Wooseok Lee

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Research Interests

I am a first-year Ph.D. student in Computer Science at Seoul National University, specializing in Data Science. My research interests include **representation learning, latent action models, and world models** for embodied and interactive intelligence. I am also interested in **Vision-Language-Action (VLA) models** and **World Action Models** that connect multimodal perception, reasoning, and control in real-world environments. Previously, I worked on **domain adaptation and model compression** in computer vision to improve model generalization and efficiency.

Education

Seoul National University (SNU) — Seoul, Republic of Korea

- Ph.D. in Data Science — Sep 2025 – Present
- M.S. in Data Science — Sep 2023 – Aug 2025
- B.S. in Energy Resources Engineering — Mar 2017 – Aug 2023

Publications

C=Conference, J=Journal, W=Workshop, Pr=Preprint, *: Equal Contribution, ^: Co-corresponding Author

[C.1] **Frequency Composition for Compressed and Domain-Adaptive Neural Networks**.
Yoojin Kwon*, Hongjun Suh*, **Wooseok Lee***, Taesik Gong, Songyi Han, Hyung-Sin Kim
SenSys 2027. To appear. [arXiv]
- *Keywords: Model Quantization, Domain Generalization, Test-time Adaptation, Frequency Composition*

[C.1] **Tracking the Discriminative Axis: Dual Prototypes for Test-Time OOD Detection Under Covariate Shift**.
Wooseok Lee*, Jin Mo Yang*, Saewoong Bahk, Hyung-Sin Kim
WACV 2027.
- *Keywords: Out-of-distribution (OOD) Detection, Covariate Shift, Robustness*

[W.1] **Measurement Plasticity: Sensor-Level Adaptation for Vision-Language Models**.
Boyeong Im, **Wooseok Lee**, Yoojin Kwon, Hyung-Sin Kim
ICML 2026 CATS Workshop.
- *Keywords: Test-time Adaptation, Test-time Prompt Tuning, Camera Sensor Control*

[J.1] **DistillSleep: Real-Time, On-Device, Interpretable Sleep Staging from Single-Channel EEG**.
Keondo Park, Joopyo Hong, **Wooseok Lee**, Hyun-Woo Shin^, Hyung-Sin Kim^
SLEEPJ, 2025.
- *Keywords: On-device AI, Knowledge Distillation, Interpretability, Sleep AI*

Honors and Awards

Best Paper Award — Korean Artificial Intelligence Association Summer Conference 2025 (CKAIA 2025)
Korean Artificial Intelligence Association (KAIA)

MARS Award (4th Place) — 2024 Astronomical and Space AI Competition
Korea Astronomy and Space Science Institute (KASI) and Korea Advanced Institute of Science and Technology (KAIST)

3rd Place — 2023 Winter Ambient AI Competition
Graduate School of Data Science, SNU

Top 12 Nationwide Teams — 2022 Challenge K-Startup
Ministry of SMEs (Small and Medium Enterprises) and Startups, Republic of Korea

5th Place — 2022 National Defense Startup Challenge
Ministry of National Defense, Republic of Korea

Runner-up (2nd Place) — 2022 Army Startup Competition
Republic of Korea Army (ROKA)

National Science and Technology Scholarship (2017)
Korea Student Aid Foundation

Teaching and Service Experience

Lab Server Administrator Sep 2024 – Aug 2025

Ambient AI Platforms and Practice (TA) Winter 2023

Computing Foundations for Data Science (TA) Fall 2023

Republic of Korea Army (ROKA) Interpreter and Liaison Officer Jun 2021 – Dec 2022

Research Projects

Adding Safety to a Visual Navigation Foundation Model with Residual Reinforcement Learning Apr 2026 – Jul 2026

- Developed a safety-aware residual reinforcement learning framework that refines frozen visual navigation policies with depth-guided PPO corrections, reducing collisions while preserving the base policy behavior.
- *Keywords: Robot navigation, Reinforcement learning, Safe robotics*

Event-Centric Surprise Localization for Intuitive Physics in Video Aug 2025 – Jan 2026

- Developing a framework for event-centric spatio-temporal localization of physical-law violations in videos to advance intuitive physics understanding in AI models.
- *Keywords: Physical intuition, Multi-modal LLM, Representation learning, Interpretability*

Cross-Subject EEG-to-Video Reconstruction Mar 2025 – Jul 2025

- Developed an EEG-to-video reconstruction framework, introducing subject-invariant encoders and evaluation protocols to enhance cross-subject generalization.
- *Keywords: Neural decoding, Video generation*

Real-Time On-Device Flying Bird Detection for Bird Collision Prevention Jan 2023 – Mar 2023

- Developed a system on the Coral Dev Board that detects birds and emits low-frequency sounds to deter them.
- *Keywords: On-device AI, Object detection, Transfer learning*

ML-based Classification of Stars and Galaxies with Visible Light Image Apr 2021 – Jun 2021

- Proposed a method to distinguish galaxies from stars—often challenging even for experts using a single image—exclusively with visible-light images.
- *Keywords: Astronomy, Machine learning*

Remote Sensing for the Possibility of Water Existence Using Lunar Surface Olivine Basalt Nov 2019 – Jan 2020

- Using olivine basalt's rapid weathering in wet conditions and distinct mid-/far-infrared emissions, employed THEMIS (Thermal Emission Imaging System) to investigate potential water on Mars.
- *Keywords: Remote sensing, Planetary science*

Entrepreneurship

Curastem Feb 2022 – Jan 2023

- Co-founded *Curastem*—a startup team focused on a stem cell burn patch—and served as Chief Operating Officer (COO)
- *Keywords: Startup, Business, Dermatology, Stem cell*

Extra-curricular Experience

Google ExploreCSR, Google and Graduate School of Data Science (GSDS), SNU Dec 2022 – Mar 2023

- Explored data science career paths and research areas while building a professional network. Seoul, Republic of Korea

Student Volunteer, Seoul National University Social Responsibility (SNUSR) Oct 2022 – Feb 2023

- Volunteered in Samarqand through educational programs, medical assistance, and cultural activities. Samarkand, Uzbekistan

SUB Announcer, SUB (SNU Broadcasting System) Mar 2020 – Jun 2021

- Served as a SUB News anchor and hosted SNU music radio shows. Seoul, Republic of Korea

Junior Reporter, YoungSamsung of Samsung Electronics Aug 2019 – Feb 2020

- Seoul: Produced multimedia content on Samsung's IoT innovations (CES 2020), SNU campus life, and data visualization. Seoul, Republic of Korea and London, United Kingdom
- London: Interviewed UX experts and produced a video, highlighting the importance of user engagement and immersive interaction in UX and IoT.

Student Ambassador, SHINE (SNU Student Ambassador Group) Mar 2017 – Aug 2019

- Served as Lead Ambassador, Lead of HR team and Lead of External Cooperation team. Seoul, Republic of Korea
- Designed and led campus tours for SNU visitors.