Jaewoo Lee

Ph.D. Applicant @ Seoul, Korea
AI Researcher

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Research Interest

- **Multimodal:** Vision-Language, Audio-Video, Audio-Image
  My ultimate goal is to build a model that understands and communicates through various modalities. This will enhance human-machine interaction and increase the accessibility of AI technology in human life.
- **Efficiency:** Data pruning, Model compression, Token selection
  To further increase the accessibility of AI technology, addressing the high costs associated with developing and implementing concurrent models (i.e. large-scale datasets, significant GPU consumption) is crucial. I aim to minimize costs by developing algorithms that identify data or model structure redundancies.
- **Beyond Supervised Learning:** Continual learning, Curriculum learning, Instruction tuning etc.
  Continual learning - focused on developing algorithms that keep models up-to-date with new knowledge.
  Instruction tuning - interested in discovering structures of skills from Large Vision-Language Models (e.g. OCR, recognizing color, visual reasoning) and using them to optimize data order for instruction tuning.

Education

- **Korea Advanced Institute of Science and Technology (KAIST)** Seoul, South Korea
  Master of Science in Artificial Intelligence (GPA: 3.88/4.3) *Mar. 2023 – Aug. 2024*
  - Advisor: Prof. Sung-Ju Hwang
  - A half-year early graduation.
  - **Thesis:** Efficient Training Techniques for Multimodal Learning
- **Korea Advanced Institute of Science and Technology (KAIST)** Daejeon, South Korea
  Bachelor of Science in Electrical Engineering (GPA: 4.11/4.3) *Mar. 2020 – Feb. 2023*
  - Summa Cum Laude.
  - One-year early graduation.
  - **Selected Coursework:** Programming Structure, Data Structures and Algorithms, Introduction to Optimization Techniques, Information Theory, Machine Learning Basics and Practices, Deep learning for Computer Vision, Engineering Random Processes, Digital Speech Processing, Digital Signal Processing, Communication Engineering.

Publications

[1] **Unified Multi-Modal Interleaved Document Representation for Information Retrieval**
Jaewoo Lee*, Joonho Ko*, Jinheon Baek, Soyeong Jeong, Sung Ju Hwang (* denotes equal contribution)
Preprint (submitted to ICLR 2025)

[2] **Concept-skill Transferability-based Data Selection for Large Vision-Language Models**
Jaewoo Lee, Boyang Liˆ, Sung Ju Hwangˆ (ˆ denotes equal advising)
Conference on Empirical Methods in Natural Language Processing (EMNLP, 2024)

[3] **STELLA: Continual Audio-Video Pre-training with Spatio-Temporal Localized Alignment**
Jaewoo Lee*, Jaehong Yoon*, Wonjae Kim, Yunji Kim, Sung Ju Hwang (* denotes equal contribution)
International Conference on Machine Learning (ICML, 2024)

[4] **Sound-based drone fault classification using multitask learning**
Wonjun Yi, Jung-Woo Choi Jaewoo Lee
International Congress on Sound and Vibration (ICSV, 2023)

Research Experiences

- **DeepAuto ai** — Seoul, South Korea
  AI Researcher — *Aug. 2024 - current*
  - Focusing on a task-specific LLM compression method leveraging FFN neurons and MSA heads.
- **MLAI Lab-KAIST** — Seoul, South Korea
  Master's Degree Student Researcher (Advisor: Sung Ju Hwang) — *Mar. 2023 - Aug. 2024*
  - Proposed a visual instruction data pruning method by clustering samples by visual concept-skill compositions and selecting samples based on cluster importance, thereby facilitating efficient fine-tuning of the target model.
  - Suggested audio-video continual pre-training scenarios featuring dynamic multimodal semantics and introduced a novel audio-video patch selection method for continual pre-training, enhancing both performance & efficiency.
- **MLAI Lab-KAIST** — Seoul, South Korea
  Undergraduate Student Researcher (Advisor: Sung Ju Hwang) — *Jul. 2022 - Feb. 2023*
  - Investigated audio-video online continual learning within the context of egocentric video streams.
- **Smart Sound Systems Lab-KAIST** — Daejeon, South Korea
  Undergraduate Student Researcher (Advisor: Jung-Woo Choi) — *Sep. 2021 - Jun. 2022*
  - Bulit *UAV anomaly sound dataset* containing various faults and maneuvering scenarios and released it in public.
  - Developed models using UAV sound signals and multitask learning to identify anomalous UAV operations.
- **Urban Robotics Lab-KAIST** — Daejeon, South Korea
  Undergraduate Student Researcher (Advisor: Hyun Myung) — *Jun. 2021 - Aug. 2021*
  - Worked on Simultaneous Localization and Mapping (SLAM) for autonomous navigation of self-driving cars

Academic Services

- **Reviewer**
  - Neural Information Processing Systems Workshop on Continual Foundation Model, 2024

Awards & Honors

- **Summa Cum Laude Award** — KAIST
  Graduated with highest honors and a 4.11/4.3 GPA. — *Feb. 2023*
- **National Scholarship for Science & Engineering** — Korea Student Aid Foundation
  Awarded for outstanding academics and potential impact in science and technology. — *Sep. 2022 - Feb. 2023*
- **Encouragement Award for the Undergraduate Research Program** — KAIST
  Earned a top ranking in the Undergraduate Research Program, competing against 65 teams. — *Aug. 2022*
- **College of Engineering Dean's List** — KAIST
  Achieved within the top 3% of academic performance in the Electrical Engineering Department. — *Aug. 2022*
- **School of Freshman Dean's List** — KAIST
  Acheived within the top 2% in academic excellence among Freshman. — *Aug. 2020*

Skills

- **Programming Languages** - Python, C, MATLAB, System Verilog
- **Miscellaneous** - Git, Linux, LaTeX, Markdown
- **Language Abilities** - Fluent in English (IBT TOEFL: 110) and Native in Korean

Extracurricular Activities

- **LS Dream Science Class** — *Dec. 2019 - Feb. 2020*
  - Participated in a tutoring program for underprivileged students, teaching science for 6 hours daily for two months.
- **The Republic of Korea's Army Sergent** — *Feb. 2018 - Oct. 2019*
  - Served as a supply specialist in an armored battalion.
  - One-month early promotion to sergeant and corporal, respectively, due to excellence in duty.