# Sunwook Hwang

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## Summary

**Hardware–software co-design engineer for AI accelerators at Samsung Electronics — System LSI**, working on architecture–compiler co-design that enhances the performance and energy efficiency of Exynos mobile NPUs. Beyond this core role, I research 3D-vision models and V2X for autonomous driving and 3D feature-data inversion attacks—work that has led to first-author papers at ICCV'23 and ICLR'25, as well as several patents in the United States 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

## Employment

**Samsung Electronics** *South Korea*

Staff Engineer - SoC IP Development Team (S.LSI) — Sep 2024 – Present

- **[HW Architecture]** Building cycle-accurate performance-simulation models and collaborating with RTL, verification, and silicon bring-up teams to tune NPU pipelines across diverse AI workloads.
- **[SW Compiler Optimization]** Developing workload-balancing passes that maximize NPU utilization under the tight resource constraints of mobile devices.

**Seoul National University (SNU)** *Seoul, South Korea*

Postdoctoral Researcher — Sep 2023 – Aug 2024

- 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): Collecting 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** *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

## Research Projects in University

**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 hybrid 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**

## Selected Publications

[1] **[ICLR 2025]** [*Published in Apr. 2025*]
ConcreTizer: Model Inversion Attack via Occupancy Classification and Dispersion Control for 3D Point Cloud Restoration [Link]
∗Youngseok Kim, ∗**Sunwook Hwang**, Saewoong Bahk, and Hyung-Sin Kim (∗**Equal Contribution**)

[2] **[IEEE Access]** [*Published in Apr. 2025*]
FrameBoost: Advanced Video Analytics with Inference Trigger Frame Selection via Tracking Error Estimation [Link]
Jin Mo Yang, †**Sunwook Hwang**, Jeongjun Park, and †Saewoong Bahk (†**Corresponding authors**)

[3] **[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

[4] **[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

[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

**Full publication list:** Google Scholar

## Selected Patents (US & KR)

[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] 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.

**Full Patents and Software Intellectual Properties list:** Personal page

## Technical Skills

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|---|---|
| **Computer skills** | C++, Python, Unix based system |
| **Framework** | PyTorch, Tensorflow, Apache TVM |
| **Editing & Productivity software** | Docker, Git, Vim [my dotfiles] |
| **Languages** | English (Professional fluency), Korean (Native) |

## 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.