

# Sunwook Hwang

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## Professional Summary

- \* Expertise in object detection models, semi-supervised learning, distributed learning, and V2X for autonomous driving systems
- \* Strong knowledge of neural network algorithms and their applications, as well as the performance characteristics of machine learning models
- \* Strong experience with various simulations and a firm grasp of programming languages and frameworks essential for deep learning tools
- \* An author of **top-tier academic papers** (including *first author ICCV 2023*) and **several patents** registered in the US and South Korea

## Experience

### Seoul National University (SNU)

Seoul, South Korea

Postdoctoral Researcher

Sept. 2023 - present

- Model Inversion Attack for 3D Point Clouds Restoration
- Adaptive Super-Resolution Framework for Efficient Video Analytic Systems
- Safe Driving Assistance Framework using Impulse Radio Ultra-Wideband

### Panasonic USA

Mountain View, CA

Research Engineer - Intern within Panasonic Ventures LLC

May. 2019 - Oct. 2019

- Explore and research key technologies emerging from startups and university laboratories
- Conduct research and evaluation of new startups' technologies, aiding in business development

## Publications

- [1] [IEEE/CVF ICCV] [Published in Oct. 2023]  
UpCycling: Semi-supervised 3D Object Detection without Sharing Raw-level Unlabeled Scenes [Link]  
Sunwook Hwang, Youngseok Kim, Seongwon Kim, Saewoong Bahk, and Hyung-Sin Kim
- [2] [IEEE Transactions on Vehicular Technology] [Published in Dec. 2020]  
Beyond Vision: Hidden Car Detector with On-demand Relaying in Vehicular Communications [Link]  
Sunwook Hwang, Seongwon Kim, Hoyoung Yoon, Byungjun Kim, Sunghyun Choi, and Saewoong Bahk
- [3] [IEEE VTS APWCS] [Published in Aug. 2022]  
A Study on the Feature-level Perception Sharing of Autonomous Vehicles  
Youngseok Kim, Sunwook Hwang, and Saewoong Bahk
- [4] [IEEE WCNC] [Published in Mar. 2021]  
PRESS: Predictive Assessment of Resource Usage for C-V2V Mode 4  
Jin Mo Yang, Hoyoung Yoon, Sunwook Hwang, and Saewoong Bahk
- [5] [IEEE Access] [Published in Feb. 2019]  
Nearest-First: Efficient Relaying Scheme in Heterogeneous V2V Communication Environments [Link]  
Byungjun Kim, Seongwon Kim, Hoyoung Yoon, Sunwook Hwang, M. Xavier Punithan, Byeong Rim Jo, and Sunghyun Choi
- [6] [IEEE DySPAN] [Published in Mar. 2017]  
COTA: Channel Occupancy Time Adaptation for LTE in Unlicensed Spectrum  
Kangjin Yoon, Taejun Park, Jihoon Kim, Weiping Sun, Sunwook Hwang, Ingab Kang, and Sunghyun Choi
- [7] [IEEE ICTC] [Published in Oct. 2017]  
Channel Switching Operation of LTE-LAA in Unlicensed Spectrum  
Sunwook Hwang, Kangjin Yoon, and Sunghyun Choi

## Research Projects

### Research on distributed learning and extended-vision based 3D object detection model for autonomous driving in 5G networks

Seoul National University

National Research Foundation grant funded by the Korea government (MSIT)

Jan. 2021 – Feb. 2023

- Developing a **distributed learning framework** to enhance **3D object detection model** deployed in autonomous driving using LiDAR sensors
- Developing a **semi-supervised learning that addresses data privacy** by using de-identified data through intermediate feature extraction
- Leading this project and conducting research that resulted in a first-authored paper for **ICCV 2023** and a **US patent** [US 11,495,012 B1]

### Scalable Spectrum Sharing for Beyond 5G Communication

Seoul National University

Institute of Information & Communications Technology Planning & Evaluation grant funded by the Korea government (MSIT)

Jul. 2018 – Oct. 2020

- Developing a **system-level simulator** for C-V2X, incorporating real-world road conditions in urban environments
- Developing an **information-sharing system** that integrates communication to expand the situational awareness range of vehicles
- Based on this project, a paper was published in the **IEEE TVT** and a **US patent** was granted: [US 11,032,682 B2]

## Dual Interface Synchronized Hybrid V2X Research by Simulation

Seoul National University

Funded by LG Electronics

2018

- Developing a **system level simulator** for IEEE 802.11p (DSRC) based on **Simulator for Urban MObility (SUMO)** vehicle traffic
- Developing a **hyrid system equipped with both DSRC and C-V2V communication** to expand the situational awareness range of vehicles
- Based on this project, a paper was published in the **IEEE Access**

## Education

### Seoul National University (SNU)

Seoul, South Korea

Ph.D in Electrical and Computer Engineering

Aug. 2023

### Pohang University of Science and Technology (POSTECH)

Pohang, South Korea

BS in Electrical Engineering

Feb. 2016

## Patents

- [1] **Sunwook Hwang**, Youngseok Kim, Hyung-sin Kim, and Saewoong Bahk,  
“Semi-supervised learning method for object detection in autonomous vehicle and server for performing semi-supervised learning for object detection in autonomous vehicle,”  
**US 11,495,012**, Nov. 2022.  
**Korean Patent 10-23-4024**, Apr. 2022.
- [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,”  
**US 11,032,682**, June, 2021.  
**Korean Patent 10-1975759**, Apr. 2019.
- [3] Byounghoon Jung , Jihoon Kim , Sunghyun Choi , Seung-Hoon Park , Jungsoo Jung , Taejun Park , Kangjin Yoon , Jaehong Yi , **Sunwook Hwang**,  
“Apparatus and Method for using Multiple Carriers in Wireless Communication System,”  
**US 11,330,585**, May, 2022.
- [4] 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.
- [5] 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.
- [6] 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.
- [7] 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.

## Teaching Experiences

### Seoul National University (SNU)

Seoul, South Korea

Instructor

- 400.019A Introduction to Electrical Engineering, Spring 2016.
- 430.469 Networking Protocol Design, Fall 2017.

### The Korean Institute of Communications and Information Sciences (KICS)

Seoul, South Korea

KICS Invited Instructor

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

## Technical Skills

<b>Programming languages &amp; Frameworks</b>	C++, Python, Pytorch, Tensorflow 2.0
<b>Editing &amp; Productivity software</b>	Docker, Git
<b>Languages</b>	English (Professional fluency), Korean (Native)