Hyeon Woo Lee

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TECHNICAL SKILLS

- Deep Learning: PyTorch, TensorFlow, CNN, Transformers, LSTM, Computer Vision, NLP, Generative AI
- Cloud Development Toolkits: Docker, AWS, HSDP, CUDA
- Programming Language: Python(Scikit-learn, Numpy, Pandas), C/C++, MATLAB, R, HTML, CSS, SQL

PROFESSIONAL EXPERIENCE

Research Data Scientist, *Ultrasound AI group, Philips* July 2020 ~ Present

- Deep learning algorithm development for FAST ultrasound exam on mobile system: *Lumify*
  - Developed real-time organ detection and free fluid segmentation model for 2D ultrasound image
  - Successfully passed internal validation process for AI solution deployment to Philips ultrasound system
- Leading development of middle cerebral arteries (MCA) detection model for Transcranial Doppler ultrasound
  - Developed light MCA detection model for intracranial pressure estimation in 3D ultrasound image
  - Collaborated with MIT and BIDMC for volunteer & patient study and data annotation
- Report classification and style transfer with Large Language Model (LLM)
  - Utilized prompt-engineering and RAG to process the report
- Developed models with variants of CNNs, Transformers, YOLOs, U-Net, and LLaMA2
  - Utilized Multi-Task Learning, Weakly-Supervised Learning, Domain Adaptation, and Generative models
- Developed internal ML model development workflow that is now used by multiple project teams
  - Data extraction, statistical analysis, transformation & load, and model performance evaluation toolbox
  - Active learning to select unlabeled data with high uncertainty for annotation
- Collaborated with UI/UX designer to develop point-of-care-ultrasound workflow and showcased to key customers

Scientific Data Engineer, *Allen Institute for Cell Science, Allen Institute* 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 pseudo-label for the iterative learning.
- 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.

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)

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.

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

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

J. Fincke, J. Sutton, S. Kyne, R. S. Naidu, **H. Lee**, T. Heldt, B. I. Raju,
"Automated ultrasound methods for cerebral blood flow velocity measurement in point-of-care settings"
International Symposium on Intracranial pressure and Brain Monitoring, Cape Town, South Africa, 2022

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"
Military Health System Research Symposium (MHSRS). Poster Presentation. September 2022

ACADEMIC SERVICE

IEEE Engineering in Medicine and Biology Society (EMBC) Reviewer 2023