Jaewoo Lee

Ph.D. Applicant @ Seoul, Korea
AI Researcher

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RESEARCH INTERESTS

- **Multimodal:** Vision-Language, Audio-Video, Audio-Image
  My ultimate goal is to build multimodal models that understand various modalities, leading to enhanced human-machine interaction and increased AI accessibility in human life.
- **Efficiency:** Data pruning, Model compression, Token selection
  To further enhance the AI accessibility, I aim to minimize AI training & inference costs by developing algorithms that identify data or model structure redundancies.
- **Continual learning:**
  I am also interested in developing algorithms that keep models up-to-date with new knowledge.
- **Curriculum learning:**
  I aim to discover the structure of skills in Large Vision-Language Models to optimize data order in instruction tuning, enhancing training efficiency (empirical study PDF).

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.
- A 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

[**P1**] **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)

[**C1**] **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)

[**C2**] **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)

[**C3**] **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*

- Currently focusing on task-specific LLM compression methods leveraging neuron activations.

MLAI Lab-KAIST Seoul, South Korea
Master's Degree Student Researcher (Advisor: Sung Ju Hwang) *Mar. 2023 - Aug. 2024*

- **[P1]** Suggested an information retrieval framework using VLMs to integrate interleaved multimodal content from a document into a unified document representation.
- **[C1]** Proposed a visual instruction data pruning method that uses a small model to cluster data into concept-skill compositions and selects data based on cluster transferability and density.
- **[C2]** Addressed dynamic multimodal semantics in audio-video continual pre-training by introducing an audio-video patch selection method that leverages cross-attention maps.

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*

- **[C3]** Developed a multitask learning approach and audio datasets (link) for UAV anomaly detection.

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

EXTRACURRICULAR ACTIVITIES

LS Dream Science Class *Dec. 2019 - Feb. 2020*

- Participated in a tutoring program for underprivileged students, teaching science for 6 hours a day 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 promotions to sergeant and corporal, respectively, due to excellence in duty.