Sunwook Hwang *Curriculum vitae*

CONTACT INFORMATION

Ubiquitous Network Laboratory
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RESEARCH INTERESTS

Protocol design for V2X communication and 5G New Radio (NR):
3GPP LTE and NR standard for V2X communication systems, DSRC protocol design

Protocol design for LTE in unlicensed spectrum and 5G New Radio (NR):
3GPP LTE and NR standard, synchronization, control signaling, link adaptation, wide-band operation

Coexistence issue between heterogeneous wireless networks in unlicensed spectrum (especially, IEEE 802.11 WLAN and LAA):
Airtime fairness, channelization, clear channel assessment, hidden node problem, listen-before-talk (LBT)

Machine learning:
Supervised learning, clustering, convolutional neural network, reinforcement learning

EDUCATION

Seoul National University, Seoul, Korea

Unified Course of M.S. and Ph. D., Department of Electrical and Computer Engineering, Mar. 2016 to present

- Advisor: **Professor Saewoong Bahk**
  (Changed from **Sunghyun Choi** who was a professor until August of 2019 and is currently a Senior Vice President and Head of Advanced Communications Research Center at Samsung Research)
- Ubiquitous Network Laboratory in Seoul National University (NETLAB)
- Area of Research: Network Systems & Wireless Communications

Pohang University of Science and Technology (POSTECH), Pohang, Korea

B.S., Department of Electrical Engineering, in Feb. 2016

EXPERIENCE

Panasonic USA, Mountain View, CA.

Research Intern, May 2019 – Oct. 2019.

RESEARCH PROJECT

- 5G Unmanned Vehicle Research Center funded by the Institute for Information & Communications Technology Promotion, "Research and Education for Integrated Technology of 5G/Autonomous Vehicles," 2018-2019.
  - Create MATLAB system level simulator for IEEE 802.11p based on Simulator for Urban MObility (SUMO) vehicle traffic
- LG Electronics, "Dual Interface Synchronized Hybrid-V2X Research by Simulation," 2018.
- Institute for Information & communications Technology Promotion grant funded by Ministry of Science, ICT and Future Planning (MSIP) of the Republic of Korea, "Spectrum Sensing and Future Radio Communication Platforms," 2015–2017.
  - Implement the USRP LTE-LAA testbed for coexistence with Wi-Fi in 5 GHz
- Electronics and Telecommunications Research Institute (ETRI), "Development of Core Technologies for Small-cell Coexistence," 2015–2017.

AWARDS

- **Second Prize from SNU ECE for graduate deeplearning project** "SmartSearch: AIBRIL conversation API & facial keypoints detection for beauty items recommendation system", Fall. 2017.
- **First Prize from POSTECH EE for Undergraduate design project**, Apr. 2012.

PAPERS

[1] **Sunwook Hwang**, Seongwon Kim, Hoyoung Yoon, Byungjun Kim, Sunghyun Choi, and Saewoong Bahk, "Beyond Vision: Hidden Car Detector with On-demand Relaying in Vehicular Communications," submitted to *IEEE Trans. Veh. Technol.*, Jan. 2020. **(Under review)**

[2] Byungjun Kim, Seongwon Kim, Hoyoung Yoon, **Sunwook Hwang**, M. Xavier Punithan, Byeong Rim Jo, and Sunghyun Choi, "Nearest-First: Efficient Relaying Scheme in Heterogeneous V2V Communication Environments," *IEEE Access*, vol. 7, pp. 23615–23627, Feb. 2019.

[3] **Sunwook Hwang**, Kanjin Yoon, and Sunghyun Choi, "Channel Switching Operation of LTE-LAA in Unlicensed Spectrum," in *Proc. ICTC 2017*, Jeju, South Korea, Oct. 18-20, 2017.

[4] Kangjin Yoon, Taejun Park, Jihoon Kim, Weiping Sun, **Sunwook Hwang**, Ingab Kang, and Sunghyun Choi, "COTA: Channel Occupancy Time Adaptation for LTE in Unlicensed Spectrum," in *Proc. IEEE DySPAN 2017*, Baltimore, USA, Mar. 2017.

PATENTS

[1] **Sunwook Hwang**, Seongwon Kim, Hoyoung Yoon, Byungjun Kim, and Sunghyun Choi, "Method and apparatus for communication between vehicles and apparatus for using the same,"
Korean Patent 10-1975759, Apr. 2019.
US/16/686,519, Nov. 2019.

[2] Seungil Park, **Sunwook Hwang**, Hoyoung Yoon, Byungjun Kim, and Sunghyun Choi, "Method and apparatus for message relaying,"
Korean Patent 10-1935230, Dec. 2018.
PCT/KR2019/008328, July 2019.

[3] Kangjin Yoon, **Sunwook Hwang**, and Sunghyun Choi, "Method, apparatus and computer readable record media for collision-aware link adaptation through clustering,"
Korean Patents Application 10-2018-0018143, filed Feb. 2018, Patent Pending.

[4] Kangjin Yoon, **Sunwook Hwang**, Taejun Park, Jihoon Kim, and Sunghyun Choi, "Method, apparatus and computer readable record media for sharing radio resource on unlicensed band,"
Korean Patent 10-1865390, May 2018.

[5] Byounghoon Jung, Jihoon Kim, Sunghyun Choi, Seunghoon Park, Jungsoo Jung, Jaehong Yi, Kangjin Yoon, and **Sunwook Hwang**, "Apparatus and method for operating a plurality of carriers in wireless communication system,"
Korean Patents Application 10-2017-0111389, filed Aug. 2017, Patent Pending.

SOFTWARE INTELLECTUAL PROPERTIES

[1] Kangjin Yoon, **Sunwook Hwang**, Taejun Park, Jihoon Kim, and Sunghyun Choi, "LAA Channal Occupancy Time Adaptation Algorithm for fair coexistence with WLAN," Korea Copyright Commission C-2017-024231, Oct. 2017.

[2] Kangjin Yoon, **Sunwook Hwang**, Taejun Park, Jihoon Kim, and Sunghyun Choi, "WLAN Saturation Detection Algorithm," Korea Copyright Commission C-2017-000564, Jan. 2017.

HARDWARE AND SOFTWARE SKILLS

Simulation Tools:
- Network Simulator 3 (ns-3)
- MATLAB

Computer Programming:
- C, C++, Python

Desktop Editing and Productivity Software:
- Vim, Visual Studio Code, TEX (LATEX, BIBTEX), Microsoft Office, Gnuplot

TEACHING EXPERIENCES

Instructor

Department of Electrical and Computer Engineering, Seoul National University
- 400.019A Introduction to Electrical Engineering, Spring 2016.
- 430.469 Networking Protocol Design, Fall 2017.

KICS Invited Instructor

Korean Institute of Communications and Information Sciences (KICS),
- Basic Course for Network Simulation using ns-3. Feb. 2020.
- Basic Course for Network Simulation using ns-3. Feb. 2019.
- Basic Course for Network Simulation using ns-3. Feb. 2018.