

Sunwook Hwang

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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)

Ph.D in Electrical and Computer Engineering

Seoul, South Korea

Aug. 2023

Pohang University of Science and Technology (POSTECH)

BS in Electrical Engineering

Pohang, South Korea

Feb. 2016

Experience

Seoul National University (SNU)

Postdoctoral Researcher

Seoul, South Korea

Sept. 2023 - present

- Feature-level Perception Sharing for Autonomous Vehicles
 - Interpreting feature data from heterogeneity models
- Model Inversion Attack for 3D Point Clouds Restoration
 - Restoring 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 of keyframes for object detection

Panasonic USA

Research Engineer - Intern within Panasonic Ventures LLC

Mountain View, CA

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)