

CONTACT INFORMATION	Ubiquitous Network Laboratory Department of Electrical and Computer Engineering Seoul National University 1 Gwanak-ro, Gwanak-gu Seoul 08826, Korea	<i>Email:</i> swhwang@netlab.snu.ac.kr <i>Url:</i> sunwook-hwang.github.io
RESEARCH INTERESTS	<p><b>Protocol design for V2X communication and 5G New Radio (NR):</b> 3GPP LTE and NR standard for V2X communication systems, DSRC protocol design</p> <p><b>Protocol design for LTE in unlicensed spectrum and 5G New Radio (NR):</b> 3GPP LTE and NR standard, synchronization, control signaling, link adaptation, wide-band operation</p> <p><b>Coexistence issue between heterogeneous wireless networks in unlicensed spectrum (especially, IEEE 802.11 WLAN and LAA):</b> Airtime fairness, channelization, clear channel assessment, hidden node problem, listen-before-talk (LBT)</p> <p><b>Machine learning:</b> Supervised learning, clustering, convolutional neural network, reinforcement learning</p>	
EDUCATION	<p><b>Seoul National University</b>, Seoul, Korea</p> <p>Unified Course of M.S. and Ph. D., Department of Electrical and Computer Engineering, Mar. 2016 to present</p> <ul style="list-style-type: none"> <li>• Advisor: <b>Professor Saewoong Bahk</b> (Changed from <b>Sunghyun Choi</b> 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)</li> <li>• Ubiquitous Network Laboratory in Seoul National University (NETLAB)</li> <li>• Area of Research: Network Systems &amp; Wireless Communications</li> </ul> <p><b>Pohang University of Science and Technology (POSTECH)</b>, Pohang, Korea</p> <p>B.S., Department of Electrical Engineering, in Feb. 2016</p>	
EXPERIENCE	<p><b>Panasonic USA</b>, Mountain View, CA.</p> <p>Research Intern, May 2019 – Oct. 2019.</p>	
RESEARCH PROJECT	<ul style="list-style-type: none"> <li>• 5G Unmanned Vehicle Research Center funded by the Institute for Information &amp; 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</li> <li>• Institute for Information &amp; 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</li> </ul>	
PAPERS	<p>[1] <b>Sunwook Hwang</b>, Seongwon Kim, Hoyoung Yoon, Byungjun Kim, Sunghyun Choi, and Saewoong Bahk, “Beyond Vision: Hidden Car Detector with On-demand Relaying in Vehicular Communications,” to appear in <i>IEEE Trans. Veh. Technol.</i></p>	

- [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] Kangjin Yoon, **Sunwook Hwang**, and Sunghyun Choi, "Method, apparatus and computer readable record media for collision-aware link adaptation through clustering," **Korean Patent 10-2099376**, Apr. 2020.
- [2] **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.
- [3] 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.
- [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

Computer Programming:

- Python, C, C++

Simulation Tools:

- Network Simulator 3 (ns-3)
- MATLAB

Desktop Editing and Productivity Software:

- Git, Docker, Visual Studio Code,  $\LaTeX$

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. 2019.
- Basic Course for Network Simulation using ns-3. Feb. 2018.