

Sangwu Lee

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Education

University of Rochester | Anticipated May 2024 | Rochester, NY | 4.0/4.0 GPA

Majors: BS in Computer Science | BS Honors in Mathematics

Coursework: Artificial Intelligence, Computer Vision, Deep Learning, Linear Algebra, Analysis, Differential Equations

Publications

1. VisReas : A Dataset for Complex Visual Reasoning with Unanswerable Questions (Under review for AAAI)

Syeda Akter, **Sangwu Lee**, Yingshan Chang, Srijan Bansal, Yonatan Bisk, Eric Nyberg

2. Using AI to measure Parkinson Severity at Home (Nature npj Digital medicine 2023)

Md. Saiful Islam, Wasifur Rahman, Abdelrahman Abdelkader, **Sangwu Lee**, Phillip T. Yang, Jennifer Lynn Purks, Jamie Lynn Adams, Ruth B. Schneider, Earl Ray Dorsey, Ehsan Hoque

[\[Paper\]](#) [\[Demo\]](#)

3. PARK: Parkinson's Analysis with Remote Kinetics Tasks (ACII 2023 Demo)

Sangwu Lee*, Md Saiful Islam*, Abdelrahman Abdelkader, Sooyoung Park, Eshan Hoque

**denotes equal contribution*

4. Detecting Parkinson's Disease Using a Web-Based Speech Task: observational Study (JMIR 2021)

Wasifur Rahman*, **Sangwu Lee***, Md Saiful Islam, Victor Anthony, Harshil Ratnu, Mohammad Rafayet Ali, Abdullah Al Mamun, Ellen Wagner, Stella Jensen-Roberts, Emma Waddell, Taylor Myers, Meghan Pawlik, Julia Soto, Madeleine Coffey, Aayush Sarkar, Ruth Schneider, Christopher Tarolli, Karlo Lizarraga, Jamie Adams, Max A Little, E Ray Dorsey, Ehsan Hoque

**denotes equal contribution*

[\[Paper\]](#)

5. Humor Knowledge Enriched Transformer for Understanding Multimodal Humor (AAAI 2021)

Md Kamrul Hasan, **Sangwu Lee**, Wasifur Rahman, Amir Zadeh, Rada Mihalcea, Louis-Philippe Morency, Ehsan Hoque

[\[Paper\]](#) [\[Code\]](#)

6. Integrating Multimodal Information in Large Pretrained transformers (ACL 2020)

Wasifur Rahman, **Sangwu Lee***, Md Kamrul Hasan*, Amir Zadeh, Chengfeng Mao, Louis-Philippe Morency, Ehsan Hoque

**denotes equal contribution*

[\[Paper\]](#) [\[Code\]](#)

7. Facial expression based imagination index and a transfer learning approach to detect deception (ACII 2019)

Kamrul Hasan, Wasifur Rahman, Luke Gerstner, Taylan Sen, **Sangwu Lee**, Kurtis Glenn Haut, Ehsan Hoque

[\[Paper\]](#)

8. TextMI: Textualize Multimodal Information for Integrating non-verbal cues in pretrained language models (arXiv preprint)

Md Kamrul Hasan, Md Saiful Islam, **Sangwu Lee**, Wasifur Rahman, Iftekhar Naim, Mohammed Ibrahim Khan, Ehsan Hoque

[\[Paper\]](#)

9. Unmasking Parkinson's Disease with Smile: An AI-enabled Screening Framework (Under review for NEJM)

Tariq Adnan, Md Saiful Islam, Wasifur Rahman, **Sangwu Lee**, Sutapa Dey Tithi, Kazi Noshin, Imran Sarker, M Saifur Rahman, Ehsan Hoque

[\[Paper\]](#)

Machine Learning Projects

Pretraining ViT-VQGAN on illustration dataset

- Implemented VQGAN with ViT encoder/decoder architecture in pytorch / jax.
- Reduced training time by 4x using mixed precision, flash attention, and distributed training on GPU environment.
- Released high-quality 2M illustration dataset to the open-source community.
- Curated 3.6M multimodal illustration dataset containing RGB images, text caption, depth map, and sketches.
- Managed training of 100+ hours of GPU training on SLURM cluster.

Diffusion model training on Google TPU cluster

- Implemented state-of-the-art image generation such as MUSE, EDM, MaskGIT, and MAGE.
- Deployed training TPUv3 cluster as part of Google's Tensor Research Compute (TRC) program.

ArXiv Vectors [\[demo\]](#)

- Deployed an LLM embedding based vector search service for arXiv papers from 2010 to now.
- Indexed over 200K+ arXiv documents for vector embedding search.

Parkinson Severity Assessment [\[demo\]](#)

- Developed an ML model which accesses Parkinson severity to the users using mediapipe keypoint features.
- Deployed a Next.js web application which allows accessible assessment of Parkinson severity using only a "laptop" and a "webcam".

Neural Cellular automata [\[demo\]](#)

- Implemented neural cellular automata using JAX inside Google Colab environment.
- Deployed a working public demo on Vercel using tensorflow.js and SvelteKit.

PARK [\[demo\]](#)

- Developed an online AI screening tool for Parkinson's Disease which can provide diagnosis with 89% accuracy.
- Designed and developed a full-stack ML application integrating custom ML models in the backend. The backend was built using FastAPI, Docker, Modal Labs, and Replicate. Frontend was built using Next.js, Tailwind, and Fly.io.
- Expanded dataset collection site to 3x more locations and increased internal video dataset size by 5x.

Awards and Honors

Phi Beta Keppa (2021)

O'Brien Book Award (2020)

Finalist at Y-Combinator (2020)

Dean's List – (Fall 2020 ~ Present)

Dean's List – (Fall 2018 ~ Fall 2019)

Top 5% Most Active user on Weights and Biases

10,780 Hours model training on Weights and Biases

Teaching and Leadership

- Large scale model training and deployment | Workshop Leader | Saudi Authority for Data and AI | 2023 Summer
- Frontiers in Deep learning (Undergraduate) | Teaching Assistant | 2023 Spring
- AI and Deep Learning for Healthcare (Graduate) | Teaching Assistant | 2019 Fall
- Idle Systems | Technical Lead | 2020
- Undergraduate Data Science Club | Workshop Leader | 2019 - 2020
- Japanese Student Association (JSA) | President | 2019 – 2020

Coursework

Mathematics

Analysis Honors Series, Linear Algebra Honors, Real Analysis Honors, Complex Analysis Honors, Advanced Differential Equations, Cryptography, Graduate Number theory, Topology Honors, Combinatorics, Abstract Algebra Honors

Computer Science

Introduction to AI, Machine Vision, Computational introduction to statistics, Data structures and Algorithms, Computer Organisation, Programming language design & implementation, Game theory

Skills and Interests

- **Programming:** Python (5 years), HTML/CSS/JAVASCRIPT (6 years), React (5 years), Svelte (1 year)
- **Machine Learning:** Pytorch (5 years), Pytorch lightning (2 years), JAX (2 years), tensorflow.js (3 months)
- **Interests:** Parallel training using data/model/operator parallelism, TPU training, transformers, diffusion models, image / video synthesis, medial deep learning.