

# ICTC 2022

THE 13<sup>TH</sup> INTERNATIONAL CONFERENCE ON  
ICT CONVERGENCE

**"Accelerating Digital Transformation with ICT Innovation"**

**October 19-21, 2022**  
**Ramada Plaza Hotel, Jeju Island, Korea**

## Final Program

### Organized by



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### 2022 International Conference on ICT Convergence (ICTC)

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## Message from the Chairs

With great pleasure, we would like to welcome you to the 13th International Conference on Information and Communication Technology Convergence (ICTC 2022) being held in Jeju Island, Korea. ICTC 2022 is one of the major international conferences in the area of ICT convergence organized by the Korean Institute of Communications and Information Sciences (KICS) with technical co-sponsorship of IEEE Communication Society and IEICE Communications Society, and patronized by leading ICT companies, organizations, and government including Ministry of Science and ICT, ETRI, KOFST, Jeju CVB, Samsung Electronics, Ericsson-LG, FRTek, GL associates, Huawei, LG Uplus, LG Electronics and SK Telecom. ICTC 2022 features an extremely rich program with the main theme of "Accelerating Digital Transformation with ICT Innovation." The attendees will have the opportunity to associate with the world's most distinguished industry leaders, researchers, government officials, and academia professionals in the areas of next mobile networks, 5G/6G issues and challenges, AI-based technologies for networking and communications, new waves and spectrum, future ICT services and their enablers, computing-networking convergence, quantum and neural technology, and new ICT paradigms and concepts. During ICTC 2022, distinguished keynote speeches will be delivered by highly prominent experts from University of Oulu, Samsung Electronics, Auckland University of Technology (AUT), Fraunhofer Heinrich-Hertz-Institute (HHI), National Institute of Standards and Technology (NIST), and Electronics and Telecommunications Research Institute (ETRI). The industrial experts of Hanwha Systems, Xiaomi, Huawei, Ericsson, SK Telecom, and China Mobile will deliver their talks. Moreover, special experts of Pukyong National University, Inha University, Virginia Tech, Chung-Ang University, Korea Advanced Institute of Science & Technology (KAIST), Peking University, ETRI, Incheon National University, LG Uplus, Yonsei University, Deakin University, Chalmers University of Technology, Daegu Gyeongbuk Institute of Science & Technology (DGIST), University of North Carolina, University of Texas at Dallas, and University of California Merced will give talks in different sessions. In technical program, the 177 oral papers are organized into 33 technical sessions, which will be held in 7 parallel tracks. The 243 poster papers are organized into 8 poster sessions. The 194 workshop papers are organized into 22 workshop sessions. The program covers a variety of topics on recent topics in information and communication technology convergence including 5G/6G, IoT, Edge Computing, UAV, V2X, Network Security, Big Data, Cloud, Wireless Access, Theory for Networking, Virtualization, Blockchain, SDN, ICN, Emerging Technologies, and AI for Networking. We cordially invite you to join us in Jeju Island from October 19 to 21 for this great ICT event and enjoy Jeju, known as the "Island of the Gods". We especially welcome you to visit and enjoy the natural World Heritage Site Jeju Volcanic Island and Lava Tubes. We look forward to seeing you in Jeju Island and your participation in the ICTC 2022!



**Yoan Shin**  
President of KICS



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**Sungrae Cho**  
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## Program at a Glance

October 19th (Wednesday), 2022 - Main Conference + Workshop											
Time	Mara Room	Biyang Room	Udo Room	Chuja Room	Ramada Ballroom 2	Ramada Ballroom 3	Ramada Ballroom 4	Ramada Ballroom 1	Poster Session	Halla Room	Tamra Room
Floor	2F								Virtual	8F	
08:30-10:10 (100min)	<b>Session A1</b> Internet of Things  Prof. Sharifah Hafizah Syed Ariffin (Universiti Teknologi Malaysia, Malaysia)	<b>Session B1</b> 5G & 6G Wireless Systems I  Prof. Intae Hwang (Chonnam National University, Korea)	<b>Session C1</b> Blockchain  Prof. Jae-Min Lee (Kumoh National Institute of Technology, Korea)	<b>Session D1</b> Network Functions and Tasking  Prof. Sangheon Pack (Korea University, Korea)	<b>Session E1</b> Congestion Control  Prof. Woongsoo Na (Kongju National University, Korea)	<b>Session F1</b> Applications with ML I  Prof. Ronnie Concepcion II (De La Salle University, Philippines)	<b>Session G1</b> Localization  Prof. Yeunwoong Kyung (Kongju National University, Korea)	<b>SPC Special Session I</b> Urban Air Mobility Systems  Prof. Haejoon Jung (Kyung Hee University, Korea)	<b>Poster Session P1</b>  Prof. Jeongho Kwak (DGIST, Korea)		
10:10-10:30	Coffee Break										
10:30-11:30 (60min)	<b>Plenary Session I : Opening Ceremony and Keynote Speech (Ramada Ballroom1)</b> • Opening Address 1 : Prof. Yoan Shin, President of KICS • Opening Address 2 : Prof. You-Ze Cho, General Chair of APCC 2022 • Congratulatory Address 1 : Ms. Yukari Tsuji, President, IEICE Communications Society • Congratulatory Address 2 : Mr. Tong Song, Vice Secretary of CIC • Keynote Speech 1 : Prof. Matti Latva-aho, Director of 6G Flagship, University of Oulu, Finland; Global Fellow, The University of Tokyo, "6G Flagship Perspectives on the Road Ahead"								Prof. Sungrae Cho (Chung-Ang University, Korea)		
11:30-12:40	Lunch										
12:40-14:10 (90min)	<b>Session A2</b> Intelligent Reflecting Surface  Prof. Sungtek Kahng (Incheon National University, Korea)	<b>Session B2</b> Cloud  Prof. Gabriel Avelino R Sampedro (University of the Philippines, Philippines)	<b>Session C2</b> Optimization  Prof. Do-Yup Kim (Kyungnam University, Korea)	<b>Session D2</b> Image Analytics  Prof. Youn Kyu Lee (Hongik University, Korea)	<b>Session E2</b> Algorithm I  Prof. Ronnie Concepcion II (De La Salle University, Philippines)	<b>Session F2</b> Performance  Prof. Sangheon Pack (Korea University, Korea)	<b>Session GW2</b> ICTC Workshop on Quantum Internet (IWQI)  Prof. Jun Heo (Korea University, Korea)	<b>Industrial Session I</b>  Dr. Taesik Cheung (ETRI, Korea)	<b>Poster Session P2</b>  Prof. Seong Ho Jeong (Hankuk University of Foreign Studies, Korea)	<b>Tutorial I</b> Deep Learning Aided Intelligent Sensing and Identification for Secure Wireless Communications  Prof. Oh-Soon Shin (Soongsil University, Korea)	<b>Tutorial II</b> Computer Vision (CV)-aided Wireless Communication for 6G  Prof. Dong-Seong Kim (Kumho National Institute of Technology, Korea)
14:10-14:30	Coffee Break										
14:30-16:10 (100min)	<b>Session A3</b> Energy AI  Prof. Cosmas Ifeanyi Nwakama (Kumoh National Institute of Technology, Korea)	<b>Session B3</b> 5G & 6G Wireless Systems II  Prof. Intae Hwang (Chonnam National University, Korea)	<b>Session C3</b> Learning at the Edge  Prof. Wichura Winaitham (Kamphaeng Phet Rajabhat University, Thailand)	<b>Session D3</b> Mobile Applications  Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)	<b>Session E3</b> Algorithm II  Prof. Zsolt Csaba Johanyak (John von Neumann University, Kecskemet, Hungary)	<b>Session F3</b> Applications with ML II  Prof. Haeyoung Lee (University of Hertfordshire, UK)	<b>Session G3</b> Machine Learning  Prof. Nurul Huda Mahmood (University of Oulu, Finland)	<b>SPC Special Session II</b> Recent Advances in Mobile and Ubiquitous Computing  Prof. JeongGil Ko (Yonsei University, Korea)	<b>Poster Session P3</b>  Dr. Hoondong Noh (ETRI, Korea)		
16:10-16:30	Coffee Break										
16:30-17:50 (80min)	<b>Plenary Session II : Keynote Speeches (Ramada Ballroom1)</b> • Keynote Speech 2 : Dr. Sunghyun Choi, Executive Vice President, Samsung Research, Samsung Electronics, "6G towards the Next Hyper-Connected Experience for All" • Keynote Speech 3 : Prof. Adnan Al-Anbuky, Auckland University of Technology (AUT), New Zealand, "Mobility and Software Defined Wireless Sensor Network"								Prof. Dong Seog Han (Kyungpook National University, Korea)		
17:50-18:20	Coffee Break										
18:20-20:20 (120min)	<b>Banquet (Ramada Ballroom1)</b> • APCC 2022 Event · Welcome Address : Prof. Chung G. Kang, OC Chair of APCC 2022 · TPC Report : Prof. Dong Seog Han, TPC Chair of APCC 2022 • ICTC 2022 Event · Welcome Address : Dr. Seung Chan Bang, OC Chair of ICTC 2022 · TPC Report : Prof. Sungrae Cho, TPC Chair of ICTC 2022 · Awards Ceremony • Banquet Course										

## Program at a Glance

October 20th (Thursday), 2022 - Workshops												
Time	Mara Room	Biyang Room	Udo Room	Chuja Room	Ramada Ballroom 2	Ramada Ballroom 3	Ramada Ballroom 4	Ramada Ballroom 1	Poster Session	Halla Room	Tamra Room	
Floor	2F								Virtual	8F		
08:30~10:10 (100min)	<b>Session AW4</b> ICTC Workshop on Advanced Industrial Networks with beyond 5G and Intelligence Distribution (IWAIN)  Prof. Haeyoung Lee (University of Hertfordshire, UK)	<b>Session BW4</b> ICTC Workshop on 6G STAR-MAC (IWSM)  Prof. Hyunhee Park (Myongji University, Korea)	<b>Session CW4</b> The 2nd workshop on Information and Communication Strategic Technology for Industry Convergence (IWCIST)  Dr. Woo Yong Lee (ETRI, Korea)	<b>Session DW4</b> The 4th International Workshop on Intelligent Immersive Media Communications (IIMC)  Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)	<b>Session EW4</b> ICTC Workshop on Artificial Intelligence (IWA)  Prof. Hyosu Kim (Chung-Ang University, Korea)	<b>Session FW4</b> ICTC Workshop on Sub-THz/THz Communication for 6G (IWTZH)  Prof. Sang-Woon Jeon (Hanyang University, Korea)	<b>Session GW4</b> ICTC Workshop on ETRI 5G+ and 6G Technologies - Mobile Communications (IWEMC)  Dr. Ilgyu Kim (ETRI, Korea)	<b>SPC Special Session III</b> Next-Generation Communications and Services  Prof. Youn Kyu Lee (Hongik University, Korea)	<b>Poster Session P4</b>  Prof. Sang-Hyo Kim (Sungkyunkwan University, Korea)		<b>Tutorial III</b> Wireless Infrastructure of the Future: Integrated Terrestrial-HAPS-LEO Networks  Prof. Ji-Woong Choi (DGIST, Korea)	
10:10~10:30	Coffee Break											
10:30~12:10 (100min)	<b>Session AW5</b> The 4th Workshop on Advances in Convergence of ICT and Brain Science for Better Health (ACIBS)  Prof. Young-Im Cho (Gachon University, Korea)	<b>Session BW5</b> ICTC Workshop on Enabling Technologies for 6G Mobile Core (IW6GMC)  Prof. Haneul Ko (Kyung Hee University, Korea)	<b>Session CW5</b> ICTC Workshop on Technologies and Services for Private 5G/6G (IWTSP)  Prof. Valmik Tilwari (Korea University, Korea)	<b>Session DW5</b> ICTC Workshop on ETRI Everything on Media (IWEEEM)  Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)	<b>Session EW5</b> ICTC Workshop on 5G/6G Communication Network Research Center (IWCNRC)  Prof. Jeongyeup Paek (Chung-Ang University, Korea)	<b>Session FW5</b> The 4th Joint International Workshop on Military Informatics (IWMI)  Prof. Rubina Akter (Kumoh National Institute of Technology, Korea)	<b>Session GW5</b> ICTC Workshop on Satellite Information Convergence Application Service (IWSICA)  Prof. Ki Choongho (Ajou University, Korea)	<b>Industrial Session II</b>  Dr. Namseok Ko (ETRI, Korea)	<b>Poster Session P5</b>  Prof. Minseok Choi (Kyung Hee University, Korea)			
12:10~13:20	Lunch											
13:20~15:00 (100min)	<b>Session AW6</b> ICTC Workshop on Network/Service Federation for 5G and Beyond (NSF5G)  Dr. Taesang Choi (ETRI, Korea)	<b>Session BW6</b> ICTC Workshop on ETRI 5G+ & 6G Technologies - Security (IWES)  Dr. Jong-Geun Park (ETRI, Korea)	<b>Session CW6</b> ICTC Workshop on Cognition Augmented Meta-Communications (IWCAM)  Prof. Seung Jun Baek (Korea University, Korea)	<b>Session DW6</b> ICTC Workshop on ETRI 5G+ & 6G Technologies - Network Infrastructure  Dr. Tae Yeon Kim (ETRI, Korea)	<b>Session EW6</b> ICTC Workshop on Big Data (IWBD)  Prof. Sungrae Cho (Chung-Ang University, Korea)	<b>Session FW6</b> ICTC Workshop on Advanced Technologies for beyond 5G and unmanned vehicles (IWAT)  Prof. Sunwoo Kim (Hanyang University, Korea)	<b>Session GW6</b> KICS 6G Research Initiative Workshop (K6RIW)  Prof. Paulson Eberechukwu (Hanyang University, Korea)	<b>SPC Special Session IV</b> Next-Generation AI and Applications  Prof. Jihong Park (Deakin University, Australia)	<b>Poster Session P6</b>  Prof. Nhu-Ngoc Dao (Sejong University, Korea)			
15:00~15:30	Coffee Break											
15:30~17:30 (120min)	<b>Plenary Session III : Keynote Speeches (Ramada Ballroom1)</b> • Keynote Speech 4 : Dr. Thomas Haustein, Head, Wireless communications and Networks, Fraunhofer Heinrich-Hertz-Institute, "Technology Forecast into 6G – a German Research and Innovation Perspective" • Keynote Speech 5 : Dr. Abdella Battou, Division Chief, NIST, "Quantum Optical Networking – Architecture Ideas for Integrating Classical and Quantum" • Keynote Speech 6 : Ms. Sunme Kim, Assistant Vice President, ETRI, "Toward Service-Native Networking"										Prof. Haneul Ko (Kyung Hee University, Korea)	



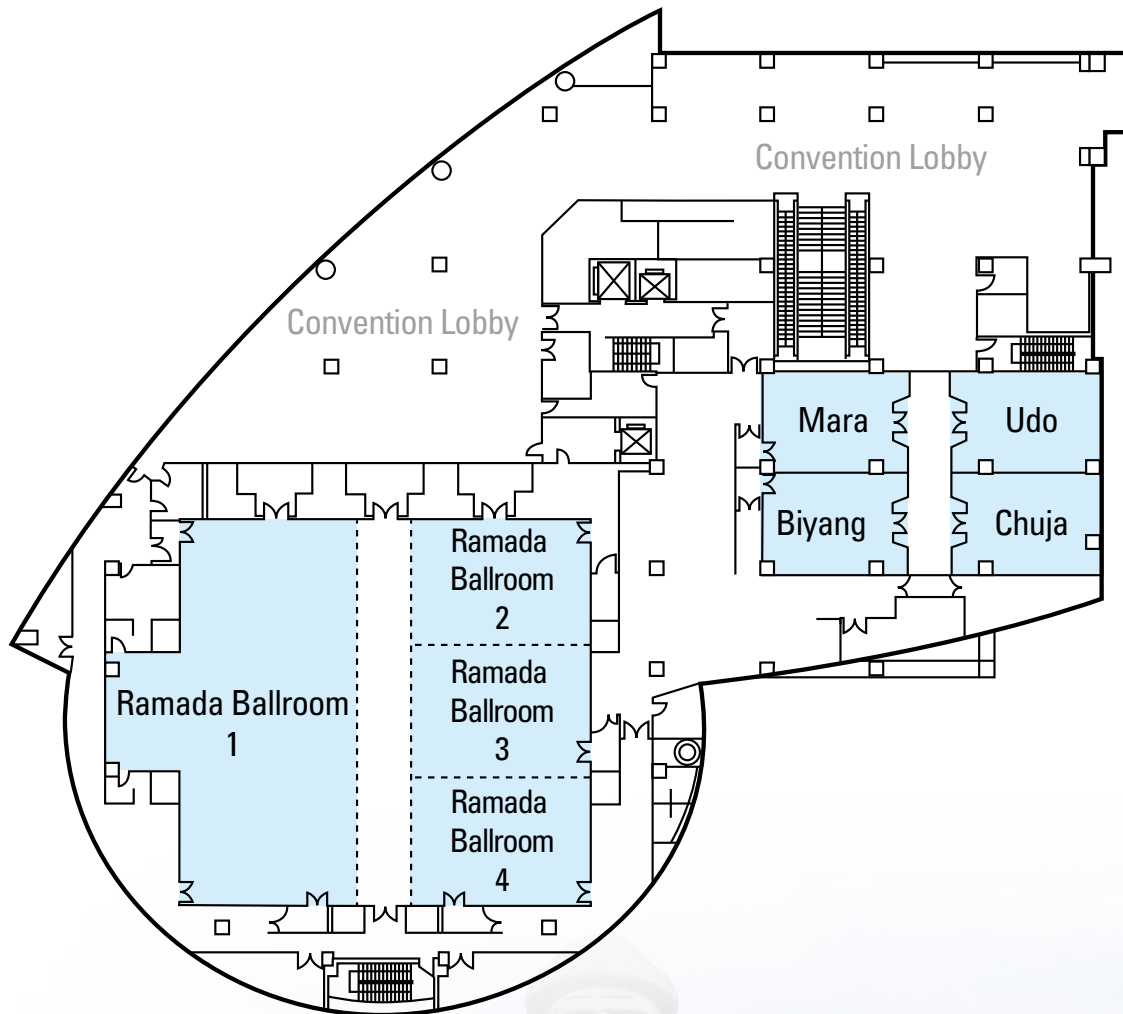
## Program at a Glance

October 21st (Friday), 2022 - Main Conference											
Time	Mara Room	Biyang Room	Udo Room	Chuja Room	Ramada Ballroom 2	Ramada Ballroom 3	Ramada Ballroom 4	Ramada Ballroom 1	Poster Session	Halla Room	Tamra Room
Floor	2F								Virtual	8F	
08:30~10:10 (100min)	<b>Session A7</b> Unmanned Aerial Vehicles Prof. Noor Gul (Tech University of Korea, Korea)	<b>Session B7</b> MIMO Prof. Seok-Hwan Park (Jeonbuk National University, Korea)	<b>Session C7</b> Security I Prof. Dongwan Shin (New Mexico Tech, USA)	<b>Session D7</b> Human Sensing I Prof. Ananta Sinchai (King Mongkut's Institute of Technology Ladkrabang, Thailand)	<b>Session E7</b> Non-Terrestrial Networks Dr. Seung-Que Lee (ETRI, Korea)	<b>Session F7</b> Applications with ML III Prof. Youn-Hee Han (Korea University of Technology and Education, Korea)	<b>Session G7</b> Multiple Access Prof. Soo Young Shin (Kumoh National Institute of Technology, Korea)	<b>SPC Special Session V</b> AI-Driven Digital Transformation Prof. Seulki Lee (UNIST, Korea)	Poster Session P7 Prof. Dongwan Kim (Dong-A University, Korea)	<b>Tutorial IV : SCSS</b> OTFS and Delay-Doppler Communications Dr. Pansoo Kim (ETRI, Korea)	
10:10~10:30	Coffee Break										
10:30~12:10 (90min)	<b>Session A8</b> Vehicular Networks Prof. Noor Gul (Tech University of Korea, Korea)	<b>Session B8</b> Distributed ML Prof. Ajit Kumar (Soongsil University, Korea)	<b>Session C8</b> Security II Prof. Orland Delfino Tubola (Polytechnic University of the Philippines, Philippines)	<b>Session D8</b> Human Sensing II Prof. Cosmas Ifeanyi Nwakanma (Kumoh National Institute of Technology, Korea)	<b>Session E8</b> Cellular Networks Prof. Muhammad Sajjad Khan (International Islamic University, Pakistan)	<b>Session F8</b> Applications of Convergence Technology Prof. Young-Woo Kwon (Kyungpook National University, Korea)		<b>SPC Special Session VI</b> Emerging Systems and Security Prof. Jun Han (Yonsei University, Korea)	<b>Session RR1</b> Prof. Soyi Jung (Ajou University, Korea)		

## Session Room Locations

### Ramada Plaza Hotel

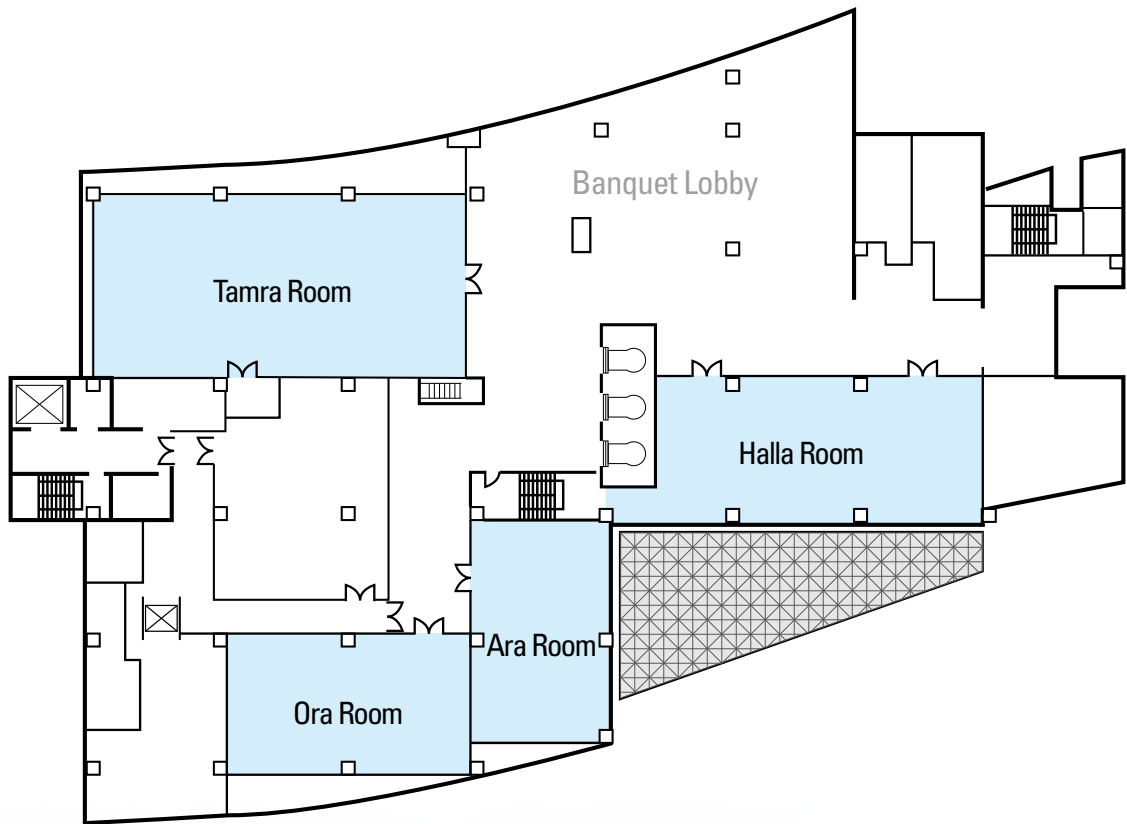
#### 2nd Floor



## Session Room Locations

### Ramada Plaza Hotel

#### 8th Floor





## Plenary Sessions

**October 19th (Wednesday), 2022**

### Plenary Session I : Opening Ceremony and Keynote Speech

10:30-11:30 | Ramada Ballroom 1

Chair : Prof. Sungrae Cho (Chung-Ang University, Korea)

Time	Title	Invited Speakers
10:30-11:30	6G Flagship Perspectives on the Road Ahead	Prof. Matti Latva-aho Director of 6G Flagship, University of Oulu, Finland; Global Fellow, The University of Tokyo

### Keynote Speech 1 : 6G Flagship Perspectives on the Road Ahead

Prof. Matti Latva-aho, Director of 6G Flagship, University of Oulu, Finland; Global Fellow, The University of Tokyo

#### Abstract:

The second phase of 6G Flagship started at the beginning of May. The next four years will be the most intensive in 6G research. At the time of ending the programme in mid-2026, 6G standardization can be expected to be progressing at full speed. Until then, we need to investigate all possible alternatives making 6G possible. Although it isn't clear at all yet what will eventually make 6G a reality, the global research community has made significant steps forward since we started in 2018. Our seminal work on identifying key research challenges and directions in the 6G White Papers series is still valid. More open questions still remain rather than mature answers. In this talk, the key visions of 6G Flagship will be highlighted as well as the research directions chosen for the next four years.



#### Biography:

Matti Latva-aho received the M.Sc., Lic.Tech. and Dr. Tech (Hons.) degrees in Electrical Engineering from the University of Oulu, Finland in 1992, 1996 and 1998, respectively. From 1992 to 1993, he was a Research Engineer at Nokia Mobile Phones, Oulu, Finland after which he joined Centre for Wireless Communications (CWC) at the University of Oulu. Prof. Latva-aho was Director of CWC during the years 1998-2006 and Head of Department for Communication Engineering until August 2014. Currently he is professor at the University of Oulu on wireless communications and Director for National 6G Flagship Programme. He is also a Global Fellow with Tokyo University. His research interests are related to mobile broadband communication systems and currently his group focuses on 6G systems research. Prof. Latva-aho has published over 500 conference or journal papers in the field of wireless communications. He received Nokia Foundation Award in 2015 for his achievements in mobile communications research.

## Plenary Sessions

**October 19th (Wednesday), 2022**

### Plenary Session II : Keynote Speeches

16:30-17:50 | Ramada Ballroom 1

Chair : Prof. Dong Seog Han (Kyungpook National University, Korea)

Time	Title	Invited Speakers
16:30-17:50	6G towards the Next Hyper-Connected Experience for All	Dr. Sunghyun Choi Executive Vice President, Samsung Research, Samsung Electronics
	Mobility and Software Defined Wireless Sensor Network	Prof. Adnan Al-Anbuky Auckland University of Technology (AUT), New Zealand

### Keynote Speech 2 : 6G towards the Next Hyper-Connected Experience for All

Dr. Sunghyun Choi, Executive Vice President, Samsung Research, Samsung Electronics

#### Abstract:

Since the first commercial launch in 2019, 5G has grown to be the core infrastructure for a wide range of industries. It is used to support everything from high-quality communication to smart factories, vehicle-to-vehicle communication, and a whole raft of other new services.

Future communication networks will require not only more powerful network equipment with vast amounts of information processing but also softwarization of communication technologies to make equipment flexible with lower costs.

To overcome current technical challenges, strengthening the function of software and developing AI will be a top priority, and furthermore research activities are essential to build 6G, the next-generation communication system, in both academia and industry.

In this talk, I will discuss various aspects such as megatrends, services, requirements, candidate technologies towards 6G as a next-generation co-communication system along with the current developments status within Samsung.



#### Biography:

Sunghyun Choi is an Executive Vice President and Head of the Advanced Communications Research Center at Samsung Research, Samsung Electronics, Seoul, Korea.

He was a professor at the Department of Electrical and Computer Engineering, Seoul National University (SNU), Seoul, Korea from Sept. 2002 to Aug. 2019, and served as a Vice Dean for Academic Affairs, College of Engineering during the last two years at SNU.

He received his B.S. (summa cum laude) and M.S. degrees in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST) in 1992 and 1994, respectively, and received Ph.D. at the

Department of Electrical Engineering and Computer Science, The University of Michigan, Ann Arbor in 1999. He is currently heading researches and standardization for 6G, 5G-Advanced, and IoT connectivity at Samsung Research.

He co-authored over 250 technical papers and held over 160 patents, and numerous patents pending. He has served as a Program Committee Co-Chair of IEEE WCNC 2020, IEEE DySPAN 2018, ACM Multimedia 2007, and IEEE WoWMoM 2007. He has served as an editor of numerous publications including IEEE Transactions on Wireless Communications, IEEE Transactions on Mobile Computing, and IEEE Wireless Communications Magazine. He was named IEEE fellow in 2014.

## Plenary Sessions

### Keynote Speech 3 : Mobility and Software Defined Wireless Sensor Network

Prof. Adnan Al-Anbuky, Auckland University of Technology (AUT), New Zealand

#### Abstract:

The progress made within the technologies around wireless sensor Networks (WSN) and IoT has extended the offerings and capabilities of stationary and mobile WSN. Areas of network softwarization, dynamic reorchestration, virtualization & digital twins, delay tolerance, and opportunistic connectivity, to name few, have made their way towards WSN, IoT, IIoT and cyber physical systems. In effect the harmonic interaction between the dynamics of the physical environment and that of WSN has become more realisable. The main challenges remain are the intelligent utilization of these backup technologies, the reaction-time constrains when it comes to interaction with the processes that experience rapid or critical dynamics such as vehicular or tactile networks, and fluidity of data flow when it comes to network connectivity or possible rupture in network organization. Development of intelligence around the manoeuvres in utilizing the available resources significantly help in easing out the challenges. This talk will discuss life examples extracted from AUT SeNSE lab on software defined wireless and mobile sensor network organizations and possible scenarios for smart mitigating of the challenges. Number of use cases such as vehicular networks, UAV-based data collection, and Precision-health related to human movement tracking are discussed. Smart and timely interaction with the physical environment together with software definition should facilitate the fluency in network topological re-orchestration and hence smooth the path towards the data flow.



#### Biography:

Dr Adnan Al-Anbuky holds a PhD degree from the University of Manchester/UK and is currently a full Professor at Auckland University of Technology (AUT) New Zealand. Adnan has assumed various academic and administrative roles at AUT, University of Canterbury, Yarmouk University, and Baghdad University of Technology. He also spent significant time with Industry for taking the research outcome into commercialization. The latter is manifested through his work with SWICHTEC NZ, Plant and Food, SCION and others. Adnan is a member of the editorial board of number of international journals and scientific groups. He is actively contributing to the organization and operation of numerous local and international events and conferences like APCC, ATNAC, ITNAC, and PICOM. He has delivered number of keynote-talks and has numerous conference and journal peer reviewed publications. He has examined a good number of PhD theses. He has been invited as a visiting professor for number of international research institutes and universities. He has also been consulted as a reviewer for number of international funding bodies like New Zealand MBIE, Netherland NOW, Korean Scientific funding authority and Austria FWF.



## Plenary Sessions

**October 20th (Thursday), 2022**

### Plenary Session III : Keynote Speeches

15:30-17:30 | Ramada Ballroom 1

Chair : Prof. Haneul Ko (Kyung Hee University, Korea)

Time	Title	Invited Speakers
15:30-17:30	Technology Forecast into 6G – a German Research and Innovation Perspective	Dr. Thomas Haustein Head, Wireless communications and Networks, Fraunhofer Heinrich-Hertz-Institute
	Quantum Optical Networking – Architecture Ideas for Integrating Classical and Quantum	Dr. Abdella Battou Division Chief, NIST
	Toward Service-Native Networking	Ms. Sunme Kim Assistant Vice President, ETRI

### Keynote Speech 4 : Technology forecast into 6G – a German Research and Innovation Perspective

Dr. Thomas Haustein, Head, Wireless Communications and Networks Department, Fraunhofer HHI

#### Abstract:

5G is currently deployed and optimized from coverage to performance and first experiences in new vertical sectors are emerging. In that context the global effort in R&D and standardization has taken up 6G as the next generation to be envisioned and shaped. Therefore, a multitude of 6G programs and projects has been kicked off world-wide to actively focus on the societal, economic, environmental, and technological needs for 6G. The talk will provide a snapshot about selected 6G research activities in Germany.



#### Biography:

Thomas Haustein received the Dr.-Ing. (Ph.D.) degree in mobile communications from the University of Technology Berlin, Germany, in 2006. In 1997, he was with the Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute (HHI), Berlin, where he worked on wireless infrared systems and radio communications with multiple antennas and OFDM. He focused on real-time algorithms for baseband processing and advanced multiuser resource allocation. From 2006 till 2008, he was with Nokia Siemens Networks, where he conducted research for 4G. Since 2009 he is heading the Wireless Communications Department at Fraunhofer HHI focussing on 5G and Industrial Wireless. Since 2015 he is actively participating in 3GPP standardization advocating technology contributions for full duplex, millimeter wave communication and new use cases like Vehicular Communications and Industry 4.0. He has published more than 50 papers in scientific journals and conferences and holds more than 100 patents.

## Plenary Sessions

### Keynote Speech 5 : Quantum Optical Networking – Architecture Ideas for Integrating Classical and Quantum

Dr. Abdella Battou, Division Chief, NIST

#### Abstract:

The talk will review optical node architectures currently in use in transport networks and propose ways to integrate quantum capabilities. It will also describe some of the work in control, management, and measurement plane work currently underway at NIST.



#### Biography:

Abdella Battou is the Division Chief of the Smart Connected Systems Division, within The Communication Technology Lab at NIST. He also leads the Cloud Computing Program.

From 2012 to 2021 he served as the Division Chief of the Advanced Network Technologies Division with the Information Technology Lab.

From 2009 to 2012, before joining NIST in December 2012, Abdella served as the Executive Director of The Mid-Atlantic Crossroads (MAX) GigaPop founded by The University Of Maryland, The George Washington University, The Georgetown University and The Virginia Polytechnic Institute.

From 2000 to 2009, he was Chief Technology Officer, and Vice President of Research and Development for Lambda Optical Systems, where he was responsible for overseeing the company's system architectures, hardware design and software development teams.

Additionally, he served as senior research scientist for the Naval Research Laboratory's high speed networking group, Center for Computational Sciences from 1992 to 2000.

Dr. Battou holds a PhD and MSEE in Electrical Engineering, and MA in Mathematics all from the Catholic University of America.

### Keynote Speech 6 : Toward Service-Native Networking

Ms. Sunme Kim, Assistant Vice President, ETRI

#### Abstract:

The network architecture is becoming completely dualized into a high-speed, low-latency physical delivery layer based on openness/standardization and a flexible software control and management layer in cloud-native environment. The delivery layer is developing into a network with optical-based ultra-fast/large capacity, packet-based low latency, and programmability, and cloud native control and management software is being microservices and distributed optimally, and is developing in the direction of full automation through cooperation between multi-layer artificial intelligence technologies.

Just as the history of communication has upgraded the level of services step by step with the advent of TDX, mobile communication, and smartphones, it seems that the time for another stage of upgrade has arrived.

It is predicted that the level of communication service in our daily lives will be upgraded by enabling the development and rapid universalization of new digital services in the future virtual-reality convergence by providing service-native full-stack networking.



#### Biography:

Sunme Kim is the Assistant Vice President and a principal researcher of Electronics and Telecommunication Research Institute (ETRI) for 21 years. She received the M.S. degree at Pohang University of Science and Technology, Department of Computer Science, in 1993. Her research focuses on network architecture, network protocols, network software and systems.

## Industrial Sessions

**October 19th (Wednesday), 2022**

### Industrial Session I

12:40-14:10 | Ramada Ballroom 1

Chair : Dr. Taesik Cheung (ETRI, Korea)

Time	Title	Invited Speakers
12:40-14:10	Preparation for LEO (Low-Earth Orbit) Satellite Networks	Dr. Yeo-Sun Yoon Director/V.P., Hanwha Systems
	Ranging Based Services and Sidelink Positioning - Enlighten Your Life	Ms. Sherry Shen Senior Standards Director, Xiaomi
	ACTN for Optical Networks Automation	Mr. Italo Busi Principal Optical Transport Network Research Engineer, Huawei Italy

#### Invited Talk 1 : Preparation for LEO (Low-Earth Orbit) Satellite Networks

Dr. Yeo-Sun Yoon, Director/V.P., Hanwha Systems

##### Abstract:

These days, space is considered as the last field to explore. Since the success of Space X, aerospace industry changes its paradigm to 'new space' from 'old space' where the government led and controlled everything related to the space. In the center of this paradigm, LEO satellites play very important roles. While recent advanced technologies make LEO satellite network possible both practically and financially, many private companies are working toward this 'new space.' In this talk, the effort and preparation for LEO satellites of Hanwha group and Korean companies will be introduced



##### Biography:

Dr. Yoon is a director of the fundamental technology R&D center at Hanwha Systems Company (HSC) which is one of the major defense companies in Korea. Before he became the director, he was a head of radar SW team and led many frontier development programs including an UWB radar, a MIMO radar, and an adaptive beamformer. He is now working on many new technologies from AI for a night vision to new heat transfers for next-generation radars. Prior to join HSC, he received his PhD degree at Georgia Tech, MS degree at Univ. of Michigan, and BS degree at Yonsei University, Korea, all in ECE.

#### Invited Talk 2 : Ranging Based Services and Sidelink Positioning - Enlighten Your Life

Ms. Sherry Shen, Senior Standards Director, Xiaomi

##### Abstract:

Ranging refers to the determination of the distance between two UEs or more UEs and/or the direction and/or relative positioning of one UE from another UE via direct communication. Sidelink Positioning is to position a UE using PC5 direct communication. Ranging based services and Sidelink Positioning technology can be used in a variety of verticals, such as smart home, smart city, smart transportation, smart retail, industry 4.0, V2X and public safety services for in-coverage, partial coverage and out of coverage use cases.

3GPP (3rd Generation Partnership Project), a standard organization for developing cellular telecommunication specifications, has identified the above use cases and the technical requirements, and has established several Release 18 study items on Ranging and Sidelink positioning to specify the radio enhancements, 5GC architectural enhancements and security impacts, which are parts of 5G-Advanced features.



## Industrial Sessions



### Biography:

Sherry Shen has about 20 years of telecommunication standardization experience in 3GPP, ITU-T, IETF, GSMA, CCSA, etc., as the delegate representing the employer company (15 years for Nokia and 2 years for Xiaomi). Her rich work experiences in the telecom operator, network equipment vendor and mobile device/IoT/vehicle vendor endow her a broad view of cutting-the-edge technologies in the telecom industry. She has contributed to the 3GPP 5GC work since the beginning of the 5G study, and she is now the rapporteur of FS\_Ranging\_SL in 3GPP SA2 Working Group.

### Invited Talk 3 : ACTN for Optical Networks Automation

Mr. Italo Busi, Principal Optical Transport Network Research Engineer, Huawei Italy

### Abstract:

The presentation provides a short introduction to the Abstraction and Control of TE Networks (ACTN), being standardized in IETF, in the context of optical networks and some highlights on potential future topics related to network automation.



### Biography:

Italo Busi is currently a Principal Optical Transport Network Research Engineer at Huawei Milan Research Institute in Milan, Italy.

He joined Huawei in 2014 and he is mainly working on Abstraction and Control of TE Networks (ACTN) standardization in IETF and in particular on YANG models for optical networks control. He is also working on the standardization of information models and YANG data models in ITU-T SG15 for optical device management.

He worked previously in Alcatel-Lucent (1998-2014) as a System Engineer and CTO group member, focusing on packet (ATM, IP, MPLS-TP and Carrier Ethernet) implementations on MS-SDH and PTN platforms. He received M.S. degree in Telecommunication Engineering from Politecnico di Milano in June 1997.

## Industrial Sessions

October 20th (Thursday), 2022

### Industrial Session II

10:30-12:10 | Ramada Ballroom 1

Chair : Dr. Namseok Ko (ETRI, Korea)

Time	Title	Invited Speakers
10:30-12:10	Model Equivalence and Impact on Interoperability	Mr. Scott Mansfield Standards Researcher, Ericsson
	Current Status and Plan for SK Telecom's Network Transformation	Mr. Jong-Yoon Shin Team Leader, SK Telecom
	Development of Fine Bandwidth Granularity Transport Technology for 5G and Other Slicing Applications	Dr. Han Li Chief Expert, Director of Department of Basic Network Technology, China Mobile Research Institute

#### Invited Talk 4 : Model Equivalence and Impact on Interoperability

Mr. Scott Mansfield, Standards Researcher, Ericsson

##### Abstract:

Modeling is the backbone of interoperable systems. There is a common misconception that all modeling is created equal. This presentation covers the important differences between Information and Data Modeling, how not all modeling protocols and languages are the same, and how even when using the same modeling protocols and languages there are issues with system integrity and cross standards development organization (SDO) interoperability.



##### Biography:

Scott Mansfield is a Standard Researcher at Ericsson focusing on wireline network standardization. Scott is Vice-Chairman of ITU-T Study Group 13 and the Chairman of the Joint Coordination Activity on IMT-2020 (JCA-ITM2020). Scott is the Associate Rapporteur of Question 14 in ITU-T Study Group 15 and the editor of the protocol neutral network management modeling recommendations for Ethernet, MPLS-TP, and OTN. Scott is active in IETF serving as the IETF - ITU-T liaison coordinator. Scott is a MEF Distinguished Fellow and serves as the chair of the YANGsters group in the IEEE 802.1 Working Group.

#### Invited Talk 5 : Current Status and Plan for SK Telecom's Network Transformation

Mr. Jong-Yoon Shin, Team Leader, SK Telecom

##### Abstract:

This presentation introduce two representatives development and commercialization cases of SK Telecom's 5G transmission network transformation and present future plans. The first is the transformation of the 5G fronthaul network to an all-optical network as one of the network infrastructure transformations. The other is digital network transformation for 5G transport network automation. And it suggests the future direction of transport network for B5G/6G.



##### Biography:

Jongyoon Shin joined SK Telecom in February 2012 and is currently responsible for the design, development and deployment of next-generation transport network and Wi-Fi network technologies for B5G/6G transport network of SK Telecom and wired core network of SK Broadband, including Carrier Software-defined networking for wired and wireless networks. His current interests include intelligent network automation, integrated wired and wireless network management, big data analytics, microservice architecture, and modernized network environment. He has also participated in global standardization activities through

## Industrial Sessions

ITU, IETF, ETSI, and IOWN Global Forum. Prior to joining SK Telecom, he worked at ETRI (Electronics Telecommunications and Research Institute) as a Senior Researcher for 10 years of experiences designing, developing and networking embedded systems and communication systems. He received the B.S. and M.S. degrees in electrical engineering from Seoul National University, Seoul, Korea, in 2000 and 2002, respectively. He also has a Master of ITMS (IT Media & Strategy) from Yonsei University in 2020.

### Invited Talk 6 : Development of Fine Bandwidth Granularity Transport Technology for 5G and other Slicing Applications

Dr. Han Li, Chief Expert, Director of Department of Basic Network Technology, China Mobile Research Institute

#### Abstract:

With the continuous development of 5G network and other dedicated network applications, the multi vertical industries and customers requires to be sliced using fine bandwidth granularity hard pipes. The slice bandwidth of traditional MTN and OTN technologies was greater than 1Gbps. Therefore, the technology evolution for fine granularity slicing has recently become a hotspot. The ITU-T standard organization is also carrying out corresponding study. This report will introduce the application demand, design concept, key technology direction and standardization of fine granularity MTN and OTN.



#### Biography:

Dr. Han Li is the Chief Expert of CMCC, and has a long career in optical communication strategy, standardization and R&D, involving various fields of SPN, 5G front-haul, 100G/400G, OTN, GPON and time synchronization. Dr. Li is also the leading talent of National High Level Talents Special Support Program, the leading talent of Middle-young Age Technology Innovation program, deputy director of CCSA transmission group, and editor of ITU-T and IETF standards.



## SPC Special Sessions

**October 19th (Wednesday), 2022**

### SPC Special Session I : Urban Air Mobility Systems

08:30-10:10 | Ramada Ballroom 1

Chair : Prof. Haejoon Jung (Kyung Hee University, Korea)

Time	Title	Invited Speakers
08:30-10:10	Decentralized Computation Offloading with Cooperative UAVs: Multi-Agent Deep Reinforcement Learning Perspective	Prof. Hoon Lee Assistant Professor, Pukyong National University
	Ultimate Mobility, UAM	Prof. KyungHi Chang Professor, Inha University
	Learning and Communications for Urban Air Mobility (UAM)	Prof. Walid Saad Professor, Virginia Tech

#### Decentralized Computation Offloading with Cooperative UAVs: Multi-Agent Deep Reinforcement Learning Perspective

Prof. Hoon Lee, Assistant Professor, Pukyong National University

##### Abstract:

Limited computing resources of IoT devices incur prohibitive latency in processing input data. This triggers new research opportunities toward task offloading systems. Deploying computing servers at existing base stations may not be sufficient. This requests mobile edge servers mounted on unmanned aerial vehicles (UAVs) that provide on-demand mobile edge computing (MEC) services. This talk presents an overview of recent deep reinforcement learning (DRL) approaches, in particular, a multi-agent DRL method where multiple intelligent UAVs cooperatively determine their computations and communication policies. Technical challenges and research opportunities in developing multi-UAV MEC networks are discussed.



##### Biography:

Hoon Lee received the B.S. and Ph.D. degrees from Korea University, Seoul, Korea, in 2012 and 2017, respectively. Since 2019, he has been with the Department of Information and Communications Engineering, Pukyong National University, Busan, Korea. His research interests include machine learning, signal processing, and optimization for wireless communications.

#### Ultimate Mobility, UAM

Prof. KyungHi Chang, Professor, Inha University

##### Abstract:

Speech covers general aspects of UAM Service, Market, Ecosystem, and Experimental Demonstrations. R&D results on VSLAM-based UAV Trajectory Planning using Reinforced Swarm Intelligence are also presented.



##### Biography:

KYUNGHI CHANG (SM'98) received the B.S. and M.S. degrees in electronics engineering from Yonsei University, Seoul, South Korea, in 1985 and 1987, respectively, and the Ph.D. degree in electrical engineering from Texas A&M University, College Station, TX, USA, in 1992. From 1989 to 1990, he was with the Samsung Advanced Institute of Technology (SAIT), and from 1992 to 2003, he was with the Electronics and Telecommunications Research Institute (ETRI). He is currently with the Electrical and Computer Engineering Department, Inha University. His research interests include radio transmission technology in 3GPP LTE &

## SPC Special Sessions

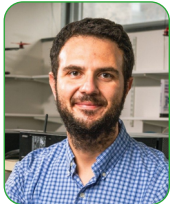
5G NR systems, public safety and mobile ad-hoc networks (especially for UAV), cellular-V2X technology, NTN(Non-Terrestrial Network) & network intelligence for 6G, and applications of AI technologies. He was a recipient of the Haedong Academic Awards, in 2010, MSIT Minister's Commendation and KICS Fellow in 2020, and Presidential Commendation, in 2021. He is currently a Chairman of 5G Forum, Executive Committee, and Chairman of Technology Committee for National Integrated Public Network. He has served as a Vice President at the KICS from 2017 to 2018, and from 2021. He has also served as an Editor of ITU-R TG8/1 IMT.MOD.

### Learning and Communications for Urban Air Mobility (UAM)

Prof. Walid Saad, Professor, Virginia Tech

#### Abstract:

To meet the growing mobility needs in intra-city transportation, the concept of urban air mobility (UAM) has been proposed in which vertical takeoff and landing (VTOL) aircraft are used to provide a ride-hailing service. UAMs are expected to revolutionize the transportation industry by providing new aerial mobility options that can change the way in which we travel. However, the effective deployment of UAMs is contingent upon the presence of a reliable wireless and machine learning infrastructure that can enable UAM aircraft to communicate and navigate autonomously in dynamic environments. In this talk, we first present a rigorous performance analysis on the connectivity requirements for UAM systems. Then, leveraging these connectivity results, we propose a novel wireless-enabled asynchronous federated learning (AFL) framework that uses a Fourier neural network to tackle the challenging problem of turbulence prediction during UAM operations. We then show various properties of this framework, and we discuss key results related to learning and communications with UAM. We conclude the talk with some open problems in this field as well as in other related non-terrestrial network research areas.



#### Biography:

Walid Saad (S'07, M'10, SM'15, F'19) received his Ph.D degree from the University of Oslo in 2010. Currently, he is a Professor at the Department of Electrical and Computer Engineering at Virginia Tech where he leads the Network sciEnce, Wireless, and Security (NEWS) laboratory. His research interests include wireless networks (5G/6G/beyond), machine learning, game theory, cybersecurity, unmanned aerial vehicles, semantic communications, and cyber-physical systems. Dr. Saad was the author/co-author of eleven conference best paper awards and of the 2015 and 2022 IEEE ComSoc Fred W. Ellersick Prize. He was a co-author of the 2019 IEEE Communications Society Young Author Best Paper and of the 2021 IEEE

Communications Society Young Author Best Paper. He is a Fellow of the IEEE. He currently serves as an editor for several major IEEE Transactions. He is an Area Editor for the IEEE Transactions on Network Science and Engineering, and the Editor-in-Chief for the IEEE Transactions on Machine Learning in Communications and Networks.

## SPC Special Sessions

**October 19th (Wednesday), 2022**

### SPC Special Session II : Recent Advances in Mobile and Ubiquitous Computing

14:30-16:10 | Ramada Ballroom 1

Chair : Prof. JeongGil Ko (Yonsei University, Korea)

Time	Title	Invited Speakers
14:30-16:10	Listening to Sounds to Introduce a New Class of Smart Mobile Applications	Prof. Hyosu Kim Assistant Professor, Chung-Ang University
	mmWave Backscatter for Millions of Concurrent IoT	Prof. Song Min Kim Associate Professor, KAIST
	Cross-layer Multipath Networking for High-speed Railway	Prof. Chenren Xu Associate Professor, Peking University

#### Listening to Sounds to Introduce a New Class of Smart Mobile Applications

Prof. Hyosu, Kim, Assistant Professor, Chung-Ang University

##### Abstract:

In our daily lives, various kinds of sounds are produced from people themselves, computing devices, and surroundings. These sounds have plenty of information including when, where and what happened and eventually lead to the emergence of a new class of smart mobile applications. Two interesting examples are introduced through this talk. One is to turn any surface into a touch interface by listening to sounds. When a user taps a surface, an impact sound, called a touchsound, is produced. We can capture it using the built-in microphones of mobile devices and pinpoint the tapping location by analyzing the propagation pattern of the touchsound. Another work is to leverage sounds as a side channel for mobile payment services. When using magnetic induction-based communication technologies, such as NFC (Near-Field Communication) and MST (Magnetic Secure Transmission), some parts of smartphones are slightly deformed and emit sounds. We reveal that these sounds contain sensitive information and can introduce a new security threat for mobile device users.



##### Biography:

Hyosu Kim received his B.S. degree in Department of Computer Engineering from Sungkyunkwan University in 2010. He then received his M.S. and Ph.D. degrees in School of Computing from Korean Advanced Institute of Science and Technology (KAIST), Republic of Korea in 2012 and 2018, respectively. He is currently an assistant professor at Chung-Ang University, School of Computer Science and Engineering, Seoul, South Korea. His research interests include IoT, cyber-physical systems, mobile and ubiquitous systems, and privacy.



## SPC Special Sessions

### mmWave Backscatter for Millions of Concurrent IoT

Prof. Song Min Kim, Associate Professor, KAIST

#### Abstract:

Massive connectivity is a key to the success of the Internet of Things. While mmWave backscatter has great potential, substantial signal attenuation and overwhelming ambient reflections impose significant challenges. We present OmniScatter, a practical mmWave backscatter with an extreme sensitivity of -115 dBm and scalability up to millions of concurrent tags. At the heart of OmniScatter is the new High Definition FMCW (HD-FMCW), which interplays with the tag (FSK) signal to disentangle the ambient reflections from the tag signal in the frequency domain. This essentially offers immunity to ambient reflections and improves the SNR by over five orders of magnitude! OmniScatter offers coordination-free Frequency Division Multiple Access (FDMA) that scales to millions of concurrent tags without coordination, paving a pathway towards the vision of massive IoT.



#### Biography:

Song Min Kim is currently an associate professor in the School of Electrical Engineering at KAIST, Korea. Previously, he was with the Department of Computer Science at George Mason University, USA. He received his Ph.D. from the University of Minnesota in 2016 and M.E./B.E. degrees from Korea University in 2009/2007. His research interests include wireless networking and communication, mobile and embedded systems, and the Internet of Things. He currently serves on the editorial board of IEEE/ACM Transactions on Networking. He has received the best paper awards in ACM MobiSys and IEEE ICDCS.

### Cross-layer Multipath Networking for High-speed Railway

Prof. Chenren Xu, Associate Professor, Peking University

#### Abstract:

Modern high-speed railway (HSR) systems offer a speed of more than 250 km/h, making on-board Internet access through track-side cellular base stations extremely challenging. We conduct extensive measurements on commercial HSR trains, and collect a massive 1.79 TB GPS-labeled TCP-LTE dataset covering a total travel distance of 28,800 km. Leveraging the new insights from the measurement, we design, implement, and evaluate POLYCORN, a first-of-its-kind networking system that can significantly boost Internet performance for HSR passengers. The core design of POLYCORN consists of a suite of novel multipath scheduling algorithms that intelligently determine what, when, and how to schedule user traffic over multiple highly fluctuating cellular links between HSR and track-side base stations. POLYCORN is specially designed for HSR environments through a cross-layer and proactive approach. We deploy POLYCORN on the operational LTE gateway of the popular Beijing-Shanghai HSR route at 300 km/h. Real-world experiments demonstrate that POLYCORN outperforms state-of-the-art multipath schedulers by 31% to 242% in goodput, and reduces the delivery time by 45% for instant messaging applications.



#### Biography:

Prof. Chenren Xu (<http://ceca.pku.edu.cn/chenren>) is a Boya Young Fellow Associate Professor (with early tenure) in the School of Computer Science at Peking University (PKU) where he directs Software-hardware Orchestrated ARchitecture (SOAR) Lab. His research interests span wireless, networking and system, with a current focus on backscatter communication for low power IoT connectivity, future mobile Internet for high mobility data networking, and collaborative edge intelligence system for mobile and IoT computing. He earned his Ph.D. from WINLAB, Rutgers University, and worked as postdoctoral fellow in Carnegie Mellon University and visiting scholars in AT&T Shannon Labs and Microsoft Research. He is the General Secretary of ACM SIGBED China, Executive Committee of ACM SIGMOBILE and ACM SIGBED, Associate Editor of ACM IMWUT and Communications of the CCF. He published papers and has been serving as organization committee and/or TPC in top venues including ACM SIGCOMM, MobiCom, SenSys, UbiComp, and IEEE INFOCOM. He is a recipient of NSFC Excellent Young Scientists Fund (2020), Alibaba DAMO Academy Young Fellow (2018), ACM SIGCOMM China Rising Star (2020), CCF-Intel Young Faculty (2017) and CIE Outstanding Scientific and Technological Worker (2021) awards. His work has been featured in MIT Technology Review.



## SPC Special Sessions

**October 20th (Thursday), 2022**

### SPC Special Session III : Next-Generation Communications and Services

08:30-10:10 | Ramada Ballroom 1

Chair : Prof. Youn Kyu Lee (Hongik University, Korea)

Time	Title	Invited Speakers
08:30-10:10	ATSC 3.0 Technologies and Future Evolution	Mr. Dong-Joon Choi Executive Director of Media Broadcasting Research Section, ETRI
	Millimeter-Wave Metamaterial Antennas for 5G Today and LEO Satellites Tomorrow	Prof. Sungtek Kahng Professor, Incheon National University
	6G LEO Satellite Network Optimization with Quantum Computing	Dr. Changjun Kim Specialist, LGU+

#### ATSC 3.0 Technologies and Future Evolution

Mr. Dong-Joon Choi, Executive Director of Media Broadcasting Research Section, ETRI

##### Abstract:

The next generation terrestrial digital broadcasting standard, known as ATSC 3.0 has a variety of new features which the first generation system (ATSC 1.0) does not support, responding to the changes of TV watching trends and needs for the efficient cooperation with broadband networks.

The physical layer of ATSC 3.0 provides various operation modes for different robustness and spectral efficiency required differently for each of intended services. Also, the standard is developed as all-IP based, and therefore, it realizes convergence of broadcast and broadband networks more efficiently. Due to the excellence of ATSC 3.0 technology, it was successfully commercialized in South Korea and the U.S., and furthermore, other countries such as India and Brazil are considering ATSC 3.0 as their next generation terrestrial broadcasting standard.

In this talk, I will review the ATSC 3.0 technologies and the status of the next generation broadcast systems for other countries. Then, I will introduce the new emerging technologies based on the ATSC 3.0 standard - MIMO-LDM, diversity antenna for mobile reception, and channel bonding – which are being developed to accommodate the recent trends of media services, such as future immersive media, 8K UHD, and mobile services.



##### Biography:

Dong-Joon Choi received the B.S. and M.S. degree in electronics engineering from the Pohang University of science and technology, Korea, in 1991 and 1993, respectively. He joined in ETRI (Electronics and Telecommunications Research Institute) in 1993 and has worked on satellite, cable and terrestrial broadcasting system technologies. He is currently serving as executive director of Media Broadcasting Research Section at ETRI.

## SPC Special Sessions

### Millimeter-Wave Metamaterial Antennas for 5G Today and LEO Satellites Tomorrow

Prof. Sungtek Kahng, Professor, Incheon National University

#### Abstract:

Since the 5G mobile service kicked off, with a view to the wider band and beamforming, millimeter-wave antennas have been employed for the communication system. In order to make up for rapid path-loss in the Ka-band, the antenna is in the form of an array which ends up with inevitable loss from the PCB and wirings. To cope with this drawback, metamaterial surfaces are devised to enhance the antenna in light of directivity and gain, without resorting to excessive use of beamformer chipsets. The metamaterial antenna technology is extended to the wireless link of moving vehicles such as LEO satellites. The IITP-RF RRC/MIEMI presents examples of millimeter-wave beamforming antennas generating radiated far-fields of high directivity ascribed to the lensing effect of the metasurface whose size is way smaller than the conventional array antenna at the same frequency. Plus, some of them including the RIS are tested with TEXWave5G the measurement equipment of our own making.



#### Biography:

Prof. Sungtek Kahng received his Ph.D. degree from Hanyang University, Korea in 2000, with a specialty in Radio Science and Engineering. From 2000 to 2004, he worked for the Electronics and Telecommunication Research Institute(briefly, ETRI), and developed Satellite Payloads of GEOs, Computational EM methods and Electromagnetic Field Measurement Techniques.

Currently, in Dept. of Info. & Telecomm. Eng. of Incheon National University, he works on WPT devices, PD sensors, EMI/EMC for IED, RF components for UAVs and satellites, smart antennas for 5G/IoT networking. He in the committee evaluating Korean Satellite Development Programs appointed by NRF has cooperated with LGE, LIGNEX1, ETRI, KARI, ADD, CAMM, Corning, Samsung, AceTechnology, Hyundai, Amotech, Innertron, etc. He served as the General Chair for IEEE APCAP 2019.

### 6G LEO Satellite Network Optimization with Quantum Computing

Dr. Changjun Kim, Specialist, LGU+

#### Abstract:

The satellite network is a key element of 6G, and it is expected to overcome the limitations of terrestrial communication and provide communication without spatial restrictions such as deserts or airplanes. Among them, the Low-Earth Orbit (LEO) satellite network, which is actively studied nowadays, is more complex and more time-sensitive than the geostationary orbit (GSO) satellite network. In this talk, I will introduce a solution using a D-wave quantum computer, the first commercialized quantum computer. I will explain how to set the constraints and the objective functions of the LEO satellite network. It will be formulated with Quadratic Unconstrained Binary Optimization (QUBO) so that a quantum computer can solve the problem. Also, I will review the basic quantum properties for a quantum computer to solve QUBO.



#### Biography:

Changjun Kim received the B.S., M.S., and Ph.D. (2021) degrees in electrical engineering from KAIST, Daejeon, South Korea. He currently working as a specialist in LG Uplus. Dr. Changjun Kim's research interests are quantum computing and advanced core network including cloud.

## SPC Special Sessions

October 20th (Thursday), 2022

### SPC Special Session IV : Next-Generation AI and Applications

13:20-15:00 | Ramada Ballroom 1

Chair : Prof. Jihong Park (Deakin University, Australia)

Time	Title	Invited Speakers
13:20-15:00	Towards New Challenges on Recommender Systems Using Graph Neural Networks	Prof. Won-Yong Shin Professor, Yonsei University
	Semantics-Native and Knowledge-Driven 6G Semantic Communications	Prof. Jihong Park Lecturer, Deakin University
	Breaking the Hardware Impairment Barrier: from Model-based to AI-based Localization and Sensing	Prof. Henk Wymeersch Professor, Chalmers University of Technology

#### Towards New Challenges on Recommender Systems Using Graph Neural Networks

Prof. Won-Yong Shin, Professor, Yonsei University

##### Abstract:

Recommender systems have been widely advocated as a way of providing suitable recommendation solutions to customers in various fields such as e-commerce, advertising, and social media sites. In recent years, thanks to the highly expressive capability of graph neural networks (GNNs) for effective representation learning of graphs, GNN-based recommender systems have been developed for improving the recommendation accuracy while exhibiting the state-of-the-art performance. In this talk, I first review existing GNN models for top-K recommendation, which generally were developed using implicit feedback by regarding observed user-item interactions as positive relations. More precisely, I describe state-of-the-art GNN-based recommender systems such as NGCF and LightGCN, which apply convolutions to graph domains, while performing layer aggregation to solve the oversmoothing problem. Then, I address some challenges such that existing GNN-based recommender systems overlook the existence of negative feedback due to their ease of modeling. To tackle this challenge, we discuss how to make use of low rating scores for representing users' preferences since low ratings can still be informative in designing recommender systems. As a practical solution, I present SiReN, a new Sign-aware Recommender system based on GNN models and its performance superiority over state-of-the-art methods through comprehensive experiments.



##### Biography:

Won-Yong Shin received the Ph.D. degree in Electrical Engineering and Computer Science from Korea Advanced Institute of Science and Technology (KAIST), Republic of Korea, in 2008. In May 2009, he joined the School of Engineering and Applied Sciences, Harvard University, MA USA, as a Postdoctoral Fellow and was promoted to a Research Associate in October 2011. From 2012 to 2019, Dr. Shin was a faculty member (with tenure) in the Department of Computer Science and Engineering, Dankook University, Republic of Korea. Since March 2019, he has been with the Department of Computational Science and Engineering, Yonsei University, Republic of Korea, where he is currently an Associate Professor.

From 2014 to 2018, Dr. Shin served as an Associate Editor of the IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences. He also served as an Organizing Committee for the 2015 IEEE Information Theory Workshop and the 2023 IEEE Consumer Communications and Networking Conference. He was a recipient of the Bronze Prize of the Samsung Humantech Paper Contest (2008), the KICS Haedong Young Scholar Award (2016), and the ICT Express Best Guest Editor Award (2021).



## SPC Special Sessions

### Semantics-Native and Knowledge-Driven 6G Semantic Communications

Prof. Jihong Park, Lecturer, Deakin University, Australia

#### Abstract:

Oftentimes humans can immediately respond to unseen events without instantaneously communicating with others. This is thanks to the ability of reasoning about future events, others' minds, and their possible reactions to the events based on the background knowledge accumulated from experiences and communication in the past. In this talk I will trace back to the fundamentals of human cognition and artificial intelligence (AI), and introduce the ways to deal with semantics and knowledge in various disciplines including linguistics, semiotics, logic, and category theory. Inspired from this, I will introduce several promising ways towards designing AI and semantics native 6G communication with selected examples using multi-agent reinforcement learning and probabilistic logic programming.



#### Biography:

Jihong Park is a Lecturer at the School of IT, Deakin University, Australia. He received the B.S. and Ph.D. degrees from Yonsei University, Seoul, Korea, in 2009 and 2016, respectively. He was a Post-Doctoral Researcher with Aalborg University, Denmark, from 2016 to 2017; the University of Oulu, Finland, from 2018 to 2019. His recent research focus includes distributed machine learning, control, and resource management, as well as their applications to 6G semantic, AI-native, and non-terrestrial communications. Dr. Park served as a Conference/Workshop Program Committee Member for IEEE GLOBECOM, ICC, and INFOCOM, as well as NeurIPS, ICML, and IJCAI. He received the IEEE GLOBECOM Student Travel Grant and the IEEE Seoul

Section Student Paper Contest Bronze Prize in 2014, the 6th IDIS-ETNEWS Paper Award sponsored by the Ministry of Science, ICT, and the Future Planning of Korea, and FL-IJCAI Best Student Paper Award in 2022. Currently, he is an Associate Editor of Frontiers in Data Science for Communications and in Signal Processing for Communications. He is a Senior Member of IEEE and a Member of ACM.

### Breaking the Hardware Impairment Barrier: from Model-based to AI-based Localization and Sensing

Prof. Henk Wymeersch, Professor, Chalmers University of Technology

#### Abstract:

Communication systems are moving to increasingly higher carrier frequencies, which brings benefits for high-accuracy localization and sensing, but also poses a significant challenge: at these higher carrier frequencies certain hardware impairments (HWIs) will be more pronounced. In this talk, we cover two HWIs (antenna element perturbations and mutual coupling) and show that (i) for communication these HWIs are relatively mild; (ii) for localization and sensing these HWIs lead to significant performance degradations. To mitigate the effect of these degradations, we propose an AI-based approach, learning both new transmit signals and receiver algorithms, based on data over the impaired channel. We show that under this approach, the performance loss can be recovered. Finally, challenges for future work in this area will be discussed.



#### Biography:

Henk Wymeersch is a Professor in Communication Systems with the Department of Electrical Engineering at Chalmers University of Technology, Sweden. He is also a Distinguished Research Associate with Eindhoven University of Technology (TU Eindhoven). Prior to joining Chalmers, he was a Postdoctoral Associate during 2006-2009 with the Laboratory for Information and Decision Systems (LIDS) at the Massachusetts Institute of Technology (MIT). He obtained the Ph.D. degree in Electrical Engineering/Applied Sciences in 2005 from Ghent University, Belgium. He has served as Associate Editor for several IEEE journals and also as General Chair of the 2015 International Conference on Localization and GNSS. Awards include an ERC Starting Grant and a Chalmers supervision award. He currently leads the CROSSNET team at Chalmers.



## SPC Special Sessions

October 21st (Friday), 2022

### SPC Special Session V : AI-Driven Digital Transformation

08:30-10:10 | Ramada Ballroom 1

Chair : Prof. Seulki Lee (UNIST, Korea)

Time	Title	Invited Speakers
08:30-10:10	VisionScaling: Learning and Resource Co-Optimization for Mobile Vision Applications	Prof. Jeongho Kwak Assistant Professor, DGIST
	Intermittent Learning on Harvested Energy	Prof. Shahriar Nirjon Associate Professor, University of North Carolina
	AI/ML in Radio Access Networks	Dr. Heesoo Lee Director of Intelligent Wireless Access Research Section, ETRI

#### VisionScaling: Learning and Resource Co-Optimization for Mobile Vision Applications

Prof. Jeongho Kwak, Assistant Professor, DGIST

##### Abstract:

As deep learning technology becomes advanced, mobile vision applications such as AR/VR are prevalent. Although there exist many studies on the optimization of mobile resource allocation and learning model independently, they cannot reflect realistic mobile environments due to the assumption of fixed distributions for wireless and service request. In this talk, we will discuss the joint optimization of learning model and process/network resources adapting to system dynamics, and development of corresponding algorithm using state-of-the-art Online Convex Optimization (OCO) learning technique. Finally, we show the performance evaluation of the algorithm using recent AI embedded devices.



##### Biography:

Jeongho Kwak received the B.S. degree in electrical and computer engineering from Ajou University, Suwon, Korea, in 2008 and the M.S. and Ph.D. degrees in electrical engineering from the KAIST, Daejeon, Korea, in 2011 and 2015, respectively. Prior to joining DGIST, he was with INRS-EMT, Montreal, Canada and Trinity College Dublin, Dublin, Ireland, as a Post-doctoral Researcher and a Marie Skłodowska-Curie Fellow, respectively. His current research interests lie on learning model & resource allocation in hybrid cloud/edge network architecture, code/data offloading and service caching systems, and satellite edge computing architecture.

## SPC Special Sessions

### Intermittent Learning on Harvested Energy

Prof. Shahriar Nirjon, Associate Professor, University of North Carolina

#### Abstract:

Years of technological advancements have made it possible for small, portable, electronic devices of today to last for years on battery power, and last forever - when powered by harvesting energy from their surrounding environment. Unfortunately, the prolonged life of these ultra-low-power systems poses a fundamentally new problem. While the devices last for years, programs that run on them become obsolete when the nature of sensory input or the operating conditions change. The effect of continued execution of such an obsolete program can be catastrophic. For example, if a cardiac pacemaker fails to recognize an impending cardiac arrest because the patient has aged or their physiology has changed, these devices will cause more harm than any good. Hence, being able to react, adapt, and evolve is necessary for these systems to guarantee their accuracy and response time. We aimed at devising algorithms, tools, systems, and applications that will enable ultra-low-power, sensor-enabled, computing devices capable of executing complex machine learning algorithms while being powered solely by harvesting energy. Unlike common practices where a fixed classifier runs on a device, we take a fundamentally different approach where a classifier is constructed in a manner that it can adapt and evolve as the sensory input to the system, or the application-specific requirements, such as the time, energy, and memory constraints of the system, change during the extended lifetime of the system.



#### Biography:

Dr. Shahriar Nirjon is an Associate Professor of Computer Science at the University of North Carolina at Chapel Hill, NC. He is interested in Embedded Intelligence – the general idea of which is to make resource constrained real-time and embedded sensing systems capable of learning, adapting, and evolving. Dr. Nirjon builds practical cyber-physical systems that involve embedded sensors and mobile devices, mobility and connectivity, and mobile data analytics. His work has applications in the area of remote health and wellness monitoring, and mobile health. Dr. Nirjon received his Ph.D. from the University of Virginia, Charlottesville, and has won a number of awards including four Best Paper Awards at Mobile Systems, Applications and

Services (MOBISYS 2014), the Real-Time and Embedded Technology and Applications Symposium (RTAS 2012), Distributed Computing in Sensor Systems (DCOSS '19), and Challenges in AI and Machine Learning for IoT (AIChallengIoT '20). Dr. Nirjon is a recipient of NSF CAREER Award in 2021. Prior to UNC, Dr. Nirjon has worked as a Research Scientist in the Networking and Mobility Lab at the Hewlett-Packard Labs in Palo Alto, CA.

### AI/ML in Radio Access Networks

Dr. Heesoo Lee, Director of Intelligent Wireless Access Research Section, ETRI

#### Abstract:

Artificial intelligence/Machine Learning (AI/ML) is known to be effective in reducing network installation cost, automating network operation, and improving network performance by solving nonlinear problems or complex optimization problems in the mobile communication field.

Recently, there are a lot of researches using AI/ML to design air interface and replacing some existing algorithms which was based on mathematical models in RAN. AI/ML is expected to play a defining role in future mobile communication. This presentation introduces some AI/ML use cases, research results, the current status of 3GPP standardization of AI/ML in the RAN domain.



#### Biography:

HEESOO LEE received the B.S., M.S., and Ph.D. degrees in industrial engineering from the Korea Advanced Institute of Science and Technology (KAIST) in 1993, 1995, and 2001, respectively. In 2001, he joined the ETRI where he is currently the Director of Intelligent Wireless Access research section.

He is working on core technologies for the future wireless cellular communication, especially in the area of artificial intelligence, millimeter wave, OFDM, SC-FDMA, multiuser MIMO, interference management, relay, etc.

## SPC Special Sessions

October 21st (Friday), 2022

### SPC Special Session VI : Emerging Systems and Security

10:30-12:10 | Ramada Ballroom 1

Chair : Prof. Jun Han (Yonsei University, Korea)

Time	Title	Invited Speakers
10:30-12:10	Cyber Meets Physical: Cross-Domain Fuzzing for Autonomous Vehicle Security	Prof. Chung Hwan Kim Assistant Professor, University of Texas at Dallas
	Improving Cross-Platform Binary Analysis using Representation Learning via Graph Alignment	Prof. Dokyung Song Assistant Professor, Yonsei University
	Sense for Less: Physical-Informed Adaptation for Vibration-based Internet of Things	Prof. Shijia Pan Assistant Professor, University of California Merced

#### Cyber Meets Physical: Cross-Domain Fuzzing for Autonomous Vehicle Security

Prof. Chung Hwan Kim, Assistant Professor, University of Texas at Dallas

##### Abstract:

Autonomous vehicles (AVs), such as drones and self-driving cars, are a type of cyber-physical systems for automated transportation and missions. With their increasing adoption, AVs are facing threats of cyber and cyber-physical attacks that exploit their attack surfaces. Although many AVs are critical to human safety and the environment, it is difficult to make them secure against such attacks due to new challenges that are not addressable by traditional approaches. Many of these challenges originate from a semantic gap between cyber and physical domains in which AV systems operate.

In this talk, I will introduce my recent work that bridges the gap to discover security vulnerabilities in AV systems effectively. Specifically, I will introduce two fuzzing tools that automatically explore the input spaces of (1) drone control systems and (2) self-driving car systems, respectively, and detect hidden vulnerabilities that attackers may exploit to cause critical accidents. I will show how our fuzzing tools (in the cyber domain) generate sensor inputs and monitor vehicle operations (in the physical domain), and discuss unique challenges that we addressed while building these mechanisms. Using our tools, we have discovered over 100 new bugs in popular drone control and self-driving car systems and contributed to the elimination of the bugs for the security and safety of the AV systems.



##### Biography:

Chung Hwan Kim is an Assistant Professor of Computer Science at the University of Texas at Dallas (UT Dallas). Before joining UT Dallas in 2020, he received his Ph.D. in Computer Science from Purdue University in 2017 and worked at NEC Labs as a Researcher for three years. His research interest lies in solving security problems in modern computing systems, recently with more focus on cyber-physical systems safety and security. His research seeks to achieve this by developing new tools using program analysis, software testing, and operating/embedded system techniques. He received the UT Dallas New Faculty Research Symposium Grant Award in 2021. His work has been nominated as a Top 10 Finalist for the CSAW Best

Applied Research Paper Award in 2018.



## SPC Special Sessions

### Improving Cross-Platform Binary Analysis using Representation Learning via Graph Alignment

Prof. Dokyung Song, Assistant Professor, Yonsei University

#### Abstract:

Cross-platform binary analysis requires a common representation of binaries across platforms, on which a specific analysis can be performed. Recent work proposed to learn low-dimensional, numeric vector representations (i.e., embeddings) of disassembled binary code, and perform binary analysis in the embedding space. Unfortunately, however, existing techniques fall short in that they are either (i) specific to a single platform producing embeddings not aligned across platforms, or (ii) not designed to capture the rich contextual information available in a disassembled binary.

In this talk, I will present a deep learning-based method, XBA, which addresses the aforementioned problems. To this end, binaries are first represented as typed graphs, dubbed binary disassembly graphs (BDGs), which encode control-flow and other rich contextual information of different entities found in a disassembled binary, including basic blocks, external functions called, and string literals referenced. Binary code representation learning is then formulated as a graph alignment problem, i.e., finding the node correspondences between BDGs extracted from two binaries compiled for different platforms. XBA uses graph convolutional networks to learn the semantics of each node, (i) using its rich contextual information encoded in the BDG, and (ii) aligning its embeddings across platforms. This formulation allows XBA to learn semantic alignments between two BDGs in a semi-supervised manner, requiring only a limited number of node pairs be aligned across platforms for training. The evaluation results show that XBA can learn semantically-rich embeddings of binaries aligned across platforms without apriori platform-specific knowledge.



#### Biography:

Dokyung Song is an assistant professor in the Department Computer Science at Yonsei University and the director of Yonsei University's Cyber Security Lab. He received his B.S. degree in Electrical and Computer Engineering from Seoul National University in 2014, and his M.S. and Ph.D. degree in Computer Science from UC Irvine in 2019 and 2020, respectively. During his Ph.D. studies, he worked as an intern in the C++ dynamic analysis team and the Fuchsia OS security team at Google, and in the product security team at Qualcomm. He also worked in the server technologies group at Oracle as a senior member of technical staff. His research interest lies in the broad area of systems security, and his current focus is on developing

new systems, compiler and machine learning techniques that can better analyze the security of OS kernels as well as binary-only software.

### Sense for Less: Physical-Informed Adaptation for Vibration-Based Internet of Things

Prof. Shijia Pan, Assistant Professor, University of California Merced

#### Abstract:

The number of everyday smart devices is projected to grow to the billions in the coming decade, which enables various smart building applications. These applications, especially in-home long-term occupant monitoring, rely on the emerging Internet-of-Things sensing techniques. We introduce 'Structures as Sensors', where we leverage ambient vibration induced by people to infer their information indirectly and non-intrusively. From the system perspective, general problems faced by sensing technologies, especially for indirect sensing, are the tradeoff between the sensing data efficiency/quality and the system deployment constraints. We address this issue by repurposing human sensing data to learn the information about the deployment. Then we optimize the sensing system to acquire high-quality data for the application accordingly. However, high-quality sensing data may still lead to low prediction accuracy, due to the complexity of the physical world -- sensing data distributions can change significantly under different sensing conditions. Therefore, from the data/learning perspective, accurate information learning through pure data-driven approaches requires a large amount of labeled data, which is costly and difficult to obtain in real-world applications. We address these challenges by combining physical and data-driven knowledge to reduce label data needed via physical knowledge-guided model transfer.



## SPC Special Sessions



### Biography:

Dr. Shijia Pan is an Assistant Professor at the University of California Merced. She received her bachelor's degree in Computer Science and Technology from the University of Science and Technology of China and her Ph.D. degree in Electrical and Computer Engineering from Carnegie Mellon University. Her research interests include cyber-physical sensing systems (CPS), multimodal learning for CPS/IoT, and ubiquitous computing. She worked in multiple disciplines and focused on indoor human information acquisition through ambient sensing. She has published in both top-tier Computer Science ACM/IEEE conferences and high-impact Civil Engineering journals. She received Rising Stars in EECS, Nick G. Vlahakis Graduate Fellowship, Google Anita Borg Scholarship, Best Paper Awards (IoTDI, ASME SHM/NDE, HASCA), Best Poster Awards (SenSys, IPSN), Best Demo Award (Ubicomp, BuildSys), Best Presentation Award (SenSys Doctoral Colloquium), and Audience Choice Award (BuildSys) from ACM/IEEE conferences.

## Tutorial

October 19th (Wednesday), 2022

### Tutorial I

12:40-16:10 | Halla Room

Chair : Prof. Oh-Soon Shin (Soongsil University, Korea)

Time	Title	Invited Speakers
12:40-16:10	Deep Learning Aided Intelligent Sensing and Identification for Secure Wireless Communications	Prof. Tomoaki Ohtsuki (Keio University) Prof. Guan Gui (Nanjing University of Posts and Telecommunications)

### Deep Learning Aided Intelligent Sensing and Identification for Secure Wireless Communications

Prof. Tomoaki Ohtsuki, Keio University

Prof. Guan Gui, Nanjing University of Posts and Telecommunications

#### Abstract:

With the rapid development in artificial intelligence (AI) and deep learning (DL), it can be foreseen that the future wireless communication systems will have much more intelligence and secure than the predecessors. For problems that can be accurately modeled, traditional algorithms show good performance and efficient solutions on partially convex problems. However, for some non-convex problems, existing algorithms usually obtain more efficient solutions while allowing a certain performance loss. At this time, the DL technology is used to mine the parameter information of the known structure algorithm from the obtained data samples, to improve the convergence speed of the algorithm and the performance of the algorithm. In this talk, the artificial neural networks (ANNs) including deep neural network (DNN), convolutional neural network (CNN) and so on are used to parameterize the model or algorithm, and the gradient based methods are used to optimize the NNs. These methods that obtain model or algorithm features from massive amounts of data rather than based on pre-established rules are generally called data-driven. Here, this talk focuses on the research and application of DL in physical layer. On the one hand, model based algorithms for signal detection or channel estimation can be enhanced by DL to improve the computing efficiency and system performance. On the other hand, traditional model-based methods are increasingly unable to meet the increasing demands of next-generation communication systems under the channel conditions with more complex interference and higher uncertainty. DL has the potential opportunities to redesign the baseband module including coding/decoding, detection and so on.



#### Biography:

Tomoaki Ohtsuki (Ohtsuki) received the B.E., M.E., and Ph. D. degrees in Electrical Engineering from Keio University, Yokohama, Japan in 1990, 1992, and 1994, respectively. He is now a Professor at Keio University. He has published more than 235 journal papers and 460 international conference papers. He served as a Chair of IEEE Communications Society, Signal Processing for Communications and Electronics Technical Committee. He served as a technical editor of the IEEE Wireless Communications Magazine and an editor of Elsevier Physical Communications. He is now serving as an Area Editor of the IEEE Transactions on Vehicular Technology and an editor of the IEEE Communications Surveys and Tutorials. He has served as general-co

chair, symposium co-chair, and TPC co-chair of many conferences, including IEEE GLOBECOM 2008, SPC, IEEE ICC 2011, CTS, IEEE GLOBECOM 2012, SPC, IEEE ICC 2020, SPC, IEEE APWCS, IEEE SPAWC, and IEEE VTC. He gave tutorials and keynote speeches at many international conferences including IEEE VTC, IEEE PIMRC, IEEE WCNC, and so on. He was Vice President and President of the Communications Society of the IEICE. He is a senior member and a distinguished lecturer of the IEEE, a fellow of the IEICE, and a member of the Engineering Academy of Japan.

## Tutorial



### Biography:

Guan Gui was born in Zongyang county, Anhui province, China, in 1982. He received the Ph.D. degree from the University of Electronic Science and Technology of China, Chengdu, China, in 2012. From 2009 to 2014, he joined the Tohoku University as a research assistant as well as a postdoctoral research fellow, respectively. From 2014 to 2015, he was an Assistant Professor in the Akita Prefectural University, Akita, Japan. Since 2015, he has been a professor with Nanjing University of Posts and Telecommunications, Nanjing, China. His recent research interests include intelligence sensing and recognition, intelligent signal processing, and physical layer security. Dr. Gui has published more than 200 IEEE Journal/Conference papers and won several best paper awards, e.g., ICC 2017, ICC 2014 and VTC 2014-Spring. He received the IEEE Communications Society Heinrich Hertz Award in 2021, top 2% scientists of the world by Stanford University in 2021, the Clarivate Analytics Highly Cited Researcher in Cross-Field in 2021, the Highly Cited Chinese Researchers by Elsevier in 2020 and 2021, the Member and Global Activities Contributions Award in 2018, the Top Editor Award of IEEE Transactions on Vehicular Technology in 2019, the Outstanding Journal Service Award of KSII Transactions on Internet and Information System in 2020, the Exemplary Reviewer Award of IEEE Communications Letters in 2017, the 2012 Japan Society for Promotion of Science (JSPS) Postdoctoral Fellowships for Foreign Researchers, and the 2018 Japan Society for Promotion of Science (JSPS) International Fellowships for Overseas Researchers. He was also selected as for the Jiangsu Specially-Appointed Professor in 2016, the Jiangsu High-level Innovation and Entrepreneurial Talent in 2016, the Jiangsu Six Top Talent in 2018. Since 2022, he has been a Distinguished Lecturer of the IEEE Vehicular Technology Society. He is a Senior Member of the IEEE, a Member of the IEEE Communications Society and of the IEEE Vehicular Technology Society. He is serving or served on the editorial boards of several journals, including IEEE Transactions on Vehicular Technology, IEICE Transactions on Communications, Physical Communication, Wireless Networks, IEEE Access, Journal of Circuits Systems and Computers, Security and Communication Networks, IEICE Communications Express, and KSII Transactions on Internet and Information Systems, Journal on Communications. In addition, he served as the IEEE VTS Ad Hoc Committee Member in AI Wireless, TPC Chair of PRAI 2022, TPC Chair of ICGIP 2022, Executive Chair of VTC 2021-Fall, Vice Chair of WCNC 2021, TPC Chair of PHM 2021, Symposium Chair of WCSP 2021, General Co-Chair of Mobimedia 2020, TPC Chair of WiMob 2020, Track Chairs of EuCNC 2021 and 2022, VTC 2020 Spring, Award Chair of PIMRC 2019, and TPC member of many IEEE international conferences, including GLOBECOM, ICC, WCNC, PIMRC, VTC, and SPAWC.



## Tutorial

October 19th (Wednesday), 2022

### Tutorial II

12:40-16:10 | Tamra Room

Chair : Prof. Dong-Seong Kim (Kumho National Institute of Technology, Korea)

Time	Title	Invited Speakers
12:40-16:10	Computer Vision (CV)-aided Wireless Communication for 6G	Prof. Byonghyo Shim Seoul National University

### Computer Vision (CV)-aided Wireless Communication for 6G

Prof. Byonghyo Shim, Seoul National University

#### Abstract:

Recently, we are now witnessing the emergence of unprecedented services and applications using artificial intelligence (AI) such as the autonomous vehicles, drone-based deliveries, smart cities and factories, remote medical diagnosis and surgery, to name just a few. AI-based approaches are data-driven in nature, so applications using visual and audio/speech data are popular among others. In particular, computer vision (CV) technique, a field of AI that enables computers to derive meaningful information from visual data such as image and video, has achieved a remarkable success in various tasks such as the image classification, object detection, image captioning, and saliency detection. In the perspective of future wireless systems, benefits of CV are twofold: First, physical characteristics of wireless signals (in particular, mmWave and THz radio waves) are very close to the sensing signal (e.g., visible light in 400~790 THz) in that the transmit energy is mostly concentrated in the line of sight (LoS) path. Second, recent advances of the CV techniques have made a gigantic improvement in various tasks, from which we can infer that the CV techniques can dramatically reduce the complicated control process of the wireless communication systems since the essential operation of CV-aided wireless systems is to capture the image and use AI in performing the desired task. In this tutorial, we present CV-aided future wireless systems equipped with the visual sensing mechanism (e.g., RGB, LiDAR, laser, infrared). After discussing basics of sensing devices and deep learning (DL) mechanism, we will explain the state-of-the-art CV-techniques and its applications to 6G wireless communication systems. We will also discuss the practical issues such as multi-modal sensor fusion, dataset acquisition, model training, and integration with communication systems. From our discussion, we will show that the CV technique is effective in improving the reliability and capacity, reducing the end-to-end latency and power consumption, and also operation cost of wireless systems.



#### Biography:

Byonghyo Shim received the B.S. and M.S. degree in Control and Instrumentation Engineering (currently Electrical Eng.) from Seoul National University (SNU), Seoul, Korea, in 1995 and 1997, respectively, and the M.S. degree in Mathematics and the Ph.D. degree in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign (UIUC), Urbana, in 2004 and 2005, respectively. From 1997 and 2000, he was with the Department of Electronics Engineering at the Korean Air Force Academy as an Officer (First Lieutenant) and an Academic Full-time instructor. He also had a short time research position in the Texas Instruments and Samsung Electronics in 1997 and 2004, 2019, respectively. From 2005 to 2007, he was with the Qualcomm Inc., San Diego, CA as a Staff Engineer working on CDMA systems. From 2007 to 2014, he was with the School of Information and Communication, Korea University, Seoul, Korea, as an associate professor. Since September 2014, he has been with the Dept. of Electrical and Computer Engineering, Seoul National University, where he is currently a Professor. His research interests include signal processing for wireless communications, statistical signal processing, machine learning, compressed sensing, and information theory. Dr. Shim was the recipient of the M. E. Van Valkenburg Research Award from the ECE Department of the University of Illinois (2005), the Hadong Young Engineer Award from IEIE (2010), the Irwin Jacobs Award from Qualcomm and KICS (2016), the Shinyang Research Award from the Engineering College of SNU (2017), the Okawa Foundation Research Award (2020), and the IEEE COMSOC Asia Pacific Outstanding Paper Award (2021). He was a technical committee member of Signal Processing for Communications and Networking (SPCOM), and currently serving as an associate editor of IEEE Transactions on Signal Processing (TSP), IEEE Transactions on Communications (TCOM), IEEE Transactions on Vehicular Technology (TVT), IEEE Wireless Communications Letters (WCL), Journal of Communications and Networks (JCN), and a guest editor of IEEE Journal of Selected Areas in Communications (location awareness for radios and networks).



## Tutorial

October 20th (Thursday), 2022

### Tutorial III

08:30-12:10 | Tamra Room

Chair : Prof. Ji-Woong Choi (DGIST, Korea)

Time	Title	Invited Speakers
08:30-12:10	Wireless Infrastructure of the Future: Integrated Terrestrial-HAPS-LEO Networks	Prof. Halim Yanikomeroglu Carleton University

### Wireless Infrastructure of the Future: Integrated Terrestrial-HAPS-LEO Networks

Prof. Halim Yanikomeroglu, Carleton University

#### Abstract:

In this tutorial, we will present a multi-layer vertical access architecture composed of fully integrated terrestrial and non-terrestrial layers towards a vertical HetNet which is expected to evolve progressively in the next 20 years, during the 6G era and beyond. In particular, we will examine a new access & computing layer composed of HAPS (high altitude platform station) systems in stratosphere, 20 km above the ground, in addition to the legacy terrestrial layer and the emerging satellite layer. With its bird's-eye and almost-line-of-sight view of an entire metropolitan area, a HAPS is more than a base station in the air; it is a new architecture paradigm with access, transport, and core network functionalities for integrated connectivity, computing, sensing, positioning, navigation, and surveillance, towards enabling a variety of use-cases in an agile, smart, and sustainable manner for smart cities and societies of the future. The tutorial will feature a number of enabling technologies for the envisioned architecture including RIS (reconfigurable intelligent surfaces) and advanced antennas.



#### Biography:

Dr. Halim Yanikomeroglu is a Professor in the Department of Systems and Computer Engineering at Carleton University, Canada. His primary research domain is wireless communications and networks. His research group has made substantial contributions to 4G/5G wireless technologies. His group's current focus is the wireless infrastructure for the 6G and B6G era with terrestrial, aerial (HAPS and UAV), and satellite network elements. He has coauthored around 550 published peer-reviewed research papers including 240+ papers in 28 different IEEE journals; these publications have received 20,000 citations. His extensive collaboration with industry resulted in 39 granted patents. Dr. Yanikomeroglu is a Fellow of IEEE, Engineering Institute of Canada (EIC), and Canadian Academy of Engineering (CAE). He is an IEEE Distinguished Speaker for ComSoc and VTS. He has given 165 keynotes, tutorials, and invited seminars in the last ten years. Dr. Yanikomeroglu is currently serving as the Steering Committee Chair of IEEE Wireless Communications and Networking Conference (WCNC). He is also a member of the IEEE ComSoc Conference Council and IEEE PIMRC Steering Committee. He served as the Honorary Chair, General Chair, and Technical Program Chair of several IEEE conferences. He has also served in the editorial boards of various IEEE periodicals. Dr. Yanikomeroglu received several awards for his research, teaching, and service, including the IEEE ComSoc Fred W. Ellersick Prize (2021), IEEE VTS Stuart Meyer Memorial Award (2020), and IEEE ComSoc Wireless Communications TC Recognition Award (2018). He received best paper awards at IEEE ICC 2021 and IEEE WISSE 2021.

## Tutorial

October 21st (Friday), 2022

### Tutorial IV : SCSS

09:30-12:10 | Halla Room

Chair : Dr. Pansoo Kim (ETRI, Korea)

Time	Title	Invited Speakers
09:30-12:10	OTFS and Delay-Doppler Communications	Prof. Yi Hong Monash University

### OTFS and Delay-Doppler Communications

Prof. Yi Hong, Monash University

#### Abstract:

Orthogonal time frequency space (OTFS) modulation has been recently proposed by Hadani et al. at WCNC'17, San Francisco. It was shown to offer significant advantages over OFDM in doubly dispersive channels for high mobility wireless communications. The key idea of OTFS is to model mobile wireless channels in the Delay-Doppler domain, where a sparse nature of the geometry of the wireless channel is captured. This tutorial will introduce the general notion of OTFS/Delay-Doppler communications, starting from the fundamentals of high mobility wireless channels, followed by the transceiver architecture used for detection and channel estimation and finally the potential application to LEO Satcom.



#### Biography:

Yi Hong is an Associate Professor at the Department of Electrical and Computer Systems Engineering (ECSE), Monash University, Australia. She served as a member of the Australian Research Council (ARC) College of Experts (2018–2020) and the Director of Graduate Research in the ECSE department at Monash University (2016–18). She received the Ph.D. degree in Electrical Engineering and Telecommunications from University of New South Wales, Sydney, and she also received the NICTA-ACoRN Early Career Researcher award in AusCTW'07. She is a Fellow of IET, a Senior Member of IEEE, a member of IEEE Communications Society, IEEE Information Theory Society, and IEEE Vehicular Technology Society. She served as the Tutorial

Chair of the 2021 IEEE International Symposium on Information Theory, Melbourne, the General Co-Chair of the IEEE International Conference on Communications Workshop on Orthogonal Time Frequency Space Modulation (OTFS) (2019–22). She is currently the Associate Editor (AE) of IEEE Transactions on Green Communications and Networking (TGCN), and was the AE of IEEE Wireless Communications Letters (WCL) and Transactions on Emerging Telecommunications Technologies (ETT). Her research interests include communication theory, coding, and information theory with applications to telecommunication engineering.

## Technical Paper Sessions

October 19th (Wednesday) 2022

### [Session A1] Internet of Things

Oct. 19, 08:30~10:10

Chair : Prof. Sharifah Hafizah Syed Ariffin (Universiti Teknologi Malaysia, Malaysia)

**Session A1-1 Peer to Peer Communication for the Internet of Things Using ESP32 Microcontroller for Indoor Environments**

*Muhammad Syukor Abdul, Suriani Mohd Sam, Norliza Mohamed, Noor Hafizah Hassan, Azizul Azizan and Yusnaldi Md Yusof (UTM, Malaysia)*

**Session A1-2 Robust Wide-Angle Metamaterial-based Absorber Design for Powering IoT Devices**

*Kassen Dautov, Kozhakhmet Abdugapbar, Mohammad Hashmi and Galymzhan Naurzybayev (Nazarbayev University, Kazakhstan)*

**Session A1-3 Substate-based UAV Movement Control for Data Collection in WSN Using Q-Learning**

*Aliia Beishenalieva, Qin Yang and Sang-jo Yoo (Inha University, Korea)*

**Session A1-4 Wireless Multi-parameter Sensing System for monitoring in the complex environment**

*Chenggen Wu and Lei Han (University of Southeast, China)*

**Session A1-5 Industrial Humanless Monitoring System over 5G Networks in the Shipyard Environment**

*Woo-Sung Jung (ETRI, Korea); Daeseung Yoo (ETRI, Korea)*

**Session A1-6 Petification: Node-RED Based Pet Care IoT Solution Using MQTT Broker**

*Haeram Kim, Hyejong Kang, Sunghan Kim and Dukho Choi (Chungnam National University, Korea); Jihyun You and Anthony Smith (Purdue University, USA); Minsun Lee (Chungnam National University, Korea)*

### [Session B1] 5G & 6G Wireless Systems I

Oct. 19, 08:30~10:10

Chair : Prof. Intae Hwang (Chonnam National University, Korea)

**Session B1-1 Regularization Based Sparse Support Recovery for Asynchronous Multicarrier Modulation Signals in Cognitive Radio Networks**

*Ashwin Bhobani Baral (University of Texas at Dallas, USA); Won Namgoong (SUNY Albany, USA); Murat Torlak (The University of Texas at Dallas, USA)*

**Session B1-2 An Overview and Performance Analysis of CQI Reporting in 5G NR Sidelink**

*Igor Serunin and Andrey Pudeev (LG Electronics, Russia); Jin-Yup Hwang and Sang-Wook Lee (LG Electronics, Korea); Alexander Maltsev (University of Nizhny Novgorod, Russia)*

**Session B1-3 Self-Driven High-Q On-Off Keying: An Efficient Modulation Scheme for Magnetic (Underwater) Communication**

*Maurice Hott (Kiel University, Germany); Julius Maximilian Placzek (Christian Albrecht University, Germany); Peter A. Hoeher (University of Kiel, Germany)*

**Session B1-4 A Method of Adaptive Low-Latency Downlink Transmission on FAPI based 5G NR gNB**

*Seung-Que Lee (ETRI, Korea); Moon-Sik Lee (ETRI & Stanford University, Korea)*



## Technical Paper Sessions

### **Session B1-5 Direction of Arrival (DoA) Estimation Performance in a Multipath Environment with Envelope Fading and Spatial Correlation**

*Mutmainnah Hasib (RMIT University Melbourne City Campus, Australia); Sithamparanathan Kandeepan, Wayne Rowe and Akram Al-Hourani (RMIT University, Australia)*

### **Session B1-6 PAPR Performances in Spectrum Suppressed Transmission Applied by OQPSK**

*Teppe Kanke and Takatoshi Sugiyama (Kogakuin University, Japan)*

## **[Session C1] Blockchain**

Oct. 19, 08:30~10:10

Chair : Prof. Jae-Min Lee (Kumoh National Institute of Technology, Korea)

### **Session C1-1 Industrial Intelligence of Things (IIoT 2.0) based Automated Smart Factory Management System using Blockchain**

*Md Masduzzaman, Ramdhan Nugraha and Soo Young Shin (Kumoh National Institute of Technology, Korea)*

### **Session C1-2 A General and Robust Blockchain Storage System based on External Storage Service**

*Woochang Jeong (POSTECH, Korea); Chanik Park (Pohang University of Science and Technology, Korea)*

### **Session C1-3 A Preliminary Study for the Ethereum Blockchain-Based Smart Home Systems**

*Yiyang Cheng and Kazu Takashio (Keio University, Japan)*

### **Session C1-4 Recent Advances in Privacy Protection Technologies in Blockchain**

*Bingbing Li, Guodong Qi and Wenning Lu (Hubei University of Technology, China)*

### **Session C1-5 A Blockchain-Based Privacy Sensitive Data Acquisition Scheme During Pandemic Through the Facilitation of Federated Learning**

*Anik Islam and Soo Young Shin (Kumoh National Institute of Technology, Korea)*

### **Session C1-6 Blockchain-Based Trusted Container Orchestration for Edge Computing**

*Shuyang Ren and Choonhwa Lee (Hanyang University, Korea); Zohaib Latif (Hanyang University & Seoul, Korea)*

## **[Session D1] Network Functions and Tasking**

Oct. 19, 08:30~10:10

Chair : Prof. Sangheon Pack (Korea University, Korea)

### **Session D1-1 A Novel Heuristic Algorithm for Energy Saving in SDN networks**

*Péter András Agg and Zsolt Csaba Johanyak (John von Neumann University, Hungary)*

### **Session D1-2 Software-Defined Networking driven Time-Sensitive Networking for Mixed-Criticality Control Applications**

*Fabian Kurtz, Gösta Stomberg, Máisa Beraldo Bandeira, Jens Püttchneider, Felix Greiwe, Michael Kaupmann, Christoph Hams, Tim Harnisch, Mey Olivares Tay, Asha Choudhary, Jorge Ramírez Treviño, Abhishek Bhandari, Apurva Rajashekhar, Padmashree Vemana and Ahmed Alhanafi (TU Dortmund University, Germany); Timm Faulwasser (Karlsruhe Institute of Technology, Germany); Christian Wietfeld (TU Dortmund University, Germany)*

### **Session D1-3 MINIWAN: A New Framework For Simulating Multi-Segment Network Topology Based On Mininet**

*Wei-Cheng Lei, Yu-Ping Chang and Li-Der Chou (National Central University, Taiwan)*

## Technical Paper Sessions

### Session D1-4 Implementation and field trial of SDN-based control plane for Deterministic Networking

Yeoncheol Ryoo (ETRI, Korea); Taesik Cheung (ETRI, Korea); Ho Geon Kim (Electronics and Telecommunication Research Institute, Korea)

### Session D1-5 Opportunities and Challenges of Metaverse for Automotive and Mobility Industries

Joon Young Kim and Jeong Min Oh (Sungshin Women's University, Korea)

## [Session E1] Congestion Control

Oct. 19, 08:30~10:10

Chair : Prof. Woongsoo Na (Kongju National University, Korea)

### Session E1-1 Mutually Beneficial Cooperative Driving to Solve Traffic Congestion through V2V Communication

Qingyue Wang, Chunxiao Li, Honghui Jin and Chunyan Qi (Yangzhou University, China)

### Session E1-2 Throughput Fairness in Congestion Control of Multipath TCP

Yu Deguchi, Aoshi Kobayashi, Yuya Tarutani, Yukinobu Fukushima and Tokumi Yokohira (Okayama University, Japan)

### Session E1-3 UD-assisted Multi-path Transport in RDMA

Mingyu Choi, Sugi Lee and Younghoon Kim (Sungkyunkwan University, Korea)

## [Session F1] Applications with ML I

Oct. 19, 08:30~10:10

Chair : Prof. Ronnie Concepcion II (De La Salle University, Philippines)

### Session F1-1 Seismic Activity-based Human Intrusion Detection using Deep Neural Networks

Harsha Bm (CHRIST University India); Siby Cyriac and Yong Woon Kim (CHRIST University, India)

### Session F1-2 Application of LSTM Model for Western Music Composition

Ashvinee Ashvinee (Christ University, India); Siby Cyriac and Yong Woon Kim (CHRIST University, India); Robert Linton Tavis Ashton-Bell (Christ University, India)

### Session F1-3 Connecting Quality Metrics to Deep Learning Accuracy for Image Fusion Methods

Hosung Joo (Pohang University of Science and Technology (POSTECH), Korea); Youngchol Choi (Korea Ocean Research and Development Institute, Korea); Jongwon Park (Korea Research Institute of Ships and Ocean Engineering, Korea); Chang Hwy Lim (M1 International Inc., Korea); Hyun Jong Yang (POSTECH, Korea)

### Session F1-4 The Scientific Review of AI Functions of Enhancement English Learning and Teaching

Wichura Winaitham (Kamphaeng Phet Rajabhat University, Thailand)

### Session F1-5 Performance Analysis of Convolutional Neural Networks with Different Window Functions for Automatic Modulation Classification

Ha-Khanh Le and Van-Phuc Hoang (Le Quy Don Technical University, Vietnam); Sang Van Doan (Vietnam Naval Academy, Vietnam & ICT CRC, Kumoh National Institute of Technology, Korea); Ngoc Phong Dao (Posts and Telecommunications Institute of Technology, Vietnam); Minh Thien Hoang (Le Quy Don Technical University, Vietnam)

### Session F1-6 Multi-Access Edge Computing Implementation On Tower Ecosystem Indonesia: Challenges And Visibility

Pratignyo A Budiman (PT Dayamitra Telekomunikasi, Indonesia); Marfani Marfani (PT Telkomsel, Indonesia); Detriana M Sari (PT Dayamitra Telekomunikasi, Indonesia)

## Technical Paper Sessions

### [Session G1] Localization

Oct. 19, 08:30~10:10

Chair : Prof. Yeunwoong Kyung (Kongju National University, Korea)

#### **Session G1-1 Weighted Positioning Algorithm for Considering Geometrical Errors of Relay-based Positioning System**

*Jin Seok Lee and Jae Sung Lim (Ajou University, Korea)*

#### **Session G1-2 Real-Time Indoor Localization and Altitude Monitoring using Self-Adaptive Algorithm**

*Jeffrey Ng (Mapua University, Philippines); Shekinah Lor Huyo-a (Philippine Coding Camp, Philippines); Mideth Abisado (Technological Institute of the Philippines & National University, Philippines); Gabriel Avelino R Sampedro (Kumoh National Institute of Technology, Korea & University of the Philippines, Philippines)*

#### **Session G1-3 GPS Positioning Errors Improvements by The Pseudo Range Correction with An Actually Measured Parameter in Shinjuku Area**

*Koichi Saito (University of Kogakuin, Japan); Takatoshi Sugiyama (Kogakuin University, Japan)*

#### **Session G1-4 Toward Suitable Area Coverage for Finding Battery Swapping Station Locations using GIS and Distance Function**

*Athita Onuean and Nuttaporn Phakdee (Burapha University, Thailand); Wira Srimala (Rambhai Barni Rajabhat University, Thailand); Kittisak Chaengakson (Kasetsart University, Thailand); John Ham (Burapha University, Thailand)*

#### **Session G1-5 Corridor Occupancy-Based Multi-Agent Pathfinding in Topological Maps**

*Soohwan Song and Wonpil Yu (ETRI, Korea); Kiin Na (ETRI, Korea)*

### [Session P1] Poster Session 1

Oct. 19, 08:30~10:10

Chair : Prof. Jeongho Kwak (DGIST, Korea)

#### **Session P1-1 Effective Handling Method of Sidelink Identifier Conflict**

*Manho Park and Heesang Chung (ETRI, Korea)*

#### **Session P1-2 A Study on NeRF-based Synthetic Image Generation and Post-processing Method for Object Detection**

*SungWon Moon (ETRI, Korea); Jiwon Lee (ETRI, Korea); Jung Soo Lee, Do-Won Nam and Wonyoung Yoo (ETRI, Korea)*

#### **Session P1-3 Zero-shot Fire And Arson Detection Using Textual Descriptions**

*HoBeom Jeon (University of Science and Technology & ETRI, Korea); Hyungmin Kim (University of Science and Technology, Korea); DoHyung Kim (ETRI, Korea); Jaehong Kim (Electronics & Telecommunication Research Institute (ETRI), Korea)*

#### **Session P1-4 Nullspace-based Finite Rate of Innovation Algorithm to Resolve Multiple Signal Sources**

*Kyung-Won Kim, Myung-Don Kim, Jae-Joon Park, Juyul Lee and Heon Kook Kwon (ETRI, Korea)*

#### **Session P1-5 Image to Lidar Registration Using Image Feature Matching**

*Chang Woo Chu and Chang Joon Park (ETRI, Korea)*

#### **Session P1-6 Towards Access Pattern Prediction for Big Data Applications**

*Changjong Kim (Seoul National University of Science and Technology, Korea); Yongseok Son (Chung-Ang University, Korea); Sunggon Kim (Seoul National University of Science and Technology, Korea)*

#### **Session P1-7 Spatio-Temporal Attack Course-of-Action (COA) Search Learning for Scalable and Time-Varying Networks**



## Technical Paper Sessions

*Haemin Lee, Seok Bin Son, Won Joon Yun and Joongheon Kim (Korea University, Korea); Soyi Jung (Ajou University, Korea); Dong Hwa Kim (ADD, Korea)*

**Session P1-8 State-of-the-Art Object Detectors for Vehicle, Pedestrian, and Traffic Sign Detection for Smart Parking Systems**

*Judith Nkechinyere Njoku, Goodness Oluchi Anyanwu, Ikechi Igboanus, Cosmas Ifeanyi Nwakanma, Jae Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

**Session P1-9 Analysis and Application of Sensor Data Collected from Strawberry Greenhouse**

*Seungtaek Oh and Jaewon Moon (Korea Electronics Technology Institute, Korea); Jungsu Jo (Kyungpook National University, Korea); Seung Woo Kum (Korea Electronics Technology Institute, Korea)*

**Session P1-10 A Study of real-Time 4K drone images visualization to rescue for missing people base on web**

*Sangsu Kim, Hee Tac Jung, Seung Jae Lee, Junhee Go, Jin Ho Park and Sung Hwan Yu (ICTWAY, Korea)*

**Session P1-11 Reconfigurable Intelligent Surface Assisted Multi-User Orbital Angular Momentum Communications**

*Hye Yeong Lee and Soo Young Shin (Kumoh National Institute of Technology, Korea)*

**Session P1-12 Access Point selection schemes for Cell-free massive MIMO UDN systems**

*Sojung Jung, Seung-Eun Hong and Jeehyeon Na (ETRI, Korea)*

**Session P1-13 Inspection System of Firefighting Facilities Based on YOLOv4 Using Augmented Reality Glass**

*Dasom Oh (University of Science and Technology, Korea); Ji Hun Jeon, JeongKyun Kim and Kang Bok Lee (ETRI, Korea); Sang Gi Hong (Electronics and Telecommunication Research Institute, Korea)*

**Session P1-14 A Study on Module Manufacture and Sterilization Effect of 405nm Laser Diodes for Application of Intelligent Prevention System**

*Ji Hye Lee and Woogeun Lee (KAIST, Korea); ChaeSeok Lee and Byunghun Han (KAIST Institute for IT Convergence, Korea); A-Ryoung Kim (KAIST Institute for Information Technology Convergence, Korea); Hojong Chang (KAIST, Korea)*

**Session P1-15 Traffic-Effective Architecture for Seamless CAN-based In-Vehicle Network Systems**

*Duc N. M. Hoang, Sang Yoon Park and Jong Rhee (Myongji University, Korea)*

**Session P1-16 A Survey on Awesome Korean NLP Datasets**

*Byunghyun Ban (Imagination Garden Inc., Korea)*

**Session P1-17 Towards Accurate and Certain Molecular Properties Prediction**

*Kyung Pyo Ham, Jeong Noh Yoon and Lee Sael (Ajou University, Korea)*

**Session P1-18 Towards Uncertainty-aware Remaining Useful Life Prediction via Domain Adaptation**

*HyunYong Lee, Nacwoo Kim, Jungi Lee and Byung Tak Lee (ETRI, Korea)*

**Session P1-19 Lightweight framework for the violence and falling-down event occurrence detection for surveillance videos**

*Hyungmin Kim (University of Science and Technology, Korea); HoBeom Jeon (University of Science and Technology & ETRI, Korea); DoHyung Kim (ETRI, Korea); Jaehong Kim (Electronics & Telecommunication Research Institute (ETRI), Korea)*

**Session P1-20 YOLOX-based fast and lightweight single-class object detector**

*Jiwon Lee (ETRI, Korea); Byunggyu Lee (Telecommunications & Media Research Laboratory & Electronics and Telecommunications Research Institute, Korea); Sung-Uk Jung (ETRI, Korea)*

**Session P1-21 An Empirical Study of Remaining Useful Life Prediction using Deep Learning Models**

*HyunYong Lee, Nacwoo Kim, Jungi Lee and Byung Tak Lee (ETRI, Korea)*

## Technical Paper Sessions

**Session P1-22 Evaluation and Analysis of 2.3 Gbps Full-duplex Mobile Optical Wireless Communication System for High-speed Link between Air and Ground Station**

*Chan IL Yeo and Siwoong Park (ETRI, Korea); Youngsoon Heo (ETRI, Korea); JiHyoungh Ryu and Hyunseo Kang (ETRI, Korea)*

**Session P1-23 Evaluation of Hydrogen Safety Leakage Risk using Pseudo Hydrogen Leakage(%)**

*Hyun Mi Lee (TOD-based Engineering Research Center, Korea); Jeong Ah Jang (Ajou University & Transportation Oriented Development, Korea); Yongju Yi (Ajou University, Korea); Si Woo Kim (Korea Transportation Safety Authority, Korea)*

**Session P1-24 Blockchain and IPFS-based Data Storage for VANET**

*Sangeeta Narayan and Jae Won Jeong (Yeungnam University, Korea); Abdul Mateen Abdul (Federal Urdu University of Arts, Science & Technology Islamabad Pakistan & International Islamic University Islamabad Pakistan, Pakistan); Seung Yeob Nam (Yeungnam University, Korea)*

**Session P1-25 Identifier Update Method for Sidelink Communication**

*Manho Park and Heesang Chung (ETRI, Korea)*

**Session P1-26 An Open Source-based Digital Twin Broker Interface for Interaction between Real and Virtual Assets**

*Youngjae Lim (ETRI, Korea); Yang Koo Lee (ETRI (ETRI), Korea); Jaejun Yoo (Electronics and Telecommunication Research Institute, Korea); Daesub Yoon (ETRI, Korea)*

**Session P1-27 Experimental Demonstration of an Optically Connected CPU-Memory System with Service-Aware Scheduler**

*Jiwook Youn (ETRI, Korea)*

**Session P1-28 A Functional Verification Study of Quantum Key Distribute Networks and Services with a Trusted Node applied in KOREN**

*Sang-kil Park (ETRI, Korea); Yongsun Lee (NIA, Korea); Jung Jin Ju and Younseo Jeong (ETRI, Korea)*

**Session P1-29 Anomaly Detection for Robotic Assembly**

*Hyejin S. Kim (ETRI, Korea)*

**Session P1-30 A Study on ECG Monitoring Embedded Systems**

*Yeuwoong Kyung (Kongju National University, Korea); Jaehyuk Kim (Hanshin University, Korea); Eunchan Kim (Seoul National University, Korea); Haneul Ko (Kyunghee University, Korea)*

**Session P1-31 Indoor Localization System with PDR and WiFi Complementary Integration**

*Youngjun Kim (Kyungnam University, Korea); Yeuwoong Kyung (Kongju National University, Korea); Haneul Ko (Kyunghee University, Korea)*

**Session P1-32 IoT-Assisted Intelligent Vehicle Tracking System using Cloud Computing**

*Odinachi Udemezuo Nwankwo, Cosmas Ifeanyi Nwakanma, Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)*

## [Session A2] Intelligent Reflecting Surface

Oct. 19, 12:40~14:10

Chair : Prof. Sungtek Kahng (Incheon National University, Korea)

**Session A2-1 IRS Assisted Wireless Powered Communication: Active or Passive?**

*Luiggi Cantos and Yun Hee Kim (Kyung Hee University, Korea)*

**Session A2-2 Channel Modeling and Outage Performance of Cascaded RIS-empowered Wireless Networks**

*Zhandos Zhakipov and Galymzhan Nauryzbayev (Nazarbayev University, Kazakhstan)*

## Technical Paper Sessions

### Session A2-3 Outage Analysis and Realization Challenges of RIS-enabled Underlay CR Networks over Nakagami-m Fading

Madi Makin, Kassen Dautov and Mohammad Hashmi (Nazarbayev University, Kazakhstan); Theodoros Tsiftsis (Jinan University, China); Galymzhan Nauryzbayev (Nazarbayev University, Kazakhstan)

### Session A2-4 Energy-Efficient Aerial-RIS Deployment for 6G

Hong-Bae Jeon and Chan-Byoung Chae (Yonsei University, Korea)

### Session A2-5 A New Antenna System Using a Metasurface Abreast of New Satellites for NTN Communication

Junghyun Cho (Incheon National University, Korea); Yejune Seo (Incheon National University, Korea); Jiyeon Jang and Yejin Lee (Incheon National University, Korea); Joong-ki Park and Hosub Lee (LIGNex1, Korea); Sungtek Kahng (University of Incheon, Korea)

## [Session B2] Cloud

Oct. 19, 12:40~14:10

Chair : Prof. Gabriel Avelino R Sampedro (University of the Philippines, Philippines)

### Session B2-1 Breaching GPU data on a cloud VM

Seunggyun Lee and Seehwan Yoo (Dankook University, Korea)

### Session B2-2 Vision Based Deformable Wires Recognition using Point Cloud in Wire Harness Supply

Ji Sung Lee (ETRI, Korea); Donghyung Kim (ETRI(ETRI), Korea); Myoungchan Roh and Joong Bae Kim (ETRI, Korea)

### Session B2-3 A Characterization of Google Stadia Traffic for Modeling Real-Time Streaming Service

Youngboo Kim and Seungmin Oh (Kongju National University, Korea); Junho Jeong (Dongguk University, Korea); Gayoung Kim (Kangnam University, Korea)

### Session B2-4 Smart AmbuBag: A Cloud-Based Automated Respiratory Ventilator

Gabriel Avelino R Sampedro (Kumoh National Institute of Technology, Korea & University of the Philippines, Philippines); Jose Mari Cobar, Keith Daniel Abaja and Ronnie Baluis (Technological Institute of the Philippines, Philippines); Shekinah Lor Huyo-a (Philippine Coding Camp, Philippines); Mideth Abisado (Technological Institute of the Philippines & National University, Philippines)

### Session B2-5 Demand Management System for Electric Vehicle Charging Energy and Energy Cloud Operation

Seokjin Lee, Taehyung Kim and Youn-Kwae Jeong (ETRI, Korea)

## [Session C2] Optimization

Oct. 19, 12:40~14:10

Chair : Prof. Do-Yup Kim (Kyungnam University, Korea)

### Session C2-1 Joint Trajectory and Charging Power Optimization for Laser-Charged UAV Relaying Networks

Young-Ik Park (Yonsei University, Korea); Do-Yup Kim (Kyungnam University, Korea); Jang-Won Lee (Yonsei University, Korea)

### Session C2-2 Joint Optimization of Offloading Scheduling and Path Planning for Space-air-ground Integrated Edge Computing Systems

Doyoung Kim (Kyungpook National University, Korea); Seongah Jeong (Kyungpook National University & School of Electronics Engineering, Korea)



## Technical Paper Sessions

### Session C2-3 Stochastic Differential Equation of the Quantization based Optimization

*Jinwuk Seok (Electronics and Telecommunication Research Institute, Korea); Chang-Sik Cho (ETRI & ETRI), Korea)*

### Session C2-4 Joint Optimization of Placement, Beamwidth, and Power Allocation in the UAV-enabled Network

*Jonghyeon Won (Yonsei University, Korea); Do-Yup Kim (Kyungnam University, Korea); Jang-Won Lee (Yonsei University, Korea)*

### Session C2-5 An improved particle swarm optimization algorithm based on S-shaped activation function for fast convergence

*Haris Muhammad (Hanyang University, Korea); Dost Muhammad Saqib Bhatti (Hanyang University, South Korea, Korea); Haewoon Nam (Hanyang University, Korea)*

## [Session D2] Image Analytics

Oct. 19, 12:40~14:10

Chair : Prof. Youn Kyu Lee (Hongik University, Korea)

### Session D2-1 Photon counting integral imaging using Kalman estimation

*Ryo Shinohara, Hyun-Woo Kim, Jaehoon Lee and Jong-Hoon Huh (Kyushu Institute of Technology, Japan); Myungjin Cho (Hankyong National University, Korea); Min-Chul Lee (Kyushu Institute of Technology, Japan)*

### Session D2-2 A Cluster Chip Selection Method for Object Detection in Aerial Images

*Yungi Ha (KAIST, Korea); Changha Lee and Chan-Hyun Youn (KAIST, Korea)*

### Session D2-3 Enhanced integral imaging 3D depth map by using SRCNN

*Hideaki Uchino, Jaehoon Lee, Hyun-Woo Kim and Kazuaki Honda (Kyushu Institute of Technology, Japan); Myungjin Cho (Hankyong National University, Korea); Min-Chul Lee (Kyushu Institute of Technology, Japan)*

### Session D2-4 3D occluded object visualization by using integral imaging and semantic segmentation

*Kazuaki Honda, Jaehoon Lee, Hyun-Woo Kim and Hideaki Uchino (Kyushu Institute of Technology, Japan); Myungjin Cho (Hankyong National University, Korea); Min-Chul Lee (Kyushu Institute of Technology, Japan)*

### Session D2-5 A study on the classification of red blood cells specimen and data analysis method for the diagnosis of blood disease using a digital holographic microscopy

*Hyun-Woo Kim and Jaehoon Lee (Kyushu Institute of Technology, Japan); Myungjin Cho (Hankyong National University, Korea); Min-Chul Lee (Kyushu Institute of Technology, Japan)*

## [Session E2] Algorithm I

Oct. 19, 12:40~14:10

Chair : Prof. Ronnie Concepcion II (De La Salle University, Philippines)

### Session E2-1 Genotype Imputation Using K-Nearest Neighbors and Levenshtein Distance Metric

*Nishkal Hundia (Puna International School, India); Naveed Kabir (Georgia Institute of Technology, USA); Sweksha Mehta (Union County Vocational Technical High School, USA); Abhay Pokhriyal (Bellarmine College Preparatory, USA); Zhuo En Chua (SJII, Singapore); Arjun H Rajaram (University of Maryland, USA); Michael J Lutz (University of California Berkeley, USA); Amisha Kumar (Case Western Reserve University, USA)*

### Session E2-2 Classification Prediction of Familial Hypercholesterolemia using Ensemble-based Classifier with Feature Selection and Rebalancing Technique

*Jafhate Edward (Universiti Teknologi MARA, Malaysia); Marshima Mohd Rosli and Yung An Chua (Universiti Teknologi Mara,*

## Technical Paper Sessions

Malaysia); Noor Alicezah Mohd Kasim (Faculty of Medicine, University Teknologi MARA (UiTM) & Institute for Pathology, Laboratory and Forensic Medicine (I-PPerForM), Malaysia); Hapizah Mohd Nawawi (Universiti Teknologi MARA, Malaysia)

### Session E2-3 Topic Modelling Supreme Court Case Decisions using Latent Dirichlet Allocation

Bermylle John U Razon, Geoffrey A. Solano and Lorenz Timothy Barco Ranera (University of the Philippines Manila, Philippines)

### Session E2-4 A Q-Learning-Based Solar Energy Prediction Algorithm with Energy Data Association

Min Li, Huiping Gu, Jiafu Zhao and Heng Wang (Chongqing University of Posts and Telecommunications, China)

## [Session F2] Performance

Oct. 19, 12:40~14:10

Chair : Prof. Sangheon Pack (Korea University, Korea)

### Session F2-1 Advanced Mechanisms for Guaranteeing the High Performance of Virtualized 4G Core Networks

Diep Pham Quang (Mobile Switching Technologies Center & Viettel High Technology Corporation, Vietnam); Nguyen Tai Hung (Hanoi University of Technology, Vietnam); Hieu Le Van, Sang Le Van, Quan Le Hong and Anh Trieu Tuan (Mobile Switching Technologies Center, Vietnam)

### Session F2-2 Performance Evaluation of OCW Control Algorithm in IEEE 802.11ax Networks

Won-Jae Lee (Ajou, Korea); Jae-Hyun Kim (Ajou University, South Korea, Korea)

### Session F2-3 Performance Analysis of Spiking Neural Networks with Memristive Synapses in Detecting and Classifying RF Wave Signals

Hyun-Jong Lee (University of Kwangwoon, Korea); Dong-Hoon Kim (University of Incheon, Korea); Dong-Gyun Kim (University of Kwangwoon, Korea); Yeon-sup Lim (Sungshin Women's University, Korea); Jae-Han Lim (University of California, Los Angeles, USA & Kwangwoon University, Korea)

### Session F2-4 Joint VNF Scheduling and Deployment: A Dynamic Scenario

Zixiao Zhang and Eiji Oki (Kyoto University, Japan)

### Session F2-5 Quantum computing for the optimization of CT image reconstruction

Kyungtaek Jun (Ewha Womans University, Republic of Korea.); Jennifer Kim (Cardozo High School, USA); Hyunju Lee (Yonsei University Health System, Korea); Youngpyo Ryu (Dongguk University, Korea)

## [Session GW2] ICTC Workshop on Quantum Internet (IWQI)

Oct. 19, 12:40~14:10

Chair : Prof. Jun Heo (Korea University, Korea)

### Session GW2-1 Investigation of unconditionally secured classical key distribution via a free space

Byoung Seung Ham (Gwangju Institute of Science and Technology, Korea)

### Session GW2-2 Pulsed Erbium-doped Fiber Laser for Quantum Optics Applications

Kyungtaek Lee, Suh-young Kwon, Jeehwan Kim, Geunweon Lim and Ju Han Lee (University of Seoul, Korea)

### Session GW2-3 Analysis of Quantum Search Algorithm for Weighted Solutions: Simple Case

Youngjin Seo and Jun Heo (Korea University, Korea)

### Session GW2-4 Reducing Iterations of Grover Search Algorithm for N-Queen Problem Using Quantum Permutation States

Jinyoung Ha and Jun Heo (Korea University, Korea)

## Technical Paper Sessions

### Session GW2-5 Statistical Fluctuation Analysis for Quantum Secure Direct Communication with Entanglement source and Single-photon Measurement

Jooyoun Park (Korea University, Korea); Bumil Kim (Korea university, Korea); Jun Heo (Korea University, Korea)

## [Session P2] Poster Session 2

Oct. 19, 12:40~14:10

Chair : Prof. Seong Ho Jeong (Hankuk University of Foreign Studies, Korea)

### Session P2-1 Fast Reference Node Scheduling for Time Synchronization in Industrial Wireless Sensor Networks

Mahmoud Abdelsamad Ahmed Abdelwarth, Saifur Rahman Sabuj and Han-Shin Jo (Hanbat National University, Korea)

### Session P2-2 Optimal Estimation of Entangled States in Classical Quantum Simulator

Kisung Jin and Gyu-II Cha (ETRI, Korea)

### Session P2-3 GCN-based Semantic Relation Network for Few-Shot Object Detection

Jaegi Hwang (Kwangwoon University, Korea, Korea); Seongju Kang and Kwangsue Chung (Kwangwoon University, Korea)

### Session P2-4 Real-Time Data Processing Framework for Things with time-series and spatial features

Won Gi Choi, Sohyeon Kim, Jeehyeong Kim, Min-Hwan Song and Sang-Shin Lee (Korea Electronics Technology Institute, Korea)

### Session P2-5 SQR: Secure QR transaction with randomized rotation

Jihoon Ryoo, Shubhangi Saileja Rabichandra Garnaik and Youngho Kim (SUNY Korea, Korea)

### Session P2-6 Methodology for Assessment of Mobile Network Saturation based on Traffic and Resource Utilization

Yeeun Lee (ETRI, Korea); Kyung-yul Cheon (ETRI(ETRI), Korea); Hyeeyeon Kwon (ETRI, Korea); Ki-II Kim (Chungnam National University, Korea)

### Session P2-7 Impact of Receiver Selectivity Mask on Maximum Power Estimation at 6 GHz band

Igor Kim (ETRI, Korea); Seung Keun Park (ETRI, Korea)

### Session P2-8 A Traffic-Aware Dynamic Frame Adaptation Scheme for LoRaWAN Networks

Junhee Lee (ETRI, Korea); Jung-Sik Sung (ETRI, Korea)

### Session P2-9 Automatic Modulation Classification for Aggregated PDSCH in 5G New Radio

Kim JeongSeok, Byeong-Gwon Kang and Taehyoung Kim (Soonchunhyang University, Korea)

### Session P2-10 Probability-based Data Reception in Aol-sensitive Wireless Networks

Junhyeong Jo (Sungkyunkwan University (SKKU), Korea); Seongjun Kim (Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea); Jemin Lee (Sungkyunkwan University (SKKU), Korea)

### Session P2-11 A method for providing situation information and work process for disaster situation management

Eunjoo Kim (ETRI, Korea); Hyesun Lee (ETRI (ETRI), Korea); Sun-Hwa Lim (ETRI, Korea); Sang Gi Hong (Electronics and Telecommunication Research Institute, Korea); Kang Bok Lee (ETRI, Korea)

### Session P2-12 Parallel Execution of Solidity Smart Contract using Append-only Shared Log

Moonhyeon Chung and Chanik Park (Pohang University of Science and Technology, Korea)

### Session P2-13 Locality-based Time Series Data Augmentation for Multi-Sensor Internet Of Things Terminal

Kang-II Choi (ETRI, Korea); Jung Hee Lee (Electronics and Telecommunication Research Institute, Korea)



## Technical Paper Sessions

**Session P2-14 Lightweight Object Recognizer for Edge Devices**

*Seungtae Hong and Jeong-Si Kim (ETRI, Korea); YungJoon Jung (ETRI, Korea)*

**Session P2-15 Comparison between STDP and Gradient-descent Training Processes for Spiking Neural Networks Using MNIST Digits**

*Taewook Kang (ETRI (ETRI), Korea); Kwang-Il Oh and Jae-Jin Lee (ETRI, Korea); Wangrok Oh (Chungnam National University, Korea)*

**Session P2-16 A Survey on Digital Twin in Aerospace in the New Space Era**

*Myeung Un Kim (Korea Aerospace Research Institute, Korea)*

**Session P2-17 SAR Image Despeckling Based on U-shaped Transformer from a Single Noisy Image**

*Chushi Yu (University of Soongsil, Korea); Yoan Shin (Soongsil University, Korea)*

**Session P2-18 Design of Neural Network Model Converting Framework based on NNEF**

*KyungHee Lee, Jaebok Park and Seon-Tae Kim (ETRI, Korea); Ji-Young Kwak (ETRI, Korea); Chang-Sik Cho (ETRI & (ETRI), Korea)*

**Session P2-19 Deep Residual Denoising Network for IRS-Cascaded Channel Estimation with a Receiver Impairment**

*Muhammad Awais (Kyung Hee University, Korea); Jinsung Park and Mubasher Ahmed Khan (Kyunghee University, Korea); Yun Hee Kim (Kyung Hee University, Korea)*

**Session P2-20 Ag mesh / PEDOT: PSS bilayer electrode with high stretchability and conductivity**

*Jae Jin Chung, Tae Hyuk Kim and Jae Won Shim (Korea University, Korea)*

**Session P2-21 A Parcel Delivery Scheduling Scheme in Road Networks**

*JunHee Kwon and Jaehoon Jeong (Sungkyunkwan University, Korea)*

**Session P2-22 Conditional GAN based Collaborative Filtering with Data Augmentation for Cold-Start User**

*Sungpil Woo, Muhammad Zubair and Sunhwan Lim (ETRI, Korea); Chan-Won Park (ETRI, Korea); Daeyoung Kim (KAIST, Korea)*

**Session P2-23 Propagation Characteristics of Indoor Channels at 7.1 GHz Frequency Band**

*Junseok Kim and Ju Yeon Hong (ETRI, Korea); Jong Soo Lim (ETRI, Algeria); Young Jun Chong (ETRI, Korea)*

**Session P2-24 Low-Complexity Equalization of 3GPP High-Speed Train Channel**

*Taejun Jang (Pohang University of Science and Technology (POSTECH), Korea); Joohee Chae (POSTECH, Korea); Joon Ho Cho (Pohang University of Science and Technology (POSTECH), Korea)*

**Session P2-25 A Study on mmWave Sensor Technology and its Applications**

*Dongwan Kim and Ansary Shafew (Dong-A University, Korea); Eui-Jik Kim (Hallym University, Korea)*

**Session P2-26 Improper Gaussian Signalings for Secure Non-Orthogonal Multiple Access**

*Hyeonsik Yeom (KAIST, Korea); Jeongseok Ha (KAIST, Korea)*

**Session P2-27 Development of Touch Interface Using LIDAR for Multi-user Interactions in Projection-based VR**

*Hojin Lee, Sunghyun Kim, Seong-Won Ryu and Junseok Lee (ETRI, Korea); Koojoo Kwon (Baewha Womens University, Korea); Sukhyun Lim (Hanyang Womens University, Korea); Eun-Seok Lee (Yuhan University, Korea)*

**Session P2-28 Human Action Recognition Method using YOLO and OpenPose**

*Bigyeol Choi, Wonyoung An and Hyunwoo Kang (Korea Polytechnics, Korea)*

**Session P2-29 "Creativia" Metaverse Platform for Exhibition Experience**

*Cosmas Ifeanyi Nwakanma, Judith Nkechinyere Njoku, Jae-Young Jo, Chang-Hwan Lim and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

## Technical Paper Sessions

### Session P2-30 An Efficient Networks Operation System for Private 5G Networks

*Chang-Kyo Lee, (Gumi Electronics & Information Technology Research Institute, Korea); Jeaseok Park, Taeuk Park, Jaeuk Kwon, Hyunjoon Lee and Mahn-suk Yoon (Gumi Electronics and Information Technology Research Institute, Korea)*

### Session P2-31 Exploratory Data Analysis of Manufacturing Data

*Jihyun Lee (ETRI, Korea)*

### Session P2-32 Changes in Communication Networks and Computing for Intelligent IoT Services from Cloud to Edge

*Yeuwoong Kyung (Kongju National University, Korea); Haneul Ko (Kyunghee University, Korea)*

### Session P2-33 Multi-Stage Instance Segmentation

*Guohua Zhu and Suk Chan Kim (Pusan National University, Korea)*

## [Session A3] Energy AI

Oct. 19, 14:30~16:10

Chair : Prof. Cosmas Ifeanyi Nwakanma (Kumoh National Institute of Technology, Korea)

### Session A3-1 EV charging demand and Problem Formulation for the Optimization of the Hydrogen-integrated Electric Vehicle Charging Station: A Review

*Hyeon Woo (Korea University, Korea); Yongju Son (Korea University, Korea); Sungyun Choi (Korea University, Korea)*

### Session A3-2 A Study on the Application of Game Theory for Optimal Operation of Electric Vehicle Charging Station

*Yongju Son (Korea University, Korea); Hyeon Woo and Sungyun Choi (Korea University, Korea)*

### Session A3-3 Short-term Solar Power Generation Forecasting using Edge AI

*Duc Hoang Tran, Van Linh Nguyen, Huy Nguyen and Yeong Min Jang (Kookmin University, Korea)*

### Session A3-4 A Study on Meshed Distribution System and Protection Coordination Using HILS System

*Juan Noh (Korea University, Korea); Woogyu Chae and Woohyun Kim (KEPCO Research Institute, Korea); Sungyun Choi (Korea University, Korea)*

### Session A3-5 Application of Reinforcement Learning to Operate the Unbalanced Distribution System

*Yeunggurl Yoon and Sungyun Choi (Korea University, Korea)*

### Session A3-6 Non-communication Protection Scheme for Meshed Distribution Systems using a New Time-Current-Voltage Characteristic

*Dongyob Shin (Korea University & Korea Electric Power Corporation (KEPCO), Korea); Sungyun Choi (Korea University, Korea)*

## [Session B3] 5G & 6G Wireless Systems II

Oct. 19, 14:30~16:10

Chair : Prof. Intae Hwang (Chonnam National University, Korea)

### Session B3-1 Single-Frequency-Driven Multi-Resonant FSK: An Easy-to-Operate Wideband Modulation Scheme for Magnetic (Underwater) Communication

*Maurice Hott (Kiel University, Germany); Julius Maximilian Placzek (Christian Albrecht University, Germany); Peter A. Hoeher (University of Kiel, Germany)*

### Session B3-2 Traffic Classification using Deep Learning Approach for End-to-End Slice Management in 5G/B5G

## Technical Paper Sessions

Noor Abdalkarem Mohammedali, Triantafyllos Kanakis and Michael Opoku Agyeman (University of Northampton, United Kingdom (Great Britain)); Ali Al-Sherbaz (The University of Gloucestershire & School of Computing and Engineering, United Kingdom (Great Britain))

### Session B3-3 Bandwidth Prediction in TDM-PON-based Mobile Fronthaul for Small Cell CRAN

Garima Gupta (Indira Gandhi Delhi Technical University For Women, India); Vivekanand Jha (Indira Gandhi Delhi Technical University for Women, India); Rakesh Singh (Indira Gandhi Delhi Technical University for Women, India)

### Session B3-4 Fingerprint-aided mmWave Beam Selection for Enhanced Beam-space Massive MIMO Communication

Yuna Sim, Seungseok Sin, Yuna Jeong and Jihun Cho (Chonnam National University, Korea); Sangmi Moon (Korea Nazarene University, Korea); Intae Hwang (Chonnam National University, Korea)

### Session B3-5 Dual-Directional Polarization Insensitive Metamaterial Absorber based on Modified Circular Ring Structure

Osman Bin Ayop and Mohamad Kamal A Rahim (Universiti Teknologi Malaysia, Malaysia); Noor Asniza Murad (Universiti Teknologi Malaysia & HID GLOBAL Sdn. Bhd., Malaysia); Mohamad Fakrie Mohamad Ali (Universiti Teknologi Malaysia, Malaysia)

### Session B3-6 A 5G/LTE Monitoring System to Mitigate Catastrophic Damage

Seung Hyun Jeon (Korea Telecom, Korea); Kwangkoog Lee (KT Corporation, Korea); Young-Ok Lee and Jong pil Lee (Korea Telecom, Korea)

## [Session C3] Learning at the Edge

Oct. 19, 14:30~16:10

Chair : Prof. Wichura Winaitham (Kamphaeng Phet Rajabhat University, Thailand)

### Session C3-1 Real-time semantic segmentation on edge devices: A performance comparison of segmentation models

Myeong Seok Lee (University of Science and Technology Korea & ETRI, Korea); Moo-seop Kim (ETRI, Korea); Chi Yoon Jeong (ETRI & University of Science and Technology, Korea)

### Session C3-2 A Study on the Supplementary Method between RNN and CNN Model to Improve the Accuracy of Fine Dust Concentration Inference

Hyun Jong Kim and Taegyung Kang (ETRI, Korea); Kiseok Choi (KISTI (Korea Institute of Science and Technology Information), Korea)

### Session C3-3 Leveraging Edge Computing Resource Orchestration to Improve QoS for IoT

Wen-Pin Lai, Yu-Ping Chang, Chien-Chang Liu, Wei-Cheng Lei and Li-Der Chou (National Central University, Taiwan)

### Session C3-4 Multi-Agent Learning-based Package Caching in Serverless Edge Computing

Hongseok Jeon (ETRI, Korea); Seungjae Shin and Chunglae Cho (ETRI, Korea); Seunghyun Yoon (ETRI(ETRI), Korea)

### Session C3-5 Impact of Base Station Activation in Edge Computing-enabled Networks

Chanwon Park (Daegu Gyeongbuk Institute of Science and Technology, Korea); Jemin Lee (Sungkyunkwan University (SKKU), Korea)

### Session C3-6 Optimal Task Offloading with Deep Q-Network for Edge-Cloud Computing Environment

Ihsan Ullah, Hyun-Kyo Lim, Yeong-Jun Seok and Youn-Hee Han (Korea University of Technology and Education, Korea)



## Technical Paper Sessions

### [Session D3] Mobile Applications

Oct. 19, 14:30~16:10

Chair : Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)

#### **Session D3-1 Increasing Awareness of Cellular Signals on Smartphones using Augmented Reality**

*Nattamon Srithammee, Benchaporn Jantarakongkul and Kanuengnij Kubola (Burapha University, Thailand); Prajaks Jitngernmadan (Burapha University & Faculty of Informatics, Thailand)*

#### **Session D3-2 A Study of Effect of SPQ on IP Telephony Service with Binaural 3D Sounds**

*Honoka Awane, Yoshihiro Ito and Koizumi Maika (Nagoya Institute of Technology, Japan)*

#### **Session D3-3 The transformation from Pandemic to Endemic of Covid-19: Spatio-temporal Analysis of Citizen Mobility in Asia Countries**

*Samuel Ady Sanjaya (Universitas Multimedia Nusantara, Indonesia); Suyoto Suyoto (Universitas Atma Jaya Yogyakarta, Indonesia)*

#### **Session D3-4 Driver Drowsiness Detection based on 3D Convolution Neural Network with Optimized Window Size**

*Namkyoo Kang and Seungeun Han (University of Science and Technology & ETRI, Korea); Seungyeon Kim (University of Science and Technology & ETRI, Korea); SeungJoon Kwon, Yeongjae Choi, Yong-Tae Lee and Seung-Ik Lee (ETRI, Korea)*

#### **Session D3-5 Drowsy Driving Prevention IoT System: Waking Up the Driver Through Responsiveness Check**

*Gyeyoung Jung, Sinyoung Bok, Yesung Lee, Mirae Kwak, Heejung Kim and Jaejeung Kim (Chungnam National University, Korea); William Park, Alex Choi, Minji Lee and Anthony Smith (Purdue University, USA)*

### [Session E3] Algorithm II

Oct. 19, 14:30~16:10

Chair : Prof. Zsolt Csaba Johanyak (John von Neumann University, Kecskemet, Hungary)

#### **Session E3-1 A Novel Sensing Strategy through Denoising Autoencoder and Ensembling Methods**

*Noor Gul (University of Peshawar & Tech University of Korea, Pakistan); Saeed Ahmed (Mirpur University of Science and Technology, Pakistan); Su Min Kim and Junsu Kim (Tech University of Korea, Korea)*

#### **Session E3-2 Graph Query Language (GQL) - structured algorithms for Geospatial Intelligence on Public Transportation**

*Marielet A. Guillermo, Maverick Rivera and Ronnie Concepcion II (De La Salle University, Philippines); Robert Kerwin Billones (De La Salle University Manila, Philippines); Argel Bandala, Edwin Sybingco and Alexis Fillone (De La Salle University, Philippines); Elmer P. Dadios (Philippines, Philippines)*

#### **Session E3-3 Simulated Annealing with Mixed Evaluation Methods for Shared Backup Allocation of Middleboxes**

*Han Zhang and Eiji Oki (Kyoto University, Japan)*

#### **Session E3-4 A Beam Selection Algorithm Using Iterative Maximum Weighted Matching**

*Seungkwon Cho (Electronics and Telecommunication Research Institute, Korea); Seung-Eun Hong and Jeehyeon Na (ETRI, Korea)*

#### **Session E3-5 Sneak Path Aware Bit-Flipping Algorithm for ReRAM Crossbar Array**

*Myungin Kim (KAIST, Korea); Jeongseok Ha (KAIST, Korea)*

## Technical Paper Sessions

### [Session F3] Applications with ML II

Oct. 19, 14:30~16:10

Chair : Prof. Haeyoung Lee (University of Hertfordshire, UK)

#### **Session F3-1 A Solution Design for Solving Road Deadlock in Autonomous Driving**

*Chunyan Qi and Chunxiao Li (Yangzhou University, China)*

#### **Session F3-2 Green caviar Quality Classification based on Enhanced Deeply Learn Model**

*Krisana Chinnasarn, Watcharaphong Yookwan, Sirima Chinnasarn and Wichamanee Yuenyongputtakal (Burapha University, Thailand)*

#### **Session F3-3 Printed Circuit Board Defect Detection Using Generative Deep Learning Model**

*Jae Han Park and Soo Young Shin (Kumoh National Institute of Technology, Korea)*

#### **Session F3-4 Supervised vs. Self-supervised Pre-trained models for Hand Pose Estimation**

*Gyusang Cho (KAIST, Korea); Chan-Hyun Youn (KAIST, Korea)*

#### **Session F3-5 UAV Assisted Integrated Sensing and Communications for User Blockage Prediction**

*Igbafe Orikumhi (Hanyang University, Korea); Jungsook Bae (ETRI, Korea); Sunwoo Kim (Hanyang University, Korea)*

#### **Session F3-6 Finger Vein Pattern Extraction Improvement by Enhance Maximum Curvature and Frangi Filter**

*Viet Dung Nguyen (Hanoi University of Science and Technology, Vietnam); Tran Anh Tu (Ha Noi University of Science and Technology, Vietnam)*

### [Session G3] Machine Learning

Oct. 19, 14:30~16:10

Chair : Prof. Nurul Huda Mahmood (University of Oulu, Finland)

#### **Session G3-1 Pneumonia Detection using Ensemble Transfer Learning**

*Nidhin Raju, Siby Cyriac and Yong Woon Kim (CHRIST University, India)*

#### **Session G3-2 Automatic Modulation Classification using Relation Network with Denoising Autoencoder**

*Hyeonkyun Kim (Hanyang University, Korea); Adnan Shahid (Gent University - imec, Belgium); Jaron Fontaine (Ghent University - imec, Belgium); Eli De Poorter (Ghent University & Imec, Belgium); Ingrid Moerman (Ghent University - imec, Belgium); Haewoon Nam (Hanyang University, Korea)*

#### **Session G3-3 Adaptive loss function design algorithm for input data distribution in autoencoder**

*Joohong Rheey, Dayoung Choi and Hyunggon Park (Ewha Womans University, Korea)*

#### **Session G3-4 Continuous Differential Image-based Fast Convolution for Convolutional Neural Networks**

*Sunghoon Hong (Kyungpook National University, Korea); Daejin Park (Kyungpook National University (KNU), Korea)*

#### **Session G3-5 LazyNet: Lazy Entry Neural Networks for Accelerated and Efficient Inference**

*Junyong Park (ETRI, Korea); Yong-Hyuk Moon (ETRI (ETRI) & University of Science and Technology (UST), Korea); Daeyoung Kim (KAIST, Korea)*

#### **Session G3-6 Online Reinforcement Learning based HTTP Adaptive Streaming Scheme**

*Jeongho Kang and Kwangsue Chung (Kwangwoon University, Korea)*

## Technical Paper Sessions

### [Session P3] Poster Session 3

Oct. 19, 14:30~16:10

Chair : Dr. Hoondong Noh (ETRI, Korea)

**Session P3-1 A Study on the Considerations for Establishing a Security Model for Non-face-to-face Telehealth**

*Jungha Jin (KOREA University, Korea); Inhye Lee (Korea University, Korea)*

**Session P3-2 Performance Evaluation of 100 Gb/s 16-QAM Alamouti-coded Optical Coherent System**

*Oh J Yeol (ETRI, Korea & Optical Network Research Lab, Korea); Sang-Rok Moon, Hun-Sik Kang and Sun Hyok Chang (ETRI, Korea)*

**Session P3-3 Perceptual Encryption-based Privacy-Preserving Deep Learning in Internet of Things Applications**

*Ijaz Ahmad and Seokjoo Shin (Chosun University, Korea)*

**Session P3-4 State Injection and Syndrome Decoding for Rotated Surface Code in Quantum Computing**

*Soo-Cheol Oh and Gyu-Il Cha (ETRI, Korea)*

**Session P3-5 Super Resolution Network for Artistic Paintings**

*Jung-Jae Yu, Juwon Lee and Jaewan Kim (ETRI, Korea)*

**Session P3-6 Towards Robust Combination of Neural Networks for Fingerprint Presentation Attack Detection**

*Seong Hee Park, Min Young Lim, Dongwoo Kang and Youn Kyu Lee (Hongik University, Korea)*

**Session P3-7 Pedestrian Detection Method on Crosswalk for Autonomous Driving in Urban Environment**

*HyeongSeok Yun, Tae Hyeong Kim, Bong Seob Kim, Yun Ki Yoon and Kyung Su Yun (KIAP, Korea); Tae Hyoung Park (Chungbuk National University, Korea)*

**Session P3-8 A Study of Prediction Methods for lithium-ion Battery Capacity**

*HyunYong Lee, Nacwoo Kim, Jungi Lee and Byung Tak Lee (ETRI, Korea)*

**Session P3-9 Comparative Analysis of Forward and Backward Private Searchable Encryption using SGX**

*Hyundo Yoon and Junbeom Hur (Korea University, Korea)*

**Session P3-10 Sound Event Localization and Detection using Spatial Feature Fusion**

*Su-Hwa Jo (Pukyong National University & ETRI, Korea); Chi Yoon Jeong (ETRI & University of Science and Technology, Korea); Moo-seop Kim (ETRI, Korea)*

**Session P3-11 Underwater Internet of Things: Standardization Strategy**

*Eunbi Ko (Kookmin University, Korea); Delphin Raj K M (Kookmin University, South Korea, India); Soo-Young Shin (University of Kookmin, Korea); Howard Choe (WSN Technologies, Inc.); Soo-Hyun Park (Kookmin University, Korea)*

**Session P3-12 Grouped Intersection-based Routing using Reinforcement Learning for Urban VANETs**

*Qin Yang and Sang-jo Yoo (Inha University, Korea)*

**Session P3-13 Inter-radio interference analysis of multi-radio based C-ITS roadside unit**

*Seong-Keun Jin and Han-Gyun Jung (Korea Electronics Technology Institute, Korea)*

**Session P3-14 Lightweight Signature-based Range Proof**

*Kwantaee Cho (ETRI, Korea); Sang Rae Cho (ETRI (ETRI), Korea); Soohyung Kim (ETRI, Korea)*

**Session P3-15 Traffic Generation Scheduling for Performance Improvement in WLAN based drone network**

*Jun-Woo Cho (Ajou University, Korea); Jae-Hyun Kim (Ajou University, South Korea, Korea)*

**Session P3-16 Privacy-Preserving Federated Learning Using Homomorphic Encryption With Different Encryption Keys**

*Jaehyoung Park and Nam Yul Yu (Gwangju Institute of Science and Technology (GIST), Korea); Hyuk Lim (Korea Institute of Energy Technology (KENTECH), Korea)*



## Technical Paper Sessions

**Session P3-17 Floor Localization Based on Seq2Seq Model**

*Chenxiang Lin and Yoan Shin (Soongsil University, Korea)*

**Session P3-18 Self-Conditional Crowd Activity Detection Network with multi-label Classification Head**

*Soonyong Song and Heechul Bae (ETRI, Korea)*

**Session P3-19 A study on the sleep quality analysis of single-person households based on life pattern data using ambient sensors**

*Jungi Lee, Sangjoon Lee, SangJun Park and Byung Tak Lee (ETRI, Korea)*

**Session P3-20 Improved Timing Accuracy by Upsampling in Wireless OFDM Systems**

*Kapseok Chang, Junhyeong Kim and Yongsun Kim (ETRI, Korea); Young-Jo Ko (ETRI, Korea)*

**Session P3-21 Dimensional reduction algorithm using feature selection and matrix decomposition**

*Dawit Yong, Yaeun Lee and Hyunki Lim (Kyonggi University, Korea)*

**Session P3-22 Graph Feature Generation based on Scene Graph Benchmark Application on Video**

*Jiyoun Lim and Nam Kyung Lee (ETRI, Korea)*

**Session P3-23 LiveCap: Live Video Captioning with Sequential Encoding Network**

*Wangyu Choi and Jongwon Yoon (Hanyang University, Korea)*

**Session P3-24 On the Hardness of Pruning NASNet**

*Jong-Ryul Lee (ETRI, Korea); Yong-Hyuk Moon (ETRI (ETRI) & University of Science and Technology (UST), Korea)*

**Session P3-25 Octopus-Inspired Robot for Underwater Exploration in Military Internet of Battle Operations and Surveillance**

*Mohamed Abubakar Dini (Kumoh National Institute of Technology, Korea); Simeon Ajakwe (Kumoh National Institute of Technology, Gumi, Korea); Jae Min Lee, Dong-Seong Kim and Taesoo Jun (Kumoh National Institute of Technology, Korea)*

**Session P3-26 Design and implementation of Deep Learning for MIMO C-00K scheme-based Optical Camera Communication**

*Huy Nguyen, Duc Hoang Tran, Van Linh Nguyen and Yeong Min Jang (Kookmin University, Korea)*

**Session P3-27 Quantum Circuit Simulator based on FPGA**

*Hong Yun Pyo (Korea Electronics Technology Institute, Korea); Seokhun Jeon (KETI, Korea); Sihyeong Park and Byung-Soo Kim (Korea Electronics Technology Institute, Korea)*

**Session P3-28 Monocular Depth Estimation using Improved CSR**

*Jung-Jae Yu (ETRI, Korea)*

**Session P3-29 Data Preprocessing Method for ANN-Based Travel Time Estimation Using Insufficient GPS Data**

*Hye Young An and Won Seok Choi (Chungbuk National University, Korea); Seong Gon Choi (Chungbuk University, Korea)*

**Session P3-30 Implementation of Internet of Maritime Things Platform in the Ocean**

*Yujae Song (Kumoh National Institute of Technology, Korea); Hui cheol Shin (University of Science and Technology, Korea); Seong Ho Chae (Tech University of Korea, Korea); Yongjae Kim (KIOST, Korea)*

**Session P3-31 The Pattern Analysis-based Data Imputation Method for Data Table**

*Eun JeeSook (ETRI, Korea); Se-han Kim (ETRI(Electronics and Telecommunications Research Institute), Korea)*

**Session P3-32 Detecting In-Game Play Event in Live Esports Stream**

*Seung-Jin Hong (University of Science and Technology(UST), Korea); Sang-Kwang Lee (ETRI, Korea)*

**Session P3-33 An Implementation of Retrieving Situation-Aware Information for Emergency Incident**

*Sungwon Byon (Electronics and Telecommunication Research Institute, Korea); Eunjung Kwon, Hyunho Park and Eui-Suk Jung (ETRI, Korea)*

## Technical Paper Sessions

**October 20th (Thursday) 2022**

### **[Session AW4] ICTC Workshop on Advanced Industrial Networks with beyond 5G and Intelligence Distribution (IWAIN)**

Oct. 20, 08:30~10:10

Chair : Prof. Haeyoung Lee (University of Hertfordshire, UK)

#### **Session AW4-1 On Distribution of Intelligence: From the Perspective of Edge Computing**

Jc Yeom (KETI, Korea); Jaewon Moon (Korea Electronics Technology Institute, Korea); Seung Woo Kum (Korea Electronics Technology Institute, Korea)

#### **Session AW4-2 An introduction to the architecture of CLUST platform supporting multiple time series data integration and analysis**

Jaewon Moon (Korea Electronics Technology Institute, Korea); Seung Woo Kum (Korea Electronics Technology Institute, Korea); Seungtaek Oh (Korea Electronics Technology Institute, Korea)

#### **Session AW4-3 IoT Network Intrusion Detection with Ensemble Learners**

Sulyman Age Abdulkareem, Chuan Heng Foh, Haeyoung Lee, Francois Carrez and Klaus Moessner (University of Surrey, United Kingdom (Great Britain))

#### **Session AW4-4 An Active Reference Reset Method Adapting Distribution Shift for Robust System Anomaly Detection**

Seungwan Seo and Heejeong Choi (Korea University, Korea); Pilsung Kang (Korea)

#### **Session AW4-5 ML-based estimation of the number of devices in industrial networks using unlicensed bands**

Oluwatobi E Baiyekusi (University of Strathclyde, United Kingdom (Great Britain)); Haeyoung Lee and Klaus Moessner (University of Surrey, United Kingdom (Great Britain))

### **[Session BW4] ICTC Workshop on 6G STAR-MAC (IWSM)**

Oct. 20, 08:30~10:10

Chair : Prof. Hyunhee Park (Myongji University, Korea)

#### **Session BW4-1 Device Distribution Scheme of Random Access in Space-Air-Ground Integrated Network for Massive IoT**

Joohyun Oh, Joohan Park, Jiseung Youn, Jeong-Ju Im and Sunghyun Cho (Hanyang University, Korea)

#### **Session BW4-2 An Adaptive Contention Window Mechanism for Improving fairness of Multi links in Wi-Fi 7**

Jiha Kim, Hyunhee Park (Myongji University, Korea)

#### **Session BW4-3 Sleeping Combinatorial Bandits with Fairness Guarantees for Fast Uplink Grant in mMTC**

Jose Agostinho Antonio, Hyunhee Park (Myongji University, Korea)

#### **Session BW4-4 Design of Distributed Computational Offloading using Ray Framework**

Sumit Singh, Bong-Seok Seo and Dong Ho Kim (Seoul National University of Science and Technology, Korea)

#### **Session BW4-5 UAV Position & Cell Partition Optimization Considering User Distribution and Data Rate in UAV Network**

Hwang Subin, Bong-Seok Seo and Dong Ho Kim (Seoul National University of Science and Technology, Korea)

## Technical Paper Sessions

### **Session BW4-6 Random Access Issues for Next Generation Mobile Communications Services**

*Seokju Byun, Su-Jin Lee and Ye Hoon Lee (Seoul National University of Science and Technology, Korea)*

### **Session BW4-7 MS-ActionFormer Multi-Scale Transformer for End-to-End Video Action Detection**

*Tae In Son, Seok Hwan Lee, Jun Won Choi (Hanyang University, Korea)*

## **[Session CW4] The 2nd workshop on Information and Communication Strategic Technology for Industry Convergence (IWICST)**

Oct. 20, 08:30~10:10

Chair : Dr. Woo Yong Lee (ETRI, Korea)

### **Session CW4-1 Doped Graphene on Silicon Bottom Gated FET for High Drain Current and Applications in RF And Logic Circuit**

*Md Mahfuzur Rahman (National Research University - Moscow Power Engineering Institute, Russia & University of Technology Malaysia Johor, Malaysia)*

### **Session CW4-2 Improved Generative Convolution Method for Image Generation**

*Seung Park (Chungbuk National University Hospital, Korea); Minuk Yang (Chungbuk National University Hospital, Korea); Kim Geunhyeong, Jueng Eun Im and Kihun Kim (Chungbuk National University Hospital, Korea); Yong-Goo Shin (Hannam University, Korea)*

### **Session CW4-3 An effect analysis of code-word distance extension in Reed-Muller codes with dynamic frozen bits**

*Woo Yong Lee and Keunyoung Kim (ETRI, Korea)*

### **Session CW4-4 RF Signal-Based Multipurpose UAV Surveillance System Using Deep Neural Network**

*Rubina Akter (Kumoh National Institute of Technology & Networked Systems Laboratory, Korea); Mohtasin Golam (Kumoh National Institute of Technology (KIT) & IT Convergence, Korea); Ahmad Zainudin (Kumoh National Institute of Technology, Korea); Sang Van Doan (Vietnam Naval Academy, Vietnam & ICT CRC, Kumoh National Institute of Technology, Korea); Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

### **Session CW4-5 Selective layered BP decoding for low-latency NR LDPC codes**

*Chanho Yoon (ETRI, Korea); Woncheol Cho and Young-Jo Ko (ETRI, Korea)*

## **[Session DW4] The 4th International Workshop on Intelligent Immersive Media Communications (IIMC)**

Oct. 20, 08:30~10:10

Chair : Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)

### **Session DW4-1 Identifying Elements of Gamification for Reading Music Notation in Music Education**

*Jessellah Samat (Universiti Malaysia Sabah, Malaysia); Aslina Baharum (Universiti Teknologi MARA (UiTM), Malaysia); Christina Andin (Universiti Malaysia Sabah, Malaysia)*

### **Session DW4-2 Delta QP Allocation for MPEG Immersive Video**

*Jong-Beom Jeong (Sungkyunkwan University, Korea); Soonbin Lee and Eun-Seok Ryu (Sungkyunkwan University (SKKU), Korea)*

### **Session DW4-3 Overview of the Volumetric Video Capturing System for Immersive Media**

*Jaeyeol Choi and Jong-Beom Jeong (Sungkyunkwan University, Korea); Soonbin Lee and Eun-Seok Ryu (Sungkyunkwan University (SKKU), Korea)*



## Technical Paper Sessions

### Session DW4-4 Overview of the Video-based Dynamic Mesh Coding (V-DMC) Standard Work

YiHyun Choi and Jong-Beom Jeong (Sungkyunkwan University, Korea); Soonbin Lee and Eun-Seok Ryu (Sungkyunkwan University (SKKU), Korea)

### Session DW4-5 Multipass Hierarchical View Grouping method for Efficient 6DoF Video Streaming

Yeongil Ryu (Sungkyunkwan University, Korea); Eun-Seok Ryu (Sungkyunkwan University (SKKU), Korea)

## [Session EW4] ICTC Workshop on Artificial Intelligence (IWAI)

Oct. 20, 08:30~10:10

Chair : Prof. Hyosu Kim (Chung-Ang University, Korea)

### Session EW4-1 Comparison of optical flow image preprocessing options for state of the art deep learning models

Tomislav Dobrički, Yonghee Oh, Haeun Ko, Taeyun Kim, Dongyoung Kim and Byung-Woo Hong (Chung-Ang University, Korea)

### Session EW4-2 Incremental Learning for Optical Flow

Tomislav Dobrički, Yonghee Oh, Haeun Ko, Taeyun Kim, Dongyoung Kim and Byung-Woo Hong (Chung-Ang University, Korea)

### Session EW4-3 Survey on unsupervised learning methods for optical flow estimation

Tomislav Dobrički (Chung-Ang University, Korea); Kyoung Jae Won (University of Copenhagen, Denmark); Xiahai Zhuang (Fudan University, China); Byung-Woo Hong (Chung-Ang University, Korea)

### Session EW4-4 Immersive Body-Hand Gesture Interfaces for HMD-Based Virtual Environment Navigation

Ki Seok Jung and Bong-Soo Sohn (Chung-Ang University, Korea)

### Session EW4-5 A Self-Learning French Language Learner Assistant Chatbot Leveraging Deep Learning

Rifat Sarker Aoyon, Yamin Ara, Tahsin Anzum Baptee and Mehrin Afroz (Brac University, Bangladesh); Md Sabbir Hossain (BRAC University, Bangladesh); Md Humaion Kabir Mehedi (Brac University, Bangladesh); Annajiat Alim Rasel (BRAC University, Bangladesh)

### Session EW4-6 Generative Data Augmentation via Wasserstein Autoencoder for Text Classification

Kyohoon Jin, Junho Lee, Juhwan Choi, Soojin Jang and Youngbin Kim (Chung-Ang University, Korea)

### Session EW4-7 A Study on Corporate Information Assets Management System Using NFT

Giwan Hong and Hangbae Chang (Chung-Ang University, Korea)

### Session EW4-8 An exploratory study of security data analysis method for insider threat prevention

Jawon Kim and Hangbae Chang (Chung-Ang University, Korea)

### Session EW4-9 Audio-driven facial animation: a survey

Jewoong Hwang and Kyoungju Park (Chung-Ang University, Korea)

### Session EW4-10 Analysis of Sub-Routines in NVIDIA cuBLAS Library for a series of Matrix-Matrix Multiplications in Transformer

Donghyeon Kim, Inseo Kim and Jinsung Kim (Chung-Ang University, Korea)

### Session EW4-11 Scale Decision Network for Correlation Filter-based Tracking

Jongwon Choi (Chung-Ang University, Korea)

### Session EW4-12 3D human body pose estimation in virtual reality: A survey

Taravat Anvari and Kyoungju Park (Chung-Ang University, Korea)

### Session EW4-13 Analysis of Several Sparse Formats for Matrices used in Sparse-Matrix Dense-Matrix Multiplication for Machine Learning on GPUs

Donghyeon Kim and Jinsung Kim (Chung-Ang University, Korea)

## Technical Paper Sessions

### Session EW4-14 A Study on Graph-based Classification for Important Technical Documents

*Yuna Han, Wonseok Yoon and Hangbae Chang (Chung-Ang University, Korea)*

### Session EW4-15 Crop Yield Prediction Enhancement Utilizing Deep Learning and Ensemble Algorithms

*Ohnmar Khin and Sungkeun Lee (Sunchon National University, Korea)*

### Session EW4-16 Multi-Task Learning with Convolutional Neural Network for Packet Format Detection and Modulation Classification of Wireless LAN

*Dody Ichwana Putra (Kyushu Institute of Technology, Japan)*

### Session EW4-17 Convolutional Residual Blocks With Edge Guidance for Image Denoising

*Shivarama Holla and Bumshik Lee (Chosun University, Korea)*

### Session EW4-18 Estimating Deep Curve and Illumination Maps for Old Image Brightness Enhancement

*Arshiana Shamir and Bumshik Lee (Chosun University, Korea)*

### Session EW4-19 Gradient Surgery for Text-Dependent Speaker Verification: A Preliminary Study

*Sunghyun Yoon and Dong Sub Kim (Kongju National University, Korea)*

### Session EW4-20 A Comparison of 2 Step Classification with 3-Class Classification for Webpage Classification

*Tsering Losel (Wiznet India Private Limited, India); Yong Woon Kim (CHRIST University, India)*

### Session EW4-21 Stance Detection of Political Tweets with Transformer Architectures

*Pranav R Gunhal (Homestead High School, USA); Aditya Bashyam (Irvington High School, USA); Kelly H Zhang (Brooklyn Technical High School, USA); Alexandra L Koster (Eleanor Roosevelt High School, USA); Julianne Huang (Staten Island Technical High School, USA); Neha Haresh (High School, Pakistan); Rudransh Singh (High School, USA); Michael J Lutz (University of California Berkeley, USA)*

### Session EW4-22 Identification of SARS-COV-2 viral escape sequences using ESCAPETRANS Network

*Prem S Bist (Jeonbuk National University, Korea); Hilal Tayara and Kil To Chong (Jeonbuk National University, Korea)*

### Session EW4-23 Adaptive Tsallis Entropy Regularization for Efficient Reinforcement Learning

*Kyungjae Lee (Chung-Ang University, Korea)*

### Session EW4-24 Efficient Extreme Motion Planning by Learning from Experience

*Kyungjae Lee (Chung-Ang University, Korea)*

## [Session FW4] ICTC Workshop on Sub-THz/THz Communication for 6G (IWTHZ)

Oct. 20, 08:30~10:10

Chair : Prof. Sang-Woon Jeon (Hanyang University, Korea)

### Session FW4-1 Wideband Circular Polarized Series Fed Cross Dipole Antenna

*Tae Hwan Jang (Hanyang University @ Ansan Campus, Korea)*

### Session FW4-2 Nanonetworks: Next Frontier in Wireless Communications

*Pankaj Singh and Sung-yoon Jung (Yeungnam University, Korea)*

### Session FW4-3 Enhanced Channel Estimation for MIMO OFDM Systems

*HoonGeun Song and Kwanghyun Park (Korea Testing Laboratory, Korea); Sang-Woon Jeon (Hanyang University, Korea)*

### Session FW4-4 Sum Rate Maximization for RIS-Assisted Hybrid Beamforming Systems

*Najam Us Saqib (Hanyang University, Korea); Kwanghyun Park and HoonGeun Song (Korea Testing Laboratory, Korea); Sung Ho Chae (Kwangwoon University, Korea); Sang-Woon Jeon (Hanyang University, Korea)*

## Technical Paper Sessions

### Session FW4-5 Optimal Placement of Reconfigurable Intelligent Surface for Millimeter-Wave Indoor Communication

Shumei Hou and Najam Us Saqib (Hanyang University, Korea); Sung Ho Chae (Kwangwoon University, Korea); Zhi Dou (Henan Normal University, China); Sang-Woon Jeon (Hanyang University, Korea)

### Session FW4-6 MMSE-based IQ Imbalance Compensation for mmWave Uplink MIMO Systems

Guopei Zhu and Najam Us Saqib (Hanyang University, Korea); HoonGeun Song and Jaesuk Lee (Korea Testing Laboratory, Korea); Sang-Woon Jeon (Hanyang University, Korea)

### Session FW4-7 Sampling Frequency Offset Estimation Scheme for CP-OFDM based NR Sidelink System

Yong-An Jung, Sang-Bong Byun, Dong-Cheul Han, Soo-Hyun Cho and Sung-hun Lee (Gumi Electronics & Information Technology Research Institute, Korea)

## [Session GW4] ICTC Workshop on ETRI 5G+ and 6G Technologies - Mobile Communications (IWEMC)

Oct. 20, 08:30~10:10

Chair : Dr. Ilgyu Kim (ETRI, Korea)

### Session GW4-1 Remote monitoring of a smart factory over an intercontinental link: Vistas from ETRI-Oulu collaboration project

Nurul Huda Mahmood, Hossein Rezaei and Antti Pauanne (University of Oulu, Finland); Gweondo Jo, JaeSheung Shin and Hyun Kyu Chung (ETRI, Korea); Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland); Matti Latva-aho (University of Oulu, Finland)

### Session GW4-2 Effective PSCCH Detecting in 5G-NR V2X System

Sung Woo Choi, Junhyeong Kim and Heesang Chung (ETRI, Korea)

### Session GW4-3 A Method of PRACH detection in mmWave 5G Communications system

Jun woo Kim, Yong Su Lee, Young-jin Moon, Seungjae Bahng, Jang-won Moon and Heesoo Lee (ETRI, Korea)

### Session GW4-4 Software Implementation of 5G NR Downlink Polar Encoders

Giyoon Park and Nam-il Kim (ETRI, Korea)

### Session GW4-5 Phase Noise Observation in Sub-Terahertz Band

Kyeongpyo Kim (ETRI, Korea); Wooram Shin (ETRI & KAIST, Korea); Kapseok Chang and Young-Jo Ko (ETRI, Korea)

### Session GW4-6 Joint Access Point Beamforming and Switch On/Off Scheme for Energy Efficient Cell-Free mmWave massive MIMO

Seung-Eun Hong and Jeehyeon Na (ETRI, Korea)

## [Session P4] Poster Session 4

Oct. 20, 08:30~10:10

Chair : Prof. Sang-Hyo Kim (Sungkyunkwan University, Korea)

### Session P4-1 High-efficiency wireless charging system for logistics robots

Jung Ick Moon (ETRI, Korea); Sang-Won Kim, Seong-Min Kim, Gwangzeen Ko and In-Kui Cho (ETRI, Korea)

### Session P4-2 Personal Driving Style-based ADAS Customization in Diverse Traffic Environments using SVM for Public Driving Safety

Giyoung Hwang, Dongjun Jung, Yunyeong Goh and Jong-Moon Chung (Yonsei University, Korea)



## Technical Paper Sessions

**Session P4-3 An Emotion Classification Scheme for English Text Using Natural Language Processing**

*Mose Gu, JunHee Kwon, Jaehoon Jeong and Sang Hee Kweon (Sungkyunkwan University, Korea)*

**Session P4-4 Chipmunk: Simple Distributed Object Storage for Named Data Networking**

*Sae Hyong Park (ETRI, Korea); Yongyoon Shin and Namseok Ko (ETRI, Korea)*

**Session P4-5 A Blockchain Sharding Protocol supporting Dynamic Locality in Mobile Edge Computing**

*Yongrae Jo and Chanik Park (Pohang University of Science and Technology, Korea)*

**Session P4-6 A Study on the Necessity to Manage the Psychological States of Workers in Shipyard**

*Yoonsook Hwang (Intelligent Robotics Research Division, ETRI, Korea); Woo-Sung Jung (ETRI, Korea); Daeseung Yoo (ETRI, Korea)*

**Session P4-7 A Vision of Distributed Cloud Computing**

*Qui Pham, Thien Huynh-The and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

**Session P4-8 Reinforcement of IoT Open Platform Security using PUF-based Device Authentication**

*Byoungkoo Kim (ETRI (ETRI), Korea); Seungyong Yoon (ETRI, Korea)*

**Session P4-9 Tutorial on Course-of-Action (COA) Attack Search Methods in Computer Networks**

*Seok Bin Son, Soohyun Park, Haemin Lee and Joongheon Kim (Korea University, Korea); Soyi Jung (Ajou University, Korea); Dong Hwa Kim (ADD, Korea)*

**Session P4-10 Virtualized Infrastructure as an Incentive on AI-Data Commons**

*Boyun Eom, Sunhwan Lim, Young-Ho Suh and Sungpil Woo (ETRI, Korea); Chan-Won Park (ETRI, Korea)*

**Session P4-11 Designing ML-based Approximate Query Processing Services on Time-Varying Large Dataset for Distributed Systems**

*Kihyuk Nam, Sung-Soo Kim, Choon Seo Park, Taekyong Nam and Taewhi Lee (ETRI, Korea)*

**Session P4-12 Downlink Control Information Analysis of UEs according to Service Types at LTE Cell Edge**

*Gyeong-June Hahm, Minho Han and Hyejeon Kwon (ETRI, Korea)*

**Session P4-13 Crisis analysis on blockchain-based decentralized learning in wireless networks**

*Jiae Lee (Seoul Institute of Technology, Korea); Gyungmin Kim (GIST, Korea); Yonggang Kim (Kongju National University, Korea)*

**Session P4-14 Reinforcement Learning based Adaptive Resource Allocation Scheme for Multi-User Augmented Reality Service**

*Kyungchae Lee and Chan-Hyun Youn (KAIST, Korea)*

**Session P4-15 Blockchain-based Federated Approach for Privacy-Preserved IoT-enabled Smart Vehicular Networks**

*Sushil Kumar Singh, Laihyuk Park and Jong Hyuk Park (Seoul National University of Science and Technology, Korea)*

**Session P4-16 Beamforming Design for Cache-enabled Integrated Access and Backhaul Networks**

*Mingun Kim and Hewon Cho (Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea); Jemin Lee (Sungkyunkwan University (SKKU), Korea)*

**Session P4-17 Outage Performance Analysis of Multiple Reflected Channels for OAM transmission**

*Man Hee Lee and Soo Young Shin (Kumoh National Institute of Technology, Korea)*

**Session P4-18 Classical music information generating system using AI Video Classification**

*Joo Hun Yoo, Harim Jeong and TaiMyoung Chung (Sungkyunkwan University, Korea)*

## Technical Paper Sessions

**Session P4-19 FaceBERT: Face De-Identification Using VQGAN and BERT**

*Dong-Hyuck Im and Yongseok Seo (ETRI, Korea)*

**Session P4-20 Virtual Agents with Augmented Reality in Digital Healthcare**

*Harim Jeong, Joo Hun Yoo and Hayeon Song (Sungkyunkwan University, Korea)*

**Session P4-21 Activity and environmental sensor application: Tonometry aided arrhythmia detection system**

*Kyungdon Choi (Kaist, Korea); Yongho Kim (CNFrontier, Korea); Byunghun Han (KAIST Institute for IT Convergence, Korea); HeeJung Kang and YoungSang Kun (DAEYOMEDI Co., Ltd., Korea); Hojong Chang and Kyungho Byoun (KAIST, Korea)*

**Session P4-22 Propagation characteristics of various highway V2V environment at 5.9GHz Band**

*Chung Sup Kim and Hyuk-Je Kim (ETRI, Korea); Sung Woong Choi (ETRI, Korea); Junseok Kim and Kwanwoong Ryu (ETRI, Korea)*

**Session P4-23 DRX enhancement method in sidelink**

*MinSuk Choi and Heesang Chung (ETRI, Korea)*

**Session P4-24 Lightweight method with controllable appearance details for 3D reconstructed building models**

*Kyung-Kyu Kang and Chang-joon Park (ETRI, Korea)*

**Session P4-25 Automatic Rule Generation Method for User Action Detection from Traffic Data**

*Jee Tae Park and Ui-Jun Baek (Korea University, Korea); Chang-Yui Shin (Defense Agency for Technology and Quality, Korea); Min-Seong Lee, Jeong-Woo Choi and Myung-Sup Kim (Korea University, Korea)*

**Session P4-26 Considerations on Multi-Radio Multi-Connectivity in 6G System**

*Sun Mi Jun (ETRI, Korea)*

**Session P4-27 Sparsification on Different Federated Learning Schemes: Comparative Analysis**

*Jongmyeong Lee, Youngsu Jang, Jangho Lee and Joonhyuk Kang (KAIST, Korea)*

**Session P4-28 Performance Analysis of Single Coil and Multi-Coil with Same Cross-Sectional Area**

*Sang-Won Kim and Seong-Min Kim (ETRI, Korea); Jung Ick Moon (ETRI, Korea); Gwangzeen Ko and In-Kui Cho (ETRI, Korea)*

**Session P4-29 Cluster Cloud with SDN Virtual Network**

*SungChol Cho (Konkuk University, Korea); Khin Chan Myae Aung (ETRI, Korea); Sunyoung Han (Konkuk University, Korea)*

**Session P4-30 Energy Resource Capacity Optimization for Zero-Energy Housing Complex**

*Sewan Heo (ETRI, Korea); Tai Yeon Ku and Wan-Ki Park (ETRI, Korea)*

**Session P4-31 Implementation of Carrier Phase Positioning for 5G OFDM System**

*Wanhee Kim (Locaila, Inc., USA); Jongphil Park and Jaihyung Cho (Locaila, USA)*

**Session P4-32 Design of Interactive Reading Comprehension Competence Assessment System using AI**

*HongYeon Yu (ETRI, Korea); Seung Hun Oh (ETRI (Electronics and Telecommunications Research Institute), Korea); Eun-Kyoung Jeon (Electronics and Telecommunication Research Institute, Korea); Donghoon Son (ETRI, Korea); Seihyoung Lee (ETRI, Korea); Kwon-Seob Lim (ETRI, Korea)*

**Session P4-33 UAV arming Authorization using DIM and Flight Authorization Code**

*Juhan Kim (Electronics and Telecommunications Research Institute, Korea)*

## Technical Paper Sessions

### [Session AW5] The 4th Workshop on Advances in Convergence of ICT and Brain Science for Better Health (ACIBS)

Oct. 20, 10:30~12:10

Chair : Prof. Young-Im Cho (Gachon University, Korea)

**Session AW5-1 Automatic measurement algorithm of femoral/tibial torsion on standardized CT slices**

*Ji soo Jeon, Kwang Gi Kim and Young Jae Kim (Gachon University, Korea)*

**Session AW5-2 A Study on Liver Segments Separation and Hologram Visualization Using Deep Learning-Based Liver Vascular in CT Images**

*Dae Jin Kim and Young Jae Kim (Gachon University, Korea); Youngbae Jeon and Jeong-Heum Baek (Gil Medical Center, Korea); Kwang Gi Kim (Gachon University, Korea)*

**Session AW5-3 Peripheral vision function training contents for people with low vision with Python tkinter**

*Hyunsung Park, Incheol Jeong, Kapyol Kim, Jongwon Lee, JungYoon Kim and Jinsoo Cho (Gachon University, Korea)*

**Session AW5-4 AB-XLNet: Named Entity Recognition Tool for Health Information Technology Standardization**

*KyoungSu Oh, Min Kang, SeoHyun Oh, Do-hyoung Kim, Seokhwan Kang and Youngho Lee (Gachon University, Korea)*

**Session AW5-5 Hologram clinical system for standardization of brain computer interface**

*Min Chan Kim, PK and Kicheol Yoon Yoon (Gachon University Gil Medical Center & Gachon University, Korea); Sangyun Lee (Gachon University Gil Medical Center, Korea); Kwang Gi Kim (Gachon University, Korea)*

**Session AW5-6 Standardization of brain computer interface based on brain disease sensor safty and rectenna applications**

*Kicheol Yoon Yoon and Min Chan Kim, PK (Gachon University Gil Medical Center & Gachon University, Korea); Sangyun Lee (Gachon University Gil Medical Center, Korea); Kwang Gi Kim (Gachon University, Korea)*

**Session AW5-7 Wireless Endoscopic Image detection using YOLO-Inception-Res-A**

*Doniyorjon Mukhtorov and Young Im Cho (Gachon University, Korea)*

**Session AW5-8 GAN based Hairstyle Generation Framework for Standardization of Lightweight-model**

*Seok Jeong Gee, Young Im Cho and QiaoYue Man (Gachon University, Korea)*

### [Session BW5] ICTC Workshop on Enabling Technologies for 6G Mobile Core (IW6GMC)

Oct. 20, 10:30~12:10

Chair : Prof. Haneul Ko (Kyung Hee University , Korea)

**Session BW5-1 Design and Implementation of Network Data Analytics Function in 5G**

*Seunghyun Lee (Korea University, Korea); Jaewook Lee (ETRI, Korea); Taeyun Kim, Daeyoung Jung, Inho Cha and Dongju Cha (Korea University, Korea); Haneul Ko (Kyunghee University, Korea); Sangheon Pack (Korea University, Korea)*

**Session BW5-2 Intent-Based Network Management in 6G Core Networks**

*Patrick Lingga, Jeonghyeon (Joshua) Kim and Jaehoon Jeong (Sungkyunkwan University, Korea)*

**Session BW5-3 A Prediction based Autoscaling in Serverless Computing**

*Phung Ha Duong and Young Han Kim (Soongsil University, Korea)*

**Session BW5-4 Delay Optimization in Mobile Edge Computing Federation using Task Offloading and Resource Allocation**

*Huong Mai Do (Soongsil, Korea); Myungsik Yoo (Soongsil University, Korea)*



## Technical Paper Sessions

### [Session CW5] ICTC Workshop on Technologies and Services for Private 5G/6G (IWTSP)

Oct. 20, 10:30~12:10

Chair : Prof. Valmik Tilwari (Korea University, Korea)

#### **Session CW5-1 Holistic Orchestration for Edge-Native Applications: A Review**

Taeyun Kim, Seoyul Oh, Inho Cha and Seunghyun Lee (Korea University, Korea); Haneul Ko (Kyunghee University, Korea); Sangheon Pack (Korea University, Korea); Jinyoung Han (Sungkyunkwan University, Korea)

#### **Session CW5-2 Deep Reinforcement Learning-based Power Allocation for Downlink RSMA System**

Hoang Thi Huong Giang (Korea University, Korea); Pham Duy Thanh (Kongju National University, Korea); Haneul Ko (Kyunghee University, Korea); Sangheon Pack (Korea University, Korea)

#### **Session CW5-3 Technology Acceptance Perspectives on Mobile Services: A Comparison Between 4G and 5G Services**

Yanyan Chi, Hyeongjin Ahn, Min Su Park, Eunil Park and Jinyoung Han (Sungkyunkwan University, Korea); Sangheon Pack (Korea University, Korea)

#### **Session CW5-4 Autonomous 3-D UAV Localization using Taylor Series linearized TDOA-based approach with Machine Learning Algorithms**

Valmik Tilwari and Sangheon Pack (Korea University, Korea)

#### **Session CW5-5 TransTraffic: Predicting Network Traffic using Low Resource Data**

Chaewon Kang and Jeewoo Yoon (Sungkyunkwan University, Korea); Daejin Choi (Incheon National University, Korea); Eunil Park (Sungkyunkwan University, Korea); Sangheon Pack (Korea University, Korea); Jinyoung Han (Sungkyunkwan University, Korea)

#### **Session CW5-6 Cost-Efficient Edge Cloud Deployment Method for Autonomous Driving**

Changyu Park (Korea University, Korea); Haneul Ko (Kyunghee University, Korea); Yeunwoong Kyung (Kongju National University, Korea)

### [Session DW5] ICTC Workshop on ETRI Everything on Media (IWEEM)

Oct. 20, 10:30~12:10

Chair : Prof. Aslina Baharum (Universiti Malaysia Sabah, Malaysia)

#### **Session DW5-1 Video Coding Tool Performance for Multi-View Texture map**

JiHoon Do (ETRI, Korea)

#### **Session DW5-2 Study on Urban Environment Gap-fillers of Mobile Broadcasting for Autonomous Vehicles**

JaeHwui Bae, Dong-Joon Choi, Namho Hur and Jae-Hyun Seo (ETRI, Korea)

#### **Session DW5-3 Overview of Cloud-Based High Quality Media Production Systems**

Soon-Choul Kim, Jae-young Lee, Hye-Ju Oh and Dong-Joon Choi (ETRI, Korea)

#### **Session DW5-4 Measurement of spectral noise caused by binarization in computer-generated holograms designed for lithographic patterns**

Yongjun Lim, Kwan-Jung Oh (ETRI, Korea); Jae-Hyeung Park (Inha University, Korea)

#### **Session DW5-5 Relabeling Method for Improving Vehicle Part Detection**

Sungjin Hong, Cho Rong Yu, Youn-Hee Gil and Heesook Shin (ETRI, Korea); Seongmin Baek (ETRI, Korea)

## Technical Paper Sessions

### [Session EW5] ICTC Workshop on 5G/6G Communication Network Research Center (IWCNRC)

Oct. 20, 10:30~12:10

Chair : Prof. Jeongyeup Paek (Chung-Ang University, Korea)

**Session EW5-1 Evaluation of Metaheuristic Algorithms for TAS Scheduling in Time-Sensitive Networking**

*Junhong Min, MyoungJin Oh, Woongsoo Kim, Hyewon Seo and Jeongyeup Paek (Chung-Ang University, Korea)*

**Session EW5-2 Broadcasting in Vehicular Ad-hoc Network: Survey on Recent Advances**

*Yejin Cho, Mingyu Park and Jeongyeup Paek (Chung-Ang University, Korea)*

**Session EW5-3 Multi-agent DRL-based Task Offloading in Hierarchical HAP-LAP Networks**

*Tri-Hai Nguyen and Laihyuk Park (Seoul National University of Science and Technology, Korea)*

**Session EW5-4 A Survey on Deep Reinforcement Learning-driven Task Offloading in Aerial Access Networks**

*Tri-Hai Nguyen and Laihyuk Park (Seoul National University of Science and Technology, Korea)*

**Session EW5-5 Reconfigurable Intelligent Surface-assisted System Models for Uplink Communications**

*Heejae Park, Tri-Hai Nguyen and Laihyuk Park (Seoul National University of Science and Technology, Korea)*

**Session EW5-6 Federated Deep Learning for RIS-assisted UAV-enabled Wireless Communications**

*Heejae Park, Tri-Hai Nguyen and Laihyuk Park (Seoul National University of Science and Technology, Korea)*

**Session EW5-7 Survey on Integrated Vehicular Platforms for Next Generation Mobility**

*Chaeyeong Lee, Moonbeom Kim, Hyewon Seo and Jeongyeup Paek (Chung-Ang University, Korea)*

**Session EW5-8 Survey on Advanced Video Streaming with Multi-Access Edge Computing**

*Heemin Kim, Moonbeom Kim and Jeongyeup Paek (Chung-Ang University, Korea)*

**Session EW5-9 Survey: Strategies for Loss-Based Discrete-Time Hazard and Survival Function Estimation**

*Changhee Lee (Chung-Ang University, Korea); Chunghyun Lee (Chun-Ang University, Korea); Taeyun Ha and Sungrae Cho (Chung-Ang University, Korea)*

**Session EW5-10 Multi-functional anisotropic metasurface using mechanical shape memory alloy spring**

*Chungheng Lor and Sungjoon Lim (Chung-Ang University, Korea)*

**Session EW5-11 Research on Automatic Balance Patch Technology Through AI Analysis**

*Yongsik Im, Jaewoo Kim, Jaeho, Joonhee Kim and Woongsoo Na (Kongju National University, Korea)*

**Session EW5-12 Application Arduino-based Unmanned Calculation System**

*Junyoung Kim, Beomseo Park, Jiyoung Lee, Hyunhee Jang and Woongsoo Na (Kongju National University, Korea)*

**Session EW5-13 Research Challenge on MPTCP in 5G/6G Networks**

*Hansu Choi, Deajin Han and Woongsoo Na (Kongju National University, Korea)*

**Session EW5-14 LDPC coded massive MIMO systems with FG-GAI BP detector**

*Han Jin Park and Jeong Woo Lee (Chung-Ang University, Korea)*

**Session EW5-15 Intelligent Radar Signal Detection for Future Generation Wireless Networks Using Deep Learning**

*Harun Ur Rashid and Seong-Ho Jeong (Hankuk University of Foreign Studies, Korea)*

**Session EW5-16 A Measurement Study of Adalm-PLUTO Software Defined Radio with IEEE 802.15.4**

*Yonghan Kwon, Mingyu Park and Jeongyeup Paek (Chung-Ang University, Korea)*

**Session EW5-17 Indoor Location Based Tracking using Euclidean Distance Estimation (LTS-ED)**

*Sharifah Hafizah Syed Ariffin, Nur Haliza Abdul Wahab and Chun Hian Jee (Universiti Teknologi Malaysia, Malaysia)*

## Technical Paper Sessions

### [Session FW5] The 4th Joint International Workshop on Military Informatics (IWMI)

Oct. 20, 10:30~12:10

Chair : Prof. Rubina Akter (Kumoh National Institute of Technology, Korea)

#### **Session FW5-1 Misbehavior Detection in Connected Vehicles using BurST-ADMA Dataset**

*Goodness Oluchi Anyanwu, Cosmas Ifeanyi Nwakanma, Jung Hyeon Kim, Jae Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-2 Time-Efficient Deep Learning-Based Energy Consumption Prediction for Smart Factory**

*Love Allen Ahakonye, Cosmas Ifeanyi Nwakanma, Jae Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-3 Deep Reinforcement Learning Based Cooperative Retransmission in Downlink NOMA Systems**

*Won Jae Ryu, Jae Woo Kim and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-4 Industrial Network Attack Vulnerability Detection and Analysis using Shodan Eye Scanning Technology**

*Ebuka Chinaecheam Nkoro, Cosmas Ifeanyi Nwakanma, Jae Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-5 Lightweight Blockchain Assisted Unauthorized UAV Access Prevention in the Internet of Military Things**

*Mohtasin Golam (Kumoh National Institute of Technology (KIT) & IT Convergence, Korea); Rubina Akter (Kumoh National Institute of Technology & Networked Systems Laboratory, Korea); Esmot Ara Tuli (Kumoh National Institute of Technology & Networked Systems Lab, Korea); Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-6 Data Prediction-Based Virtual Sensor in Digital Twin Scenario using Deep Learning Approach**

*Adinda Riztia Putri (Kumoh National Institute of Technology, Korea); Made Adi Paramartha Putra (Kumoh National Institute of Technology, Korea & STMIK Primakara, Indonesia); Taesoo Jun, Jae-Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-7 Backhaul Aggregator Design for Real-Time 3D Printer System**

*Yohana Jayanti Aruan (Kumoh National Institute of Technology, Korea); Made Adi Paramartha Putra (Kumoh National Institute of Technology, Korea & STMIK Primakara, Indonesia); Adinda Riztia Putri (Kumoh National Institute of Technology, Korea); Philip T. Daely (Kumoh National Institute of Technology, Korea & Institut Teknologi Telkom Surabaya, Indonesia); Dong-Seong Kim and Jae-Min Lee (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-8 Fine-Tuned CNN with Data Augmentation for 3D Printer Fault Detection**

*Syifa Maliah Rachmawati (Kumoh National Institute of Technology, Korea); Made Adi Paramartha Putra (Kumoh National Institute of Technology, Korea & STMIK Primakara, Indonesia); Taesoo Jun, Dong-Seong Kim and Jae-Min Lee (Kumoh National Institute of Technology, Korea)*

#### **Session FW5-9 SimuPrint: A Printing Path Simulation Tool for Additive Manufacture**

*Gabriel Avelino R Sampedro (Kumoh National Institute of Technology, Korea & University of the Philippines, Philippines); Syifa Maliah Rachmawati (Kumoh National Institute of Technology, Korea); Khurboev Shakhzodbek Dilshodbek Ugli (Conception Co., Ltd., Korea); Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)*



## Technical Paper Sessions

### [Session GW5] ICTC Workshop on Satellite Information Convergence Application Service (IWSICA)

Oct. 20, 10:30~12:10

Chair : Prof. Ki Choongho (Ajou University, Korea)

#### **Session GW5-1 Performance Evaluation of GNSS Positioning with Geometric Dilution of Precision**

*Md. Humayun Kabir (Ajou University, Sowon, Republic of Korea & Islamic University, Kushtia, Bangladesh); Sangmok Lee and Wonjae Shin (Ajou University, Korea)*

#### **Session GW5-2 Urban Subsidence monitoring in Pohang city using time-series InSAR technique**

*Suresh Krishnan Palanisamy Vadivel (SNU Future Innovation Institute, Korea)*

#### **Session GW5-3 SAR-to-Optical Image Translation Using SSIM Loss Based Unpaired GAN**

*Jieon Hwang and Yoan Shin (Soongsil University, Korea)*

#### **Session GW5-4 Survey on Satellite-Mobile Code Offloading**

*Jeonghwan Kim, Dongho Ham, Taeyeoun Kim and Jeongho Kwak (DGIST, Korea)*

#### **Session GW5-5 Beam Size Design for LEO Satellite Networks with Doppler Shift Characteristics**

*Sang-Min Han and Wonjae Shin (Ajou University, Korea); Jae-Hyun Kim (Ajou University, South Korea, Korea)*

#### **Session GW5-6 GAN Inversion with Semantic Segmentation Map for Image Editing**

*Chang Jong Shin and Yong Seok Heo (Ajou University, Korea)*

### [Session P5] Poster Session 5

Oct. 20, 10:30~12:10

Chair : Prof. Minseok Choi (Kyung Hee University, Korea)

#### **Session P5-1 A Service Programmable Network Architecture based on SRv6**

*HyunKyung Yoo and Sung Hyuk Byun (ETRI, Korea); Sunhee Yang (Electronics and Telecommunication Research Institute, Korea); Namseok Ko (ETRI, Korea)*

#### **Session P5-2 Implementation of 1.8V MIPI RFFE slave controller in CMOS 180nm process for 5V RF front-end modules**

*Seunghyun Jang (ETRI, Korea); Sunwoo Kong (ETRI, Korea); Hui Dong Lee (Electronics and Telecommunications Research Institute, Korea); Bonghyuk Park and Soek-Bong Hyun (ETRI, Korea); Seunghun Wang (Electronics and Telecommunications Research Institute, Korea)*

#### **Session P5-3 Method and System for Evaluating Tracking Performance of VR/AR/MR Devices**

*Yeseul Son, Kwang-Soon Choi, Ji-Woon Yeom, Sehwan Lim and Dohoon Kim (Korea Electronics Technology Institute, Korea)*

#### **Session P5-4 The Analysis of Use Case, Effects and Considerations for SRv6-based Mobile User Plane**

*Sunjin Kim, JongSeok Lee, Noik Park, Namseok Ko (ETRI, Korea)*

#### **Session P5-5 A Survey on Vulnerabilities of Service Workers**

*Yeomin Jeong and Junbeom Hur (Korea University, Korea)*

#### **Session P5-6 Wireless PLL Communication System for Next Generation IoT Application**

*Md. Moklesur Rahman and Heung-Gyoon Ryu (Chungbuk National University, Korea)*

#### **Session P5-7 Design of Multi-resonant Loop Antenna for Magnetic Induction Communication**

*JungHoon Oh (ETRI, Korea)*

## Technical Paper Sessions

### **Session P5-8 The range spreading EW technique against the compressed pulse**

*Jung Hoon Lee (Agency for Defense Development, Korea); Jeil Jo (Agency for Defense Development & Chungnam National University, Korea); Byungkoo Park (Agency for Defense Development, Korea); Chang hoon Lee (Korea); Seungho Choi (ADD, Korea)*

### **Session P5-9 Ensuring Data Freshness for MU-MISO Networks in Finite Blocklength Regime**

*Minsu Kim (Daegu Gyeongbuk Institute of Science & Technology (DGIST), Korea); Jemin Lee (Sungkyunkwan University (SKKU), Korea)*

### **Session P5-10 Predictive Mechanism for Server Health Check: Network Packet-Flow Learning Approach**

*SeungChul Son, Seok-Kap Ko, Hyungok Lee and Byung Tak Lee (ETRI, Korea)*

### **Session P5-11 Prediction of Dangerous Areas for Food Desertification in Gyeonggi Province**

*Sehyoung Kim, Jaehyeong Park, Seyeon Cheon, Seongwoo Park, Haesung Kim and Kang Juyoung (Ajou University, Korea)*

### **Session P5-12 Modeling of nano-scale PLL using Verilog HDL**

*Lee Hyehyun, Yeon-Seob Song and Kang-Yoon Lee (Sungkyunkwan University, Korea)*

### **Session P5-13 Korean Food Detection in Video Contents**

*Alex Lee and Nam Kyung Lee (ETRI, Korea)*

### **Session P5-14 Automatic VLAN Control Framework for a Small Network**

*Jeehyeong Kim, Hyeyoung Kim, Won Gi Choi, Min-Hwan Song and Sang-Shin Lee (Korea Electronics Technology Institute, Korea)*

### **Session P5-15 Performance Analysis of Sequence-based Deep Learning Model for LPI Radar Waveform Recognition in Fading Channel**

*Dongun Lee, Yoonji Kim and Dongweon Yoon (Hanyang University, Korea)*

### **Session P5-16 RBCA-Net: Reverse Boundary Channel Attention Network for Kidney Tumor Segmentation in CT images**

*Gyeongyeon Hwang, Yewon Ji, Hakyoung Yoon and Sang Jun Lee (Jeonbuk National University, Korea)*

### **Session P5-17 Object Detection with Dataset Augmentation for Fire Images Based on GAN**

*Hyungtak Lee, Seongju Kang and Kwangsue Chung (Kwangwoon University, Korea)*

### **Session P5-18 Free-viewpoint based high-resolution 3D data acquisition and generation technology for the construction and diffusion of digital cultural assets**

*Hyunjoo Kim (ETRI, Korea); Joongyong Choi (ETRI, Korea); Ah Reum Oh (ETRI, South Korea, Korea); Hyung-Keun Jee (ETRI, Korea)*

### **Session P5-19 An Enhanced Security Architecture for Industry 4.0 Applications based on Software-Defined Networking**

*Anichur Rahman, Kamrul Hasan and Seong-Ho Jeong (Hankuk University of Foreign Studies, Korea)*

### **Session P5-20 A Study on the Subjective Questionnaire-based Stress Assessment using k-means Clustering**

*Hyunsuk Kim (ETRI & Emotion Recognition IoT Research Section, Korea); Minjung Kim, Jungsook Kim and Kyonghyun Park (ETRI, Korea); Daesub Yoon (ETRI, Korea); Junghee Jo (Pusan National University of Education, Korea)*

### **Session P5-21 A Survey on Security Threats in Blockchain-based Internet of Things Systems**

*Donghee Kim and Junbeom Hur (Korea University, Korea)*

### **Session P5-22 Energy Efficiency Improvement Rate for Low Power UAV Identification Environment**

*Jinhyung Oh (ETRI, Korea); Dong-Woo Lim (ETRI (ETRI), Korea); Kyu-Min Kang (ETRI, Korea)*

## Technical Paper Sessions

**Session P5-23 Priority-based CBS Transmission for Multiple CBEs in 5G Networks**

*Hyunjoo Kang, Seung-Hee Oh and Sang-Lim Ju (ETRI, Korea)*

**Session P5-24 Application of Deep Learning Model Inference with Batch Size Adjustment**

*Seungtaek Oh and Jaewon Moon (Korea Electronics Technology Institute, Korea); Seung Woo Kum (Korea Electronics Technology Institute, Korea)*

**Session P5-25 Human Activity Detection based on Infrared Array Sensor using Advanced Deep Learning Technique**

*Van Linh Nguyen, Duc Hoang Tran, Huy Nguyen and Yeong Min Jang (Kookmin University, Korea)*

**Session P5-26 An Architecture for Named Data Networking over IP Core Network**

*JongSeok Lee and Namseok Ko (ETRI, Korea)*

**Session P5-27 Measurements of the Benefits of Edge Computing on Autonomous Driving**

*Yang Yu and Sanghwan Lee (Kookmin University, Korea)*

**Session P5-28 Classification of lower extremity motions for exoskeleton robot control**

*Ho Chul Shin, Dong-Woo Lee (Electronics and Telecommunication Research Institute, Korea)*

**Session P5-29 A fire detection scheme using 5G network based KNN algorithm**

*Mahn-suk Yoon (Gumi Electronics & Information Technology Research Institute, Korea); Chang-Kyo Lee (Gumi Electronics and Information Technology Research Institute, Korea); Gilhwan Lim (Daon Co., Ltd., Korea); Hyunchul Choi (Daon Co., Ltd., Korea); Keuchul Cho (Kyungpook National University, Korea)*

**Session P5-30 The Data Model for the Composite Locations in Indoor Spaces**

*Jaejun Yoo (Electronics and Telecommunication Research Institute, Korea); Byung-Bog Lee (Electronics and Telecommunications Research Institute (ETRI), Korea); Minjung Kim (ETRI, Korea)*

**Session P5-31 Effects of Signal Blockage by a Road Bridge on mmWave Vehicular Communications**

*Junhyeong Kim (ETRI, Korea); Dong Yan, Ke Guan and Danping He (Beijing Jiaotong University, China); Gosan Noh (ETRI, Korea); Sung Woo Choi and Heesang Chung (ETRI, Korea)*

**Session P5-32 Generating Curated Photo Collection using Shot Type Pattern**

*Dongwann Kang (Seoul National University of Science and Technology, Korea, Korea); Yangmi Lim (School of Digital Media, Duksung Women's University, Korea)*

**Session P5-33 Interpretation of eigenvectors by coupled oscillations of network dynamics**

*Takako Hoshiyama (The University of Tokyo & Research Center, Japan); Hironori Shimoyama (Professional of Computational Science and Education, Japan)*

## [Session AW6] ICTC Workshop on Network/Service Federation for 5G and Beyond (NSF5G)

Oct. 20, 13:20~15:00

Chair : Dr. Taesang Choi (ETRI, Korea)

**Session AW6-1 CloudMesh<sup>15S</sup> - Design and Implementation of Agile Private/Public 5G/B5G Service Federation Platform**

*Seungkyu Go (IIN-Soft, Korea); Taesang Choi (ETRI, Korea); SungHyun Na (Dankook University, Korea)*

**Session AW6-2 Testing of Federated Autonomics in 5G Multi-Operator Scenarios, as a Use Case for Testbeds Federations for 5G and Beyond**

*Muslim Elkotob (Vodafone, Germany); Ranganai Chaparadza (IPv6 Forum, Germany); Benoit Radier (Orange Labs, France); Tayeb Ben Meriem (IPv6 Forum, Germany); Taesang Choi (ETRI, Korea)*



## Technical Paper Sessions

### Session AW6-3 The Path to Cloud Federation through Standardization

Robert Bohn (National Institute of Standards and Technology, USA); Ranganai Chaparadza (IPv6 Forum, Germany); Muslim Elkotob (Vodafone, Germany); Taesang Choi (ETRI, Korea)

### Session AW6-4 OneVision<sup>NFP</sup> - Design and Implementation of Agile Private/Public 5G/B5G Network Federation Platform

Moonkook Park and Yoonwan Ma (Mobigen, Korea); Taesang Choi (ETRI, Korea)

### Session AW6-5 The Era of Knowledge Plane (KP) Platforms Driven Networking-Anchor for Federation of Autonomic/Autonomous Networks (ANs) Across Industry Sectors

Ranganai Chaparadza (IPv6 Forum, Germany); Muslim Elkotob (Vodafone, Germany); Benoit Radier (Orange Labs, France); Tayeb Ben Meriem (IPv6 Forum, Germany); Taesang Choi (ETRI, Korea); Robert Bohn (National Institute of Standards and Technology, USA); Abdella Battou (NIST, USA); Tao Zhang (National Institute of Standards and Technology, USA)

### Session AW6-6 ML-Defense: Machine Learning for building Dependable Federated Network System

Ranju Kumari (University of Missouri Kansas City (UMKC), USA); Faheed A.F. Alenezi (Northern Border University, Saudi Arabia); Sejun Song (University of Missouri Kansas City, USA); Baek-Young Choi (University of Missouri - Kansas City, USA)

### Session AW6-7 SdBaSE: Software-defined Base Station for Energy-efficient Federated Cellular Networks

Sunae Shin (University of Central Missouri, USA); Sejun Song (University of Missouri Kansas City, USA); Manasa Leela Gummadavally and Baek-Young Choi (University of Missouri - Kansas City, USA)

## [Session BW6] ICTC Workshop on ETRI 5G+ & 6G Technologies - Security (IWES)

Oct. 20, 13:20~15:00

Chair : Dr. Jong-Geun Park (ETRI, Korea)

### Session BW6-1 Network Security in 5G Cloud Native MEC Environments

Yongyoon Shin (ETRI, Korea); Jisoo Shin (ETRI, Korea); Cheolhee Park (ETRI, Korea); Jong-Geun Park (ETRI, Korea)

### Session BW6-2 Network Detection of Fake Base Station using Automatic Neighbour Relation in Self-Organizing Networks

Jisoo Shin (ETRI, Korea); Yongyoon Shin (ETRI, Korea); Jong-Geun Park (ETRI, Korea)

### Session BW6-3 AI-based Network Security Enhancement for 5G Industrial Internet of Things Environments

Jonghoon Lee (ETRI, Korea); Hyun Jin Kim (ETRI, Korea); Cheolhee Park and Youngsoo Kim (ETRI, Korea); Jong-Geun Park (ETRI, Korea)

### Session BW6-4 Network Anomaly Detection based on Domain Adaptation for 5G Network Security

Hyun Jin Kim (ETRI, Korea); Jonghoon Lee and Cheolhee Park (ETRI, Korea); Jong-Geun Park (ETRI, Korea)

### Session BW6-5 Potential Security Concerns at the Physical Layer of 6G Cellular Systems

Min Suk Kang (KAIST, Korea)

## [Session CW6] ICTC Workshop on Cognition Augmented Meta-Communications (IWCAM)

Oct. 20, 13:20~15:00

Chair : Prof. Seung Jun Baek (Korea University, Korea)

### Session CW6-1 Covert Communications in Two-way Relay Systems with Energy Harvesting

Zhilin Fu and Boya Ju (Korea University, Korea); Jihwan Moon (Hanbat National University, Korea); Sangwon Hwang (Korea Technology Finance Information, Korea); Inkyu Lee (Korea University, Korea)

## Technical Paper Sessions

### Session CW6-2 Performance Evaluation of TSCH scheduler under Network Size Variations

*Geon Hee Lee, Hongchan Kim, Saewoong Bahk (Seoul National University, Korea)*

### Session CW6-3 Federated Codebook for Multi-User Deep Source Coding

*Chae Hoon Park and Jinhyuk Choi (Yonsei University, Korea); Jihong Park (Deakin University, Australia); Seong-Lyun Kim (Yonsei University, Korea)*

### Session CW6-4 Extreme Massive MIMO for Upper-Mid Band 6G Communications

*Kwanghoon Lee and Jonghyun Kim (Yonsei University, Korea); Eui Whan Jin (Yonsei Univ, Korea); Kwang Soon Kim (Yonsei University, Korea)*

### Session CW6-5 3D Multi-path Geometry Localization using Generalized Approximate Message Passing

*Tae-Woo Kim (Yonsei University, Korea); Sang Hyun Lee (Korea University, Korea); Dong Ku Kim (Yonsei University, Korea)*

## [Session DW6] ICTC Workshop on ETRI 5G+ & 6G Technologies - Network Infrastructure (IWENI)

Oct. 20, 13:20~15:00

Chair : Dr. Tae Yeon Kim (ETRI, Korea)

### Session DW6-1 Elastic Network Cache Control Using Deep Reinforcement Learning

*Chunglae Cho and Seungjae Shin (ETRI, Korea); Hongseok Jeon (ETRI, Korea); Seunghyun Yoon (ETRI(ETRI), Korea)*

### Session DW6-2 Cost Assessment of Ring Topology-based 5G Ethernet Mobile Fronthaul

*Joonyoung Kim and Beomjun Cho (Sangmyung University, Korea); Sun Hyok Chang (ETRI, Korea); Joon Ki Lee (ETRI, Korea)*

### Session DW6-3 Implementation and Performance Evaluation of 100Gb/s DetNet Packet Forwarding Engine

*Chang Ho Choi, Woo Young Choi and Kang TaeKyu (ETRI, Korea); Taesik Cheung (ETRI, Korea)*

### Session DW6-4 Towards realizing a cloud-native B5G mobile core architecture

*Quang Tung Thai and Namseok Ko (ETRI, Korea)*

## [Session EW6] ICTC Workshop on Big Data (IWBD)

Oct. 20, 13:20~15:00

Chair : Prof. Sungrae Cho (Chung-Ang University, Korea)

### Session EW6-1 Multitask Learning with Heterogeneous Tasks

*Changseong Kim (Chung-Ang University in the Republic of Korea, Korea); Eunwoo Kim (Chung-Ang University, Korea)*

### Session EW6-2 A Survey on Passive Beamforming using Statistical State Information in Intelligent Reflecting Surface Assisted Networks

*The Vi Nguyen, Thi My Tuyen Nguyen, Thien Duc Hua, Nam Phuong Tran and Sungrae Cho (Chung-Ang University, Korea)*

### Session EW6-3 A Survey on Intelligent Reflecting Surface-aided Non-Orthogonal Multiple Access Networks

*Thi My Tuyen Nguyen, The Vi Nguyen, Thien Duc Hua, Nam Phuong Tran and Sungrae Cho (Chung-Ang University, Korea)*

### Session EW6-4 Intelligent Beamforming Design in mmWave mMIMO: A Reinforcement Learning Approach

*Thi Thu Hien Pham, The Vi Nguyen and Sungrae Cho (Chung-Ang University, Korea)*

### Session EW6-5 Analysis of Base Station Location Impact on Performance of LEACH Protocol in Wireless Sensor Networks

## Technical Paper Sessions

*Geeranuch Woraphonbenjakul (Chung Ang University, Korea); Sungrae Cho and Yunseong Lee (Chung-Ang University, Korea); Chunghyun Lee (Chun-Ang University, Korea); Arooj Masood, Thi My Tuyen Nguyen, The Vi Nguyen and Anh-Tien Tran (Chung-Ang University, Korea)*

### **Session EW6-6 A survey of Energy-saving routing protocol for Wireless Sensor Networks**

*Donghyun Lee, Junsuk Oh, Taeyun Ha, Jeonghwa Lee, Yongin Jeon and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-7 Transmission Control Protocol Technique through Congestion Window Control based on Link Disconnection Awareness**

*Yongin Jeon, Yunseong Lee and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-8 Trajectory Design in multi-UAV-assisted RSMA Downlink Communication**

*Thien Duc Hua, Quang Tuan Do, The Vi Nguyen, Cuong Ho and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-9 Improving Scene Text Recognition With A Combinative Image Augmentation Approach**

*Ngan-Linh Nguyen, Gia-Huy Lam and Hoang-Thong Vo (University of Information Technology, Ho Chi Minh City, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam); Anh-Tien Tran and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-10 Understanding operating characteristics of polymer electrolyte membrane water electrolyzer for developing optimal machine learning techniques**

*Sangwon Kim (KIST-Europe, Germany); Ji Tae Kim (Chung-Ang University, Korea); Dong Kyu Kim (Chung-Ang, Korea)*

### **Session EW6-11 Privacy-Preserving Learning Models for Communication: A tutorial on Advanced Split Learning**

*Nam Phuong Tran (Chung-Ang University, Korea); Nhu-Ngoc Dao (Sejong University, Korea); The Vi Nguyen and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-12 An Implementation of Traffic Volume Forecasting System using Distributed Deep Learning**

*Chi Thi Kim Le (University of Information Technology, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam); Quang Dieu Tran (Academy of Journalism and Communication & Ho Chi Minh National Academy of Politics, Vietnam); Dinh-Thuan Do (University of Colorado Denver, USA); Hong Anh Le (Hanoi University of Mining and Geology, Vietnam); Nhu-Ngoc Dao (Sejong University, Korea)*

### **Session EW6-13 Energy Efficient Multi-UAV Communication Using DDPG**

*Quang Tuan Do, Thien Duc Hua, Anh-Tien Tran and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-14 Federated Flowchart: Overview of State-of-the-Arts based on Federated Learning Process**

*Junsuk Oh, Donghyun Lee, Taeyun Ha and Yongin Jeon (Chung-Ang University, Korea); Wonjong Noh (Hallym University, Korea); Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-15 A Deep Learning based System for Covid-19 Positive Cases Detection Using Chest X-ray Images**

*Thong Thai Nguyen (University of Information Technology, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam); Quang-Dung Pham (Vietnam National University of Agriculture, Vietnam)*

### **Session EW6-16 Balanced Data Augmentation of Object Detection Via Boot-strapping**

*Sungmin Cho, Jinwook Paeng and Junseok Kwon (Chung-Ang University, Korea)*

### **Session EW6-17 B-Cell Linear Epitope Prediction Using Transformer Encoder**

*Yujin Kim, Jinhee Park and Junseok Kwon (Chung-Ang University, Korea)*



## Technical Paper Sessions

### **Session EW6-18 Learning to Intrinsic Image Filter for Instagram Filter Removal**

*SeoHyeon Lee (Chung Ang University, Korea); Guisik Kim and Junseok Kwon (Chung-Ang University, Korea)*

### **Session EW6-19 Building a Time-Series Forecast Model with Automated Machine Learning for Heart Rate Forecasting Problem**

*Cap Huu Anh Duc (University of Information Technology, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam); Demeke Shumeye and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-20 Face Mask Wearing Recognition System for Big Data Video Streaming**

*Lê Văn Phúc and Bui Ngoc (University of Information Technology, Vietnam); Truc Thanh Nguyen (Information Technology, Vietnam); Trong-Hop Do (University of Information Technology, Ho Chi Minh City & Vietnam National University, Ho Chi Minh City, Vietnam); Arooj Masood and Sungrae Cho (Chung-Ang University, Korea)*

### **Session EW6-21 Meta-learning-based lightweight learning framework for healthcare recommendation system**

*Mincheol Shin, Mucheel Kim, Yongmun Cho and Hyonjun Kang (Chung-Ang University, Korea)*

### **Session EW6-22 Application of Recommendation System for Personalized Smart Home Care**

*Yongmun Cho, Hyonjun Kang and Mucheel Kim (Chung-Ang University, Korea)*

### **Session EW6-23 Luxating Patella and Obesity Prevention Device Model of Dogs Based on Vision Transformers**

*Hyeonwuk Yu, Mucheel Kim and Junho Kim (Chung-Ang University, Korea)*

### **Session EW6-24 A Survey on Data Management using Integrated Rule-Oriented Data System**

*Kiet Tuan Pham, Sangjin Lee and Seokjoo Cho (Chung-Ang University, Korea); Sunggon Kim (Seoul National University of Science and Technology, Korea); Yongseok Son (Chung-Ang University, Korea)*

### **Session EW6-25 K-Nearest Neighbor Based Association Data Mining in Healthcare Correlated Data Systems**

*Fawad Mustafa, Kim Jong Ho and Murtaza Hussain Shaikh (Kyungsung University, Korea)*

### **Session EW6-26 Comparative Study of Hoax Detection using Support Vector Machine Algorithm, Naive Bayes, Random Forest and K-Nearest Neighbor**

*Ignatius Ferdiansyah and Wella Wella (Universitas Multimedia Nusantara, Indonesia)*

### **Session EW6-27 PUPVOTE: Blockchain-Based Voting System Using NEAR Protocol**

*Orland D Tubola, Lloyd Mar J Dela Torre and Rowin Edward E Quindoza (Polytechnic University of the Philippines, Philippines); Nathalie Jane S Tamondong and Renz Vincent M. Mengoy (Philippines)*

### **Session EW6-28 A Survey on Minimizing Lock Contention in Shared Resources in Linux Kernel**

*Seokjoo Cho, Sangjin Lee and Kiet Tuan Pham (Chung-Ang University, Korea); Anh Lan Nguyen (Ha Noi University of Science and Technology, Vietnam); Sunggon Kim (Seoul National University of Science and Technology, Korea); Yongseok Son (Chung-Ang University, Korea)*

### **Session EW6-29 A Survey on Lock-free Binary Search Tree**

*Sangjin Lee, Seokjoo Cho and Kiet Tuan Pham (Chung-Ang University, Korea); Sunggon Kim (Seoul National University of Science and Technology, Korea); Yongseok Son (Chung-Ang University, Korea)*

### **Session EW6-30 Improving the performance of door detection in color images using deep neural networks and data augmentation techniques on various hardware platforms**

*Bui Hai Phong (MICA, HUST - Hanoi Architectural University & FIT, Vietnam); Le Minh Hoang, Tran Minh Hoang, Nguyen Chi Nhon Duc, Phan Dang Huy Khanh and Pham Hoang Lam (Vitech Institute, Vietnam)*

## Technical Paper Sessions

### **Session EW6-31 Metal Enhanced Fluorescence Microarray Biochip using Glancing Angle Deposited Ag nanorods**

Mohsin Ali Badshah (University of California Irvine, USA); Seong-min Lee, Chengjun Jin, Seongyoung Byeon, Tasadduq Hussain, Muzahir Ali and Seok Min Kim (Chung-Ang University, Korea)

### **Session EW6-32 Design of Nanophotonic Devices using Multi Objective Optimization Method**

Xun Lu (Yanbian University, China); Young Kyu Kim, Seong-min Lee, Chengjun Jin, Seongyoung Byeon, Tasadduq Hussain, Muzahir Ali and Seok Min Kim (Chung-Ang University, Korea)

### **Session EW6-33 Fabrication of Vitreous Carbon Mold for Glass Molded Microarray**

Muhammad Ali Asgar (Jatiya Kabi Kazi Nazrul Islam University, Bangladesh); Young Kyu Kim, Chengjun Jin, Jun Kim, Seongyoung Byeon, Muzahir Ali, Tasadduq Hussain and Seok Min Kim (Chung-Ang University, Korea)

### **Session EW6-34 Known Plaintext Attacks on the Omar and abed Homomorphic Encryption Scheme**

Seongbong Choi and Hyung Tae Lee (Chung-Ang University, Korea)

### **Session EW6-35 A Mapping Study on Privacy Attacks in Big Data and IoT**

Raisa Islam (New Mexico Tech, USA); Mohammad Sahinur Hossen (New Mexico Institute of Mining and Technology, USA); Dongwan Shin (New Mexico Tech, USA)

### **Session EW6-36 DTN-based Multi-link Bundle Protocol Architecture for Deep Space Communications**

Taeyun Ha, Donghyun Lee, Junsuk Oh and Yongin Jeon (Chung-Ang University, Korea); Chunghyun Lee (Chun-Ang University, Korea); Sungrae Cho (Chung-Ang University, Korea)

### **Session EW6-37 An Assessment of Graph Neural Networks for Detecting Pointer and Type Errors**

Yoola Choi (Kyungpook National University, Korea); Jangha Kim (National Security Research Institute, Korea); Young-Woo Kwon (Kyungpook National University, Korea)

## **[Session FW6] ICTC Workshop on Advanced Technologies for beyond 5G and unmanned vehicles (IWAT)**

Oct. 20, 13:20~15:00

Chair : Prof. Sunwoo Kim (Hanyang University, Korea)

### **Session FW6-1 Emergency Handling Considerations in Wireless BMS**

Joonha Park, Sang Je Lee and Haram Kim (Infineon Technologies, Korea)

### **Session FW6-2 A Survey on System Configurations of Integrated Sensing and Communication (ISAC) Systems**

Kyubin Kim, Jaehong Kim and Jingon Joung (Chung-Ang University, Korea)

### **Session FW6-3 EKF-based Geolocation using TDOA/FDOA Measurements in Dual-Satellite**

Hongseok Jung, Jeongwan Kang and Sunwoo Kim (Hanyang University, Korea)

### **Session FW6-4 Design Autonomous Drone Control For Delivery Package using Prim Algorithm and Waypoint Method**

Andri Agustav Wirabudi (Hanbat National University, Korea & Institut Teknologi Telkom Jakarta, Indonesia); Lia Hafiza and Nurwan Reza Fachrurrozi (Institut Teknologi Telkom Jakarta, Indonesia)

### **Session FW6-5 OFedIT: Communication-Efficient Online Federated Learning with Intermittent Transmission**

Dohyeok Kwon, Jonghwan Park and Songnam Hong (Hanyang University, Korea)

## Technical Paper Sessions

### **Session FW6-6 Joint Optimization of Multiple UAV-mounted RISs Deployment and RIS Elements Allocation**

*Limei Peng, Haoran Mei, Ke Zhao and Shuai Lyu (Kyungpook National University, Korea)*

### **Session FW6-7 Performance Analysis of M-ary PSK with I/Q Imbalances over Nakagami-m Fading Channels in the Presence of Impulsive Noise**

*Yoonji Kim and Dongweon Yoon (Hanyang University, Korea)*

### **Session FW6-8 Deep Reinforcement Learning for Complex Topography in Urban Aerial Mobility: Sensor-based Calibration and Visualization**

*Park Sanghyon (University of Hallym, Korea); Jaeyoon Park (Hallym University, Korea); Joongheon Kim (Korea University, Korea); Soyi Jung (Ajou University, Korea)*

### **Session FW6-9 Development of Modular Automatic Steering System for Straight Driving of Agricultural Tractor**

*Jinho Won, Gookhwan Kim, Changju Yang, Jintack Jeon and Youngki Hong (Rural Development Administration, Korea)*

### **Session FW6-10 A Study on Ultra-Reliable and Low-Latency Communication Technologies for 5G & 6G Services**

*Hwang You-sun (ETRI, Korea); Sung-Min Oh (ETRI (ETRI), Korea)*

### **Session FW6-11 Joint DoA and TDoA Estimation for mmWave Communications Using Zadoff-Chu Sequence**

*Seungnyun Kim and Byonghyo Shim (Seoul National University, Korea)*

## **[Session GW6] KICS 6G Research Initiative Workshop (K6RIW)**

Oct. 20, 13:20~15:00

Chair : Prof. Paulson Eberechukwu (Hanyang University, Korea)

### **Session GW6-1 A Survey on Physical Layer Security Schemes in Satellite Networks**

*Geunyeong Jang, Byungha You and Haejoon Jung (Kyung Hee University, Korea)*

### **Session GW6-2 On the Design Principles for Deep Learning-based Wireless Data Collection and Channel Estimation**

*Yongjun Ahn, Jinhong Kim and Byonghyo Shim (Seoul National University, Korea)*

### **Session GW6-3 6G Integrated Sensing and Communication: Recent Results and Future Direction**

*Jaebok Lee (Hanyang University, Korea); Abdulahi Abiodun Badrudeen (Hanyang University, Korea & Federal Polytechnic Ede, Nigeria); Sunwoo Kim (Hanyang University, Korea)*

### **Session GW6-4 Current Trends on Deep Learning-aided Channel Coding**

*Tuyet-Mai T Dang, Cho Eunyoung and Sang-Hyo Kim (Sungkyunkwan University, Korea)*

### **Session GW6-5 Load balancing algorithm running on Open RAN RIC**

*Hyeon-Min You (Khunghee University, Korea); Jong-Seok Rhee, Seok-Young Bang and Een-Kee Hong (Kyunghee University, Korea)*

### **Session GW6-6 Deep Reinforcement Learning approach for Fairness-aware Scheduling in Wireless Networks**

*Minseok Kim (Korea University, Korea); Sangwon Hwang (Korea Technology Finance Information, Korea); Inkyu Lee (Korea University, Korea)*



## Technical Paper Sessions

### [Session P6] Poster Session 6

Oct. 20, 13:20~15:00

Chair : Prof. Nhu-Ngoc Dao (Sejong University, Korea)

#### **Session P6-1 Vulnerability Risk Score Recalculation for the Devices in Critical Infrastructure**

*Yangseo Choi (ETRI & Information Security Reserch Division, Korea); Sang-Su Lee and Byeong Cheol Choi (ETRI, Korea)*

#### **Session P6-2 An Overview of Opportunities and Challenges of Edge Computing in Smart Manufacturing**

*Gabriel Avelino R Sampedro (Kumoh National Institute of Technology, Korea & University of the Philippines, Philippines); Raymer Manaig (National University Manila, Philippines); Paulyne Salazar-Manaig (National University, Philippines); Mideth Abisado (Technological Institute of the Philippines & National University, Philippines); Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)*

#### **Session P6-3 Intelligent disaster safety warning system through risk level analysis**

*Byungyun Lee, Woo-Sug Jung (Electronics and Telecommunication Research Institute, Korea)*

#### **Session P6-4 Development of a Method for Ensuring Fairness of an Artificial Intelligence System in the Implementation Process**

*Yejin Shin, Kyoungwoo Cho, Joon Ho Kwak and JaeYoung Hwang (Telecommunications Technology Association, Korea)*

#### **Session P6-5 Wireless Blockchains: Trade-offs and Future Challenges**

*Sungho Lee (Daegu Gyeongbuk Institute of Science and Technology (DGIST), Korea); Jemin Lee (Sungkyunkwan University (SKKU), Korea)*

#### **Session P6-6 A Survey on Vehicular Edge Computing Architectures**

*Jaehwan Lee and Woongsoo Na (Kongju National University, Korea)*

#### **Session P6-7 NR-V2V's Cross-Group Based Emergency Message Transmission System**

*Seonjong Yoo, Byoungchan Kim, Seungmin Oh and Youngbo Kim (Kongju National University, Korea)*

#### **Session P6-8 Towards Flooring Material Classification Using Acoustic Signal from COTS Mobile Devices**

*Junghoon Ha, Seunghoon Lee and Jinkyu Lee (Sungkyunkwan University, Korea)*

#### **Session P6-9 Deep Reinforcement Learning based SAR Image Pre-processing Algorithm with Finite Buffer LEO Satellite Networks**

*Tae Yoon Kim (Ajou University, Korea); Kyeongrok Kim (Hanwha system, Korea); Jae-Hyun Kim (Ajou University, South Korea, Korea)*

#### **Session P6-10 Medical artificial intelligence framework for the development of medical imaging artificial intelligence devices**

*Bumhwi Kim and Eunryung Lee (ETRI, Korea)*

#### **Session P6-11 Entropy-Based Model Generalization for Sleep Stage Classification**

*Dongyoung Kim (Hallym Univ, Korea); Jeong-Gun Lee and Dong-Kyu Kim (Hallym University, Korea); Yunhee Woo (HALLYM University, Korea); Na Younghoon (University of Hallym, Korea)*

#### **Session P6-12 Preliminary Literature Survey on LoD of Geographic Information**

*Kyongho Kim (ETRI, Korea); Kim Yonghyun (ETRI, Korea); Ji Sang Park (Electronics & Telecommunication Research Institute, Korea); Daesub Yoon (ETRI, Korea); Sung Woong Shin (ETRI (ETRI), Korea)*

#### **Session P6-13 Crime Response System based on Danger Degree Calculations of Crime Scenes**

*Hyunho Park (ETRI, Korea); Junho Yoon and Ingyue Han (ETRI, Korea); Sungwon Byon (Electronics and Telecommunication Research Insititute, Korea); Eunjung Kwon and Eui-Suk Jung (ETRI, Korea)*

## Technical Paper Sessions

**Session P6-14 Ranking Scheduling Precedence of Time-Sensitive Networking Traffics for IEEE 802.1Qbv**

HyunWoo Do (Korea University of Science and Technology, Korea); Jeong-dong Ryoo (ETRI, Korea); Taesik Cheung (ETRI, Korea); Jinoou Joung (Sangmyung University, Korea)

**Session P6-15 A Machine Learning based Scalable Blockchain architecture for a secure Healthcare system**

Mikail Mohammed Salim, Laihyuk Park and Jong Hyuk Park (Seoul National University of Science and Technology, Korea)

**Session P6-16 A Study on Communication Technologies for Urban Air Mobility**

JungSook Bae, Hyun Lee and Heesoo Lee (ETRI, Korea)

**Session P6-17 Secure 2 Tier Routing based on Vehicle Classification using Blockchain**

Asif Mehmood, Javier Jose Diaz Rivera, Afaq Muhammad and Wang-Cheol Song (Jeju National University, Korea)

**Session P6-18 Performance Comparison of Beam Scheduling Methods for Wireless Power Transfer to Multiple Devices**

Ki-Won Park, Hyeon Min Kim and Oh-Soon Shin (Soongsil University, Korea)

**Session P6-19 Review of IoT-based AI analysis method for heart monitoring and heart disease prediction**

Eunmi Mun (Jeonbuk National University & APPLIED AI RESEARCH, Korea); Jaehyuk Cho (Jeonbuk national university, Korea)

**Session P6-20 TrustOps: A risk-based AI engineering process**

Joon Ho Kwak (Telecommunications Technology Association, Korea)

**Session P6-21 A Framework to Combat COVID19 like Pandemic in Future**

Murad Khan, Teef Alenezi, Shouq Alenezi, Sara Alenezi and Albandari Alenezi, Basil Y Alothman, Chibli C. Joumaa (Kuwait College of Science and Technology, Kuwait)

**Session P6-22 A Survey on Vehicular Communication Methods**

Jaehwan Lee and Woongsoo Na (Kongju National University, Korea)

**Session P6-23 Local Group-based Fast, Efficient, and Accurate Federated Learning: A Review**

Ajit Kumar and Bong Jun David Choi (Soongsil University, Korea)

**Session P6-24 LSTM Is Not Predicting the Future; A Comment on Published Papers in Time Sequence Forecasting**

Yusuf Moallim, Jae Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)

**Session P6-25 Evaluation for Cell Density of Mobile Network in Traffic-intensive Areas**

Won Bin Lee (ETRI, Korea); Kyung-yul Cheon (ETRI(ETRI), Korea); Hyecheon Kwon (ETRI, Korea); Sungyong Hong (Chungnam National University, Korea)

**Session P6-26 Enhancement of Reliability and Availability for LTE-R based Train Control**

Byungsik Yoon, Sook-Jin Lee, Sangchul Oh and MinSuk Choi (ETRI, Korea); Sungchan Lee and Dongil Sung (Korea Railway Network Authority, Korea)

**Session P6-27 Improving Text Classification Performance through Data Labeling Adjustment**

Eunjung Kwon and Hyunho Park (ETRI, Korea); Sungwon Byon (Electronics and Telecommunication Research Insititute, Korea); Kyu-Chul Lee (Changnam National University, Korea)

**Session P6-28 Driver Monitoring System based on Distracted driving Decision Algorithm**

Sehwan Jeon (Korea Polytechnic VI Daegu, Korea); Seeyoung Lee, Eunjeong Lee and Juseok Shin (Korea Polytechnics, Korea)

**Session P6-29 Experimental Study of Zero-Copy Performance for Immersive Streaming Service in Linux**

PyungKoo Park (ETRI, Korea); Seong Moon (Principal Researcher, Korea); Seungwoo Hong (Convergence Networking Research Team/ETRI, Korea); Tae-Yeon Kim (ETRI, Korea)

## Technical Paper Sessions

**Session P6-30 Bridging the gap between AI trustworthiness guidelines and the practice use of AI service development**

*JaeYoung Hwang (Telecommunications Technology Association, Korea)*

**Session P6-31 Uplink Max-Min Spectral Efficiency of IRS-Aided Cell-Free Massive MIMO Networks: Analysis and Deep Learning Design**

*Thong Nhat Tran and Beongku An (Hongik University, Korea)*

**Session P6-32 Downlink Secrecy Rate Maximization for IRS-Aided Cell-Free Massive MIMO Networks: Analysis and Deep Learning Design**

*Thong Nhat Tran and Beongku An (Hongik University, Korea)*

## October 21st (Friday) 2022

### [Session A7] Unmanned Aerial Vehicles

Oct. 21, 08:30~10:10

Chair : Prof. Noor Gul (Tech University of Korea, Korea)

**Session A7-1 Vision-based Autonomous Landing System for Quadcopter Drone Using OpenMV**

*Rizqy Ilmi Naufal and Nyoman Karna (Telkom University, Indonesia); Soo Young Shin (Kumoh National Institute of Technology, Korea)*

**Session A7-2 Indoor Path Planning for Multiple Unmanned Aerial Vehicles via Curriculum Learning**

*Jongmin Park (Yonsei University, Korea); Kwansik Park (Korea Aerospace Research Institute, Korea)*

**Session A7-3 Cyber Edge Intelligent Intrusion Detection Framework For UAV Network Based on Random Forest Algorithm**

*Vivian Ukamaka Ihekoronye (Kumoh National Institute of Technology, Korea); Simeon Ajakwe (Kumoh National Institute of Technology, Gumi, Korea); Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)*

**Session A7-4 Optimal Movements of UAV using Reinforcement Learning in Emergency Environment**

*Jung-Hwa Kang (Ajou University, Korea); Jae-Hyun Kim (Ajou University, South Korea, Korea)*

**Session A7-5 New drone's flight path proposal to reduce information delivery time in DTN**

*Yuki Kato and Takatoshi Sugiyama (Kogakuin University, Japan)*

### [Session B7] MIMO

Oct. 21, 08:30~10:10

Chair : Prof. Seok-Hwan Park (Jeonbuk National University, Korea)

**Session B7-1 Joint Centralized and Distributed Precoding in Scalable Cell-Free Massive MIMO Systems**

*Minhyun Kim, In-Kyeong Choi, Seung-Eun Hong and Jeehyeon Na (ETRI, Korea)*

**Session B7-2 Rate-Splitting Multiple Access With Conjugate Beamforming for Cell-Free MIMO**

*Seok-Hwan Park (Jeonbuk National University, Korea); Hoon Lee (Pukyong National University, Korea); Seung-Eun Hong (ETRI, Korea)*

**Session B7-3 Weight-Counting Based Greedy Pilot Allocation in Cell-Free Massive MIMO**

*Mengmeng Qu (Dalian University of Technology, China); Wenjing Zhao (University of Electronic Science and Technology of China, China); Minglu Jin (Dalian University of Technology, China)*



## Technical Paper Sessions

### Session B7-4 Improved Neyman-Pearson Network for MIMO Radar Moving Target Detection

Jing Yan (Dalian University of Technology, China); Wenjing Zhao (University of Electronic Science and Technology of China, China); Minglu Jin (Dalian University of Technology, China)

## [Session C7] Security I

Oct. 21, 08:30~10:10

Chair : Prof. Dongwan Shin (New Mexico Tech, USA)

### Session C7-1 Revisiting TLS-Encrypted Traffic Fingerprinting Methods for Malware Family Classification

Hyundo Kim, Minsu Kim, Joonseo Ha and Heejun Roh (Korea University, Korea)

### Session C7-2 FedDDoS: An Efficient Federated Learning-based DDoS Attacks Classification in SDN-Enabled IIoT Network

Ahmad Zainudin (Kumoh National Institute of Technology, Korea); Rubina Akter (Kumoh National Institute of Technology & Networked Systems Laboratory, Korea); Dong-Seong Kim and Jae Min Lee (Kumoh National Institute of Technology, Korea)

### Session C7-3 A Network Intrusion Detection Architecture Based on Class Parallelism on Distributed Switches

Nga Thi Dao, Huu Noi Nguyen and Vu Son (Le Quy Don Technical University, Vietnam)

### Session C7-4 High Availability Solution for IPsec in IP Multimedia Subsystem

Lam The Nguyen, Huy Duc Nguyen, Linh Duc Nguyen, Nam Huu Tien Chu and Vuong Ngo (Viettel High-Technologies Industries Corporation, Vietnam)

### Session C7-5 Taxonomy of Cyber Threat Intelligence Framework

Ahmad Naim Irfan and Suriyati Chuprat (Universiti Teknologi Malaysia, Malaysia); Mohd bin Mahrin (Universiti Teknologi Malaysia, Malaysia); Aswami Ariffin (Industry, Malaysia)

### Session C7-6 Using Transformers and Deep Learning with Stance Detection to Forecast Cryptocurrency Price Movement

Yeonwoo Son (Cupertino High School, USA); Soham Vohra and Rohit Vakkalagadda (Bellarmine College Preparatory, USA); Michael Zhu (Dulles High School, USA); Aadvaith A Hirde (United Arab Emirates); Saurav Kumar (University of Illinois at Urbana-Champaign & Stanford University, USA); Arjun H Rajaram (University of Maryland, USA)

## [Session D7] Human Sensing I

Oct. 21, 08:30~10:10

Chair : Prof. Ananta Sinchai (King Mongkut's Institute of Technology Ladkrabang, Thailand)

### Session D7-1 A Central Point-based Analysis for Fingerprint Liveness Detection

Min Young Lim and Tae Yong Kim (Hongik University, Korea); Joung Eun Park and Pyo Min Hong (Seoul Women's University, Korea); Youn Kyu Lee (Hongik University, Korea)

### Session D7-2 Controlling Dependency: Selectively Resetting Channels for Pre-trained CNN Backbone Network on Hand Pose Estimation

Gyusang Cho (KAIST, Korea); Chan-Hyun Youn (KAIST, Korea)

### Session D7-3 The Radiographic view classification and localization of Lumbar spine using Deep Learning Models

Podchara Klinwichit, Krisana Chinnasarn, Athita Onuean and Somsupha Limcharoen (Burapha University, Thailand); Sang-Hun Lee (Korea Institute of Oriental Medicine, Korea); Junsu Jang (Korean Institute of Oriental Medicine, Korea)

## Technical Paper Sessions

### **Session D7-4 NU SAFE Students: A Microsoft PowerApps Application for Health Monitoring in National University Philippines**

*Vincent Kyle E Caballa, Ryan Richard H. Guadaña, Ken Zyus Itulid, Daniel Lee James Borjoña and Charles Enzo Correa (National University, Philippines)*

### **Session D7-5 Heart Disease Prediction Using Ensemble Voting Methods in Machine Learning**

*Sibu Cyriac, Nidhin Raju, Sivakumar R and Yong Woon Kim (CHRIST University, India)*

### **Session D7-6 Towards Cross-materials: Fingerprint Liveness Detection based on Style Transfer**

*Soo-Hyun Lee, Min Young Lim, Seong Hee Park, Hwa Jung Yoo and Youn Kyu Lee (Hongik University, Korea)*

## **[Session E7] Non-Terrestrial Networks**

Oct. 21, 08:30~10:10

Chair : Dr. Seung-Que Lee (ETRI, Korea)

### **Session E7-1 Atmospheric Effects on Downlink Channel of Satellite to Ground Free Space Optical Communications**

*Byung Wook Kim, Nilesh Maharjan and Nikesh Devkota (Changwon National University, Korea)*

### **Session E7-2 Deep Reinforcement Learning-based Partial Task Offloading in High Altitude Platform-aided Vehicular Networks**

*Tri-Hai Nguyen (Seoul National University of Science and Technology, Korea); Thanh Phung Truong (Viettel Network, Vietnam); Nhu-Ngoc Dao (Sejong University, Korea); Woongsoo Na (Kongju National University, Korea); Heejae Park and Laihyuk Park (Seoul National University of Science and Technology, Korea)*

### **Session E7-3 Reinforcement Learning Empowered Massive IoT Access in LEO-based Non-Terrestrial Networks**

*Ju-Hyung Lee, Dheeraj Panneer Selvam and Andreas Molisch (University of Southern California, USA); Joongheon Kim (Korea University, Korea)*

### **Session E7-4 Downlink Synchronization in New Radio (NR) Non-Terrestrial Networks (NTN)**

*Seungwon Ha (Chungang University, Korea); Qasim Sultan and Yong Soo Cho (Chung-Ang University, Korea); Sujung Choi (Chungang University, Korea)*

### **Session E7-5 Aircraft Transponder Signaling Concepts Using Multi-Mode Multi-Port Antenna**

*Nils L. Johannsen (University of Kiel, Germany); Lukas Grundmann (Leibniz University Hannover, Germany); Dirk Manteuffel (University of Hannover, Germany); Peter A. Hoeher (University of Kiel, Germany)*

### **Session E7-6 A Study on Hybrid Content Delivery using NTN and MBS in 5G Network**

*Jeongyun Kim and Changki Kim (ETRI, Korea)*

## **[Session F7] Applications with ML III**

Oct. 21, 08:30~10:10

Chair : Prof. Youn-Hee Han (Korea University of Technology and Education, Korea)

### **Session F7-1 A Study on the Spatial Division and Identifier Assignment Method for Objects Location in Indoor Digital Twin**

*ChaeSeok Lee and Byunghun Han (KAIST Institute for IT Convergence, Korea); A-Ryoung Kim (KAIST Institute for Information Technology Convergence, Korea); Woogeun Lee, Ji Hye Lee and Hojong Chang (KAIST, Korea)*

### **Session F7-2 Machine Learning in Clinical Text Classification: Specialty Identification and COVID-19 Risk**

*Chloe Tan (The Brearley School, USA); Kunal Talreja and Annika E Shivam (USA); Arpon Nag (Bangladesh); Myra Miranda (United States, USA); Samskrith K Raghav (USA); Arjun H Rajaram (University of Maryland, USA); Michael J Lutz (University*

## Technical Paper Sessions

*of California Berkeley, USA); Saurav Kumar (University of Illinois at Urbana-Champaign & Stanford University, USA); Amisha Kumar (Case Western Reserve University, USA)*

### Session F7-3 Image Steganography with Deep Learning Networks

*Wei Bingxin (Hanyang University, Korea); Duan Xintao (Henan Normal University, China); Haewoon Nam (Hanyang University, Korea)*

### Session F7-4 Face Recognition and Identification Using Successive Subspace Learning for Human Resource Utilization Assessment

*Athena Rosz Ann R. Pascua, Maverick Rivera, Marielet A. Guillermo, Argel Bandala and Edwin Sybingco (De La Salle University, Philippines)*

## [Session G7] Multiple Access

Oct. 21, 08:30~10:10

Chair : Prof. Soo Young Shin (Kumoh National Institute of Technology, Korea)

### Session G7-1 Distributed Antenna System-Assisted Energy Efficient SWIPT with Orthogonal Multiple Access

*Dongjae Kim (Korea Maritime & Ocean University, Korea); Minseok Choi (Kyung Hee University, Korea); Dong-Wook Seo (Korea Maritime and Ocean University, Korea)*

### Session G7-2 Resource Allocation for Minimizing the Transmit Power in Uplink NOMA IoT Cellular Networks

*Hyun Jung Park, Hyeon Woong Kim and Sung Ho Chae (Kwangju University, Korea)*

### Session G7-3 Model-Based Reinforcement Learning for Wireless Channel Access

*JongIn Park and Kae Won Choi (Sungkyunkwan University, Korea)*

### Session G7-4 Performance Analysis of Multi-User Uplink NOMA With Low Complex RS-OSIC Detector

*Rahul Makkar (The LNM Institute of Information Technology Jaipur, India); Sandhya Soni and Divyang Rawal (LNMIIIT, India); Nikhil Sharma (The LNM Institute of Information Technology, Jaipur, India); Laxmikant Minz (KAIST, Korea)*

### Session G7-5 New resource competition methods for good network stability in synchronous wireless distributed communication systems

*Hyungu Hwang (ETRI (ETRI), Korea); Jaemin Ahn (Chungnam National University, Korea)*

## [Session P7] Poster Session 7

Oct. 21, 08:30~10:10

Chair : Prof. Dongwan Kim (Dong-A University, Korea)

### Session P7-1 Consideration for Aerial Network Design over New Radio Cellular Networks

*Mi Young Yun (Electronics and Telecommunications Research Institute, Korea); Moon-Sik Lee (ETRI & Stanford University, Korea)*

### Session P7-2 Interference Analysis between Ground-based Meteorological Radars

*Minsoo Kang, Sangin CHO, Hyungjung KIM (ETRI, Korea)*

### Session P7-3 Enabler Development Platform for Hyper-connected Common Networking Services

*Byeongok Kwak, Ho Yong Ryu and Tae-Yeon Kim (ETRI, Korea)*

### Session P7-4 Deployment Framework Design Techniques for Optimized Neural Network Applications

*Jaebok Park and KyungHee Lee (ETRI, Korea); Ji-Young Kwak (ETRI, Korea); Chang-Sik Cho (ETRI & (ETRI), Korea)*

### Session P7-5 Implementation of UPF supporting Ultra Reliable Low Latency Communication for 5G Core

*Seunghan Choi (ETRI, Korea); Jaegu Yoo (Sysmate Corp., Korea); Changki Kim (ETRI, Korea)*



## Technical Paper Sessions

**Session P7-6 Enhancing IoT security with PUF-based authentication scheme**

*Seungyong Yoon (ETRI, Korea)*

**Session P7-7 Implementation and Performance Evaluation of Wideband Channel Sounder at 159 GHz**

*Myung-Don Kim, Heon Kook Kwon, Kyung-Won Kim, Juyul Lee and Jae-Joon Park (ETRI, Korea)*

**Session P7-8 Correlation Analysis of Usage Pattern in Home Appliance with Boosting Algorithm**

*Joa Hyoung Lee, Yoonmee Doh and Tae-Wook Heo (ETRI, Korea)*

**Session P7-9 Comparative Analysis of GPU Stream Processing between Persistent and Non-persistent Kernels**

*Suhwan Kim, Changue Jung and Younghoon Kim (Sungkyunkwan University, Korea)*

**Session P7-10 A Study on the Magnetic Shielding Effectiveness of Conductive Sheets for Protecting ICT Facilities and Devices**

*Dae-Yeon Kim, Dae-Heon Lee and Seung-Kab Ryu (ETRI, Korea)*

**Session P7-11 Demonstration and Analysis of Outdoor OWC System using FPGA-based 2.5Gigabit Ethernet including FEC**

*Youngsoon Heo (ETRI, Korea); Hyunseo Kang, Chan IL Yeo and Siwoong Park (ETRI, Korea)*

**Session P7-12 Design and Comparison of Single Band Rectangular, Cylindrical, and Triangular DRA of C and X-Band Frequency**

*Muhammad Uzair Khan, Muhammad Sajjad Khan and Musyyab Yousufi (International Islamic University Islamabad, Pakistan); Junsu Kim (Tech University of Korea, Korea); Noor Gul (University of Peshawar & Tech University of Korea, Pakistan); Su Min Kim (Tech University of Korea, Korea)*

**Session P7-13 A Survey on Mobile Edge Computing Architectures for Deep Learning Models**

*Jaehwan Lee and Woongsoo Na (Kongju National University, Korea)*

**Session P7-14 Service Function Chaining-based Traffic Steering Support in the 5G System**

*Yoo-hwa Kang (ETRI, Korea); Changki Kim (ETRI, Korea)*

**Session P7-15 Device Driver Emulator for Parallel Computing Accelerator Simulator supporting OpenCL**

*Eun-Ji Lim (ETRI, Korea); Shinyoung Ahn (Electronics Telecommunication Research Institute, Korea); Young-Ho Kim and Yoo-mi Park (ETRI, Korea)*

**Session P7-16 Random Forest Approach in Prediction Workers' Stress from Personality Traits**

*Jungsook Kim (ETRI, Korea); Daesub Yoon (ETRI, Korea); Hyunsuk Kim (ETRI & Emotion Recognition IoT Research Section, Korea)*

**Session P7-17 Design for End-to-End Ultra-high Precision Networking Architecture**

*Byeongok Kwak (ETRI, Korea); HoSun Yoon (ETRI, Korea); Seong Moon (ETRI, Korea); PyungKoo Park (ETRI, Korea); Seungwoo Hong (ETRI, Korea)*

**Session P7-18 Challenges to the Development of Manned and Unmanned Combat Systems**

*Jin-Kyu Choi (ETRI, Korea); Yong-Tae Lee (ETRI, Korea); HeaSook Park and Bong-Soo Kim (ETRI, Korea); Byung-Woon Kim (Electronics and Telecommunications Research Institute, Korea)*

**Session P7-19 The Stress Relief Effect of Massage Chair for Knowledge Workers using Questionnaires and Wearable PPG Devices**

*Minjung Kim and Kyonghyun Park (ETRI, Korea); Hyunsuk Kim (ETRI & Emotion Recognition IoT Research Section, Korea); Daesub Yoon (ETRI, Korea)*

**Session P7-20 A study on the reward generation method to be used in reinforcement learning to reduce the peak load**

*Cheol-Ho Shin (ETRI, Korea)*

## Technical Paper Sessions

**Session P7-21 Efficient Analytical Data Processing and Visualization Methods for Supporting Scientific Connoisseurship on Oil Paintings**

*Yoon-Seok Choi (ETRI, Korea); Jae Woo Kim (ETRI, Korea); Soonchul Jung (ETRI, Korea); Hyeongju Jeon and Jin-Seo Kim (ETRI, Korea)*

**Session P7-22 Implementation of Real-Time Facility Inspection Service System Based on a Drone**

*DongWan Ryoo (ETRI, Korea); Kyung-il Kim (ETRI, Slovakia); Chaedeok Lim (ETRI, Korea)*

**Session P7-23 Optimal transfer-interval frequency to minimize data loss in BLE network for healthcare service**

*Jaehyeok Lee and Seohu Lee (Sungkyunkwan University, Korea); Jayun Hyun (Hippo T&C Inc., Korea); Chan-Yong Park (Sungkyunkwan University, Korea); Ji-Ung Park, Min-Ha Choi and Won Jung Shin (Seoul National University Boramae Medical Center, Korea); TaiMyoung Chung (Sungkyunkwan University, Korea)*

**Session P7-24 Connected Intelligence for Smart Water Quality Monitoring System in IIoT**

*Simeon Ajakwe (Kumoh National Institute of Technology, Gumi, Korea); Vivian Ukamaka Ihekoronye (Kumoh National Institute of Technology, Korea); Ihunanya Ajakwe (Federal University of Technology, Owerri, Korea); Taesoo Jun, Dong-Seong Kim and Jae-Min Lee (Kumoh National Institute of Technology, Korea)*

**Session P7-25 Derivation of separation distance for LTE-M protection from HIBS interference signal**

*Ho Kyung Son and Young Jun Chong (ETRI, Korea)*

**Session P7-26 PyMatching-based Decoding Simulation of Rotated Surface Codes in Classical Quantum Simulator**

*Sangmin Lee (ETRI); Kisung Jin and Gyu-II Cha (ETRI, Korea)*

**Session P7-27 A 5G Beamforming Antenna With IoT Sensors**

*Yejune Seo (Inchoen National University, Korea); Junghyun Cho, Jiyeon Jang, Yejin Lee and Sungtek Kahng (Incheon National University, Korea)*

**Session P7-28 Investigating Correlation between the mm-wave Array Antenna and Digital Wireless Communication in the 5G Mobile System**

*Yejune Seo (Inchoen National University, Korea); Junghyun Cho, Yejin Lee, Jiyeon Jang and Sungtek Kahng (Incheon National University, Korea)*

**Session P7-29 An Enhanced Error Recovery Method for Ultra-Reliable Communication in NR**

*Namsuk Lee (ETRI, Korea); Heesang Chung (ETRI, Korea)*

**Session P7-30 Analysis of the Profit of Prosumers and Consumers Through P2P Power Trading Simulation Model Considering Real-time Trading Environment**

*Daegeun Park (ETRI, Korea); Wan-Ki Park (ETRI, Korea)*

**Session P7-31 Comparing performance between TDOA with Carrier phase positioning method**

*Jongphil Park (Locaila, USA); Wanhee Kim (Locaila, Inc., USA); Jaihyung Cho (Locaila, USA)*

**Session P7-32 On the Communication Platform for the Smart Aids to Navigation**

*Seong Chul Cho, Seok Seo, Hyungjin Kim and Hwang You-sun (ETRI, Korea); Kisoong Sung (ETRI, Korea); Sung-Min Oh (ETRI, Korea)*

## Technical Paper Sessions

### [Session A8] Vehicular Networks

Oct. 21, 10:30~12:10

Chair : Prof. Noor Gul (Tech University of Korea, Korea)

**Session A8-1 A Proposal of Method of Finding Appropriate idleSlope Values Over In-Vehicle Ethernet With CBS**

*Moe Nitta, Yoshihiro Ito and Akari Yoshimura (Nagoya Institute of Technology, Japan)*

**Session A8-2 Centralized architecture for ECU security management in connected and autonomous vehicles**

*Hamza Khemissa and Pascal Urien (Télécom Paris, France)*

**Session A8-3 A Cooperative Lane Change Strategy for Improving Road Safety through V2V Communications**

*Mei Yang, Chunxiao Li, Wen Wu and Chunyan Qi (Yangzhou University, China)*

**Session A8-4 Enhancement of information propagation on the highway in VANET based on Multiple Vehicle Class**

*Dhari Ali Mahmood (University of Technology-IRAQ, Iraq)*

**Session A8-5 Study on QoS Estimation of In-vehicle Ethernet with CBS by Multiple Regression Analysis**

*Honoka Awane, Yoshihiro Ito and Koizumi Maika (Nagoya Institute of Technology, Japan)*

**Session A8-6 Demonstration of millimeter wave vehicle-to-vehicle communication services in highway environment**

*Heesang Chung, Sung Woo Choi, Seung Nam Choi and Dae-Soon Cho (ETRI, Korea); Jung Pil Choi (Mobile Communications Research Lab., ETRI, Korea); Seon-Ae Kim (Electrics and Telecommunications Research Institute, Korea); Gosan Noh (ETRI, Korea); Junhyeong Kim and Manho Park (ETRI, Korea); Namsuk Lee (ETRI, Korea); MinSuk Choi, Jae-Su Song and Nak Woon Sung (ETRI, Korea)*

### [Session B8] Distributed ML

Oct. 21, 10:30~12:10

Chair : Prof. Ajit Kumar (Soongsil University, Korea)

**Session B8-1 Analysis of use cases enabling AI/ML to IoT service platforms**

*Nargis Khatoon (Sejong University South Korea, Pakistan); Naqqash Dilshad and JaeSeung Song (Sejong University, Korea)*

**Session B8-2 A Partial Federated Learning Model in Cognitive UAV-enabled Edge Computing Networks**

*Saifur Rahman Sabuj, Mahmoud Abdelsamad Ahmed Abdelwarth and Han-Shin Jo (Hanbat National University, Korea)*

**Session B8-3 A Communication Efficient Approach of Global Training in Federated Learning**

*Dost Muhammad Saqib Bhatti (Hanyang University, South Korea, Korea); Haris Muhammad and Haewoon Nam (Hanyang University, Korea)*

**Session B8-4 Federated Learning via Local Update with Uploading Zone**

*Seong Hoon Jeon and Dong In Kim (Sungkyunkwan University, Korea)*

**Session B8-5 Incentive Mechanisms in Federated Learning**

*Abrar Ahmed, Ali Syed Saqib and Bong Jun David Choi (Soongsil University, Korea)*

**Session B8-6 3DFed: A Secure Federated Learning-based System for Fault Detection in 3D Printer Industry**

*Made Adi Paramartha Putra (Kumoh National Institute of Technology, Korea & STMIK Primakara, Indonesia); Mark Verana (Kumoh National Institute of Technology, Korea); Gabriel Avelino R Sampedro (Kumoh National Institute of Technology, Korea & University of the Philippines, Philippines); Dong-Seong Kim and Jae-Min Lee (Kumoh National Institute of Technology, Korea)*



## Technical Paper Sessions

### [Session C8] Security II

Oct. 21, 10:30~12:10

Chair : Prof. Orland Delfino Tubola (Polytechnic University of the Philippines, Philippines)

#### **Session C8-1 Improving Key Size and Bit-Security of Modified pqsigRM**

Jinkyu Cho (Seoul National University, Korea); Yongwoo Lee (Samsung Electronics, Korea); ZaHyun Koo and Jong-Seon No (Seoul National University, Korea); Young-Sik Kim (Chosun University, Korea)

#### **Session C8-2 PCIe Side-channel Attack on I/O Device via RDMA-enabled Network Card**

Hodong Kim and Junbeom Hur (Korea University, Korea)

#### **Session C8-3 Analysis of Intrusion Detection Performance by Smoothing Factor of Gaussian NB Model Using Modified NSL-KDD Dataset**

Kijung Bong and Jonghyun Kim (ETRI, Korea)

#### **Session C8-4 Accelerating face de-identification system for real-time video surveillance services**

Ryangsoo Kim and Hark Yoo (ETRI, Korea); JiHyoung Ryu (ETRI, Korea); Sungchang Kim (ETRI, Korea)

#### **Session C8-5 AI-Based Modeling Architecture to Detect Traffic Anomalies from Dashcam Videos**

Ji Sang Park (Electronics & Telecommunication Research Institute, Korea); Ahyun Lee and Kang-Woo Lee (ETRI, Korea); Sung Woong Shin (ETRI (ETRI), Korea); Soe Sandi Htun (Seoul National University of Science, Korea); Ji-Hyeong Han (Seoul National University of Science and Technology, Korea)

#### **Session C8-6 Rethinking on Ciphertext Equality Check of Decapsulation of NIST PQC Standardization 3rd Round Finalist Candidate Saber**

Dong Hoon Lee and Jong-Seon No (Seoul National University, Korea); Young-Sik Kim and Eunyoung Seo (Chosun University, Korea)

### [Session D8] Human Sensing II

Oct. 21, 10:30~12:10

Chair : Prof. Cosmas Ifeanyi Nwakanma (Kumoh National Institute of Technology, Korea)

#### **Session D8-1 Movement Detection of Tongue and Related Body Parts Using IR-UWB Radar**

Sunghwa Lee (Yonsei University, Korea); Younghoon Shin (Hyundai Motor Company, Korea)

#### **Session D8-2 Deep Learning Based Human Activity Recognition With Improved Accuracy**

Supriya Kumari Prasad (Ajou University, Korea)

#### **Session D8-3 A study on deep learning-based classification for Pneumonia detection**

Seong Won Jo (University of Science and Technology, Korea); Jinwuk Seok (Electronics and Telecommunication Research Institute, Korea)

#### **Session D8-4 Intravascular Ultrasound Image Composite Segmentation using Ensemble Gabor-spatial Features**

Janya Onpans, Watcharaphong Yookwan, Jiranun Sangrueng and Supawadee Srikamdee (Burapha University, Thailand)

#### **Session D8-5 Hybrid Area-based Techniques for Muscle Mass Identification on Dual Energy X-Ray Absorptiometry Images**

Pusit Kulkasem (Burapha University, Thailand)

#### **Session D8-6 An Image Resizing Function Embedded in an Inverse Discrete Cosine Transform**

Ananta Sinchai and Panwit Tuwanut (King Mongkut's Institute of Technology Ladkrabang, Thailand)

## Technical Paper Sessions

### [Session E8] Cellular Networks

Oct. 21, 10:30~12:10

Chair : Prof. Muhammad Sajjad Khan (International Islamic University, Pakistan)

#### **Session E8-1 Reducing DNN inference latency using DRL**

*Suhwan Kim, Sehun Jung and Hyang-Won Lee (Konkuk University, Korea)*

#### **Session E8-2 Survey on 6G System for AI-Native Services**

*Dongho Ham and Jeongho Kwak (DGIST, Korea)*

#### **Session E8-3 Channel-Adaptive Resource Allocation Architecture for Resource-Efficient RAN Slicing**

*Serae Kim and Sunghyun Jin (Seoul National University, Korea); Junseon Kim (Ulsan National Institute of Science and Technology (UNIST), Korea); Kyunghan Lee (Seoul National University, Korea)*

#### **Session E8-4 6G for UAM communications: Challenges and Visions**

*Byeongjin Kim (Ulsan National Institute of Science and Technology, Korea); Hyoil Kim (Ulsan National Institute of Science and Technology (UNIST), Korea)*

#### **Session E8-5 Multi-Agent Reinforcement Learning-Based Coverage Maximization for Fixed-Wing Base Stations**

*Hyeonsu Lyu, SeongJin Hwang and Hyun Jong Yang (POSTECH, Korea)*

### [Session F8] Applications of Convergence Technology

Oct. 21, 10:30~12:10

Chair : Prof. Young-Woo Kwon (Kyungpook National University, Korea)

#### **Session F8-1 Performance Comparison of Moving Target Classification based on Deep Learning**

*Jun Hur and Haewoon Nam (Hanyang University, Korea)*

#### **Session F8-2 Generating and Modifying High Resolution Fashion Model Image using StyleGAN**

*InMoon Choi (ETRI(ETRI), Korea); Soonchan Park (ETRI, Korea); Jiyoung Park (ETRI (ETRI), Korea)*

#### **Session F8-3 Adoption Block Chain Technology and Internet of Thing for Medical Record in Health Insurance**

*Inayatulloh (Bina Nusantara University, Indonesia); Rozali Toyib, Eka Sahputra, Yuza Reswan and Yulia Darmi (Universitas Muhammadiyah Bengkulu, Indonesia); Meisyarah (Universitas Terbuka Jakarta, Indonesia)*

#### **Session F8-4 Virtual Skinner Box for the Test of Operant Conditioning**

*Deokgun Park (University of Texas at Arlington & School of Engineering, USA); Md Ashaduzzaman Rubel Mondol (University of Texas at Arlington, USA)*

#### **Session F8-5 Performance of Data transmission utilizing Light Fidelity System through a Hybrid System under different Weather Conditions**

*Walaa Khalil Abraham and Satea Hikmat Alnajjar (Al-Iraqia University, Iraq)*

#### **Session F8-6 Two-level obstacles avoidance method for manned aircrafts**

*Ha Manh Le (Viettel High Technology Industries Corporation, Vietnam & Moscow Institute of Physics and Technology, Russia); Tien Minh Dam (Viettel High Technology Industries Corporation & Hanoi University of Science and Technology, Vietnam); Hung Viet Bui (Viettel High Technology Industries Corporation & Insa Toulouse, Vietnam); Tiem Manh Nguyen (Viettel High Technology Industries Corporation, Vietnam); Tuan Anh Nguyen (Viettel High Technology Industries Corporation, Vietnam & Hanoi University of Science and Technology, Vietnam)*

## Technical Paper Sessions

### [Session RR1] Recent Results 1

Oct. 21, 10:30~12:10

Chair : Prof. Soyi Jung (Ajou University, Korea)

**Session RR1-1 Geometric Transformation-aware Arbitrary Style Transfer based on AdaIN**

*Bumssoo Kim, Sanghyun Seo (Chung-Ang University, Korea)*

**Session RR1-2 Mobile Communication Channel to Leverage Sounds Induced by Magnetic Field Fluctuations**

*Myeongwon Choi, Donghun Lee, Hyosu Kim (Chung-Ang University, Korea); Syed Raza Shah (Sukkur Institute of Business Administration, Pakistan)*

**Session RR1-3 Pedestrian Safety Enhancement System Using Smartphones**

*Insu Kim, Jaemin Choi, Hyosu Kim (Chung-Ang University, Korea)*

**Session RR1-4 Estimating Water Level on Cups by Listening to Singing Sounds**

*Taewon Kim, Suhyeon Shin, Hyosu Kim (Chung-Ang University, Korea)*

**Session RR1-5 Labeling Method for Stress Detection via HRV Analysis of ECG Signal**

*Gyutae Hwang (ETRI, Korea); Chang Woo Nam (Jeonbuk National University, Korea); Moonwook Ryu (ETRI, Korea)*

**Session RR1-6 Sound Event Localization and Detection Using Residual Convolutional Neural Network and Transformer Encoder**

*Yeongseo Shin, Chanjun Chun (Chosun University, Korea)*

**Session RR1-7 Towards Applying Multi-task Learning on Automated Bug Triage with Bug Component Data**

*Hoon Seong, Hyeonggi Yeo, Yongseok Son, Chan-gun Lee (Chung-Ang University, Korea)*

**Session RR1-8 Applying Component Information in Bug triage**

*Dae-Sung Wang, Hyeonggi Yeo, Yongseok Son, Chan-Gun Lee (Chung-Ang University, Korea)*

**Session RR1-9 Analysis of Byzantine Fault Tolerance Algorithms Utilizing Dynamic Factors**

*Mingyu Jo, Hoonseok Jang, Sangoh Park (Chung-Ang University, Korea)*

**Session RR1-10 Analysis Cooperative Communication-based Recovery for Networks**

*Yoseb Lee, Hyeonggi Kim, Sangoh Park (Chung-Ang University, Korea)*

**Session RR1-11 Analysis on Load Balancing Methods in Distributed Storage System**

*Sanghyuck Nam, Donghyeon Kim, Sangoh Park (Chung-Ang University, Korea)*

**Session RR1-12 A Study on the Development of Combination Information De-identification Technology for Safe Use of Personal Information**

*Myeong-Hyeon Kim, Taek-Young Youn (Dankook University, Korea)*

**Session RR1-13 Lightweight Edge Device Monitoring Framework for Resource-aware Federated Learning**

*Jongbin Park (Korea Electronics Technology Institute, Korea)*

**Session RR1-14 Deep Reinforcement Learning-Based Dynamic Split Computing Mechanism for Multi-Task Learning Model**

*Haneul Ko (Kyung Hee University, Korea); Sangheon Park (Korea University, Korea)*

**Session RR1-15 Task Migration and Offloading in Vehicular Edge Computing**

*Sungwon Moon, Yujin Lim (Sookmyung Women's University, Korea)*



## Registration

- Author Registration Deadline : **September 9, 2022**
- Early Registration Deadline (Non-Author) : **October 10, 2022**
- Late Registration : **October 11 ~ October 21, 2022**

### Registration Policy

1. To be published in the ICTC 2022 Conference Proceedings, a minimum of one author from each accepted paper MUST register at the registration fee (member or non-member) and the paper must be presented at the conference.
2. "Member" rates apply to members of IEEE (Institute of Electrical and Electronics Engineers), IEICE (The Institute of Electronics, Information and Communication Engineers), KICS (Korea Institute of Communications and Information Science), and CIC (China Institute of Communications).
3. A valid student ID is required at the registration desk to check the eligibility for student-rate registration.
4. Author/ Non-Author registration cannot be refunded after early registration.
5. Please note that the registered participants can enjoy all conference sessions (technical paper sessions, workshops, plenary sessions including keynote speeches, industrial sessions, and special session), get conference proceedings (can be downloaded from conference website), coffee breaks, luncheon tickets, and a ticket for banquet.

### Registration Fee

		Member / Non-member	
		US \$ (International)	KRW (Domestic) *
<b>Regular</b>	Early Birds	\$600 / \$660	₩600,000 / ₩660,000
	Late	\$660 / \$770	₩660,000 / ₩770,000
<b>Student*</b>	Early Birds	\$400 / \$450	₩400,000 / ₩450,000
	Late	\$450 / \$500	₩450,000 / ₩500,000
<b>International Virtual Authors**</b>	Early Birds	\$200 / \$220	

\* Student : Student registration fee does not apply to the author registration.

\*\* International Virtual Author : Authors from institutions outside Korea may present their paper using online video due to the COVID-19. In this case, the registration fee will be discounted to USD 200 from USD 600.

### Contact Information

If you have any questions, please contact Registration Secretariat of ICTC 2022 at [ictc@kics.or.kr](mailto:ictc@kics.or.kr)

- Tel: +82-2-3453-5555

- Fax: +82-2-539-5638

## Venue

### Ramada Plaze Jeju

Web Site: <http://www.ramadajeju.co.kr/ENG/>



Ramada Plaza Jeju has been founded and financed by the Korean Teachers Credit Union under a franchise agreement with Ramada International as the highest grade hotel "Ramada Plaza". Designed after the Northern European cruise ship SILJA LINE, this resort-type business hotel opened on July 1 2003 with 400 rooms and suites in a building with 9 floors above ground and 1 underground floor.

The hotel with unique, prestige interior designs has various types of rooms and suites, and banquet halls in different sizes including Grand Ballroom capable of accommodating up to 1,500 guests for seminars, meetings, and wedding ceremonies. With other convenient and versatile facilities, Ramada Plaza Jeju provides guests with some of the best hotel services and experience.

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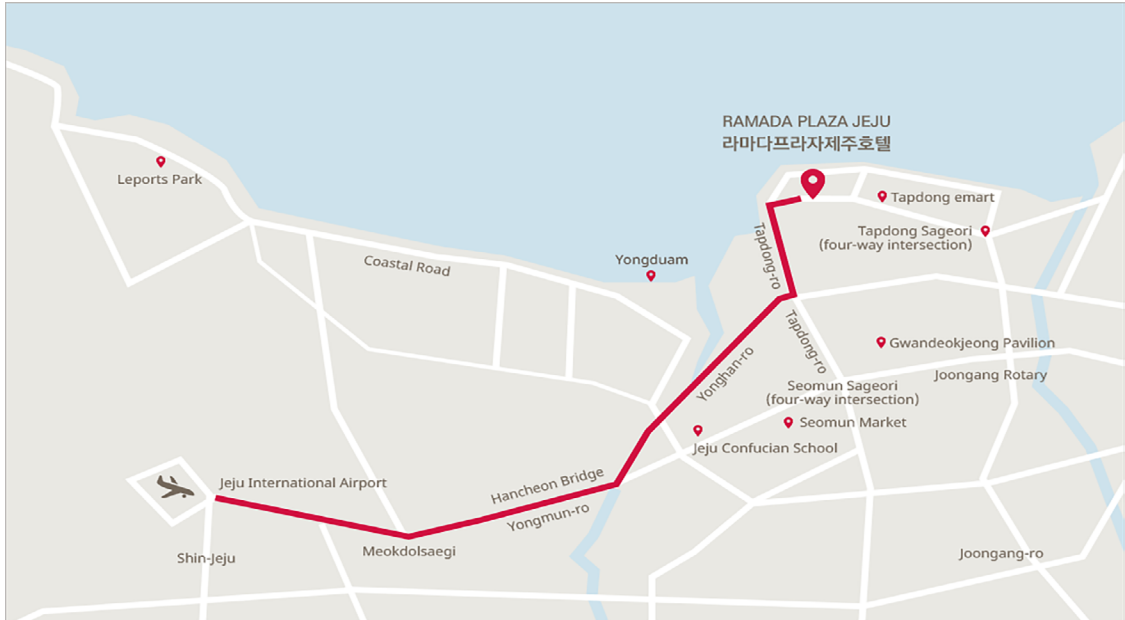
TEL. +82-64-729-8100 | E-mail : [ramadajeju@ramadajeju.co.kr](mailto:ramadajeju@ramadajeju.co.kr)



## Transportation to and from Hotel

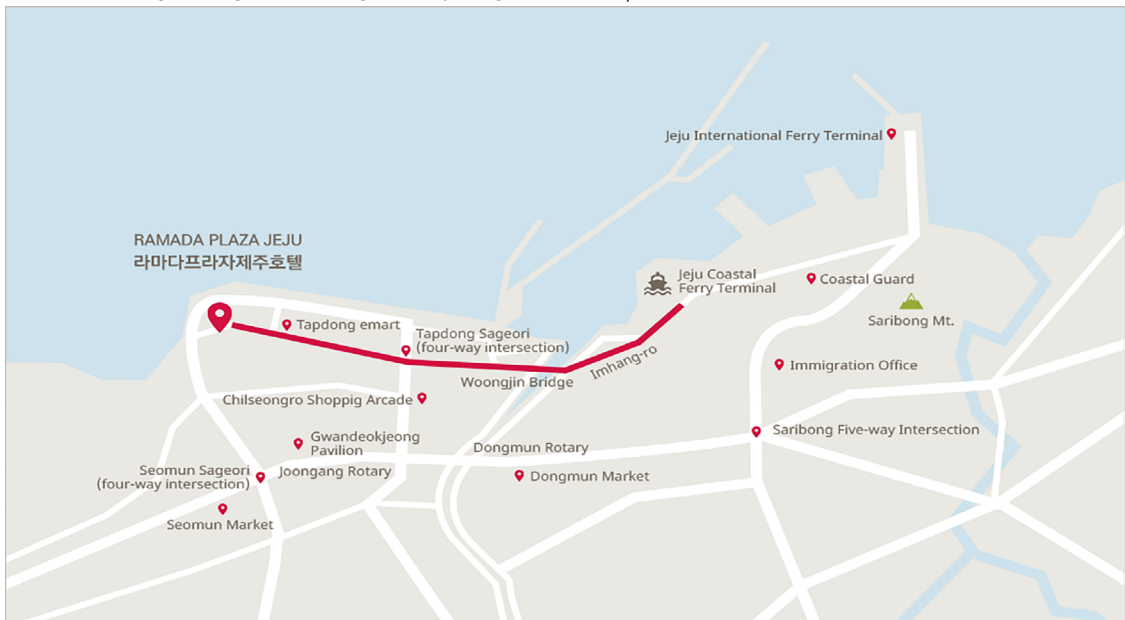
### From Jeju International Airport to Ramada Plaza Jeju

To Yongmun rotary → Hancheon Bridge → Seomun Market → Turn left at Seomun Sageori (four-way intersection) → Go straight to Tapdong-ro Total of 3.8km | 10 minutes



### From Jeju Port to Ramada Plaza Jeju

Turn left at Imhang-ro → right side to Yongduam/Tap-dong Total of 2.2km | 6 minutes





## Travel Information



### Hallasan National Park

Hallasan stands out at the center of South Korea's southernmost island, boasting exquisite landscapes due to its varied volcanic topography and vegetation distribution ranging vertically through the subtropical, temperate, frigid and alpine zones. The special nature of this area led to its being designated and managed as a national park in 1970, a UNESCO Biosphere Reserve in 2002, a World Natural Heritage Site in 2007. Muljangori Oreum registered as a Ramsar Wetland in 2008.



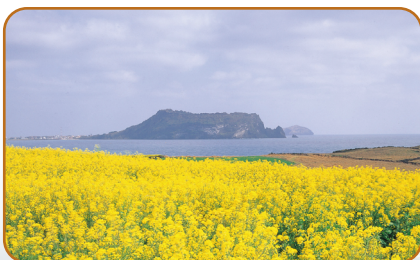
### Jeju Olle

"Olle" [Ole] is the Jeju word for a narrow pathway that is connected from the street to the front gate of a house. Hence, "Olle" is a path that comes out from a secret room to an open space and a gateway to the world. If the road is connected, it is linked to the whole island and the rest of the world as well. It has the same sound as "Would you come?" in Korean, so Jeju's "Olle" sounds the same as 'Would you come to Jeju?'. The first trail route was opened to the public in September, 2007. Since then, the Jeju Olle exploration team has created a combined total of 200km of walking trails in Jeju island. Currently eleven trail routes have been opened to walkers and the trail exploration team is still working on new routes.



### Udo (Cow Islet)

The island was named "Udo" or "Cow Island" as its contours look like a cow lying down on the ground. There are 8 scenic wonders of Udo: day and night (Judan-myeongwol and Yahang-eobeom), sky and earth (Cheonjin-gwansan and Jiducheongsan), front and back (Jeonpo-mangdo and Huhae-seokbyeok), and east and west (Dongan-gyeonggul and Seobin-baeksa). The movie "In October" and "The mermaid" were shot at Cow Island, capitalizing on its picturesque scene of a fishing village and a lush, peaceful grassy field. The white sand beach facing the indigo and turquoise sea of Jeju is very impressive.



### Seongsan Ilchulbong (Sunrise Peak)

99 rocky peaks surround the crater like a fortress and the gentle southern slope connected to water is a lush grassland. On the grassland at the entrance of Sunrise Peak, you can enjoy horseback riding. Breathtaking scenic views while taking a rest in the middle of climbing up the peak such as Mount Halla, the deep blues of the ocean, the multi-colored coast line, and the picturesque neighboring villages will become unforgettable memories.



### Seopjikoji

Jutting out at the eastern seashore of Jeju Island, Seopji-Koji is one of the most scenic views with the bright yellow canola and Seongsan Sunrise Peak as a backdrop. The pristine beauty of Jeju can be seen in Seopji-koji. Sinyang Beach, a meadow filled with canola flowers, peacefully grazing Jeju ponies, a rocky sea cliff, and a towering legendary large rock (Sunbawe) all combine to make nature's masterpiece. Unlike the other coastal areas of Jeju, it has red volcanic rock (songi) and strangely-shaped rocks that at low tide transform this area into a breath-taking stone exhibition gallery.

## Travel Information



### Manjang Cave

Manjang Cave, situated at Donggimnyeong-ri, Gujwa-eup, North Jeju, 30 kilometers east of Jeju City, was designated as Natural Monument No. 98 on March 28, 1970. The 7,416-meter long cave has been officially recognized as the longest lava tube in the world. The annual temperature inside the cave ranges from 11°C to 21°C, thus facilitating a favorable environment throughout the year. The cave is also academically significant as rare species live in the cave. Created by spewing lava, "the lava turtle", "lava pillar", and "Wing-shaped Wall" look like the work of the gods. It is considered to be a world class tourist attraction.



### Gimnyeong Maze Park

This park was opened to the public in 1997 after its development was begun in 1987. In the area of about 3300 square meters, there are 1232 Leylandii trees and two Gold Leylandii trees from England. The overall extended length of labyrinth is 932 m and the shortest course between entrance and exit is 190 m long. Manjang Cave Culture Center, located between Manjang Cave and Gimnyeongsa Cave, is a part of Manjang Cave tourist complex which is currently being expanded. Three bridges totaling 46 m and an observatory give visitors ample opportunities for picture taking.



### Mysterious Road (Dokkaebi Road)

On Mysterious Road (or Bugaboo Road), a parked car on a slight hill road rolls uphill instead of going downhill. This is a result of an optical illusion in which the lower part looks higher because of its surrounding environment.



### Cheonjiyeon Waterfall

The waterfall falls from a precipice with thundering sounds, creating white water pillars. It has the name Cheonjiyeon, meaning 'the heaven and the earth meet and create a pond'. At 22 m in height and 12 m in width, the waterfall tumbles down to the pond to produce awe-inspiring scenery. The valley near the waterfall is home to *Elaeocarpus sylvestris* var. *ellipticus*, which is Natural Monument No. 163, *Psilotum nudum*, *Castanopsis cuspidata* var. *sieboldii*, *Xylosma congestum*, *Camellia* and other subtropical trees. This place is also famous as home to the eel of *Anguilla mauritiana*, which is Natural Monument No. 27 and is active primarily at night.



### Jeju International Convention Center (ICC)

The International Conventional Center Jeju serves as a world class venue for hosting a variety of different large-scale international events. With the vast Pacific Ocean at its front and majestic Mt. Halla towering behind it as a backdrop, ICC Jeju, standing 5 stories above ground and two levels underground, sprawls over 54,700 square meters of land. As ICC Jeju is nestled right in the middle of the Jungmun Tourism Resort Complex, major tourist sites such as Yeomiji Botanical Garden, Teddy Bear Museum, Jungmun Beach, Fishing Village Museum, Cheonjiyeon Waterfall, Jusangseolli, Gangjeong Resort, Yakcheonsa Temple and Beophwasa Temple are located conveniently nearby.

# Memo

This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting or typing. There are no margins, text, or other markings on the page.





## 5G 이동통신중계기 선도기업

- 20년 업력의 탄탄한 강소기업 (2000.10.13 창립)
- 코스닥 상장법인 (2007.05)
- 총 9회 KT 우수협력사 선정
- 중계기 최초 장영실상 수상 (2002.07)
- 소부장 강소기업 100 선정 (2020.11)
- 혁신기업 국가대표 1000 선정 (2021.05)



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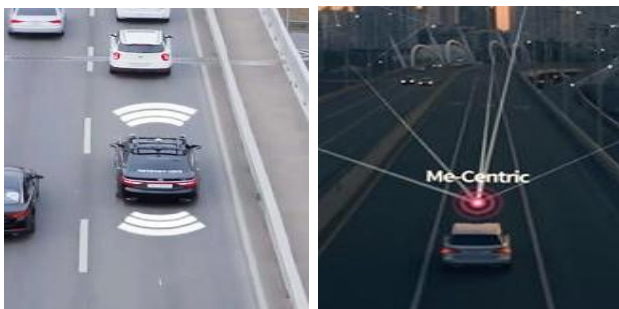


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Developing and implementing the next-generation Cooperative-Intelligent Transportation Systems & Autonomous Vehicle Service



## Key Accomplishments

### U<sup>+</sup>C-ITS / Autonomous Vehicle Service

- Selected as the operator for ITS development in Gangneung city, the largest ITS project in Korea with total investment of \$38M
- Awarded ITS World Congress Hall of Fame Award
- Completed construction of Autonomous Vehicles Big Data Control Center that collects and analyzes data of autonomous driving pilot vehicles in Sejong city



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