing Institute of Technology

Tuesday, 24 September 2019 16:00-17:30 Kaimuki 1

6A: Signal Processing II

Chair: Yuhitoshi Sanada, Keio University

- 1 Newton-Like Adaptive Blind Decision Feedback Equalizers**
Wei-Chieh Chang, National Chiao Tung University; Jenq-Tay Yuan, Fu Jen Catholic University
- 2 Designs of Sparse Predictive Decision Feedback Equalizers**
Wei-Chieh Chang, National Chiao Tung University; Jenq-Tay Yuan, Fu Jen Catholic University
- 3 Convergence Improvement in Repeating Weighted Boosting Search Algorithm for Channel Estimation**
Yuri Taniguchi, Yukitoshi Sanada, Keio University
- 4 Effect of Beam Steering on the Performance of Misaligned Multi-Mode OAM Communications**
Rui Chen, Minqiang Zou, Jiandong Li, Xidian University
- 5 On Rotated-QAM based Probabilistic Shaping Transmission Scheme for Rayleigh Fading Channels**
Kexin Xiao, Qingjian Gu, Bin Xia, Shanghai Jiao Tong University; Yao Yao, Huawei Technologies Co. Ltd.

Tuesday, 24 September 2019 16:00-17:30 Kaimuki 2

6B: Cooperative Communications I

Chair: Meng-Lin Ku, National Central University

- 1 On Outage Probability for Exploiting Residual Self-Interference in Full-Duplex Amplify-and-Forward Relay Networks**
Fu-Qiao Tang, Meng-Lin Ku, National Central University; Fan-Shuo Tseng, National Sun Yat-Sen University, Taiwan
- 2 Safeguarding NOMA Enhanced Cooperative D2D Communications via Friendly Jamming**
Qiang Li, Pinyi Ren, Qinghe Du, Dongyang Xu, Xi'an Jiaotong University; Yuncong Xie, Xi'an Jiaotong University
- 3 Buffer-Aided Virtual Full-Duplex Cooperative Networks Exploiting Source-To-Relay Broadcast Channels**
Tatsuya Mishina, Miharui Oiwa, Ryota Nakai, Tokyo University of Agriculture and Technology; Shinya Sugiura, The University of Tokyo
- 4 On User Cooperative Caching by Reverse Auction**
Xie Haonan, Jian Xiong, Bing Li, Shanghai Jiao Tong University

- 5 Performance Analysis of Multichannel EDCA-based V2V Communications via Discrete Event System**

LeWang, WPI; Renato F. Iida, Alexander Wyglinski, Worcester Polytechnic Institute

- 6 Relay Selection Strategies for Physical-Layer Security in D2D-Assisted Cellular Networks**

Jules M. Moualeu, University of the Witwatersrand; Ngatched Telex, Memorial University

Tuesday, 24 September 2019 16:00-17:30 Kaimuki 3

6C: State-of-the-Art WiFi Technologies

Chair: Sharan Naribole, Samsung Semiconductor, Inc.

- 1 SVM-based Network Access Type Decision in Hybrid LiFi and WiFi Networks**
Kaixuan Ji, Tianqi Mao, Jiaxuan Chen, Yuhan Dong, Zhaocheng Wang, Tsinghua University
- 2 SplitScan: Sharing Wi-Fi Scan Information through Bluetooth Low Energy**
Jonghun Han, Joonsuk Kim, Samsung Electronics; Changhee Joo, UNIST; Saewoong Bahk, Seoul National University
- 3 Joint Channel Selection and Spatial Reuse for Starvation Mitigation in IEEE 802.11ax WLANs**
Hiroyasu Shimizu, Bo Yin, Koji Yamamoto, Motoki Iwata, Masahiro Morikura, Takayuki Nishio, Kyoto University; Hirantha Abeysekera, NTT Corporation
- 4 Impact of MU EDCA channel access on IEEE 802.11ax WLANs**
Sharan Naribole, Samsung Semiconductor, Inc.; Wookbong Lee, Samsung Electronics; Ashok Ranganath, Samsung Semiconductor, Inc.
- 5 Dynamic Channel Bandwidth Use Through Efficient Channel Assignment in IEEE 802.11ac Networks**
Anna Zakrzewska, Lester Ho, Nokia Bell Labs

Tuesday, 24 September 2019 16:00-17:30 Milo 1

6D: Wireless Sensor Networks

Chair: Kamesh Namuduri, University of North Texas

- 1 Adaptive Contents Dissemination Method for Floating Contents**
Ryo Yamamoto, The University of Electro-Communications; Atsufumi Kashima, Waseda University; Taku Yamazaki, Shibaura Institute of Technology; Yoshiaki Tanaka, Waseda University

2 Backscatter Based Cooperative Transmission in Wireless-Powered Heterogeneous Networks

Sung Hoon Kim, Dong In Kim, Sungkyunkwan University

3 Distributed Ordering Transmissions for Latency-Sensitive Estimation in Wireless Sensor Networks

Liu Yang, Shanghai Institute of Microsystem and Information Technology, CAS; Hongbin Zhu, ShanghaiTech University; Zhenghang Zhu, Shanghai Advanced Research Institute; Xiliang Luo, ShanghaiTech University; Hua Qian, Shanghai Advanced Research Institute, Chinese Academy of Sciences

4 Energy-Efficient Routing Using Genetic Algorithm in Cluster-Based Wireless Sensor Networks

Jaemin Kim, Younghak Kim, Younghwan Yoo, Pusan National University

5 Energy Savings Using Wake-up Receivers – An Analysis of Optimal Designs

Nafiseh Seyed Mazloum, Sony; Muris Sarajlic, Ove Edfors, Lund University

5 A Machine Learning Approach for Intrusion Detection in Smart Cities

Asmaa Elsaedy, Kumudu Munasinghe, Dharmendra Sharma, University of Canberra; Abbas Jamalipour, The University of Sydney

Tuesday, 24 September 2019 16:00-17:30 Milo 2

6E: Localization

Chair: Matthias Pätzold, University of Agder

1 A New Iterative Estimation Procedure for the Localization of Passive Stationary Objects from Received RF Signals in Indoor Environments

Rym Hicheri, Matthias Pätzold, University of Agder

2 Angle-of-arrival Acquisition and Tracking via Virtual Subarrays in an Analog Array

Chuan Qin, Andrew Zhang, Xiaojing Huang, Y. Jay Guo, University of Technology Sydney

3 Ensemble-based Learning in Indoor Localization: A Hybrid Approach

Simon Tewes, Alaa Alameer, Jaber Kakar, Udaya Miriya Thanthrige, Stefan Roth, Aydin Sezgin, Ruhr-University Bochum

4 Experimental Assessment of GNSS-based Vehicle Positioning Accuracy using 3-D SLAM Reference

Howon Jung, Jae-Hyun Park, Han-You Jeong, Pusan National University

5 Range and Velocity Estimation for DFRFT-OFDM-Based Joint Communication and Sensing Systems

Rui Chen, Bin Yang, Xidian University; Wei Wang, State Key Lab of Rail Transit Engineering Informatization, FSDI; Peng Chen, Southeast University

6 When Indoor Localization Meets New Communication Technologies

Yaqian Xu, Klaus David, University of Kassel

Tuesday, 24 September 2019 16:00-17:30 Milo 3

6F: Deployment and Relay

Chair: Soumya Prakash Dash, IIT Bhubaneswar

1 AP deployment optimization: a genetic algorithm approach

Zicong Zhi, Jianghong Wu, Xin Meng, Mengqian Yao, Wenzhou University; Qian Hu, Zhenzhou Tang, Wenzhou University

2 E-Band Link for Next Generation Small-Cell Backhaul in Dense Urban Environment

Congzheng Han, IAP; Shu Duan, Institute of Atmospheric Physics, Chinese Academy of Sciences; Lei Bao, Ericsson Research; Baofeng Ji, Gaoyuan Zhang, Henan University of Science and Technology

3 Transmit Power Minimization for a Multi-Hop SWIPT Decode-and-Forward Sensor Network

Derek Kwaku Pobi Asiedu, Hanbat National University; Hoon Lee, Pukyong National University; Kyoung-Jae Lee, Hanbat National University

4 Cooperative Device-to-Device Relaying Network with Power Line Communications

Soumya Prakash Dash, Indian Institute of Technology Bhubaneswar; Sandeep Joshi, Indian Institute of Technology Delhi

5 Decode-and-Forward Two-way Relaying in Power Line Communications

Roger Kwao Ahiadormey, Prince Anokye, Han-Shin Jo, Kyoung-Jae Lee, Hanbat National University

6 Performance of a Cooperative Network with Energy Harvesting Source and Relay

Dileep Bapatla, Shankar Prakriya, Indian Institute of Technology, Delhi

Tuesday, 24 September 2019 16:00-17:30 Kou

6G: Vehicular Applications

Chair: Takamasa Higuchi, Toyota InfoTech Labs

1 A Collaborative Approach to Finding Available Parking Spots

Takamasa Higuchi, Seyhan Ucar, Toyota Motor North America R&D; Onur Altintas, Toyota North America R&D

2 Anomaly Detection in Cooperative Adaptive Cruise Control using Physics Laws

Faris Alotibi, Mai Abdelhakim, University of Pittsburgh

3 A novel Simulation-Framework for the Design and Testing of Advanced Driver Assistance Systems

Florian Alexander Schiegg, Johannes Krost, Stefan Jesenski, Robert Bosch GmbH; Johannes Frye, Robert Bosch Car Multimedia GmbH

4 Brain Storm Optimized Swarm Collaboration for Bus Scheduling

Liangxi Liu, Siqing Ma, Jun Huang, Southern University of Science and Technology

5 Experimental Results on Crowdsourced Radio Units Mounted on Parked Vehicles

Yu Nakayama, Tokyo University of Agriculture and Technology; Daisuke Hisano, Osaka University; Takayuki Nishio, Kyoto University; Kazuki Maruta, Chiba University

6 Re-route Package Pickup and Delivery Planning with Random Demands

Suttinee Sawadsitang, Dusit Niyato, Kongrath Suankaewmanee, Nanyang Technological University; Puay Siew Tan, Singapore Institute of Manufacturing Technology

Tuesday, 24 September 2019 16:00-17:30 Honolulu

6H: Physical Layer IV

Chair: Stanislav Kruglik, Skolkovo Institute of Sciency and Technology

1 Diversity Analysis of Time-indexed Media-based Modulation

Rupali Gupta, Bharath Shamasundar, A. Chockalingam, Indian Institute of Science, Bangalore

2 Structured Sparse Matrix Sketching based Detection for Media-based Modulation

Rupali Gupta, Bharath Shamasundar, A. Chockalingam, Indian Institute of Science, Bangalore

3 Blind Modulation Classification for OFDM in the Presence of Timing, Frequency, and Phase Offsets

Rahul Gupta, Indian Institute of Technology Patna; Sushant Kumar, India Institute of Technology, Patna; Sudhan Majhi, Indian Institute of Technology Patna

4 Using multiple chains in cross-correlation receivers to improve sensitivity
Mina Mikhael, Mark S. Oude Alink, André B. J. Kokkeler, University of Twente

5 On the Secrecy Capacity of Distributed Storage with Locality and Availability
Stanislav Kruglik, Pavel Rybin, Alexey Frolov, Skolkovo Institute of Science and Technology

6 Secure DoF for the MIMO MAC: The Case of Knowing Eavesdropper's Channel Statistics Only
Mohamed Amir, Memorial University; Tamer Khattab, Qatar University; Elias Yaacoub, Arab Open University; Khalid Abualsaud, Mohsen Guizani, Qatar University

Tuesday, 24 September 2019 16:00-17:30 Salon 1

6P: Vehicular Networks I

1 Beam Design for Beam Training Based Millimeter Wave V2I Communications
Jiahao Wang, Shanghai Jiao Tong University

2 Beam Design for V2V Communications with Inaccurate Positioning Based on Millimeter Wave
Yijia Feng, Shanghai Jiao Tong University

3 A Machine Learning Based Attack in UAV Communication Networks
Xiao-Chun Chen, Yu-Jia Chen, National Central University

4 NOMA Concept for PC5-based Cellular-V2X mode 4 in Crash Warning System
Takeshi Hirai, Tutomu Murase, Nagoya University

5 Permuted Resource Allocation in Cellular V2V System
Taehyung Kim, University of Yonsei; Yosub Park, Samsung Electronics; Daesik Hong, Yonsei University

6 Reducing Consecutive Collisions in Sensing Based Semi Persistent Scheduling for Cellular-V2X
So-Yi Jung, Hye-Rim Cheon, Jae-Hyun Kim, Ajou University

7 RoAdNet: A Multi-resolution transmission strategy for long range information diffusion in VANETS
Priyashraba Misra, Vinod Kulathumani, West Virginia University

8 User Centric Low Latency Data Transmission in Ultra Dense Vehicular Networks
Wei-Tsang Teng, National Central University; Chin-Ya Huang, Shan-Hsiang Shen, Tai-Lin Chin, Chung-An Shen, National Taiwan University of Science and Technology; Hong-Yi Wang, Chunghwa Telecom Laboratories

9 V2V communications under the shadowing of multiple big vehicles
Hieu Nguyen, Nanyang Technological University

10 Performance Analysis of UAV-Aided Wireless Communication Systems with Ubiquitous Coverage
Sandhya Soni, Divyang Rawal, Nikhil Sharma, LNM Institute of Information Technology, Jaipur; Dushantha Nalin K. Jayakody, National Research Tomsk Polytechnic University; Jun Li, Nanjing University of Science and Technology, China

11 Publish-Subscribe communications for V2I safety applications in Intelligent Transportation Systems
Nishanthi Dasanayaka, Queensland University of Technology

12 Detectable Object-sizes Range Estimation based Multi-task Cascaded Convolutional Neural Networks in the vehicle Environment
Whui Kim, Electronics and Telecommunications Research Institute; Min Jung Shin, KwangWoon University; Hyun Kyun Choi, Electronics and Telecommunications Research Institute

13 A Novel Collaborative Control Strategy for Enhanced Training of Vehicle Recognition
Fangyi Chen, Chenchen Zhu, Marios Savvides, Carnegie Mellon University

14 Wireless Powered UAV Relay Communications Over the Fisher-Snedecor χ^2 Fading Channels
Peng Zhang, Hongyang Du, Yiyu Cao, Jiayi Zhang, Beijing Jiaotong University

15 Secure and Safe In-Vehicle Device Pairing Using Accelerometer Sensor
Yu Seung Kim, Ford Motor Company

16A Comparative Study on Gateway Selection in Mobile-Assisted Sensor Data Collection
Cheonyong Kim, Ki Il Kim, Chungnam National University

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7A: Multicarrier Transmission

Chair: Char-Dir Chung, National Taiwan University

1 Carrier Interferometry Code Index Modulation Aided OFDM-based DCSK Communications
Zhaofeng Liu, Lin Zhang, Sun Yat-sen University; Zhiqiang Wu, Wright State University; Jing Bian, Sun Yat-sen University

2 Pilot Sequence Design for Spectral Compactness and Channel Estimation in OFDM
Wei-Chang Chen, National Taipei University of Technology; Chih-Kai Yang, National Taiwan University; Po-Tsang Chi, MediaTek Inc.; Char-Dir Chung, National Taiwan University

3 A Novel OFDM Equalizer for Large Doppler Shift Channel through Deep Learning
Qisheng Huang, Chunming Zhao, Ming Jiang, Xiaomin Li, National Mobile Communications Research Lab., Southeast University; Jing Liang, Huawei Technologies CO., LTD.

4 An Indicator-free eMBB and URLLC Multiplexed Scheme for 5G Downlink System
Wen-Rong Wu, National Chiao-Tung University; Po-Yu Lin, MediaTek Inc.; Yi-Hsiu Lee, National Chiao-Tung University

5 Low PAPR DM-RS Design for 5G Systems Operating in High Frequency Bands
Avik Sengupta, Intel Corporation; Alexei Davydov, Intel; Guotong Wang, Sameer Pawar, Gregory Morozov, Intel Corporation

Wednesday, 25 September 2019 11:00-12:30 Kaimuki 2

7B: Cooperative Communications II

Chair: Khoa Le, Western Sydney University

1 Robust Hybrid Transceiver Designs for Millimeter Wave AF Cooperative Systems
Zhen Luo, Hongqing Liu, Chongqing University of Posts and Telecommunications

2 Cooperative Contention Resolution Diversity Slotted ALOHA with Transmit Power Diversity for Multi-satellite Networks
Bo Zhao, Guangliang Ren, Huining Zhang, Xidian University

3 Dynamic User-Centric Clustering Design for Combined Transmission in Downlink LiFi System
Weibin Ma, Lin Zhang, Furong Fang, Jing Bian, Sun Yat-sen University

4 Design and Analysis of Multi-relay Cooperative Quadrature Spatial Modulation System

Ke Pang, Zhiqian Bai, Yingchao Yang, Xiaohui Kou, Dongfeng Yuan, Shandong University; Xinhong Hao, Beijing Institute of Technology; Kyung Sup Kwak, Inha University

5 Outdated Relays Employing MRC Under Generalised-Rician Fading

Khoa Le, Western Sydney University

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7C: Resource Management for mmWave & 5G Systems

Chair: Haibo Zhou, Nanjing University

1 Enhancing Throughput using Agile Beam Switching and User Scheduling in Cellular Systems

Ragunandan M Rao, Virginia Tech; Dilip Bethanabhotla, Ramesh C Palat, Blue Danube Systems Inc.

2 Millimeter Wave Multiuser Beam Clustering and Iterative Power Allocation Schemes

Li-Hsiang Shen, Kai-Ten Feng, National Chiao Tung University

3 Multi-Carrier LAA with Adaptive Energy Detection and Carrier Selection

Li Li, Samsung Research America; Seyedmohammad Salehi, Chien-Chung Shen, University of Delaware; John Graybeal, Cisco; Leonard Cimini, University of Delaware

4 Multi-tier mmWave Networks: Improving Fairness for Spectrally-Efficient Downlink Scheduling

Ziqi Chen, University of New South Wales; David Smith, CSIRO Data61

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7D: Communication and Machine Learning in ITS

Chair: Francois Chan, Royal Military College of Canada

1 A GIS-based tool for optimizing C-ITS communication infrastructure

Ane Dalsnes Storsaeter, Norwegian Public Roads Administration; Jo Skjermo, Odd Andre Hjelkrem, Sintef; Jan Erik Haakegaard, SINTEF Digital; Petter Arnesen, Erlend Dahl, Sintef

2 Driver Profil Detection using Points of Interest Neighbourhood

Brice Leblanc, Hacene Fouchal, Cyril de Runz, Université de Reims Champagne-Ardenne

3 Robust Linear-complexity Approach to Full SLAM Problems: Stochastic Variational Bayes Inference

Jiang Xiaoyue, Hang Yu, Michael Hoy, Justin Dauwels, Nanyang Technological University

4 Towards Secure Communication for High-Density Longitudinal Platooning

Markus Sontowski, Stefan Köpsell, Thorsten Strufe, TU Dresden; Christian Zimmermann, Robert Bosch GmbH; Andreas Weinand, Hans Schotten, University of Kaiserslautern; Norbert Bißmeyer, ESCRYP T GmbH

5 Unsupervised Data-driven Automotive Diagnostics with Improved Deep Temporal Clustering

Peter Wolf, BMW Group; Alvin Chin, BMW Technology Corporation; Bernard Bäker, Technische Universität Dresden

Wednesday, 25 September 2019 11:00-12:30 Milo 2

7E: Cognitive Radio and Novel Channel Access

Chair: Guanding Yu, Zhejiang University

1 A Delay-aware Edge Computing and Power Control Scheme in NOMA-enabled Cognitive Radio Networks

Yuxia Cheng, Zhanjun Liu, Qianbin Chen, Chongqing University of Posts and Telecommunications; Chengchao Liang, Carleton University

2 Spectrum Sharing and Energy Cooperation in Wireless Powered Cognitive Radio Networks

Yao Ge, Pak Chung Ching, The Chinese University of Hong Kong

3 Dynamic Channel Access and Power Control via Deep Reinforcement Learning

Ziyang Lu, M. Cenk Gursoy, Syracuse University

4 Novel Channel Access Mechanism for LTE and WiFi Coexistence

Zhang Jiaqi, Shengli Liu, Yin Rui, Zhejiang University; Zhenzhou Tang, Wenzhou University; Guanding Yu, Zhejiang University

5 Implementation and Performance Evaluation of IEEE 802.11af Channel Aggregation

Takeshi Matsumura, Kazuo Ibuka, Homare Murakami, Kentaro Ishizu, Fumihide Kojima, National Institute of Information and Communications Technology

Wednesday, 25 September 2019 11:00-12:30 Milo 3

7F: Energy Harvesting Communications

Chair: Makoto Kobayashi, Hiroshima City University

1 Design of Wireless Power Transfer Systems for Personal Mobility Devices in City Spaces

Hiromasa Hayashi, Takuya Sasatani, Yoshiaki Narusue, Yoshihiro Kawahara, The University of Tokyo

2 Energy Efficiency Optimization of Heterogeneous Networks with SWIPT: A Cell-Load Perspective

Chun-Hung Liu, Mississippi State university

3 Energy-Efficient Computing for Wireless Powered Mobile Edge Computing Systems

Hunwoo Lim, Taewon Hwang, Yonsei University

4 Sum-Throughput and Fairness Optimization of a Wireless Energy Harvesting Sensor Network

Jonathan C. Kwan, Abraham O. Fapojuwo, University of Calgary

5 Optimal Throughput of the ANC based Two-way Relay System with Energy Harvesting

Kaiqi Zhong, Liqun Fu, Xiamen University

Wednesday, 25 September 2019 11:00-12:30 Kou

7G: Channel Estimation

Chair: Roger Pierre Fabris Hoefel, Federal University of Rio Grande do Sul (UFRGS)

1 Channel Estimation Using Matrix Factorization Based Interpolation for OFDM Systems

Norisato Suga, Ryohei Sasaki, Toshihiro Furukawa, Tokyo University of Science

2 Joint Channel Equalization and Tracking for SC-FDE Schemes

Pedro Pedrosa, Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa; Daniel Castanheira, University of Aveiro; Adão Silva, DETI / Instituto de Telecomunicações / University of Aveiro; Atilio Gameiro, Universidade Aveiro

3 IEEE 802.11ax: Analyses of MIMO Channel Sounding Modes with Hardware Impairments

Roger Hoefel, Federal University of Rio Grande do Sul

4 Pilot-Assisted Sparse Channel Estimation Based on Mutual Incoherence Property

Ahmed Nasser, Osamu Muta, Kyushu University; Maha Elsabrouty, Egypt-Japan University of Science and Technology

5 Bi-directional Training for Wideband Systems

Jialing Liu, Qian Cheng, Weimin Xiao, Diana Maamari, Anthony C. K. Soong, Futurewei Technologies

6 Angle and Waveform Estimation from Coarsely Quantized Array Data

Heng Zhu, Fangqing Liu, University of Science and Technology of China; Jian Li, University of Florida

Wednesday, 25 September 2019 11:00-12:30 Honolulu

7H: Channel Modelling

Chair: *Stephan Jaeckel, Fraunhofer Heinrich Hertz Institute*

- 1 Industrial Indoor Measurements from 2-6 GHz for the 3GPP-NR and QuaDRiGa Channel Model**
Stephan Jaeckel, Nick Turay, Leszek Raschkowski, Fraunhofer Heinrich Hertz Institute; Lars Thiele, Fraunhofer HHI; Risto Vuohtoniemi, Marko Sonkki, Veikko Hovinen, University of Oulu; Frank Burkhardt, Prasanth Karunakaran, Thomas Heyn, Fraunhofer Institute for Integrated Circuits
- 2 Error Probability of $\alpha - \mu$ Fading Channels with Imperfect Carrier Phase Recovery**
Pedro E. Gória Silva, National Institute of Telecommunications; Rausley Adriano Amaral de Souza, National Institute of Telecommunications (Inatel); Michel Yacoub, State University of Campinas; Daniel Benevides da Costa, Federal University of Ceara (UFC); Jules M. Moualeu, University of the Witwatersrand
- 3 Simulative Comparison of 4G/5G ITU Channel Models in the Context of V2I**
Thomas Deinlein, Reinhard German, Anatoli Djanatliev, University of Erlangen-Nürnberg
- 4 Time Dispersion Characteristics of Cross-Polarized 2x2 MIMO Self-Interference Indoor Radio Channels**
Ramez Askar, Mehrnoosh Mazhar Sarmadi, Fabian Undi, Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute; Michael Peter, Heinrich-Hertz-Institut; Wilhelm Keusgen, Thomas Haustein, Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute
- 5 Validation of the Vale Path Loss Model for Open-pit Mines in Different Stages of Mine Exploration**
Erika P. L. Almeida, Aalborg University; Gabriel Guieiro, Vale S.A.; Ignacio Rodriguez, Troels B. Sørensen, Preben Mogensen, Aalborg University; Luis Guilherme Uzeda Garcia, Nokia Bell Labs
- 6 The Effect of LoS and NLoS Transmissions on Base Station Clustering in Dense Small-Cell Networks**
Jiaqi Wang, Xiaoli Chu, University of Sheffield; Ming Ding, Data61, CSIRO; David Lopez-Perez, Nokia Bell Labs

Wednesday, 25 September 2019 11:00-12:30 Salon 1

7P: IoT

- 1 Learning-Aided Online Task Offloading for UAVs-Aided IoT Systems**
Zhu Junge, Xi Huang, Tang Yinxu, Ziyu Shao, ShanghaiTech University

- 2 Measurements of LoRa Propagation in Harsh Environment: Numerous NLOS Areas and Ill-Conditioned LoRa Gateway**
Kenta Inagaki, Shusuke Narieda, Mie University; Takeo Fujii, The University of Electro-Communications; Kenta Umebayashi, Tokyo University of Agriculture and Technology; Hiroshi Naruse, Mie University
- 3 Weight-Adaptive Analog Fountain Codes Toward Massive Machine Type Communications**
Ke Zhang, Jian Jiao, Lianqin Li, Shaohua Wu, Ye Wang, Zhang Qinyu, Harbin Institute of Technology
- 4 Secure and Lightweight Mutual Multi-Factor Authentication for IoT Communication Systems**
Hassan Noura, Reem Melki, Ali Chehab, American University of Beirut
- 5 Narrowband Internet of Things 5G performance**
Gerardo Agni Medina Acosta, Ericsson
- 6 Load and Energy Aware Hybrid Routing Protocol for Hybrid Wireless Mesh Networks**
Yuan Chai, Xiao-Jun Zeng, University of Manchester
- 7 Preamble Barring: A Novel Random Access Scheme for Machine Type Communications with Unpredictable Traffic Bursts**
Maxime Grau, Chuan Heng Foh, Atta Qudus, Rahim Tafazolli, University of Surrey
- 8 Investigation of Deep Indoor NB-IoT Propagation Attenuation**
Krzysztof Mateusz Malarski, Jakob Thrane, Markus Greve Bech, Kamil Macheta, Henrik L. Christiansen, Martin Nordal Petersen, Sarah Ruepp, Technical University of Denmark
- 9 Dynamic Stackelberg Game for Service Auction of TV White Space in 5G**
Yizhe Zhang, Yin Xu, Dazhi He, Wen He, Yunfeng Guan, Jian Yu, Wenjun Zhang, Shanghai Jiao Tong University
- 10 Transit Prediction in a College Setting**
Pawan Subedi, The University of Alabama; Xiaoyan Hong, University of Alabama
- 11 Road Debris Detection using 79GHz Radar**
Masahiro Shibao, Akihiro Kajiwara, The University of Kitakyushu

Wednesday, 25 September 2019 14:00-15:30 Kaimuki 1

8A: MIMO and Beamforming Techniques

Chair: *Rui Dinis, Universidade Nova de Lisboa*

- 1 On Angle of Arrival (AoA) Kähler Manifolds Feedback Method for FDD mmWave V2X Systems**
Hong-Yunn Chen, Cheng-Fu Chou, National Taiwan University; Leana Golubchik, University of Southern California
- 2 Reducing the Decoupling Errors in Adaptive Beamformers by Multistage Wiener Filter**
Ming Zhang, Xiaoming Chen, Hongyu Shi, Shitao Zhu, Qinlong Li, Xi'an Jiaotong University
- 3 On the Detection of MIMO Signals with Strong Nonlinear Distortion Effects**
João Vidal Félix, Universidade Nova de Lisboa; João Guerreiro, Universidade Autónoma de Lisboa, Instituto de Telecomunicações; Rui Dinis, Universidade Nova de Lisboa
- 4 Joint Synchronization in Macro-Diversity Multi-Connectivity Networks**
Nick Schwarzenberg, Friedrich Burmeister, Albrecht Wolf, Technische Universität Dresden; Norman Franchi, Gerhard Fettweis, TU Dresden

- 5 Channel Model Validation for and Extensions of an Ultraviolet Networking Optimization Framework**
C. Hakan Arslan, CCDC Army Research Laboratory

Wednesday, 25 September 2019 14:00-15:30 Kaimuki 2

8B: Radio Resource Management

Chair: *Rony Kumer Saha, KDDI Research, Inc.*

- 1 A Technique for Massive Spectrum Sharing with Ultra-Dense In-building Small Cells in 5G Era**
Rony Kumer Saha, KDDI Research, Inc.
- 2 Dynamic PDCCH Adaptation Based on DMRS Detection for UE Power Saving in 5G New Radio**
Taehyoung Kim, Younsun Kim, Samsung Electronics
- 3 KPI impact on 5G NR deep sleep state adaption**
Richard Tano, Ericsson; Pal Frenger, Ericsson AB, Sweden; Martina Trano, Uppsala University
- 4 Optimized Power Allocation for Secure Transmission Using Polar Code and Artificial Noise**
Xiaolan Bao, Ming-Min Zhao, Ming Lei, Minjian Zhao, Chan Wang, Zhejiang University

5 Personal-Cell Scheme Using Adaptive Control CRE for Multicarrier HetNets

Kento Fujisawa, Fumiya Kemmochi, Hiroyuki Otsuka, Kogakuin University

6 Resource Allocation for OFDMA-based Cognitive Networks: An Interference-Efficient Perspective

Yongjun Xu, Guoquan Li, Qilie Liu, Zhengqiang Wang, Chongqing University of Posts and Telecommunications

Wednesday, 25 September 2019 14:00-15:30 Kaimuki 3

8C: MIMO III

Chair: Ming-Xian Chang, National Chiao Tung University

1 A Divide-and-Conquer Precoding Scheme for Sub-Connected Massive MIMO Systems

Ke Xu, Harbin Institute of Technology (Shenzhen); Fu-Chun Zheng, Harbin Institute of Technology (Shengzhen) & The University of York; Pan Cao, University of Hertfordshire; Hongguang Xu, Harbin Institute of Technology (Shenzhen); Xu Zhu, University of Liverpool

2 A Low Complexity Greedy Algorithm for Dynamic Subarrays in Massive MIMO Systems

Ke Xu, Harbin Institute of Technology (Shenzhen); Fu-Chun Zheng, Harbin Institute of Technology (Shengzhen) & The University of York; Pan Cao, University of Hertfordshire; Hongguang Xu, Harbin Institute of Technology (Shenzhen); Xu Zhu, University of Liverpool

3 A Study on Antenna Beamforming Method Considering Movement of Solar Plane in HAPS System

Kenji Hoshino, Shoichi Sudo, Yoshichika Ohta, HAPSMobile Inc.

4 Detection of MIMO Systems Based on Dynamic Search for High-Order Modulations

Pei-Hua Wu, Ming-Xian Chang, National Cheng-Kung University

5 Distributed Adaptive Beamforming and Nullforming for Covert Wireless Communications

Justin Kong, Fikadu Dagefu, Brian M. Sadler, US Army Research Laboratory

Wednesday, 25 September 2019 14:00-15:30 Milo 1

8D: Navigation, Tracking and Simulation

Chair: Ricardo Pinto de Castro, German Aerospace Center

1 A Sliding Window for Path Mapping based on a Pseudo-Derivative Method in Autonomous Navigation

Landon Bentley, Rahul Bhadani, The University of Arizona; Joe MacInnes, The College of Wooster; Hannah Mason, Lipscomb University; Tamal Bose, The University of Arizona

2 Cascaded Trajectory Tracking Control for Automated Vehicles

Ricardo de Castro, German Aerospace Center (DLR)

3 Fast Transportation in a Disaster Situation along Real-life Grid-structured Road Networks

Sayan Sen Sarma, University of Calcutta; Koushik Sinha, Southern Illinois University; Bhabani P. Sinha, Satya R. Das, SOA University

4 Generation of Optimal Velocity Trajectory for Real-Time Predictive Control of a Multi-Mode PHEV

Pradeep Krishna Bhat, Joseph Oncken, Rajeshwar Yadav, Bo Chen, Mahdi Shahbakhti, Darrell Robinette, Michigan Technological University

5 Variational Bayesian Point Set Registration

Jiang Xiaoyue, Hang Yu, Michael Hoy, Justin Dauwels, Nanyang Technological University

Wednesday, 25 September 2019 14:00-15:30 Milo 2

8E: Spectrum Management and Sensing Techniques

Chair: TBC

1 Auto-correlation based sensing of multiple Wi-Fi BSSs for LTE-U CSAT

Vanlin Sathya, University of Chicago; Morteza Mehrnosh, University of Washington; Monisha Ghosh, University of Chicago; Sumit Roy, University of Washington

2 Derivation of Sensing Features for Maximum Cyclic Autocorrelation Selection Based Signal Detection

Shusuke Narieda, Mie University; Daiki Cho, Tokyo Univ. of Agric. and Technol.; Hiromichi Ogasawara, Nat. Inst. Tech., Akashi Coll.; Kenta Umebayashi, Tokyo University of Agriculture and Technology; Takeo Fujii, The University of Electro-Communications; Hiroshi Naruse, Mie University

3 Performance Evaluation for the Co-existence of eMBB and URLLC Networks: Synchronized versus Unsynchronized TDD

Ursula Challita, Kimmo Hiltunen, Miurel Tercero, Ericsson Research

4 Predation Blocking Strategies in Real Cellular Networks and its impact on Spectrum Revenue

Washim Uddin Mondal, Goutam Das, Indian Institute of Technology Kharagpur

5 A Two-Game Algorithm for Device-to-Device Resource Allocation with Frequency Reuse

Sebastian Lindner, Raphael Elsner, Phuong Nga Tran, Andreas Timm-Giel, Hamburg University of Technology

Wednesday, 25 September 2019 14:00-15:30 Milo 3

8F: Energy-Efficient Communications

Chair: Mads Lauridsen, Nokia Bell Labs

1 5G New Radio User Equipment Power Modeling and Potential Energy Savings

Mads Lauridsen, Daniela Laselva, Frank Frederiksen, Jorma Kaikkonen, Nokia Bell Labs

2 Data Censoring in Renewable Energy Enabled Wireless Sensor Networks

Miao Yang, ShanghaiTech University; Liu Yang, Shanghai Institute of Microsystem and Information Technology, CAS; Zhenghang Zhu, Shanghai Advanced Research Institute; Haifeng Wang, Shanghai Institute of Microsystem and Information Technology, CAS; Hua Qian, Shanghai Advanced Research Institute, Chinese Academy of Sciences

3 JOTE: Joint Offloading of Task and Energy in Fog-Enabled IoT Networks

Penghao Cai, Fuqian Yang, Yao Zhao, ShanghaiTech University; Hua Qian, Shanghai Advanced Research Institute, Chinese Academy of Sciences; Xiliang Luo, ShanghaiTech University, China

4 Performance Analysis of Decentralized V2X System with FD-NOMA

Di Zhang, Zhengzhou University; Yuanwei Liu, Queen Mary University of London; Linglong Dai, Tsinghua University; Ali Kashif Bashir, Manchester Metropolitan University; Arumugam Nallanathan, Queen Mary University of London; Byonhyo Shim, Seoul National University

5 A Novel QoS Prediction for Reliable CSMA/CA Based Systems with Uncorrelated Interference

Henning Schepker, Ahmad Saad, Fraunhofer ESK

Wednesday, 25 September 2019 14:00-15:30 Kou

8G: Emerging Technology I

Chair: Ang-Hsun Tsai, National Defense University

- 1 Towards Real-time User QoE assessment via Machine Learning on LTE network data**
Umair Sajid Hashmi, University of Oklahoma; Ashok Rudrapatna, Zhengxue Zhao, Marek Rozwadowski, Joseph Kang, Raj Wuppalapati, Bell Labs Consulting, Murray Hill, NJ, USA; Ali Imran, The University of Oklahoma
- 2 Reinforcement Learning as a Pre-Diagnostic Tool for TCP/IP Protocols on In-Car Networks**
Sanghun Yun, Jahyun Kim, Hyogon Kim, Korea University
- 3 Computation Offloading and Resource Allocation for Backhaul Limited Cooperative MEC Systems**
Phuong-D Nguyen, INRS; Ha Nguyen Vu, École Polytechnique de Montréal; Long Le, INRS- University of Quebec
- 4 Towards GFDM for Handsets - Efficient and Scalable Implementation on a Vector DSP**
Stefan Damjanecvic, Emil Matus, Gerhard Fettweis, TU Dresden; Dmitry Utyansky, Pieter van der Wolf, Synopsys Inc.
- 5 Cost Minimization with Offloading to Vehicles in Two-tier Federated Edge and Vehicular Fog Systems**
Binayak Kar, Ying-Dar Lin, Jui-Chung Hu, Li-Hsing Yen, National Chiao Tung University
- 6 On-Device Federated Learning via Second-Order Optimization with Over-the-Air Computation**
Sheng Hua, Kai Yang, Yuanming SHI, ShanghaiTech University

Wednesday, 25 September 2019 14:00-15:30 Honolulu

8H: mmWave II

Chair: Satoshi Denno, Okayama University

- 1 Analysis and Optimization of Random Caching in mmWave Heterogeneous Networks**
Le Yang, Fu-Chun Zheng, Wanli Wen, Southeast University
- 2 Compressed Channel Estimation for 5G NR over Millimeter-wave Spectrum**
Hyoungju Ji, Heechul Yang, Hoondong Noh, Younsun Kim, Juho Lee, Samsung Electronics
- 3 Compressive-Sensing Based Beam and Channel Tracking with Reconfigurable Hybrid Beamforming in mmWave MIMO OFDM Systems**
Sau-Hsuan Wu, National Chiao Tung University; Guan-Yu Lu, MediaTek, Taiwan
- 4 Vehicle-to-Vehicle Millimeter-Wave Channel Measurements at 56-64 GHz**
Jiri Blumenstein, Ales Prokes, Josef Vychodil, Tomas Mikulasek, Brno University of Technology; Erich Zöchmann, Herbert Groll, Christoph Mecklenbräuker, TU Wien; Markus Hofer, Thomas Zemen, AIT Austrian Institute of Technology; Seun Sangodoyin, Andreas F. Molisch, University of Southern California
- 5 Wide-Sense Stationarity of Millimeter Wave Expressway Channels Based on 28 GHz Measurements**
Jae Joon Park, Juyul Lee, Kyung-Won Kim, Myung-Don Kim, Heon-Kook Kwon, Kwang-chun Lee, ETRI
- 6 Iterative Soft Input Decoding With Assistance of Lattice Reduction For Overloaded MIMO**
Satoshi, Denno; Tsubasa Inoue, Takuya Fujiwara, Yafei Hou, Okayama University

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9A: Industry 4.0 and Low-Latency

Chair: Ljiljana Marijanovic, Technische Universität (TU) Wien

- 1 Energy Efficient Fog RAN (F-RAN) with Flexible BBU Resource Assignment for Latency Aware Mobile Edge Computing (MEC) Services**
Chi-Hung Lin, National Dong Hwa University; Wei-Che Chien, National Cheng Kung University; Cosmos Jen-Yeu Chen, National Dong Hwa University; Chin-Feng Lai, National Cheng Kung University; Han-Chieh Chao, National Dong Hwa University
- 2 Multi-user Resource Allocation for Low Latency Communications based on Mixed Numerology**
Ljiljana Marijanovic, TU Wien
- 3 On the Delay of Finite Buffered Multi-hop Relay Wireless Internet of Things**
Ahmed ElSamadouny, University of Texas Dallas; Mazen O. Hasna, Tamer Khattab, Khalid Abualsaud, Qatar University; Elias Yaacoub, Arab Open University
- 4 Towards Ultra-Reliable Low-Latency Underwater Optical Wireless Communications**
Rawan Alghamdi, Effat University; Nasir Saeed, King Abdullah University of Science and Technology (KAUST); Hayssam Dahrouj, Effat University; Mohamed-Slim Alouini, Tareq Y. Al-Naffouri, King Abdullah University of Science and Technology (KAUST)
- 5 Implementation and Trial Evaluation of a Wireless Manufacturing Execution System for Industry 4.0**
Rasmus Suhr Mogensen, Ignacio Rodriguez, Gilberto Berardinelli, Andreas Fink, Rene Marcker, Søren Aaberg Markussen, Taus Raunholt, Aalborg University; Troels E. Kolding, Guillermo Poci, Nokia Bell Labs; Simone Barbera, Telenor A/S Danmark

6 Deployment Strategies for the Industrial IoT: A Case Study based on Surface Mines

Erika P. L. Almeida, Aalborg University; Robson. D. Vieira, Ektrum; Gabriel Guieiro, Vale S.A.; Ignacio Rodriguez, Troels B. Sørensen, Preben Mogensen, Aalborg University; Luis Guilherme Uzeda Garcia, Nokia Bell Labs

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9B: Edge Cloud and Computing

Chair: Shan-Hsiang Shen, National Taiwan University of Science and Technology

- 1 Hyperparameter Study of Machine Learning Solutions for the Edge Server Deployment Problem**
Tiago Koketsu Rodrigues, Tohoku University; Katsuya Suto, The University of Electro-Communications; Nei Kato, Tohoku University
- 2 Radio Remote Head Clustering with Affinity Propagation Algorithm in C-RAN**
Seju Park, Yonsei University; Han-Shin Jo, Hanbat National University; Cheol Mun, National University of Transportation; Jong-Gwan Yook, Yonsei University
- 3 Sustainable Vehicular Edge Computing Using Local and Solar-Powered Roadside Unit Resources**
Yu-Jen Ku, Sujit Dey, University of California, San Diego
- 4 FlowSpy: An Efficient Network Monitoring Framework using P4 in Software-Defined Networks**
Bowe Guan, Shan-Hsiang Shen, National Taiwan University of Science and Technology
- 5 Performance Measurements-based Estimation of Radio Resource Requirements for Slice Admission Control**
Irene Vilà Muñoz, Jordi Pérez-Romero, Oriol Sallent, Anna Umbert, Ramon Ferrus, Universitat Politècnica de Catalunya (UPC)

6 Mapping and Scheduling for Non-Uniform Arrival of Virtual Network Function (VNF) Requests

Mahmoud Gamal, Saber Jafarizadeh, Mehran Abolhasan, Justin Lipman, University of Technology Sydney; Wei Ni, CSIRO

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9C: Vehicular to Everything Communications

Chair: Hsin-Piao Lin, National Taipei University of Technology

1 Deep Neural Network Based Resource Allocation for V2X Communications

Jin Gao, Muhammad RA Khandaker, Heriot-Watt University; Faisal Tariq, University of Glasgow; Kai-Kit Wong, University College London; Risala Tasin Khan, Jahangirnagar University

2 Facilitated Local Context Sharing in V2X Environment with NOMA for Small Packet

Yejian Chen, Bell Labs, Nokia; Silvio Mandelli, Nokia Bell Labs; Marouan Mizmizi, Polytechnic University of Milan, Italy; Jafar Mohammadi, Bell Labs, Nokia

3 Performance Analysis of C-V2X Mode 4 Communication Introducing an Open-Source C-V2X Simulator

Fabian Eckermann, Moritz Kahlert, Christian Wietfeld, TU Dortmund University

4 A Deep Learning Based Driver Classification and Trust Computation in VANETs

Shrikant Tangade, Sunilkumar S. Manvi, REVA University

5 CCAPS: Cooperative Context Aware Privacy Scheme for VANETs

Pranav Kumar Singh, Dharmesh Chourasiya, Ayush Singh, Sunit Kumar Nandi, Sukumar Nandi, IIT Guwahati

6 Shadows Don't Lie: n-sequence Trajectory Inspection for Misbehaviour Detection and Classification in VANET

Anh Tuan Le, Carsten Maple, University of Warwick

Wednesday, 25 September 2019 16:00-17:30 Milo 1

9D: Vehicle Electronics, Batteries and Service Efficiency

Chair: Bo Chen, Michigan Technological University

1 A Control Method of Transmitter Arrays for Suppressing Magnetic Field Leakage from Wireless Power Transfer Systems

Daisuke Kobuchi, Yoshiaki Narusue, Yoshihiro Kawahara, Hiroyuki Morikawa, The University of Tokyo

2 A Study of AC Adaptor Testing Standard for Advanced Charging Interoperability in Electric Vehicle

kwangmin kim, sanggon lee, sohee lee, Korea Testing Laboratory (KTL); ju lee, hanyang university

3 Mining Vehicle Failure Consumer Reports for Enhanced Service Efficiency

Ali Khodadadi, Chen Nee Chuah, Sang Hoon Woo, University of California Davis

4 Receding Horizon Control for Mode Selection and Powertrain Control of a Multi-mode Hybrid Electric Vehicle

Huanqing Wang, Joseph Oncken, Bo Chen, Michigan Technological University

5 Temperature Distribution on Lithium-ion Polymer Battery Cell: Experiment and Modeling

Yiqun Liu, Y. Gene Liao, Ming-Chia Lai, Wayne State University

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9E: Mobility

Chair: Surya Vara Prasad, University of British Columbia

1 Throughput Aware Authentication Prioritisation for Vehicular Communication Networks

Hu Yuan, Matthew Bradbury, Carsten Maple, Chen Gu, University of Warwick

2 Analysis of LTE in Two-Path Vehicular Repeater Channels

Martin Lerch, Philipp Svoboda, Valentin Platzgummer, Markus Rupp, TU Wien

3 Benchmarking Lightweight User Mobility Predictors on Operational WLAN Data

Miriam Leopoldseder, Philipp Svoboda, Lukas Eller, Markus Rupp, Technische Universität Wien

4 Multi-Radio-Based Vehicle Pseudonym Association

Pierson Yieh, Aaron Otis, Sean Bayley, Andrew Li, Atticus Liu, Daniel Kim, Chin Chao, California Polytechnic State University; Yu Seung Kim, Ford Motor Company; Bruce DeBruhl, California Polytechnic State University

Wednesday, 25 September 2019 16:00-17:30 Milo 3

9F: Emerging Technology II

Chair: Meng-Lin Ku, National Central University

1 Decentralized Equalizer Construction for Large Intelligent Surfaces

Juan Vidal Alegria, Jesús Rodríguez Sánchez, Fredrik Rusek, Liang Liu, Ove Edfors, Lund University

2 Multi-Objective Optimization for Drone Delivery

Suttinee Sawadsitang, Dusit Niyato, Nanyang Technological University; Puay Siew Tan, Singapore Institute of Manufacturing Technology; Ping Wang, York University; Sarana Nutanong, Vidyasirimedhi Institute of Science and Technology

3 Detecting Anomalies in the Engine Coolant Sensor using One-Class Classifiers

Eronides da Silva Neto, Allan Rivalles Souza Feitosa, George Darmiton da Cunha Cavalcanti, Abel Guilhermino da Silva Filho, Universidade Federal de Pernambuco - UFPE

4 Enhanced Proof-of-Benefit: a Secure Blockchain-enabled EV Charging System

Chao Liu, Kok Keong Chai, Xiaoshuai Zhang, Yue Chen, Queen Mary University of London

5 Experimental Analysis of Pedestrians' Discomfort Zone for Personal Mobility Devices on the Footpath

Jo-Yu Kuo, Nagacharan Teja Tangirala, Jeyakaran Murugesan, Abrar Sayeed, Victoria Chua Yi Han, Justin Dauwels, Marcel Philipp Mayer, Nanyang Technological University

Wednesday, 25 September 2019 16:00-17:30 Kou

9G: Vehicular Networks II

Chair: Ang-Hsun Tsai, National Defense University

1 Interference Detection and Reporting in IEEE 802.11p Connected Vehicle Networks

David Michelson, The University of British Columbia; Hamed Noori, University of British Columbia; Quinn Ramsay, The University of British Columbia

2 Parametric Optimization Problem Formulation for Connected Hybrid Electric Vehicles using Neural Network based Equivalent Model

Wanshi Hong, Oak Ridge National Laboratory; Indrasis Chakraborty, Pacific Northwest National Lab; Hong Wang, Oak Ridge National Laboratory

3 RIoT: A Rapid Exploit Delivery Mechanism against IoT Devices Using Vehicular Botnets

Mevlut Turker Garip, Peter Reiher, Mario Gerla, University of California, Los Angeles

4 DL-CFAR: a Novel CFAR Target Detection Method Based on Deep Learning

Chia-Hung Lin, Yu-Chien Lin, National Chiao Tung University; Yui Bai, Tampere University of Technology; Wei-Ho Chung, National Tsing Hua University, Taiwan, R.O.C.; Ta-Sung Lee, National Chiao Tung University; Heikki Huttunen, Tampere University of Technology

5 Throughput Comparison for Orthogonal and Non-Orthogonal Mobile Small-Cell Networks

Ang-Hsun Tsai, National Defense University

Wednesday, 25 September 2019 16:00-17:30 Honolulu

9H: Aerial Networks

Chair: Rony Kumer Saha, KDDI Research, Inc.

1 Joint Task Allocation and Data Delivery Framework for Unmanned Aerial Vehicles in Aerial Plant Inspection

Naphat Ngoenriang, Sarana Nutanong, Vidyasirimedhi Institute of Science and Technology; Dusit Niyato, Nanyang Technological University

2 Scalable Sequence Design for UAV Cellular Networks with Down-tilted Antennas

Su Hyuk Moon, Chung-Ang University; Chang Hwan Park, LG Electronics; Yong Soo Cho, Chung-Ang University

3 The optimal distance threshold of aerial FFR systems with multiple antennas

Minyeong Kim, Seok-Ho Chang, Dankook University

4 Throughput Analysis of Incremental Redundancy Hybrid ARQ for FSO-based Satellite Systems

Hoang D. Le, University of Aizu; Vuong V. Mai, KAIST; Chuyen T. Nguyen, Hanoi University of Science and Technology; Anh T. Pham, University of Aizu

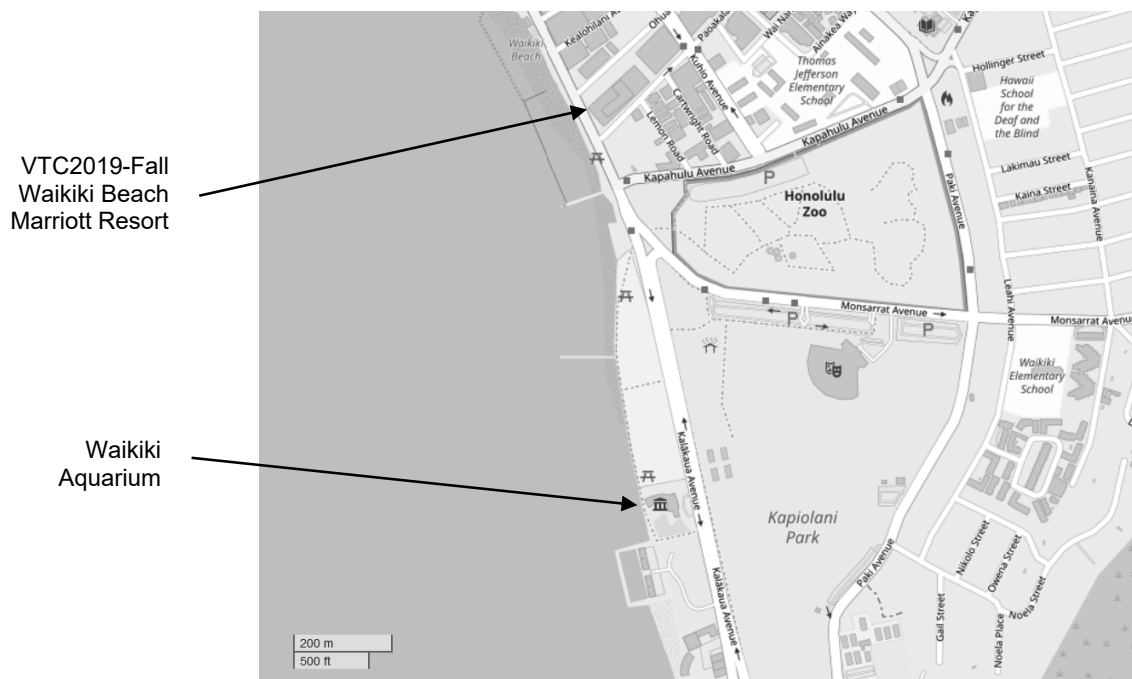
5 UAV-Based Coverage Measurement Method for 5G

Valentin Platzgummer, Vaclav Raida, Gerfried Krainz, Philipp Svoboda, Martin Lerch, Markus Rupp, TU Wien

6 Multi-band Spectrum Sharing with Indoor Small Cells in Hybrid Satellite-Mobile Systems

Rony Kumer Saha, KDDI Research, Inc.

Waikiki Aquarium



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