Hyeon Woo Lee

Research and Engineering in Deep Learning

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EDUCATION

Cornell University, College of Engineering, Ithaca, NY May 2019
Master of Engineering in Biomedical Engineering (Machine Learning Research Track. Advised by Dr. Sabuncu)

University of Rochester, College of Engineering, Rochester, NY December 2017
Bachelor of Science in Biomedical Engineering (Electrical Engineering Concentration)

PROFESSIONAL EXPERIENCE

AI Scientist – *Philips, Ultrasound AI group* July 2020 ~ Present

- Deep learning algorithm development for FAST trauma ultrasound exam.
  - Developed real-time detection and segmentation model for 2D ultrasound image
  - Designed pipeline optimized for mobile and resource-constrained ultrasound systems
  - Applied multi-task learning, weak supervision, domain adaptation, and knowledge distillation
- Leading development of middle cerebral arteries (MCA) detection model for Transcranial Doppler ultrasound
  - Developed MCA detection model for intracranial pressure estimation in 3D ultrasound image
  - Collaborated with MIT and BIDMC for volunteer & patient data collection and annotation
- Automated Multi-Label Classification of ECG Reports Using LLM and RAG
  - Utilized prompt-engineering and RAG to standardize disorganized ECG medical reports, ensuring consistent multi-label classifications.
- Developed representation learning framework for ECG time-series using token masking and transformer encoders
  - Pretrained via masked signal modeling (MSM) and fine-tuned for pathology detection
- Leading internal ML model development pipeline for multiple project teams
  - Implemented data extraction, ETL, statistics, performance evaluation, and active learning
- Contributed to FDA 510(k) regulatory affairs and intellectual property (IP) development
  - Collaborated on clinical validation design, attended FDA Q-Sub meetings
  - Authored 18+ invention disclosures and 9+ provisional patents.

Scientific Data Engineer - *Allen Institute, Allen Institute for Cell Science* July 2019 ~ July 2020

- Developed computer vision open-source toolkit for microscopic cell images, *Allen Cell Structural Segmenter*.
- Worked on classical segmentation methods to generate label for the iterative learning pipeline.
- Developed a cell pair (mitotic cell) detector with Faster-RCNN.
- Using spatial data augmentation and DeeplabV3+, I developed a 2D segmentation model for cardiomyocyte cell
- Worked on a cGAN based 3D microscopic image transfer between different magnification and resolution.

ACADEMIC RESEARCH EXPERIENCE

Graduate Research Assistant, *Sabuncu Lab, Cornell University* August 2018 – June 2019

- Biomedical image segmentation in the scenario of only a few labeled 3D brain MR images.
- Proposed a novel method, multi-atlas segmentation (MAS) with semi-supervised learning-based registration.
- MAS with semi-supervised based registration in a low supervised setting was presented at Neurips ML4H 2019.

TECHNICAL SKILLS

- **Core Expertise**: Computer Vision, Large Language Models, Image Processing, Data Engineering
- **Programming Languages**: Python, C/C++, R, SQL, HTML, CSS
- **Frameworks & Libraries**: PyTorch, TensorFlow, Keras, OpenCV, Hugging Face Transformers
- **Tools & Platforms**: Docker, AWS, CUDA, Git, Linux
- **Imaging Processing**: MATLAB, ITK

CONFERENCE & JOURNAL PUBLICATIONS

H. Lee, M. Zahiri, G. Goutam, et al
"Automated Anatomical Feature Detection for Completeness of Abdominal FAST Exam"
IEEE International Ultrasonics Symposium (IUS), 2023, pp. 1-4.

K.A. Gerbin, T. Grancharova, R. M. Donovan-Maiye, M.C. Hendershott, … , **H. Lee**, et al
"Cell states beyond transcriptomics: integrating structural organization and gene expression in hiPSC-derived cardiomyocytes"
Cell Systems, 2021, Volume 12. Issue 6. pp 680-687.

J. Chen, L. Ding, M. P. Viana, **H. Lee**, et al
"The Allen Cell and Structure Segmenter: a new open source toolkit for segmenting 3D intracellular structures in fluorescence microscopy images"
bioRxiv, 2020

H.W. Lee, M. R. Sabuncu, and A. V. Dalca.
"Few Labeled Atlases are Necessary for Deep-Learning-Based Segmentation"
NeurIPS ML4H: Machine Learning for Health, 2019 [Acc. rate: 26.1%]

PATENTS

C. Christopher, M. Xun, J. Fincke, P. Patel, … , **H. Lee**
"Graphical User Interface for Providing Ultrasound Imaging Guidance"
US published patent: US-20230320694-A1. Oct 2023

M.H. Ghani, **H. Lee**, J. Fincke, B.I Raju
"Ultrasound Imaging"
US published patent: US-20230329674-A1. Oct 2023

H. Lee, M.H. Ghani, J. Fincke, B.I Raju
"Supplemented Ultrasound"
Worldwide published patent: WO-2023242072-A1. Dec 2023

M.H. Ghani, **H. Lee**, J. Fincke, B.I Raju
"Systems and Methods for Imaging Screening"
Worldwide published patent: WO-2024013114-A1. Jan 2024

P.K. Patel, C.E. Haverstock, **H. Lee**, et al
"Dynamic Determination of Imaging Sequence Completeness"
Worldwide published patent: WO-2024235772-A1. Nov 2024

CONFERENCE ABSTRACTS

N.Schnittke, **H. Lee**, C. Gregory, B. Hicks, et all
"Development of a real time organ feature detection to enhance learning and completeness of abdominal FAST exam"
Society of Academic Emergency Medicine (SAEM), Oral Presentation, May 2023

H. Lee, N. Schnittke, J. Fincke, et all
"Artificial Intelligence model to identify organ features for guiding FAST ultrasound exam"
American College of Emergency Physicians (ACEP), Annals of Emergency Medicine 80.4 (2022): S19.

M. U. Ghani, **H. Lee**, J. Fincke, G. Ghoshal, M. Zahiri, et all
"AI Assistance to Acquire High-Quality FAST Exams"
Health System Research Symposium (MHSRS). Poster Presentation. September 2022