SEUNGJOO LEE

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KEYWORDS

Machine Learning for Healthcare, Mobile Sensing, Wearable, Foundation Models, Privacy-Preserving ML

EXPERIENCE

Carnegie Mellon University, *Ph.D. Student. Advisor: Mayank Goel & Justin Chan* Aug 2025 – Present

- Aligning **LLMs** with **wearable sensor data** for personalized healthcare applications.
- Developing **gaze-based interaction systems** that sense and interact with the physical world for **AR**/**MR**.

Microsoft Research, *Research Intern. Mentor: Lili Qiu* Sep 2024 – Mar 2025

- Developed an **earable-form wearable device** for in-the-wild ExG sensing and a **task-agnostic representation learning framework** trained on free-living ExG data, enabling robust performance across diverse downstream tasks (gaze tracking, audio & visual interest, smell & taste) – **in submission [Pr1]**

KAIST, *Graduate Student. Advisor: Sung-Ju Lee* Dec 2018 – Jul 2025

- Enabled **99.9% label-free federated learning** by introducing a semi-supervised FL approach that performs reliably with extremely limited labeled data. – **NeurIPS'24 [C3]**
- Developed an **on-device mental-health monitoring system** that analyzes speech and text data on smartphones with **NLP & AI**, achieving a 0.15 AUROC gain and 8.21% MAE reduction over prior methods. – **EMNLP'23 Main [C2]**
- Implemented **on-device training** for LLMs (BERT, LLaMA-7B) on smartphones using PEFT, LoRA, and quantization, reducing trainable parameters by $\sim$99% for efficient fine-tuning.
- Invented an **eyeglass attachable device for eating detection** with **multimodal sensors** (IMU and piezo) with AI, achieving 98% accuracy and increasing the battery life by 4.03× over state-of-the-art. – **CHI'22 Best Paper [C1]**
- Developed a UWB-based system to **detect approaching personal-mobility vehicles** and warn pedestrians to prevent collisions — **MobiSys'25 Workshop [W1]**

Samsung Electronics, *Intern* Jul 2021 – Aug 2021
MX (Mobile Experience) Division, AI Server Development Team

- Developed a RESTful server using Spring Boot; designed server APIs and implemented CI/CD pipelines in a production engineering environment. Selected as the **Best Project** among 200+ interns.
- Proposed a business concept for elderly-friendly kiosk services and delivered division-wide presentation; Won **1st place** in Creathon competition.

SK Hynix, *Intern* Dec 2017 – Jan 2018
NAND Development Branch, Solution Algorithm Division

- Optimized NAND simulation code, achieving **66% performance improvement** over the existing implementation; awarded **Best Project** in the division.

EDUCATION

Carnegie Mellon University Aug 2025 – Present
School of Computer Science, Ph.D. in Societal Computing Advisor: Mayank Goel & Justin Chan

KAIST (Korea Advanced Institute of Science and Technology) Sep 2022 – Jul 2025
M.S. and Ph.D. in Electrical Engineering (Transferred to Carnegie Mellon University) Advisor: Sung-Ju Lee

KAIST (Korea Advanced Institute of Science and Technology) Mar 2016 – Aug 2022
B.S. in Computer Science ∗ Including 1.5 years of mandatory military service
🎗 *Graduated with Honors (2nd place out of 715 students)*
🎗 *Summa Cum Laude(Major GPA : 4.13/4.3 | Total GPA : 4.0/4.3)*

PUBLICATIONS

(C: Conference, D: Demo, W: Workshop, B: Book, Pr: Preprint)
** Equal contribution. † Equal senior role*

[Pr1] **Beyond Hearing: Learning Task-agnostic ExG Representations from Earphones via Physiology-informed Tokenization**
Hyungjun Yoon*, **Seungjoo Lee***, Yu Wu*, Xiaomeng Chen*, Taiting Lu, Freddy Yifei Liu, Taeckyung Lee, Hyeongheon Cha, Haochen Zhao, Gaoteng Zhao, Sung-Ju Lee, Dongyao Chen, Cecilia Mascolo, Lili Qiu

[C3] **$(FL)^2$: Overcoming Few Labels in Federated Semi-Supervised Learning**
Seungjoo Lee, Thanh-Long V. Le, Jaemin Shin, Sung-Ju Lee
Conference on Neural Information Processing Systems (**NeurIPS**) 2024
Top ML Conference - Acceptance rate 25.8%

[C2] **FedTherapist: Mental Health Monitoring with User-Generated Linguistic Expressions on Smartphones via Federated Learning**
Jaemin Shin, Hyungjun Yoon, **Seungjoo Lee**, Sungjoon Park, Yunxin Liu, Jinho D. Choi, Sung-Ju Lee
Conference on Empirical Methods in Natural Language Processing (**EMNLP Main**) 2023
Top NLP Conference - Acceptance rate 21.3%

[C1] **MyDJ: Sensing Food Intakes with an Attachable on Your Eyeglass Frame**
Jaemin Shin, **Seungjoo Lee**, Taesik Gong, Hyungjun Yoon, Hyunchul Roh, Andrea Bianchi, Sung-Ju Lee
Conference on Human Factors in Computing Systems (**CHI**) 2022
🎗 **Best Paper Honorable mention award (top 5%)**
Top HCI Conference - Acceptance rate 24.7%

[W1] **CrashSniffer: UWB-Based Anchor-Free Pedestrian Collision Prediction for Personal Mobility Vehicles**
Taeckyung Lee, Juseung Lee, Ryuhaerang Choi, **Seungjoo Lee**, Hyeongheon Cha, Hyungjun Yoon, Song Min Kim, Sangwook Bak, Sung-Ju Lee
MobiSys Workshops (**EnvSys**) 2025

[D1] **Accurate Eating Detection on a Daily Wearable Necklace (Demo)**
Jaemin Shin, **Seungjoo Lee**, Sung-Ju Lee
International Conference on Mobile Systems, Applications and Services (**MobiSys**) 2019

[B1] **High School Arduino**
Comprehensive guide on conducting scientific experiments using Arduino, **commercially published and sold in major bookstores (4,100+ copies sold)**.
Chapters 4, 7, and 13 authored by me.

AWARDS & HONORS

NeurIPS 2025 Top Reviewer (Top 8.02%) Oct 2025
Recognized among the top 8.02% of 24,429 reviewers

CHI 2022 Honorable Mention Award Mar 2022
Awarded to top 5% of all submissions in CHI 2022 [C1].

Winner of the Graduate of the Year Award (KAIST Board of Trustee Chairpeson's Prize) Feb 2023
2nd place out of 715 students, awarded to top 5 students (0.7%) who demonstrated outstanding performances in various activities as well as in grades. Awarded at the commencement ceremony.

Summa Cum Laude Sep 2022
Awarded for achieving the highest academic performance among students.

Dean's List Spring 2019, Fall 2019
Awarded to top 3% among 2,900+ students in College of Engineering.

Engineering Innovator Award Sep 2022
Awarded to students showing outstanding performance in extracurricular activities, including academic publications, entrepreneurial activities, exhibitions, and inventions
Five students are picked from college of engineering (2,900+) each semester.

KAIST Breakthroughs Spring 2023
Featured in biannual KAIST webzine showcasing groundbreaking works [C2].

U.S. Army Certificate of Appreciation Jul 2021
Awarded for exemplary service during military duty, serving as a role model for others.

National Excellence Scholarship Fall 2018 – Fall 2019
National scholarship to students who showed excellence.

Samsung Humantech Paper Award Spring 2015
Fourth prize on "An optimal path of navigation based on fractal dimension".

PATENTS

[P5] "Wearable Devices for Status Sensing", Lili Qiu, Hyungjoon Yoon, Seungjoo Lee, Xiaomeng Chen, Yu Wu, Taiting Lu, Yifei Liu, Zilong Wang, *US patent (In progress)*

[P4] "UWB-based Pedestrian Collision Avoidance System for Personal Mobility Devices", Sung-Ju Lee, Taeckyung Lee, Hyungjun Yoon, Seungjoo Lee, Hyeongheon Cha, *Korea patent (Filing date: 2025.02.12, No. 10-2025-0018095)*

[P3] "Adaptive State-Space Model-Based Deep Learning System for Real-Time Data Inference on Mobile Devices", Sung-Ju Lee, Seungjoo Lee, HyungJun Yoon, *Korea patent (Filing date: 2025.03.31, No. 10-2025-0040898)*

[P2] "System and Method for Monitoring Mental Health Based on Smartphone User Language Expressions Through Federated Learning", Sung-Ju Lee, HyungJun Yoon, Seungjoo Lee, Jaemin Shin, *Korea patent (Filing date: 2024.10.04, No. 10-2024-0135031)*

[P1] "Artificial Intelligence Model Training Method and Apparatus for Voice Phishing Detection", Sung-Ju Lee, Seungjoo Lee, HyungJun Yoon, *Korea patent (Filing date: 2023.10.04, No. 10-2023-0131748)*

INVITED TALKS

MSRA Intern Tech Talk, MSRA Nov 2024
Overcoming Few Labels in Federated Semi-Supervised Learning [C3]

ACADEMIC SERVICES

Conference Reviewer

- International Conference on Learning Representations (**ICLR**), 2026
- Conference on Neural Information Processing Systems (**NeurIPS**), 2025 – Top Reviewer
- International Conference on Mobile Systems, Applications, and Services (**MobiSys**), 2023–2025
- International Conference On Mobile Computing And Networking (**MobiCom**), 2023–2025
- Special Interest Group on Data Communication (**SIGCOMM**), 2023
- International Joint Conference on Pervasive and Ubiquitous Computing (**UbiComp**), 2022

Outreach

- **Educational Support for Students in Difficult Circumstances** Mar 2020 – Jun 2021
  Taught math and science to 4 middle school students for 2 hours every week (total $\sim$136 hours)
- **Mentor for the Gifted Education Program, SW/AI Camp** Summer 2022
  Facilitated a 2-night, 3-day program for elementary and middle school students, focusing on creating SW/AI-related kits, providing career mentoring, and conducting quizzes
- **CS101 Tutor** Spring 2017, Fall 2017, Spring 2022
  Taught 5 freshman studying CS101 (introduction to programming)

TEACHING EXPERIENCES

Computer Network (EE323) Spring 2024
Head of teaching assistants (Prof. Sung-Ju Lee)

Operating Systems and System Programming for Electrical Engineering (EE415) Fall 2023
Teaching assistant (Prof. Sung-Ju Lee)

Programming Structures for Electrical Engineering (EE209) Spring 2023
Teaching assistant (Prof. Sung-Ju Lee)

MENTORING EXPERIENCES

Seoyoung Park, Undergraduate research intern at NMSL Jun 2024 – Oct 2024
Doing a research project about *federated learning* together

Thanh Long Le Viet, Undergraduate research intern at NMSL Oct 2023 – May 2024
Doing a research project about *federated learning* together

Rachel Kim, Undergraduate research intern at NMSL Dec 2023 – Feb 2024
Doing a research project about *UWB-based personal mobility warning system for pedestrians* together

MILITARY SERVICE

KATUSA (Korean Augmentation to the U.S. Army) Dec 2019 - Jun 2021
Served national service at eighth army as a KATUSA, providing translation between the U.S. and Korean army. Selected to participate as a Korean military interpreter in the EIB (Expert Infantryman Badge) contest, the U.S. Army's prestigious competition.

EXTRA-CURRICULAR ACTIVITIES

International Students Organization (ISO) Sep 2016 - Dec 2019
Introduce Korean culture to international students.

Flute Player in Cantabile (Orchestra) Mar 2014 - Jan 2016

Embedded Software Club Mar 2014 - Dec 2015
Been a club leader for a year. Published book about doing scientific experiments using Arduino [B1].