Sunwook Hwang

swhwang@netlab.snu.ac.kr | https://sunwook-hwang.github.io | sunwookh | Google Scholar Profile

Professional Summary

* Expertise in privacy-preserving semi-supervised learning, distributed learning, and V2X communications for autonomous vehicles
* Deep understanding of data mining, labeling, training, and evaluation pipelines for autonomous vehicles (based on *ICCV'23 First Author*)
* 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** and **several patents** registered in the US and South Korea

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

Experience

Seoul National University (SNU) *Seoul, South Korea*
Postdoctoral Researcher Sept. 2023 - present

- Feature-level Perception Sharing for Autonomous Vehicles
  - Interpreting the feature data from heterogeneity models
- Model Inversion Attack for 3D Point Clouds Restoration
  - Restoration de-identified 3D feature data for original 3D point clouds
- Safe Driving Assistance Framework using Impulse Radio Ultra-Wideband (UWB)
  - Gathering UWB real-world datasets from riding vehicles
- Adaptive Super-Resolution Framework for Efficient Video Analytic Systems
  - Rapid and real-time searching the keyframes for object detection

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**

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

Programming languages & Frameworks	C++, Python, Pytorch, Tensorflow, Unix based system
Editing & Productivity software	Docker, Git
Languages	English (Professional fluency), Korean (Native)