

July 5 (Tue.) ~ 8 (Fri.), 2022 | Barcelona, Spain & Virtual Conference

The 13th International Conference on Ubiquitous and Future Networks

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The 13th International Conference on Ubiquitous and Future Networks (ICUFN)

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IEEE Catalog No: CFP2287G-ART

ISBN: 978-1-6654-8550-0

ISSN: 2165-8536

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IV 2022

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SRIoT 2022

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Osamu Takyu	Shinshu University, Japan

Message from Organizing Committee Chairs

On behalf of the Organizing Committee, we would like to take this opportunity to express our excitement at hosting ICUFN 2022 in Barcelona, Spain and online from 5 to 8 July 2022. ICUFN 2022 is organized by KICS and technically co-sponsored by IEEE Communications Society (ComSoC) and IEICE Communications Society. With 13 years of history, the ICUFN conference has served as a premier international forum to provide a great opportunity for exchanging the state-of-the-art research advances in ubiquitous and future communications & networking technologies and expanding the research community.

We would like to welcome you to Barcelona that is a city on the coast of northeastern Spain. It is the capital and largest city of the autonomous community of Catalonia, as well as the second most populous municipality of Spain. Barcelona has a rich cultural heritage and is today an important cultural center and a major tourist destination. The city is home to two of the most prestigious universities in Spain: the University of Barcelona and Pompeu Fabra University. The city is known for hosting the 1992 Summer Olympics as well as world-class conferences and expositions and also many international sport tournaments. Barcelona is a major cultural, economic, and financial center in southwestern Europe, as well as the main biotech hub in Spain. Barcelona is a transport hub, with the Port of Barcelona being one of Europe's principal seaports and busiest European passenger port, an international airport, Barcelona–El Prat Airport, an extensive motorway network, and a high-speed rail line with a link to France and the rest of Europe.

We have prepared an exciting program for you in ICUFN 2022. Distinguished keynote speeches and tutorials on hot topics will also be delivered by highly prominent experts. We would like to express our sincere gratitude to all committee members and referees who made tremendous contributions to this event. In particular, our special thanks go to Technical Program Committee Chairs, Professors Sang-Chul Kim, Xin WANG, Dongkyun Kim, Suguru Kameda, Kun Yang, Lingyang Song, Periklis Chatzimisios, and all TPC members for their great efforts in preparing the technical program. Special thanks are extended to all workshop organizers for preparing excellent workshops. We do hope that you will take this unique opportunity to attend the technical and workshop sessions, meet the authors, and foster greater collaboration with other researchers. The Organizing Committee put a lot of effort to make this conference greatly successful and enjoyable.

We look forward to seeing you at ICUFN 2022 in Barcelona or online!



Seong Ho Jeong
HUFS,
Korea



Takeo Fujii
Univ. of Electro-Comms,
Japan



Mislav Grgic
Univ. of Zagreb,
Croatia



Zary Segall
KTH,
Sweden



Zdenek Becvar
Czech Technical Univ. in Prague,
Czech

Message from Technical Program Committee Chairs

We are pleased to welcome you all to Barcelona, Spain, from July 5 (Tue.) to 8 (Fri.), 2022, at the 13th International Conference on Ubiquitous and Future Networks (ICUFN). Since 2009, ICUFN has addressed all aspects of computing, networking, communications, and their convergence. Similar to the previous successful history of ICUFN, this year, we have also a successful conference covering various topics such as the integration of Artificial Intelligence, Machine Learning, and Deep Learning, with the ubiquitous and future network technologies. Furthermore, the ubiquitous and future networks offer multi-services, multimedia services convergence, mobility, service ubiquity, context awareness, fixed-mobile convergence, enhanced quality of service & experience, variable connectivity, spontaneous and heterogeneous networking, autonomic networking, edge and cloud computing, and other relevant services.

In ICUFN 2022, we have received many submissions electronically from 32 countries worldwide. A rigorous review process has followed in which all papers received three or more independent reviews. The accepted technical papers were organized into oral, workshops, tutorial sessions. Each oral session will lead by session chairs from around the globe. Similarly, the workshops focus on the latest trends and new results in wireless and wired networking technologies. The program is intended to provide a broad range of wireless and wired communications network technologies, including cognitive radios, cloud computing, cyber-physical system, SDN & security, network virtualization, Internet of Things (IoT), broadband wireless communications, future networks, mobile multimedia networking and applications, machine and deep learning, artificial and computational intelligence, and other vital technologies.

Alongside with the contributions of leading and renowned authors from worldwide, we believe that the technical and workshop papers' review process, management of sessions, and other relevant programs were made possible by the dedication of technical program committee members. We are indebted to all the TPC members for their active participation and processing of the review process in a timely manner. We would also like to thank our sponsors, KICS, IEEE Communications Society, IEICE Communications Society, ETRI, Samsung, LG, KT, SK Telecom and LG U+, for their kind and valuable support in this successful event. Finally, we extend our sincere thanks to the Organizing Committee Chairs, Prof. Seong-Ho Jeong, Prof. Takeo Fujii, Prof. Mislav Grgic, Prof. Zary Segall, and Prof. Zdenek Becvar, for their continued support and guidance. We hope that all of you will enjoy the splendid program of ICUFN 2022, as well as the beautiful scenery and charm of Barcelona.

We look forward to seeing you at ICUFN 2022 in Barcelona! We also wish your active participation and support in future events.



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Fudan Univ.,
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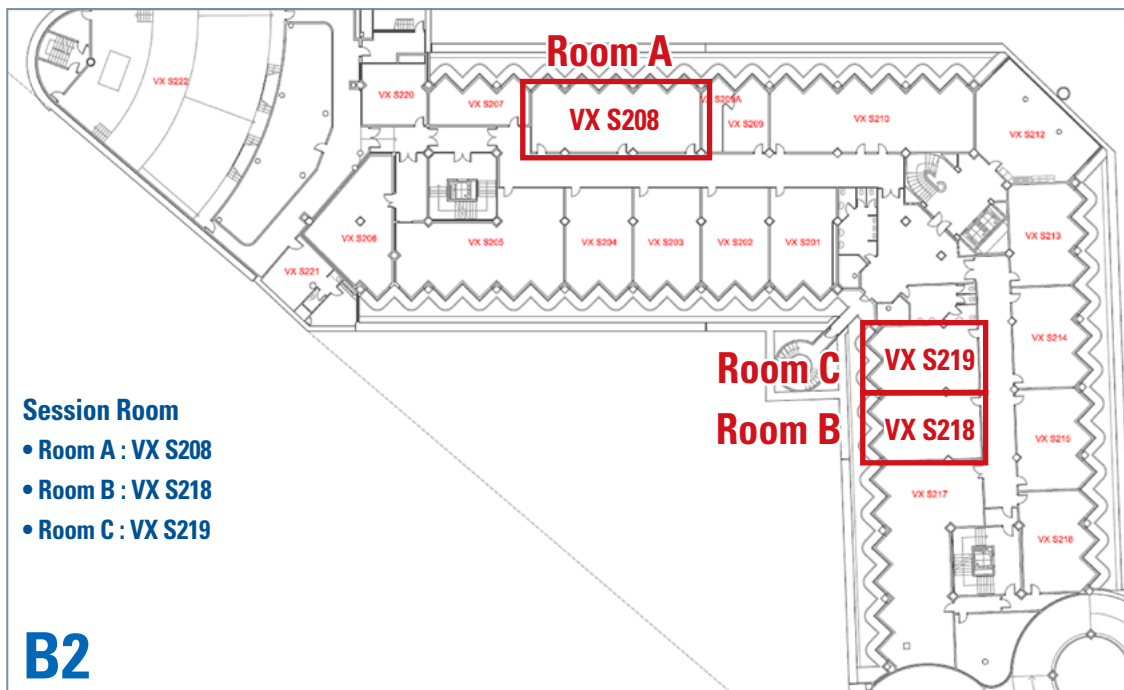
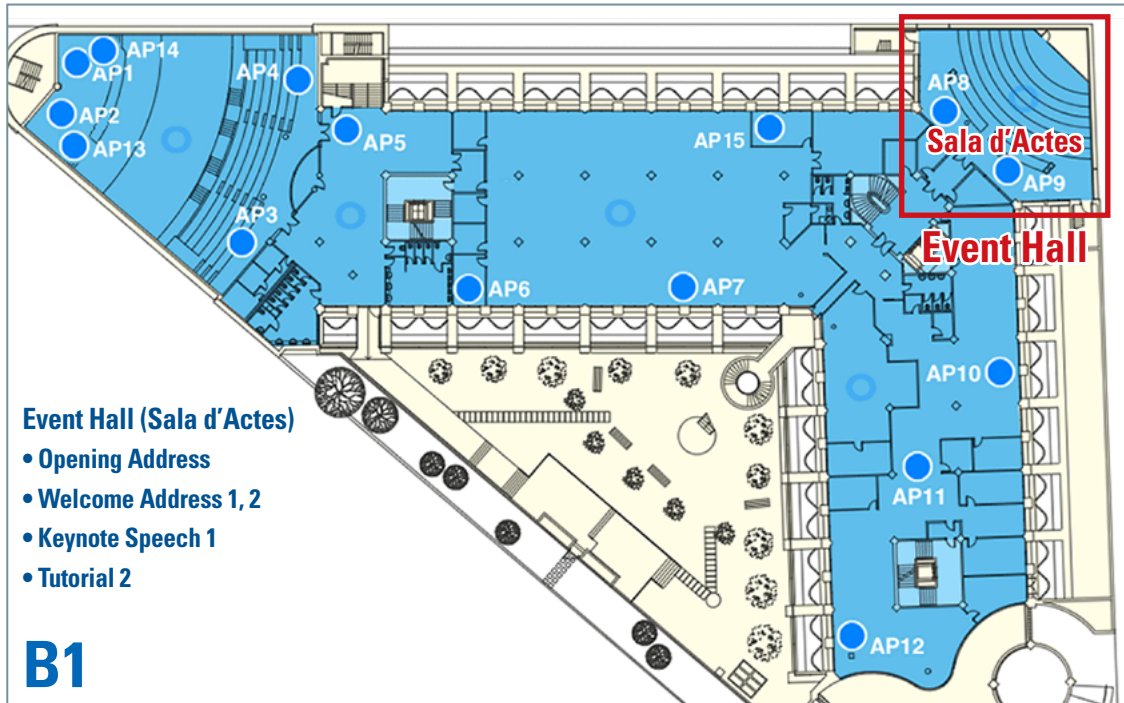
ICUFN 2022 Program at a Glance

July 4, 2022 (Monday)			
14:00 ~ 17:00	ICUFN Committee Meeting (IAC/SC/OC)		
Room	Room A (VX S208)	Room B (VX S218)	Room C (VX S219)
July 5, 2022 (Tuesday)			
13:00 ~ 14:30	Registration		
14:30 ~ 16:00	Tutorial 1 6G Wireless Systems: Challenges and Opportunities Prof. Walid Saad, IEEE Fellow, Virginia Tech, USA		
16:00 ~ 16:30	Break		
16:30 ~ 17:30	Workshop 1A The 9th International Workshop on Intelligent Vehicles (IV 2022)	Workshop 1B The 3rd International Workshop on Smart Radio for IoT Era I (SRIoT 2022 I)	Workshop 1C The 3rd International Workshop on Smart Radio for IoT Era II (SRIoT 2022 II)
July 6, 2022 (Wednesday)			
09:30 ~ 10:30	Room: Sala d'Actes	Tutorial 2: Machine Learning Techniques for Satellite Communications Dr. Miguel Angel Vazquez, Head of Space and Resilient Communications and Systems Unit, CTTC, Spain	
10:30 ~ 11:30		Opening Address: Prof. Seong Ho Jeong, Organizing Committee Co-Chair Welcome Address 1: Prof. Yoan Shin, President of KICS Welcome Address 2: Prof. Lourdes Reig Puig, Vice Rector, Universitat Politecnica de Catalunya, Spain Keynote Speech 1: Reconfigurable Holographic Surfaces: A New Paradigm to Holographic Communications for 6G Prof. Lingyang Song, IEEE Fellow, Peking University	
11:30 ~ 13:00	Lunch		
13:00 ~ 14:30	Session 1A 6G, 5G, PS-LTE, LTE-R, LTE-Advanced	Session 1B Open Wireless Networking	Session 1C Future Internet and Network
14:30 ~ 14:40	Break		
14:40 ~ 16:10	Session 2A AI/Machine Learning for Mobile Communications	Session 2B Security and Network Management	Session 2C AI/Machine Learning for Internet of Things (IoT)
16:10 ~ 16:40	Break		
16:40 ~ 18:10	Session 3A Vehicular Ad-hoc Networks and Autonomous Vehicles	Session 3B Ubiquitous Computing and Sensor Networks	Poster Session 1
18:30 ~ 20:30	Banquet		

Room	Room A (VX S208)	Room B (VX S218)	Room C (VX S219)
July 7, 2022 (Thursday)			
09:30 ~ 10:30	Keynote Speech 2 Joint Radar and Communication Design: Applications, State-of-the-Art and the Road Ahead Prof. Lajos Hanzo, IEEE Life Fellow, University of Southampton, UK Keynote Speech 3 A Light in Digital Darkness: Free Space Optics to Connect the Unconnected Prof. Mohamed-Slim Alouini, IEEE Fellow, KAUST		
10:30 ~ 11:30	Tutorial 3 Simulation Acceleration and Inverse Design with Artificial Intelligence Prof. Junhee Seok, Korea University		
11:30 ~ 13:00	Lunch		
13:00 ~ 14:00	Tutorial 4 A Paradigm Shift in Future Networks with Quantum Deep Learning Prof. Joongheon Kim, IEEE ComSoc Distinguished Lecturer, Korea University		
14:00 ~ 14:30	Break		
14:30 ~ 16:00	Session 4A Cloud Computing and Networks	Session 4B SDN, Security, and Network Virtualization	Poster Session 2
16:00 ~ 16:30	Break		
16:30 ~ 18:10	Session 5A Machine Learning and Computational Intelligence	Session 5B 6G, 5G, Computer Vision Applications & Autonomous Vehicles	Poster Session 3
July 8, 2022 (Friday)			
09:30 ~ 11:00	Session 6A Cyber-Physical System (CPS) & Information Networks	Workshop 6B Network Theory and Network Science	Poster Session 4
Closing			

* Tentative Schedule, Subject to change

Universitat Politècnica de Catalunya (UPC-BarcelonaTech), Vertex Building



- Session Room**
- Room A : VX S208
 - Room B : VX S218
 - Room C : VX S219

10:30 ~ 11:30, July 6, 2022 (Wednesday)

Room: Sala d'Actes

Keynote Speech 1: Reconfigurable Holographic Surfaces: A New Paradigm to Holographic Communications for 6G

Speaker: Prof. Lingyang Song, Professor, IEEE Fellow, Peking University, China

Abstract:

The future sixth generation wireless communications look forward to constructing a ubiquitous intelligent information network with high data rates. To fulfill such challenging visions, the reconfigurable holographic surface (RHS) is developed as a promising solution due to its capability of accurate multi-beam steering with low power consumption and hardware cost. Unlike the conventional phase-controlled antennas, RHS can control the radiation amplitude of the reference wave propagating on the metasurface by leveraging the holographic technique. Such amplitude-controlled holographic beamforming triggers new challenges since a new beamforming scheme needs to be developed to handle the complex-domain optimization problem subject to the unconventional real-domain amplitude constraints. Both analytical and simulation results verify the significant data rate improvement of the proposed scheme.



Biography

Prof. Lingyang Song received his PhD from the University of York, UK, in 2007, where he received the K. M. Stott Prize for excellent research. He worked as a research fellow at the University of Oslo, Norway until rejoining Philips Research UK in March 2008. In May 2009, he joined the School of Electronics Engineering and Computer Science, Peking University, and is now a Boya Distinguished Professor. He is the co-author of a number of best paper awards, including IEEE ComSoc Leonard G. Abraham Prize in 2016, IEEE ComSoc Heinrich Hertz Award in 2021, IEEE ComSoc Asia Pacific Outstanding Paper Award in 2021, IEEE ICC 2014, IEEE ICC 2015, IEEE Globecom 2014. He has served as a Distinguished Lecturer of IEEE Communications Society, an Area Editor of IEEE Transactions on Vehicular Technology, an Editor of IEEE Transactions on Communications. He is a Fellow of IEEE.

09:30 ~ 10:30, July 7, 2022 (Thursday)

Room: Room A (VX S208)

Keynote Speech 2: Joint Radar and Communication Design: Applications, State-of-the-Art and the Road Ahead

Speaker: Prof. Lajos Hanzo, Professor, IEEE Life Fellow, University of Southampton, UK

Abstract:

Thanks to the spectacular advances in signal processing and nano-technology, five wireless generations have been conceived over the past five decades. Whilst the 5G systems are being rolled out, the momentum of developing the 6G systems is growing and there is an ongoing debate as to what the next 'killer-application' is likely to be - could it be joint sensing, communications and computing?

- "Joint Radar and Communication Design: Applications, State-of-the-Art, and the Road Ahead" IEEE TCOM, by Fan Liu, Christos Masouros, Athina P. Petropulu, Hugh Griffiths & Lajos Hanzo
- "MU-MIMO communications with MIMO radar: From co-existence to joint transmission", IEEE Transactions on Wireless Communications, vol. 17, no. 4, pp. 2755–2770, April 2018, by F. Liu, C. Masouros, A. Li, H. Sun, & L. Hanzo
- "Network association in machine-learning aided cognitive radar and communication co-design," IEEE Journal on Selected Areas in Communications, vol. 37, no. 10, pp. 2322–2336, 2019, by J. Wang, S. Guan, C. Jiang, D. Alanis, Y. Ren, & L. Hanzo
- "Decomposition optimization algorithms for distributed radar systems," IEEE Transactions on Signal Processing, vol. 64, no. 24, pp. 6443–6458, Dec 2016, by Y. Ma, S. Chen, C. Xing, X. Bu & L. Hanzo,
- "Cooperative Multiterminal Radar and Communication: A New Paradigm for 6G Mobile Networks", Leonardo Leyva, Daniel Castanheira, Adao Silva, Atilio Gameiro & Lajos Hanzo IEEE Vehicular Technology Magazine, 2021, Vol. 16, No. 4

**Biography**

Prof. Lajos Hanzo is a Fellow of the Royal Academy of Engineering (FREng), FIEEE, FIET and a EURASIP Fellow, Foreign Member of the Hungarian Academy of Science. He holds honorary Doctorates from the University of Edinburgh and the Technical University of Budapest. He co-authored 19 IEEE Press - JohnWiley books and 2000+ research contributions at IEEE Xplore. For further information on his research in progress and associated publications please refer to IEEE Xplore.

09:30 ~ 10:30, July 7, 2022 (Thursday)**Room: Room A (VX S208)****Keynote Speech 3: A light in digital darkness: Free space optics to connect the unconnected**

Speaker: Prof. Mohamed-Slim Alouini, Professor, IEEE Fellow, King Abdullah University of Science and Technology (KAUST), Saudi Arabia

Abstract:

Despite the ubiquitous digital connectivity that we experience all around us, it is a fact that almost half of the population of the world is still “offline” due to the lack of a robust Internet and communications infrastructure in many places on the globe. The reason why such digitally dark spots still exist in the world is mainly two-folds. For one, economically backward or thinly scattered populations are not viable for relatively larger investments in communications infrastructure. Secondly, a hostile geography/terrain raises the cost of installing optical fibers and other equipment. Thus, it's no wonder that many big Internet giants such as Amazon, Facebook, and SpaceX, have attempted to reach the hitherto “digitally inaccessible” regions by providing connectivity through satellites or high altitude platforms (HAPs). A constellation of satellites/HAPs provides a more cost-effective and reliable alternative to the deployment of optical fiber and related equipment in such locations of the world. Because of the large chunks of relatively unlicensed bandwidth available in the optical spectrum, there is a great opportunity to use lasers for ground gateway station-satellite/HAPs, and inter-satellite or inter-HAP communications, a communications model known as the free-space optics (FSO). Towards that end, this talk examines the FSO communications from the perspective of satellite and HAP communications. In this regard, some new pointing, acquisition and tracking aspects are presented. Furthermore, this talk goes also through the adaptive optics and relaying schemes that are needed to deal with atmospheric turbulence which affects such kind of networks.

**Biography**

Mohamed-Slim Alouini was born in Tunis, Tunisia. He received the Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech) in 1998. He served as a faculty member at the University of Minnesota then in the Texas A&M University at Qatar before joining in 2009 the King Abdullah University of Science and Technology (KAUST) where he is now a Distinguished Professor of Electrical and Computer Engineering. Prof. Alouini is a Fellow of the IEEE and OPTICA (Formerly the Optical Society of America (OSA)).

He is currently particularly interested in addressing the technical challenges associated with the uneven distribution, access to, and use of information and communication technologies in rural, low-income, disaster, and/or hard-to-reach areas.

14:30 ~ 16:00, July 5, 2022 (Tuesday)**Room: Room A (VX S208)****Tutorial 1: 6G Wireless Systems: Challenges and Opportunities**

Speaker: Prof. Walid Saad, Professor, IEEE Fellow, Virginia Tech, USA

Abstract:

Next-generation wireless networks must support connected intelligence at a scale that has not yet seen before. As a result, both academia and industry are now becoming heavily invested in shaping up the upcoming sixth-generation (6G) wireless system to cater for tomorrow's high data rate, high reliability, and low latency connected intelligence services such as distributed artificial intelligence (AI), extended reality, autonomous systems, and wireless brain-computer interactions. To this end, the goal of this tutorial is to provide a comprehensive and bold vision on 6G wireless systems while identifying their driving applications and trends, accompanying technological advances, and performance expectations. In particular, we will provide an overview on many major research areas germane to 6G systems, ranging from AI-native network design to terahertz networks, non-terrestrial networks, connected autonomy, joint communications and sensing, edge AI, and semantic communications. In each area, we will present specific problems and potential solutions. We will also shed light on the potential open problems within each specific research area while concluding with our outlook and recommendations for 6G research.

**Biography**

Prof. Walid Saad received his Ph.D degree from the University of Oslo in 2010. 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, drones, semantic communications, cyber-physical systems, and network science. Dr. Saad is a Fellow of the IEEE. He is also the recipient of the NSF CAREER award in 2013 and the Young Investigator Award from the Office of Naval Research (ONR) in 2015. He was the author/co-author of eleven conference best paper awards. He is the recipient of the 2015 and 2022 Fred W. Ellersick Prize from the IEEE Communications Society and of several IEEE ComSoc Technical Committee Awards. He was also a co-author of the 2019 and 2021 IEEE Communications Society Young Author Best Papers. He currently serves as an editor for several major transactions. He is the Editor-in-Chief for the IEEE Transactions on Machine Learning in Communications and Networking.

09:30 ~ 10:30, July 6, 2022 (Wednesday)**Room: Sala d'Actes****Tutorial 2: Machine Learning Techniques for Satellite Communications**

Speaker: Dr. Miguel Angel Vazquez, Research Unit Head, Centre Tecnològic de Telecomunicacions de Catalunya, Spain

Abstract:

This tutorial introduces the application of machine learning (ML)-based procedures in real-world satellite communication operations. While the application of ML in image processing has led to unprecedented advantages in new services and products, the application of ML in wireless systems is still in its infancy. In particular, this tutorial focuses on the introduction of ML-based mechanisms in satellite network operation centers such as flexible payload configuration. Other novel concepts are also introduced.

**Biography**

Miguel Ángel Vázquez (SM'19) is currently Senior Researcher at CTTC and Head of the Space and Resilient Communications Research Unit. He received the Telecommunication Engineering degree, the Master's degree, and the PhD (cum laude) degree from Universitat Politècnica de Catalunya (UPC), Barcelona, Spain, in 2009, 2012, and 2014, respectively. He also holds a degree in Computer Science from National Distance Education University. In parallel to his PhD studies, he worked as a research engineer at CTTC from January 2010. He was visiting researcher at Patavina Technologies (now A2A) in the context of a Marie Curie Action. His research interest areas are the intersection of machine learning and optimization techniques for communication systems with special emphasis to satellite communications.

10:30 ~ 11:30, July 7, 2022 (Thursday)**Room: Room A (VX S208)****Tutorial 3: Simulation Acceleration and Inverse Design with Artificial Intelligence**

Speaker: Prof. Junhee Seok, Professor, Korea University, Korea

Abstract:

Over all areas of engineering, it is an essential task to design and implement a system, device, or material with desirable properties. Traditionally, such a task has been performed by engineering experts in a specific field. These experts design a system based on previous experience, knowledge, and intuition, simulate its properties with computers, and finally implement to confirm. Recently advanced artificial intelligence and machine learning technologies can help the acceleration of the engineering simulations with precise learning models and accumulated simulation data. Also, they can help the inverse design of desired systems and devices by providing potential candidates. In this tutorial, I will introduce some case studies to apply the AI-based simulation acceleration and inverse design for multi-slit optical devices and FinFET devices. I will also introduce deep generative models which can be used importantly for the inverse design.

**Biography**

Prof. Junhee Seok received the B.S. degree from the Korea Advanced Institute of Science and Technology, Daejeon, South Korea, in 2001, and the M.S. and Ph.D. degrees from Stanford University, Stanford, CA, USA, in 2006 and 2011, respectively, all in electrical engineering. From 2013 to 2014, he was an Assistant Professor with the School of Medicine, Northwestern University, Chicago, IL, USA. Since 2014, he has been an Associate Professor with the School of Electrical Engineering, Korea University, South Korea. His research interests include the development of machine learning and artificial intelligence methodologies as well as the analysis of large-scale complex data over biology, medicine, semiconductor, finance, business and others.

13:00 ~ 14:00, July 7, 2022 (Thursday)**Room: Room A (VX S208)****Tutorial 4: A Paradigm Shift in Future Networks with Quantum Deep Learning**

Speaker: Prof. Joongheon Kim, Professor, IEEE ComSoc Distinguished Lecturer, Korea University, Korea

Abstract:

In recent years, quantum computing (QC) has been getting a lot of attention from industry and academia. Especially, among various QC research topics, variational quantum circuit (VQC) enables quantum deep reinforcement learning (QRL). Many studies of QRL have shown that the QRL is superior to the classical reinforcement learning (RL) methods under the constraints of the number of training parameters. This paper extends and demonstrates the QRL to quantum multi-agent RL (QMARL). However, the extension of QRL to QMARL is not straightforward due to the challenge of the noise intermediate-scale quantum (NISQ) and the non-stationary properties in classical multi-agent RL (MARL). Therefore, this paper proposes the centralized training and decentralized execution (CTDE) QMARL framework by designing novel VQCs for the framework to cope with these issues. To corroborate the QMARL framework, this paper conducts the QMARL demonstration in a single-hop environment where edge agents offload packets to clouds. The extensive demonstration shows that the proposed QMARL framework enhances 57.7% of total reward than classical frameworks.

**Biography**

Dr. Joongheon Kim has been with Korea University, Seoul, Korea, since 2019, and he is currently an associate professor at the School of Electrical Engineering. He is also a vice director of the Artificial Intelligence Engineering Research Center at Korea University, Seoul, Korea. He received the B.S. and M.S. degrees in computer science and engineering from Korea University, Seoul, Korea, in 2004 and 2006, respectively; and the Ph.D. degree in computer science from the University of Southern California (USC), Los Angeles, CA, USA, in 2014. Before joining Korea University, he was with LG Electronics (Seoul, Korea, 2006-2009), InterDigital (San Diego, CA, USA, 2012), Intel Corporation (Santa Clara in Silicon Valley, CA, USA, 2013-2016), and Chung-Ang University (Seoul, Korea, 2016-2019). He is a senior member of the IEEE, serves as an associate editor for IEEE Transactions on Vehicular Technology, and also serves as a guest editor for IEEE Communications Standards Magazine. He is also a distinguished lecturer at IEEE Communications Society (ComSoc) and IEEE Systems Council. He was a recipient of Annenberg Graduate Fellowship with his Ph.D. admission from USC (2009), Intel Corporation Next Generation and Standards (NGS) Division Recognition Award (2015), IEEE Systems Journal Best Paper Award (2020), IEEE ComSoc MIMTC Outstanding Young Researcher Award (2020), IEEE ICOIN Best Paper Award (2021), and IEEE ComSoc MIMTC Best Journal Paper Award (2021).

July 5, 2022 (Tuesday)

Workshop 1A: The 9th International Workshop on Intelligent Vehicles (IV 2022)

Session Chair: Prof. Dong Seog Han, Kyungpook National University
Room A (VX S208), Time 16:30 ~ 17:30

- [W1A-1] Analysis of V2V Communication Performance on Roads and Tunnels Surrounded by Mountains
Youngjin Yoon, Jihun Kim and Dong Seog Han (Kyungpook National University, Korea)
- [W1A-2] 3D Map Reconstruction From Single Satellite Image Using a Deep Monocular Depth Network
Changmin Son and Soon-Yong Park (Kyungpook National University, Korea)
- [W1A-3] Pig Treatment Classification on Thermal Image Data using Deep Learning
Savina Jassica Colaco, Jung Hwan Kim and Alwin Poullose (Kyungpook National University, Korea); Zutphen sanne van and Suresh Neethirajan (Wageningen University & Research, Netherlands); Dong Seog Han (Kyungpook National University, Korea)
- [W1A-4] Dual-inferences mechanism for real-time semantic segmentation
Quyen Van Toan and Min Young Kim (Kyungpook National University, Korea)
- [W1A-5] End-to-end autonomous driving using the Ape-X algorithm in Carla simulation environment
Maxence Hussonnois (Deakin University, Australia); Jae-Yun Jun (ECE, France)

Workshop 1B: The 3rd International Workshop on Smart Radio for IoT Era I (SRIoT 2022 I)

Session Chair: Prof. Takeo Fujii, The University of Electro-Communications
Room B (VX S218), Time 16:30 ~ 17:30

- [W1B-1] Device Adaptive Control Method Considering Power Consumption for Pedestrian-to-Infrastructure Communications
Noriyuki Oki, Atsuki Mukoda, Ayumu Ueda and Takeo Fujii (The University of Electro-Communications, Japan)
- [W1B-2] Evaluation of Transmission Timing Control Error for QZSS Short Message SS-CDMA Communication System
Hiroshi OGUMA and Rei KAWAI (Toyama College, Japan); Suguru KAMEDA (Hiroshima University, Japan); Noriharu SUEMATSU (Tohoku University, Japan)

- [W1B-3] Characteristics of RSSI Kriging Interpolated Value in Neighborhood of Buildings
Ryo Miyamoto and Shusuke Narieday (Mie University, Japan); Takeo Fujii (Univ. Electro-Commun.); Hiroshi Narusey (Mie University, Japan)
- [W1B-4] Differential Packet Level Index Modulation for Low Power Wide Area System
Mai Ohta (Fukuoka University, Japan); Takeo Fujii (The University of Electro-Communications, Japan)

Workshop 1C: The 3rd International Workshop on Smart Radio for IoT Era II (SRIoT 2022 II)

Session Chair: Prof. Suguru Kameda, Hiroshima University
Room C (VX S219), Time 16:30 ~ 17:30

- [W1C-1] Dual Energy-Aware based Trajectory Optimization for UAV Emergency Wireless Communication Network: A Multi-armed Bandit Approach
Amr Amrallah (Tokyo Institute of Technology, Japan); Ehab Mahmoud Mohamed (Prince Sattam Bin Abdulaziz University, Saudi Arabia); Gia Khanh Tran and Kei Sakaguchi (Tokyo Institute of Technology, Japan)
- [W1C-2] Identifying Invalid Nodes in Bluetooth Mesh Networks by Using the Bayesian Probability Classification Algorithm and Time to Live
Ta-Te Lu, Yi-Hsuan Li and Bo-Yu Jheng (Chien Hsin University of Science and Technology, Taiwan)
- [W1C-3] Performance Evaluation of Highly Efficient Information Collection Methods by Trend Analysis of Sensor Information Using Pre-learning
Ryuji Miyamoto, Osamu Takyu and Hiroshi Fujiwara (Shinshu University, Japan); Koichi Adachi (The University of Electro-Communications, Japan); Mai Ohta (Fukuoka University, Japan); Takeo Fujii (The University of Electro-Communications, Japan)
- [W1C-4] High-Sensitivity Detection Method for Signals in PhyC-SN
Toshi Ito and Osamu Takyu (Shinshu University, Japan); Mai Ohta (Fukuoka University, Japan); Takeo Fujii and Koichi Adachi (The University of Electro-Communications, Japan)

July 6, 2022 (Wednesday)

Session 1A: 6G, 5G, PS-LTE, LTE-R, LTE-Advanced

Session Chair: Prof. Sunwoong Choi, Kookmin University

Room A (VX S208), Time 13:00 ~ 14:30

- [1A-1] Rate Splitting Multiple Access for a MISO SWIPT System Aided by a Power Beacon
Mario R. CamanaCarla E. Garcia and Insoo Koo (University of Ulsan, Korea)
- [1A-2] Throughput Improvement by Transmit 3D Beamforming and MCS Incorporating 1024-QAM
Kentaro Yoda, Takumi Yasaka, and Hiroyuki Otsuka (Kogakuin University, Japan)
- [1A-3] Reflection Design With LS Channel Estimation for RIS-enhanced OFDM Systems
Fan-Shuo Tseng and Tsang-Yi Wang (National Sun Yat-sen University, Taiwan)
- [1A-4] A Low-Complexity Multiuser Adaptive Modulation Scheme for MRC Receivers in Massive MIMO Systems
Amin Radbord (University of Guilan, Iran); Mohammed Abdel Hafez (United Arab Emirate University, United Arab Emirates); Mohammadreza Amini (Islamic Azad University, Iran)
- [1A-5] Characteristics of Transmit Power Allocation for Poor Conditioned End Devices in LPWAN with Peak Detection Based Carrier Sense
Shusuke Narieda (Mie University, Japan); Takeo Fujii (Univ. Electro-Commun., Japan)

Session 1B: Open Wireless Networking

Session Chair: Danfeng Sun, Institut f. Automation und Kommunikation

Room B (VX S218), Time 13:00 ~ 14:30

- [1B-1] On Designing Interfaces to Access Deep Learning Inference Services
Seungwoo Kum, Seungtaek Oh, Jungchul Yeom and Jaewon Moon (Korea Electronics Technology Institute, Korea)
- [1B-2] Real-time dynamic traffic scheduling for medical applications on IEEE 802.15.6
Guilherme Gil, Paulo Pedreiras and Luis Moutinho (University of Aveiro, Portugal)
- [1B-3] Spectrum Based Wireless Radio Traffic Classification using Hybrid Deep Neural Network
Md. Habibur Rahman, Raihan Bin Mofidul and Yeong Min Jang (Kookmin University, Korea)
- [1B-4] QoE Comparison of Retransmission and AL-FEC on Audiovisual Groupcast over Wireless LANs
Toshiro Nunome and Minoru Ishida (Nagoya Institute of Technology, Japan)

- [1B-5] Dynamic Adaptive Agent with Critical Movement Detection for the Next Generation of Spatial Reuse
Yoshima Syach Putri, Dion Tanjung, Dong-Hyun Kim and Jong-Deok Kim (Pusan National University, Korea)

Session 1C: Future Internet and Network

Session Chair: Prof. Kae Won Choi, Sungkyunkwan University

Room C (VX S219), Time 13:00 ~ 14:30

- [1C-1] Intelligent Addressing and Routing Strategy for Smart Devices on Interactive Internet of Everything Platforms
Pradheep Kumar .K (Dept of CSE, Pilani); Srinivasan. N. and Murali Bhaskaran (Rajalakshmi Engineering College, Chennai)
- [1C-2] Optimization of Millimeter-Wave Base Station Deployment in 5G Networks
Qingwen Zeng (Beijing Normal University-Hong Kong Baptist University United International College (UIC), China)
- [1C-3] Centralized ultra-precision service control system for providing ultra-precision services in large-scale deterministic networks
Eungha Kim, Yeoncheol Ryou, Binyeong Yoon and Taesik Cheung (ETRI, Korea)
- [1C-4] Deep Neural Network Based Parallel Signal Detection in SM-OFDM System
Jinmei Zhang, Zhiqian Bai, Kaiyue Yang and Abeer Mohamed (Shandong University, China); Kyungsup Kwak (INHA University, Korea); Xinhong Hao (Beijing Institute of Technology, China)
- [1C-5] Beamspace based AIC and MDL Algorithm for Counting the Number of Signals in Specific Range
Heui-Seon Park, Suk-seung Hwang, Seok-Joo Shin and Jae-Young Pyun (Chosun University, Korea)

Session 2A: AI/Machine Learning for Mobile Communications

Session Chair: Prof. Mohammed Abdel Hafez, United Arab Emirates University

Room A (VX S208), Time 14:40 ~ 16:10

- [2A-1] Channel BlaQLisT: Channel Blacklist using Q-Learning for TSCH
JunMyeung Kim and Sang-Hwa Chung (Pusan National University, Korea)
- [2A-2] Deep Learning Based Signal Detection in Dual Mode Generalized Spatial Modulation
Kaiyue Yang, Zhiqian Bai, Jinmei Zhang, Ke Pang and Xinhong Hao (Shandong University, China)
- [2A-3] An Explainable Multi-Task Learning Approach for RF-based UAV Surveillance Systems
Rubina Akter (Kumoh National Institute of Technology, Korea); Van-Sang Doan (Vietnam Naval Academy, Vietnam); Ahmad Zainudin and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)

- [2A-4] **Dependability Prediction with Logical Link Correlation for Industrial Wireless Communication Systems**
Danfeng Sun, Zeyun Xiao and Huifeng Wu (Hangzhou Dianzi University, China)
- [2A-5] **DNN aided PSO based-scheme for a Secure Energy Efficiency Maximization in a cooperative NOMA system with a non-linear EH**
Carla E. Garcia, Mario R. Camana and Insoo Koo (University of Ulsan, Korea)

Session 2B: Security and Network Management

Session Chair: Prof. Insoo Sohn, Dongguk University

Room B (VX S218), Time 14:40 ~ 16:10

- [2B-1] **Ethereum Based Storage Aware Mining for Permissioned Blockchain Network**
Ikechi Saviour Igboanusi Allwinna, Revin Naufal Alief, Muhammad Rasyid Redha Ansori, Jae-Min Lee and Dong-Seong Kim (Kumoh National Institute of Technology, Korea)
- [2B-2] **RPL Authenticated Mode Evaluation: Authenticated Key Exchange and Network Behavioral**
Arif Burak Ordu, Mehmet Bayar and Berna Örs (Istanbul Technical University, Turkey)
- [2B-3] **Blockchain-based Secure Ambulance-to-Everything Communications in Emergency Rescue Operations**
Chakkaphong Suthaputthakun (Bangkok University Thailand); Yue Cao (Wuhan University, China)
- [2B-4] **Joint Power and Subcarrier Allocation in Multi-Cell Multi-Carrier NOMA**
Subhankar Banerjee (University of Maryland, USA); Chung Shue Chen (Nokia Bell Labs, Paris-Saclay Center, France); Marceau Coupechoux (LTCI, Telecom Paris, Institut Polytechnique de Paris, France); Abhishek Sinha (Indian Institute of Technology (IIT) Madras, India)
- [2B-5] **Intent-based 5G UPF configuration via Kubernetes Operators in the Edge**
Ákos Leiter, István Kispál, Attila Hegyi, Péter Fazekas, Nándor Galambosi, Péter Hegyi, Péter Kulics, József Bíró (Nokia Bell Labs, Hungary)

Session 2C: AI/Machine Learning for Internet of Things (IoT)

Session Chair: Prof. Jae Yun Jun, ECE Paris

Room C (VX S219), Time 14:40 ~ 16:10

- [2C-1] **Implicit Multi-hop Communication Scheme based on Overhearing in IoT LoRa Networks**
Dick Mugerwa, Youngju Nam, Hyunchong Cho, Hyunseok Choi, Yongje Shin, Euisin Lee (Chungbuk National University, Korea)

- [2C-2] **Deep Learning and Power Allocation Analysis in NOMA System**
Mohamed Gaballa and Maysam Abbod (Brunel University, UK); Ammar Aldallal (Ahlia University, Bahrain)
- [2C-3] **Unslotted CSMA/CA mechanism with reinforcement learning of Wi-SUN MAC layer**
Sihyeon Lee and Sang-Hwa Chung (National University Busan, Korea)
- [2C-4] **Unicast Subslot Scheduling for Wi-SUN FAN System with Packet Collision Reduction**
Hee-Jun Lee and Sang-Hwa Chung (Pusan National University, Korea)
- [2C-5] **Lightweight P2P-RPL for Efficient P2P Communication in 6TiSCH Networks**
Jeongbae Park, Sang-Hwa Chung (Pusan National University, Korea)

Session 3A: Vehicular Ad-hoc Networks and Autonomous Vehicles

Session Chair: Dr. Sang Kil Lee, IITP

Room A (VX S208), Time 16:40 ~ 18:10

- [3A-1] **Enhanced Velocity Estimation Based on Joint Doppler Frequency and Range Rate Measurements**
Sohee Lim, Jaehoon Jung, Jihye Kim, and Seong-Cheol Kim (Seoul National University, Korea); Jeongsik Choi (Kyungpook National University, Korea)
- [3A-2] **Cyber Threats and Cybersecurity Reassessed in UAV-assisted Cyber Physical Systems**
Majumder Haider, Imtiaz Ahmed and Danda B. Rawat (Howard University, USA)
- [3A-3] **Object Detection Performance According to Packet Loss of C-V2X**
Eunmin Choi, Dongyoon Kwon, Kyungtae Kim, and Ji-Woong Choi (Daegu Gyungbuk Institute of Science & Technology, Korea)
- [3A-4] **Decentralized Collaborative Decision-Making for Topology Building in Mobile Ad-Hoc Networks**
Philipp Helle, Sergio Feo-Arenis, Kevin Shortt, and Carsten Strobel (Airbus Central R&T, Germany)
- [3A-5] **Introduction to Secure Computing Methods in Unmanned Aerial Vehicles**
Soohyun Park and Minjae Yoo (Korea University, Korea); Soyi Jung (Hallym University, Korea); Minseok Choi (Kyung Hee University, Korea); Joongheon Kim (Korea University, Korea)

Session 3B: Ubiquitous Computing and Sensor Networks

Session Chair: Prof. Hyunggon Park, Ewha Womans University
Room B (VX S218), Time 16:40 ~ 18:10

- [3B-1] **An Autonomous Sailboat for Environment Monitoring**
Yee-Teng Ang, Wey-Kean Ng and Yung-Wey Chong (Universiti Sains Malaysia, Malaysia); Jian Wan (Aston University, UK); Su-Yin Chee (Universiti Sains Malaysia, Malaysia); Louise B. Firth (University of Plymouth, UK)
- [3B-2] **Accident Detection and Road Condition Monitoring Using Blackbox Module**
Insan Arafat Jahan (Islamic University of Technology, Bangladesh); Insan Arafat Jamil (Chittagong University of Engineering and Technology, Bangladesh); Mohammad Shakhawat Hossain Fahim (Brac University, Bangladesh); Armana Sabiha Huq (Bangladesh University of Engineering and Technology, Bangladesh); Fahim Faisal and Mirza Muntasir Nishat (Islamic University of Technology, Bangladesh)
- [3B-3] **Reinforcement Learning-based MAC for Reconfigurable Intelligent Surface-Assisted Wireless Sensor Networks**
Faisal Ahmed, Ethungshan Shitiri, Ho-Shin Cho (Kyungpook National University, Korea)
- [3B-4] **TinyML Smart Sensor for Energy Saving in Internet of Things Precision Agriculture platform**
Chollet Nicolas (ECE, LISV, France); Bouchemal Naila (ECE, France); Ramdane-Cherif Amar (LISV, France)
- [3B-5] **Design of Middle Range Microwave Power Transfer (MPT) System for the Mobile Power Receiver**
Changyoung An and Heung-Gyoon Ryu (Chungbuk National University, Korea)

July 7, 2022 (Thursday)

Session 4A: Cloud Computing and Networks

Session Chair: Akos Leiter, Nokia Bell Labs
Room A (VX S208), Time 14:30 ~ 16:00

- [4A-1] **A Survey of Autoscaling in Kubernetes**
Minh-Ngoc Tran, Dinh-Dai Vu and Younghun Kim (Soongsil University, Korea)
- [4A-2] **Modelling the offload of AI Tasks in Mobile Clouds**
Zhiyan Chen and Ligang He (University of Warwick, Korea)
- [4A-3] **Design and Development of Server-Client Cooperation Framework for Federated Learning**
Jongbin Park and Seung Woo Kum (Korea Electronics Technology Institute, Korea)
- [4A-4] **Optimum control method of workload placement and air conditioners in a GPU server environment**
Hikotoshi Nakazato, Seisuke Arai and Masashi Kaneko (NTT Corporation, Japan)
- [4A-5] **Temperature-compensated Overcharge protection Indirect measurement circuit**
JinUk Yeon, KunSik Kim and Innyeal Oh (University of Sunmoon, Korea)

Session 4B: SDN, Security, and Network Virtualization

Session Chair: Prof. Dong Seog Han, Kyungpook National University
Room B (VX S218), Time 14:30 ~ 16:00

- [4B-1] **Performance Analysis of Python Based SDN Controllers over Real Internet Topology**
Jisi Chandroth, Byeong-hee Roh and Jehad Ali (Ajou University, Korea)
- [4B-2] **An NFV-based Scheduling and Flexible Deployment Scheme for RaaS Functions in Cloud Data Centers**
Hsueh-Wen Tseng, Ting-Ting Yang and Pei-Shan Chen (National Chung-Hsing University, Korea)
- [4B-3] **Assessing the RPKI Validator Ecosystem**
Paul Henry Friedemann, Nils Rodday and Gabi Dreö Rodosek (Universität der Bundeswehr München, Germany)
- [4B-4] **Privacy-Preserving Surveillance for Smart Cities**
Ijaz Ahmad (Chosun University, Korea); Eunkyung Kim (Hanbat National University, Korea); Suk-seung Hwang and Seokjoo Shin (Chosun University, Korea)
- [4B-5] **Software-Defined Networking: A New Approach to Fifth Generation Networks - Security Issues and Challenges Ahead**
Behrooz Daneshmand and Tu Anh Le (ITMO University, Russia)

Session 5A: Machine Learning and Computational Intelligence

Session Chair: Prof. Junhee Seok, Korea University

Room A (VX S208), Time 16:30 ~ 18:10

- [5A-1] **Efficient Device-Edge Inference for Disaster Classification**
Nathaniel Tan Sze Yang, Mau-Luen Tham, Sing Yee Chua and Ying Loong Lee (Universiti Tunku Abdul Rahman, Malaysia); Yasunori Owada (National Institute of Information and Communications Technology, Japan); Suvit Poomrittigul (Pathumwan Institute of Technology, Thailand)
- [5A-2] **Evaluating Correctness of Reinforcement Learning based on Actor-Critic Algorithm**
Youngjae Kim, Manzoor Hussain, Jae-Won Suh and Jang-Eui Hong (Chungbuk National University, Korea)
- [5A-3] **Leveraging Vehicular Communications in Automatic VRUs Accidents Detection**
Bruno Ribeiro, Maria Joˆao Nicolau and Alexandre Santos (University of Minho, Portugal)
- [5A-4] **Signal Relaying Method for High Data Rate in the MIMO System**
Yong-An Jung, Dong-Cheul Han, Soo-Hyun Cho, Han-Jae Shin and Sung-Hun Lee (Gumi Electronics & Information Technology Research Institute, Korea)
- [5A-5] **Optimization Technique of Indoor-Outdoor User Pairing in DL-NOMA System**
Adel Alqahtani and Emad Alsusa (University of Manchester, UK)

Session 5B: 6G, 5G, Computer Vision Applications & Autonomous Vehicles

Session Chair: Prof. Seokjoo Shin, Chosun University

Room B (VX S218), Time 16:30 ~ 18:10

- [5B-1] **Learning-based Second Price Auction for Distributed Delivery Scheduling in Smart and Autonomous Urban Air Mobility**
Joongheon Kim (Korea University, Korea)
- [5B-2] **Technical Challenges and Categorization of 5G Mobile Services**
Ronald Beaubrun (Laval University, Canada)
- [5B-3] **Infrastructure-Independent Pseudonym Swap Protocol for Vehicular Networks**
Abdueli Paulo Mdee, Muhammad Toaha Raza Khan, Junho Seo and Dongkyun Kim (Kyungpook National University, Korea)
- [5B-4] **Recent Advances in a Medical Domain Metaverse: Status, Challenges, and Perspective**
Jose M. Ruiz Mejia and Danda B. Rawat (Howard University, USA)
- [5B-5] **Search Space Adaptation for Differentiable Neural Architecture Search in Image Classification**
Youngkee Kim (Korea University, Korea); Soyi Jung (Hallym University, Korea); Minseok Choi (Kyung Hee University, Korea); Joongheon Kim (Korea University, Korea)

July 8, 2022 (Friday)

Session 6A: Cyber-Physical System (CPS) & Information Networks

Session Chair: Prof. Ki-Hyung Kim, Ajou University

Room A (VX S208), Time 09:30 ~ 11:00

- [6A-1] **Design and Implementation of a Digital Twin Platform in Vertical Farming Systems**
Tae-Hwan Ko, Hea-Min Lee, Dong-Hee Noh, JuHwan, Choi and Sung-Woo Byun (Korea Electronics Technology Institute, Korea)
- [6A-2] **User-Centered Design to Enhance IoT Cybersecurity Awareness of Non-Experts in Smart Buildings**
Hanning Zhao and Bilhanan Silverajan (Tampere University, Finland)
- [6A-3] **CNN Based Multi-view Image Quality Enhancement**
Gyu-Lee Jeon, Hee-Jae Kim, Eun Yeo and Je-Won Kang (Ewha Womans University, Korea)
- [6A-4] **Improving per-flow fairness by ML-based estimation of competing flows' congestion control algorithm**
Keito Maeta, Gen Kitagata and Go Hasegawa (Tohoku University, Japan)
- [6A-5] **Mitigating Coordinate Transformation for Solving Partial Differential Equations with Physic-Informed Neural Networks**
Hyo-Seok Hwang and Suhan Son (Korea University, Korea); Yoojoong Kim (The Catholic University of Korea, Korea); Junhee Seok (Korea University, Korea)

Session 6B: Network Theory and Network Science

Session Chair: Prof. Sanghwan Lee, Kookmin University

Room B (VX S218), Time 09:30 ~ 11:00

- [6B-1] **Experimental Evaluation of Roaming Performance of Cellular IoT Networks**
Kalpit Dilip Ballal, Radheshyam Singh, Lars Dittmann and Sarah Ruepp (Technical University of Denmark, Denmark)
- [6B-2] **Traffic Analytics Development Kits (TADK): Enable Real-Time AI Inference in Networking Apps**
Kun Qiu, Harry Chang, Ying Wang, Xiahui Yu, Wenjun Zhu, Yingqi Liu, Jianwei Ma and Weigang Li (Intel Corporation, China) Xiaobo Liuy and Shuo Dai (ZTE Corporation, China)
- [6B-3] **A Framework for Named Networking on Edge AI**
Fritz Kevin Flores and Marnel Peradilla (De La Salle University, Philippines)
- [6B-4] **Fault-tolerant Distributed AAA Architecture Supporting Connectivity Disruption**
Karri Huhtanen (Radiator Software Oy, Finland); Antti Kolehmainen (Tampere University, Finland)
- [6B-5] **An Improved Relay Selection Scheme for FD-MIMO based System**
Sung-Hun Lee, Sang-Bong Byun, Han-Jae Shin, Dong-Cheul Han, Soo-Hyun Cho and Yong-An Jung (Gumi Electronics & Information Technology Research Institute, Korea)

July 6, 2022 (Wednesday)

Poster Session 1

Session Chair: Prof. Hyunhee Park, Myongji University

Room C (VX S219), Time 16:40 ~ 18:10

- [P1-1] **A Lightweight End-to-End Neural Networks for Decoding of Motor Imagery Brain Signal**
Hyeon Kyu Lee, Ji-Soo Myoung and Young-Seok Choi (Kwangwoon University, Korea)
- [P1-2] **Reinforcement Learning-based Multiple Camera Collaboration Control Scheme**
Dongchil Kim and Chang Mo Yang (Korea Electronics Technology Institute, Korea)
- [P1-3] **Multi-label Text Classification of Economic Concepts from Economic News Articles using Natural Language Processing**
Soojeong Kim (Korea University, Korea); Minhyeok Lee (Chung-Ang University, Korea); Junhee Seok (Korea University, Korea)
- [P1-4] **TCAE: Temporal Convolutional Autoencoders for Time Series Anomaly Detection**
Jinuk Park, Yongju Park and Chang-il Kim (KETI, Korea)
- [P1-5] **Ride-Hailing Service aware Electric Taxi Fleet Management using Reinforcement Learning**
Paul Silva (Jeonbuk National University, Korea); YoungJoo Han (Hyundai Motor Group, Korea); Young-Chon Kim and Dong-Ki Kang (Jeonbuk National University, Korea)
- [P1-6] **Decentralized Identifiers (DIDs)-Based Authentication Scheme for Smart Health Care System**
Alnazif Mohammed Alnour and Ki-Hyung Kim (Ajou University, Korea)

July 7, 2022 (Thursday)

Poster Session 2

Session Chair: Prof. Junsu Kim, Tech University of Korea

Room C (VX S219), Time 14:30 ~ 16:00

- [P2-1] **Accelerating University Admission System using Machine Learning Techniques**
Basil Alothman, Hanadi Alazmi, Mohammad Bin Ali, Noor Alqallaf and Murad Khan (Kuwait College of Science and Technology, Kuwait)
- [P2-2] **Unsupervised Deep Learning-based End-to-end Network for Anomaly Detection and Localization**
Bekhzod Olimov, Barathi Subramanian and Jeonghong Kim (Kyungpook National University, Korea)

- [P2-3] **VLC Positioning by DNN via WkNN in Indoor Environment**
Sung Hyun Oh and Jeong Gon Kim (Tech University of Korea, Korea)
- [P2-4] **Detecting the Ripeness of Strawberries and the Coordinates of the Hull Using Deep Learning**
Seojeong Kim and Sunghwan Jeong (Korea Electronics Technology Institute, Korea); Heegon Kim and Sooho Jeong (Jeonnam Agricultural Research & Extension Services, Korea); Yun Ga-yun (Jeonnam Agricultural Research & Extension Services, Korea); Keunho Park (Korea Electronics Technology Institute, Korea)
- [P2-5] **Introduction to a new use-case based on MPEGIoMT: time-series temperature data analysis by the flower condition**
Jaewon Moon, Seungwoo Kum and Seungtaek Oh (Korea Electronics Technology Institute, Korea)

Poster Session 3

Session Chair: Prof. Junbeom Hur, Korea University

Room C (VX S219), Time 16:30 ~ 18:10

- [P3-1] **Short-term PM2.5 Prediction using Modified Attention Seq2Seq BiLSTM**
Ida Bagus Krishna Yoga Utama, Duc Hoang Tran and Yeong Min Jang (Kookmin University, Korea)
- [P3-2] **An Improved Sensor Anomaly Detection Method in IoT System using Federated Learning**
Duc Hoang Tran, Van Linh Nguyen, Ida Bagus Krishna Yoga Utama and Yeong Min Jang (Kookmin University, Korea)
- [P3-3] **Enhanced 3D Action Recognition Based on Deep Neural Network**
Sungjoo Park and Dongchil Kim (Korea Electronics Technology Institute(KETI), Korea)
- [P3-4] **Object Tracking of Aerial Imaging Device Image Using Variational Autoencoder and External Memory**
Keunho Park, Byoungjun Kim, Donghoon Kim, Seon-Hyeong Kim, Seo-jeong Kim and Sunghwan Jeong (Korea Electronics Technology Institute, Korea)
- [P3-5] **MissVoxelNet: 3D Object Detection for Autonomous Vehicle in Snow Conditions**
Anh Do The and Myungsik Yoo (Soongsil University, Korea)

July 8, 2022 (Friday)

Poster Session 4

Session Chair: Prof. Jeong Ryun Lee, Chung-Ang University

Room C (VX S219), Time 09:30 ~ 11:00

- [P4-1] A Comparative Analysis of 2D Deep CNN Models for Arrhythmia Detection Using STFT-Based Long Duration ECG Spectrogram
Tabassum Islam Toma and Sunwoong Choi (Kookmin University, Korea)
- [P4-2] Learning Based Clinical Diagnosis Framework for Inconsistently and Partially Labeled Dataset
Jae-Wook Jung, San-Eun Jeon, Jun-Pyo Hong (Pukyong National University, Korea); Ju-Hyeon Kim, Yeong-Kyun Bae and Jae-Hyun Lee (College of Medicine, Kosin University Gospel Hospital, Korea)
- [P4-3] Design of obstacle detection method for autonomous driving in agricultural environments
Sung-Woo Byun, Donghee Noh and Hea-Min Lee (Korea Electronics Technology Institute (KETI), Korea)
- [P4-4] Design of Autonomous Driving Algorithms for Fruit harvesting in orchards
Hea-Min Lee, DongHee Noh, HyunGu Kang, Sung-Woo Byun and Ju-Hwan Choi (Korea Electronics Technology Institute, Korea)
- [P4-5] Abnormal Voltage Regulation Detection in on-Grid PV-ESS System by Support Vector Machine with Principal Component Analysis
Md Morshed Alam, Raihan Bin Mofidul, Radityo Fajar Pamungkas, ByungDeok Chung and Yeong Min Jang (Kookmin University, Korea)

Universitat Politècnica de Catalunya (UPC-BarcelonaTech), Vertex Building

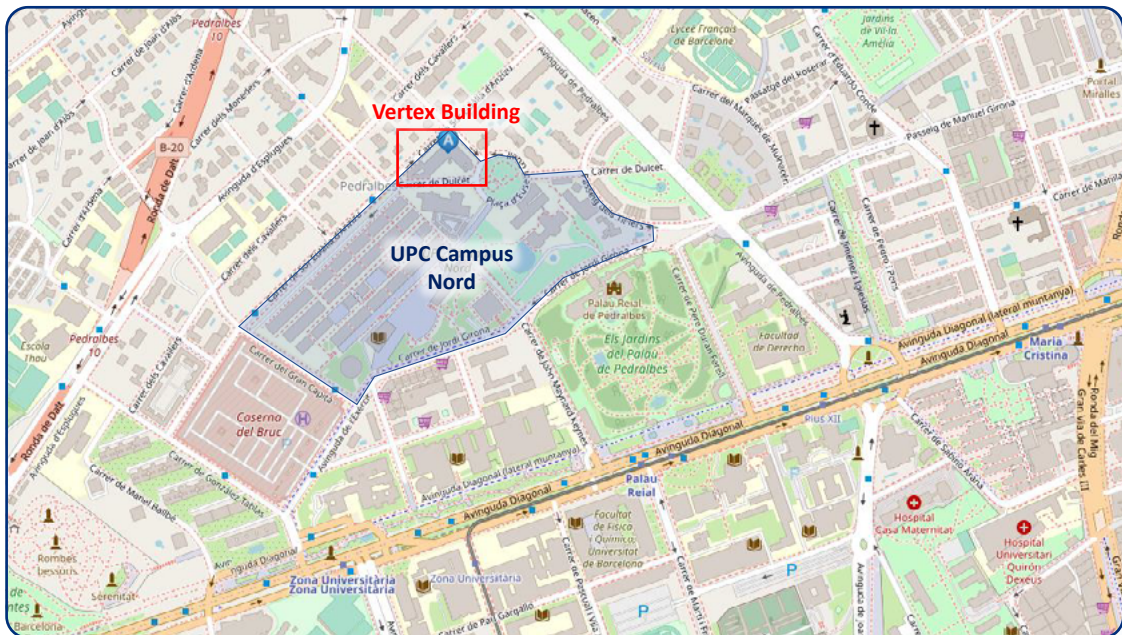
Address

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Introduction

The Universitat Politècnica de Catalunya · BarcelonaTech (UPC) is a public institution of research and higher education in the fields of engineering, architecture, sciences and technology, and one of the leading technical universities in Europe.

Map



The Vertex Building



Basilica Sagrada Familia Look down on Barcelona from the top of the tallest spire

This Art Noveau masterpiece is the most iconic landmark in Barcelona. Designed by influential artist Antoni Gaudi, construction of the church began in 1882 and it's still not finished. The level of detail on display inside and outside Sagrada Familia is awe-inspiring - despite the huge crowds which flock to the area every day. Every element of the design has added religious symbolism, which is revealed during guided tours.

Take the metro to Sagrada Familia station and, after a couple of hours of exploring, find a café on Avinguda Gaudi to sit down with the church as a backdrop. Gaudi's influence still pervades the city, but it's most keenly felt beneath the towering spires of Sagrada Familia. [Read more](#)

Park Güell Discover the magical work of Gaudi

Originally envisioned as a garden city, Park Güell is a public park that showcases the surreal and highly symbolic art of Antoni Gaudi. The park sits on top of a hill and gives you a panoramic view of Barcelona. Signature touches by the artist, like colourful mosaics and wide terraces, are scattered throughout. In summer, the park is full of life, with musicians busking in the shade. It's more subdued in winter, but still offers a nice change of pace from the frantic city streets. Check out the Gaudi House Museum within the park grounds for more information on the visionary creator's life. It's free to enter the park, but you have to pay to enter some of the attractions within.

Casa Batlló Prepare to have your mind blown by this stunning UNESCO World Heritage site

Casa Batlló is one of Antoni Gaudi's colourful masterpieces that you can't miss on a stroll down Barcelona's famous Paseo de Gracia. The renowned building was restored and redesigned by Gaudi between 1904 and 1906. Every inch of the building is packed with Gaudi's signature creativity, imagination, and superb artistic techniques. From the entrance hall and the indoor garden to the loft and the facade, Casa Batlló resembles a house from a children's fantasy picture book. Highlights include the mushroom-shaped fireplace, stained-glass windows, and the roof resembling a dragon. [Read more](#)

Cathedral of Barcelona Explore a beautiful Gothic building with a rooftop viewing deck

The Cathedral of Barcelona is a stunning Gothic church dedicated to the martyr Santa Eulàlia, the patron saint of Barcelona. The church was built between the 13th and 15th centuries and features a neo-Gothic facade, with towering spires and gargoyles inspired by real and mythical creatures. Entrance to the cathedral is free if you visit in the morning or after 3.15 pm. Once you've walked through the cathedral's 3 naves, be sure to visit the Cloister. The secluded Cloister is a cool and quiet space with geese, small chapels, palm trees, a fountain, and a museum. For a couple of euros, you can take an elevator up to the roof and enjoy spectacular 360-degree views of the city.



Picasso Museum An impressive collection of the artist's early works

The Picasso Museum in Barcelona houses some 4,000 original works of art by the great Spanish artist. It's a fantastic place to visit if you're keen on discovering how he developed his famous style known as Cubism. Artworks are displayed in chronological order, starting with his classical paintings to his most iconic works. You'll also discover how his relationship with Barcelona helped shape his unique artistic techniques. The permanent collection is housed in 5 Catalan Gothic-styled palaces in Barcelona's El Born neighbourhood. The museum's superb setting adds an extra layer of magic to your visit. Entrance is free on Thursdays from 4 pm to 7 pm, the first Sunday of each month as well as on the 12th and 13th of February, 18th of May, and 24th of September.

Las Ramblas Stroll down Barcelona's beautiful and buzzing tourist strip

This 1-km street is the centre of tourism in Barcelona. It cuts through the centre of the city, from Plaça Catalunya in the north to Drassanes station in the south. Use the Liceu Theatre as a landmark, roughly halfway down Las Ramblas. You'll find shopping, dining, and a buzz of activity here, including many street artists and performers on display. There's always something to catch your attention, but watch out for pickpockets, who are known to work this part of town. Locals complain that the restaurants are overpriced along Las Ramblas, but no one can deny that enjoying a coffee or a glass of cava while watching the festivities unfold before you is an enduringly popular thing to do. Is it touristy? Yes. Should you still go? Certainly.

Barceloneta Beach Take a dip in the Mediterranean Sea

If you want to spend a few hours enjoying the Mediterranean coastline, Barceloneta Beach is probably the most popular of the handful of beaches next to the city. You can walk here in around 20 minutes from Las Ramblas or take the metro to Barceloneta station. This wide, sandy beach is bustling throughout the day. Sun loungers are available to rent or you can relax at one of the many chiringuitos (small beachside restaurants) and soak up the afternoon sun. The call of hawkers selling drinks, snacks and beach gear can be a little tiring. If you're looking for a more secluded stretch of sand, head to Nova Icària Beach further up the coast.

Camp Nou Stadium Cheer on some of the world's best football players

FC Barcelona is a legendary football team, but they also represent the soul of the city. Known locally as the Blaugrana, their slogan is "more than a club". This is at least partially thanks to the role Camp Nou played during the harsh rule of fascist dictator General Franco in the mid-20th century. The football stadium was one of the only places where locals could speak the outlawed Catalan language.



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