Joohyung Lee

ML Researcher, AITRICS (Seoul, South Korea)

Website LinkedIn Scholar GitHub

joohyunglee.research@gmail.com

Research Summary

- My work targets **trustworthy, structure-respecting learning**: identifying domain regularities (symmetries, acquisition mechanisms, temporal dynamics) and enforcing them at scale via self-supervised objectives, soft regularizers, and inductive biases.
- Primary themes: (i) **invariance–equivariance** in self-supervised learning, (ii) **acquisition-physics priors** in medical imaging, and (iii) **multimodal temporal modeling** for irregular EHR time series.

Education

- **Texas A&M University** — College Station, TX, USA
  M.S. in Electrical Engineering — *Aug 2014*
- **The University of Texas at Dallas** — Richardson, TX, USA
  B.S. in Electrical Engineering — *Aug 2012*

Research & Industry Experience

- **AITRICS** — Seoul, South Korea
  ML Researcher — *May 2022 – Present*
  - **Geometric / structure-respecting SSL:** proposed *Soft Equivariance Regularization (SER)* to decouple invariant SSL at the final embedding from equivariance constraints at intermediate spatial feature maps (ICLR 2026, accepted; first author).
  - **Trustworthy multimodal EHR modeling:** developed self-supervised and foundation-model approaches for predicting critical patient events from irregular, partially observed clinical time series (MLHC 2023 spotlight; ICLR 2023 TML4H workshop, Best Paper Honorable Mention).
- **Korea Electronics Technology Institute (KETI)** — Seongnam-si, South Korea
  Senior Researcher — *Dec 2020 – May 2022*
  - Designed self-supervised pretraining and transfer-learning pipelines for medical image analysis under limited labels and distribution shift.
- **KAIST, Robotics & Computer Vision Lab** — Daejeon, South Korea
  Researcher — *Mar 2020 – Dec 2020*
  - Developed model architectures for anisotropic 3D medical volumes; contributed to volumetric rectal cancer staging (MICCAI 2022).
- **National Cancer Center** — Gyeonggi-do, South Korea
  Researcher — *Oct 2016 – Mar 2020*
  - Studied robustness and uncertainty of deep medical models in low-data regimes; published on variance reduction for segmentation (IEEE Access 2019).
- **Laboratory for Optical Diagnosis & Imaging, Texas A&M University** — College Station, TX, USA
  Student Researcher — *Mar 2013 – Jun 2014*
  - Developed classical ML pipelines (feature extraction/selection; supervised learning) on in-vivo multispectral fluorescence lifetime imaging microscopy data for oral carcinoma detection (Photochem. Photobiol. 2016).

Teaching & Mentoring

- **Texas A&M University, Department of Electrical Engineering** — College Station, TX, USA
  Grader (Signals and Systems) — *Jan 2014 – Apr 2014*
  - Designed grading rubrics and graded coding, written assignments, and exams.
- **GEM Center, The University of Texas at Dallas** — Richardson, TX, USA
  Math Tutor — *Jan 2011 – May 2011*
  - Tutored undergraduate-level mathematics and physics.

Publications & Preprints

Selected Publications

- **J. Lee**, C. Kim, H. Kim, K. Lee, J. Lee. "Soft Equivariance Regularization for Invariant Self-Supervised Learning." *ICLR 2026 (accepted).* [pdf]
- **J. Lee**, H. Nam, K. Lee, S. Hahn. "Compact and De-Biased Negative Instance Embedding for Multi-Instance Learning on Whole-Slide Image Classification." *ICASSP 2024.* [pdf]
- K. Lee, S. Lee, H. Hyun, S. Hahn, E. Choi, **J. Lee**. "Learning Missing Modal Electronic Health Records with Unified Multi-modal Data Embedding and Modality-Aware Attention." *MLHC 2023.* **Spotlight**. (Co-first; corresponding author.) [pdf]
- **J. Lee**, J. E. Oh, I. Shin, Y. S. Kim, D. K. Sohn, T. S. Kim, I. S. Kweon. "Moving from 2D to 3D: volumetric medical image classification for rectal cancer staging." *MICCAI 2022.* [pdf]

Workshop

- K. Lee, J. Won, H. Hyun, S. Hahn, E. Choi, **J. Lee**. "Self-Supervised Predictive Coding with Multimodal Fusion for Patient Deterioration Prediction in Fine-grained Time Resolution." *ICLR 2023 Trustworthy ML for Healthcare Workshop.* Oral Presentation. **Best Paper Honorable Mention**. (Corresponding author.) [pdf]

Journal

- **J. Lee**, J. E. Oh, M. J. Kim, B. Y. Hur, D. K. Sohn. "Reducing the Model Variance of Rectal Cancer Segmentation Network." *IEEE Access*, 2019. [pdf]
- H. Yoon, **J. Lee**, J. E. Oh, H. R. Kim, S. Lee, H. J. Chang, D. K. Sohn. "Tumor Identification in Colorectal Histology Images Using a Convolutional Neural Network." *Journal of Digital Imaging*, 2018. [pdf]
- B. H. Malik, **J. Lee**, S. Cheng, R. Cuenca, J. M. Jabbour, Y.-S. L. Cheng, J. M. Wright, B. Ahmed, K. C. Maitland, J. A. Jo. "Objective Detection of Oral Carcinoma with Multispectral Fluorescence Lifetime Imaging *In Vivo*." *Photochemistry and Photobiology*, 2016. (Co-first author.) [pdf]

In Preparation

- **J. Lee**, C. Kim, K. Lee. "Decoupling Equivariance from Invariant Self-Supervised Learning via Null-Space Projection." In preparation.
- C. Kim, **J. Lee**, K. Lee, D. Yoon, E. Yang. "SPAM: Sampling Pattern Meta-Learning for Domain Generalization on Irregular Time Series." In preparation.

Honors & Recognition

- **MLHC 2023**: Spotlight paper (Learning Missing Modal EHR with modality-aware attention).
- **ICLR 2023 TML4H Workshop**: Best Paper Honorable Mention; Oral Presentation.

References

- **Prof. Eunho Yang** (Research supervisor)
  Associate Professor, Kim Jaechul Graduate School of AI, KAIST; Email: eunhoy@kaist.ac.kr
- **Prof. Juho Lee** (Research collaborator)
  Associate Professor, Kim Jaechul Graduate School of AI, KAIST; Email: juholee@kaist.ac.kr
- **Prof. Dae Kyung Sohn** (Research Supervisor)
  Professor, Department of Public Health & Artificial Intelligence, National Cancer Center (South Korea); Email: gsgsbal@ncc.re.kr