SooHwan Eom

Ph.D. Student, Electrical Engineering, KAIST · U-AIM Lab · Daejeon, South Korea
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Research Interests

Large language model alignment and reasoning; multimodal learning; self-supervised speech representation learning; parameter-efficient adaptation of foundation models. My work develops principled methods for adapting and improving foundation models under limited, noisy, or structured supervision, with the long-term goal of building self-improving, agentic AI systems that reason reliably in complex domains.

Education

Korea Advanced Institute of Science and Technology (KAIST) 2024 – Present

Ph.D. in Electrical Engineering
Advisor: Prof. Chang D. Yoo (U-AIM Lab) · GPA: 4.06 / 4.3

Korea Advanced Institute of Science and Technology (KAIST) 2022 – 2024

M.S. in Electrical Engineering
Advisor: Prof. Chang D. Yoo (U-AIM Lab) · GPA: 4.0 / 4.3
Thesis: *Adaptive Maximum Entropy Regularization for Connectionist Temporal Classification*

Korea Advanced Institute of Science and Technology (KAIST) 2017 – 2022

B.S. in Electrical Engineering

Korean Minjok Leadership Academy (KMLA) 2014 – 2017

Research Experience

Artificial Intelligence & Machine Learning Lab (U-AIM), KAIST 2022 – Present

Research Student · Advisor: Prof. Chang D. Yoo

Artificial Intelligence & Machine Learning Lab (U-AIM), KAIST 2021 – 2022

Research Intern

Publications

* denotes equal contribution.

Conference Proceedings

[C1] Jaehyun Jang, Eunseop Yoon, Hee Suk Yoon, **SooHwan Eom**, Mark A. Hasegawa-Johnson, and Chang D. Yoo. "Token-level Response-visual Attention Guidance for Multimodal LLMs Knowledge Distillation." In *European Conference on Computer Vision (ECCV)*, 2026.

[C2] **SooHwan Eom**, Hee Suk Yoon, Eunseop Yoon, Mark Hasegawa-Johnson, and Chang D. Yoo. "Transcript-Free Flow-Matching Text-to-Speech via Speech Feature Conditioning." In *Proceedings of INTERSPEECH*, 2026. arXiv:2606.20266.

[C3] Hee Suk Yoon, Eunseop Yoon, Jaehyun Jang, **SooHwan Eom**, Ji Woo Hong, Mark Hasegawa-Johnson, Qi Dai, Chong Luo, and Chang D. Yoo. "Decomposed On-Policy Distillation for Vision-Language Reasoning: Steering Gradients for Visual Grounding." In *Proceedings of the International Conference on Machine Learning (ICML)*, 2026. **Spotlight (top 2.2%)**. arXiv:2606.00564.

[C4] Hee Suk Yoon*, Eunseop Yoon*, Ji Woo Hong, **SooHwan Eom**, Gwanhyeong Koo, Mark Hasegawa-Johnson, Qi Dai, Chong Luo, and Chang D. Yoo. "PDCR: Perception-Decomposed Confidence Reward

for Vision-Language Reasoning." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2026, pp. 18881–18891. arXiv:2605.13467.

[C5] **SooHwan Eom**, Mark Hasegawa-Johnson, and Chang D. Yoo. "SiamCTC: Learning Speech Representations through Monotonic Temporal Alignment." In *Proceedings of INTERSPEECH*, 2025. arXiv:2606.02220.

[C6] **SooHwan Eom**, Jay Shim, Gwanhyeong Koo, Haebin Na, Mark A. Hasegawa-Johnson, Sungwoong Kim, and Chang D. Yoo. "Query-based Cross-Modal Projector Bolstering Mamba Multimodal LLM." In *Findings of the Association for Computational Linguistics: EMNLP 2024*, pp. 14158–14167.

[C7] Eunseop Yoon*, Hee Suk Yoon*, **SooHwan Eom***, Gunsoo Han, Daniel Nam, Daejin Jo, Kyoung-Woon On, Mark Hasegawa-Johnson, Sungwoong Kim, and Chang D. Yoo. "TLCR: Token-Level Continuous Reward for Fine-grained Reinforcement Learning from Human Feedback." In *Findings of the Association for Computational Linguistics: ACL 2024*, pp. 14969–14981.

[C8] **SooHwan Eom**, Eunseop Yoon, Hee Suk Yoon, Chanwoo Kim, Mark Hasegawa-Johnson, and Chang D. Yoo. "AdaMER-CTC: Connectionist Temporal Classification with Adaptive Maximum Entropy Regularization for Automatic Speech Recognition." In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2024, pp. 12707–12711.

[C9] Tri Ton*, Ji Woo Hong*, **Soohwan Eom**, Jun Yeop Shim, Junyeong Kim, and Chang D. Yoo. "Zero-Shot Dual-Path Integration Framework for Open-Vocabulary 3D Instance Segmentation." In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops*, 2024, pp. 7598–7607.

[C10] Sunjae Yoon, Ji Woo Hong, **SooHwan Eom**, Hee Suk Yoon, Eunseop Yoon, Daehyeok Kim, Junyeong Kim, Chanwoo Kim, and Chang D. Yoo. "Counterfactual Two-Stage Debiasing for Video Corpus Moment Retrieval." In *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2023, pp. 1–5.

[C11] Eunseop Yoon*, Hee Suk Yoon*, Dhananjaya Gowda, **Soo Hwan Eom**, Daehyeok Kim, John Harvill, Heting Gao, Mark Hasegawa-Johnson, Chanwoo Kim, and Chang D. Yoo. "Mitigating the Exposure Bias in Sentence-Level Grapheme-to-Phoneme (G2P) Transduction." In *Proceedings of INTERSPEECH*, 2023, pp. 2028–2032.

Journal Articles

[J1] Seongwook Min, Jaehun An, Jae Hee Lee, Ji Hoon Kim, Daniel J. Joe, **Soo Hwan Eom**, Chang D. Yoo, Hyo Suk Ahn, Jin Young Hwang, Sheng Xu, John A. Rogers, and Keon Jae Lee. "Wearable Blood Pressure Sensors for Cardiovascular Monitoring and Machine Learning Algorithms for Blood Pressure Estimation." *Nature Reviews Cardiology*, 22(9):629–648, 2025.

[J2] Sunjae Yoon, Gwanhyeong Koo, Jun Yeop Shim, **SooHwan Eom**, Ji Woo Hong, and Chang D. Yoo. "Causal Localization Network for Radar Human Localization with Micro-Doppler Signature." *IEEE Access*, 12:38275–38286, 2024.

[J3] Gwanhyeong Koo, Sunjae Yoon, Donghoon Lee, **Soo Hwan Eom**, JongSik Ahn, Tae-Young Lee, and Chang D. Yoo. "Spatial Adaptive Kernel Network for Enhanced Oriented Ship Detection in Synthetic Aperture Radar Imagery." *Journal of the Institute of Electronics and Information Engineers (IEIE)*, pp. 78–91, 2024.

Preprints & Manuscripts

[P1] Ji Woo Hong, Hee Suk Yoon, Gwanhyeong Koo, Eunseop Yoon, **SooHwan Eom**, Qi Dai, Chong Luo, and Chang D. Yoo. "High-Fidelity Text-to-Image Generation from Pre-Trained Vision-Language Models via Distribution-Conditioned Diffusion Decoding." arXiv:2603.13389, 2026.

[P2] Eunseop Yoon, Hee Suk Yoon, Jaehyun Jang, **SooHwan Eom**, Qi Dai, Chong Luo, Mark A. Hasegawa-Johnson, and Chang D. Yoo. "PACR: Progressively Ascending Confidence Reward for LLM Reasoning." arXiv:2510.22255, 2025.

[P3] **SooHwan Eom**, Hee Suk Yoon, Eunseop Yoon, Mark A. Hasegawa-Johnson, and Chang D. Yoo. "Gated LoRA: Dual-Purpose Projections for Parameter-Efficient Mini-Expert Fine-Tuning." Manuscript, OpenReview, 2025.

[P4] **SooHwan Eom**, Jay Shim, Eunseop Yoon, Hee Suk Yoon, Hyeonmok Ko, Mark A. Hasegawa-Johnson, and Chang D. Yoo. "SQuBa: Speech Mamba Language Model with Querying-Attention for Efficient Summarization." Manuscript, OpenReview, 2024.

Awards & Honors

National Government Scholarship 2024 – Present

Full funding for the Ph.D. program

National Government Scholarship 2022 – 2024

Full funding for the M.S. program

Academic Service

Conference Reviewing

- International Conference on Machine Learning (ICML): 2026 · **Gold Reviewer (top 25%)**
- IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP): 2024, 2025, 2026

Teaching Experience

Teaching Assistant, KAIST

- EE.50031 Statistical Learning Theory (Spring 2024, Spring 2025, Spring 2026)
- EE.40012 Foundation of Big Data Analytics (Fall 2024)
- EE.30031 Introduction to Machine Learning (Fall 2023, Fall 2025)
- EE.20002 Signals and Systems (Fall 2022, Spring 2023)

Outreach & External Programs

- Hwaseong City–KAIST AI Specialized Curriculum: Large Language Models (2024)
- Seongnam–KAIST Next Generation ICT Research Center, EE Co-op+ Joint Research Program (Fall 2022, Fall 2024)
- Seongnam–KAIST Next Generation ICT Research Center, Machine Learning and Big Data Course (2022)

Research Projects

Research on Scene Understanding and Causal Inference for Video-Based Surveillance and Reconnaissance 2023 – 2026

Operator · Center for Applied Research in Artificial Intelligence (CARAI) grant funded by DAPA and ADD, Korea

Circuit Foundation Model for DRAM Design 2025 – Present

Co-operator · Supported by Samsung Electronics Device Solutions

Agentic AI System for Autonomous Root Cause Analysis and Verification in Display Manufacturing Process 2025 – Present

Supporter · Supported by Samsung Display Co., Ltd.

Development of Causal AI through Video Understanding and Reinforcement Learning, and Its Applications to Real Environments 2022 – Present

Supporter · IITP grant funded by the Korea Government (MSIT)

Development and Study of AI Technologies to Inexpensively Conform to Evolving Policy on Ethics 2022 – Present

Supporter · IITP grant funded by the Korea Government (MSIT)

Development of Uncertainty-Aware Agents Learning by Asking Questions 2022 – Present

Supporter · IITP grant funded by the Korea Government (MSIT)

Multi-modal Generative AI for Summarization 2023 – 2024

Supporter · Supported by Samsung Speech Recognition & Natural Language Processing Lab