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

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 art dataset to the open-source community.
- 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 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.

Medical AI Experience

Human-Computer Interaction Lab | Research Assistant | 2018 – Present

- 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, and GCP Cloud run. Frontend was built using React and Next.js.
- Expanded dataset collection site to 3x more locations and increased internal video dataset size by 5x.

Publications

1. Using AI to measure Parkinson Severity at Home
   (arXiv preprint | under review for NPJ Digital Medicine)
2. PARK: Parkinson's Analysis with Remote Kinetics Tasks **(ACII 2023 Demo)**
3. TextMI: Textualize Multimodal Information for Integrating non-verval cues in pretrained language models
   (arXiv preprint | under review for IEEE Affective Computing)
4. Detecting Parkinson's Disease Using a Web-Based Speech Task: observational Study **(JMIR 2021)**
5. Humor Knowledge Enriched Transformer for Understanding Multimodal Humor **(AAAI 2021)** [Github]
6. Integrating Multimodal Information in Large Pretrained transformers **(ACL 2020)** [Github]
7. Facial expression based imagination index and a transfer learning approach to detect deception **(ACII 2019)**

Teaching and Leadership

- 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

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, image / video synthesis, medial deep learning.