Hyeon Woo Lee

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Expertise: Deep Learning, Computer Vision, LLMs, Model Optimization for edge device

EXPERIENCE

AI Research Engineer | Philips July 2020 ~ Present

- Lead AI product development for Philips Ultrasound systems (*Lumify*, *Compact 5000 series*, and *Flash 5100*), enhancing real-time diagnostic capabilities for 2D and 3D ultrasound.
- Developed and deployed real-time (20 ms) on-device detection and segmentation models (serving with ONNX, TFLite) for FAST trauma exam guidance and an automated reporting system.
- Developed a large language model (LLM) pipeline for retrieval-augmented generation (RAG) and fine-tuning to standardize unstructured ECG free-text, leveraging vLLM and TensorRT-LLM for faster, optimized inference.
- Designed and trained a transformer-based self-supervised representation model for ECG signal classification.
- Applied multi-task learning, weak supervision, domain adaptation, and knowledge distillation to improve model robustness across limited and noisy datasets from multiple ultrasound systems.
- Built and maintained data engineering and model validation toolkits to support high-quality data curation and rigorous model evaluation workflow aligned with clinical and regulatory standards.
- Contributed to FDA 510(k) and De Novo submissions and authored 5+ granted & published patents.

Scientific Data Engineer | Allen Institute, Cell Science group July 2019 ~ July 2020

- Developer of the *Allen Cell & Structure Segmenter*, an open-source toolkit for microscopic cell images, focusing on computer vision and iterative learning workflows.
- Developed deep learning-based mitotic cell pair detection model and worked on a generative model for 3D image transfer across magnifications and resolutions.

EDUCATION

Cornell University, Ithaca, NY May 2019
Master of Engineering in Biomedical Engineering
Research: Semi-supervised image segmentation (Presented at NeurIPS ML4H). Advised by Dr. Mert Sabuncu

University of Rochester, Rochester, NY December 2017
Bachelor of Science in Biomedical Engineering
Specialization: Signal processing, Machine Learning

TECHNICAL SKILLS

- **Programming Languages**: Python, C/C++, R, SQL, HTML/CSS.
- **Frameworks & Libraries**: PyTorch, TensorFlow, Hugging Face Transformers, vLLM, OpenCV, ITK
- **Tools & Platforms**: Docker, AWS, CUDA, MATLAB, Git, Linux.
- **Model Optimization**: Quantization, Pruning, Distillation, Model Conversion (ONNX & TFLite & TensorRT)

PUBLICATIONS

H. Lee, J.An
"Hybrid Convolution-Transformer Network Integrating Time and Frequency Domains from 12-Lead ECG for Chagas Disease Detection"
Computing in Cardiology (CinC) 2025. Accepted

H. Lee, W. Shi, R. Al Mukaddim, et al,
"Deep Learning-Based Automated Detection of the Middle Cerebral Artery in Transcranial Doppler Ultrasound Examinations"
Ultrasound in Medicine & Biology, 2025, Volume 51. Issue 9. pp 1555-1563

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.

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.

K.A. Gerbin, T. Grancharova, R. M. Donovan-Maiye, … , **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

M.H. Ghani, **H. Lee**, J. Fincke, B.I Raju
"Ultrasound Imaging"
US Patent 12329577, Granted 6/2025

J. Fincke, **H. Lee**, M.H. Ghani, B.I Raju
"Dynamic medical imaging duration warning"
Worldwide published patent: EP-4494568-A1. Jan 2025.

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

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

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