SmartCom Virtual Workshop Guest Lecturer

Radio Digital Twin: Spatial Radio Resource Recognition and Control

Date : 26 January 2022
Time : 15:00 to 17:30 (JST: Japan Time)
Venue : Zoom

1. Professor Dr. Katsuya Suto
（University of Electro-Communications, Tokyo, Japan）

Title: How We Recognize Radio Environment with Deep Learning.

Time: 15:00 to 16:00 (JST: Japan Time)
Keywords: Deep learning, 6G, Digital Twin, Radio environment prediction

Abstract: Radio environment estimation plays a key role in decision-making in 6G systems, i.e., resource management for cell-free wireless networks, spatial spectrum sharing, intelligent reflecting surface (IRS). However, it remains an open challenge. Deep learning (especially image-driven deep learning) has been developing as a promising solution to express the complex radio propagation features in the urban area using feature extraction from 3D maps of cities. The approach learns the correlation between the building features and propagation features to recognize the reflection and diffraction by the buildings. By use of rapid advancement of GPU, it achieves high estimation accuracy with low computation time.
The main objective of this tutorial is to provide a fundamental background of deep learning and then show how to address practical challenges in radio environment estimation. In particular, we first give a tutorial of deep learning used in wireless network fields to provide comprehensive knowledge to the audiences. We then give the current research trend together with implementation details to have a better understanding. After that, we introduce our proposed method, the first approach of using image-to-image translation techniques for radio environment estimation. Finally, we provide how to use the information on radio environment for IRS systems.

Biography: Katsuya Suto received the B.Sc. degree in computer engineering from Iwate University, Morioka, Japan, in 2011, and the M.Sc. and Ph.D. degrees in information science from Tohoku University, Sendai, Japan, in 2013 and 2016, respectively. He has worked as a Postdoctoral Fellow for Research Abroad, Japan Society for the Promotion of Science, in the Broadband Communications Research Lab., University of Waterloo, ON, Canada, from 2016 to 2018. He is currently an Assistant Professor with the Graduate School of Informatics and Engineering, the University of Electro-Communications, Tokyo, Japan. His research interests include mobile edge computing, cognitive radio, green wireless networking, and deep learning. He received the Best Paper Award at the IEEE VTC2013-spring, the

IEEE/CIC ICCC2015, the IEEE ICC2016, and the IEEE Transactions on Computers in 2018.

2. Professor Dr. Yuichi Kawamoto
（Tohoku University, Japan）
Title: How we construct spatial radio environment with intelligent reflecting surface.

Time: 16:30 to 17:30 (JST: Japan Time)
Keywords: Intelligent Reflecting Surface (IRS), 6G, Radio propagation, Mobility

Abstract: Intelligent Reflecting Surface (IRS)-aided wireless communication system has attracted much attention. An IRS consists of a planar surface comprising artificial structures, which are called meta-material, with a large number of passive reflecting elements. By using IRS, it will become possible to flexibly control radio propagation. In this tutorial, we will talk about the researches on how to use IRS to construct spatial radio environment efficiently. Firstly, IRS–user association strategy considering user mobility for IRS-aided multibeam transmission systems will be introduced. We then give some ideas to control IRS while keeping signaling overhead low. Finally, we talk the expected role and the direction of the development of the IRS-aided system in 6G era.

Biography: Yuichi Kawamoto is an associate professor at the Graduate School of Information Sciences (GSIS), Tohoku University, Japan. He received his M.S. in 2013 and completed his Ph.D. in Information Science in 2016 from Tohoku University, Japan. He has published more than 60 peer-reviewed papers, including several high-quality publications in prestigious IEEE journals and conferences. Notably, he has received the best paper awards at several international conferences, including IEEE flagship events such as the IEEE Global Communications Conference in 2013 (GLOBECOM'13), the IEEE Wireless Communications and Networking Conference in 2014 (WCNC'14), and the IEEE International Conference on Communications in 2018 (ICC'18). In addition, he is a recipient of the prestigious Dean's award and President's award from Tohoku University in 2016. His research interests cover a wide range of areas including satellite communications, unmanned aircraft system networks, wireless and mobile networks, ad hoc and sensor networks, green networking, and network security. Moreover, he is a member of the IEEE and a member of the Institute of Electronics, Information, and Communication Engineers (IEICE).

Registration link: (Google Forms) https://forms.gle/i13mGkt9hb47Rmvx9
FREE ADMISSION. Registration can be made through the link above not later than 25 January 2022.
(NOTICE: If the registrations are over the acceptable capacity of Zoom, the registration site will have been closed before the deadline of registration.)