

Yuzhe (Bryan) Lu

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EDUCATION

Carnegie Mellon University

- M.S. in Machine Learning • GPA: 3.90 / 4.00

Pittsburgh, PA

Dec 2023

Vanderbilt University

- B.A. in Honors Computer Science & Mathematics • GPA: 3.90 / 4.00

Nashville, TN

May 2022

HONORS & AWARDS

- **Carnegie Mellon** Robotics Institute Research Fellowship (Tuition & Stipend).
- **CRA** Outstanding Undergrad Researcher Award Honorable Mention (2022) / (1/1 @ Vanderbilt).
- **Vanderbilt** School of Engineering Research Fellowship (2021), Data Science Institute Research Fellowship (2020), Buchanan Librarian Fellowship (2020), Robert Penn Warren Center Scholarship (2020).

SKILLS

- **Programming Languages:** Python, C++, JavaScript, Java.
- **Tools & Technologies:** PyTorch, Plotly Dash, Streamlit, Flask; React, D3; AWS, GCP, HPC.

SELECTED PUBLICATIONS

[23.W2] **Lu, Y.**, Hong, S., Xu, P., “Leveraging Large Language Models for Radiology Report Generation: Effective Fine-tuning Strategies and Open Challenges.” *Deep Generative Models for Health (submitted)*, 2023.

[23.C1] **Lu, Y.***, Qin, Y.*, Zhai, R., ... and Sycara, K., “Characterizing Out-of-Distribution Error via Optimal Transport.” *Conference on Neural Information Processing Systems (NeurIPS)*, 2023.

[23.J1] Liu, X., Bai, Y., **Lu, Y.**, Soltoggio, A., Kolouri, S., “Wasserstein Task Embedding for Measuring Task Similarities.” *Journal of Neural Networks (Neural Networks)* (submitted), 2023.

[22.C2] **Lu, Y.***, Liu X.*, Soltoggio, A., Kolouri, S., “Set Locality Sensitive Hashing via Sliced Wasserstein Embeddings.” *IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)* (submitted), 2022.

[22.W1] **Lu, Y.**, Perer, A., “An Interactive Interpretability System for Breast Cancer Screening with Deep Learning” *IEEE Visualization Conference (IEEE VIS)*, 2022.

[22.C1] Sahoo, S., **Lu, Y.**, and Berger, M., “Neural Flow Map Reconstruction.” *Eurographics Conference on Visualization (EuroVis)*, 2022.

[21.C2] **Lu, Y.**, Jiang, K., Levine, J.A., and Berger, M., “Compressive Neural Representations of Volumetric Scalar Fields.” *Eurographics Conference on Visualization (EuroVis)*, 2021.

[21.C1] Liu, Q., Louis, P., **Lu, Y.**, ...and Huo, Y. “Simple Triplet Representation Learning with a Single GPU.” *Int. Conf. on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2021.

[21.J1] **Lu, Y.**, Yang, H., ...and Huo, Y., “Holistic Fine-grained Global Glomerular Sclerosis Characterization: From Detection to Unbalanced Classification.” *Journal of Medical Imaging (JMI)*, 2021.

[20.C2] Yang, H., Deng, R., **Lu, Y.**, ...and Huo, Y., “CircleNet: Anchor-Free Glomerulus Detection with Circle Representation.” *Int. Conf. on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2020.

[20.W1] Zhu, Z., **Lu, Y.**, ...and Huo, Y., “An Open-source Tool for Human-in-the-loop Deep Learning of Renal Pathology.” *Int. Conf. on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2020.

PROFESSIONAL EXPERIENCE

Amazon Web Services

Santa Clara, CA

Applied Scientist Intern, advisors: Sungmin Hong, Panpan Xu

May 2023 – Aug 2023

- Implemented a lightweight framework that maps visual features as soft prompts to the large language models (LLMs) for the multimodal task of generating radiology reports from chest X-rays.
- Implemented mixed-precision training, gradient checkpointing, and parameter-efficient finetuning (LoRA) to reduce the memory consumption of LLMs.
- Proposed a novel two-stage fine-tuning strategy that consistently improves clinical accuracy scores (>1.5 points) across various models and established SOTA performance with no additional computation overhead.
- Performed analysis on the attention allocation mechanism for visual soft prompts and model uncertainties, identified lack of groundness and calibration quality as two critical challenges for future works. [23.C2]

Lawrence Livermore National Laboratory

Livermore, CA

Research Intern, advisors: Shusen Liu, Rushil Anirudh, Jay Thiagarajan

May 2022 – Aug 2022

- Designed an algorithm to leverage vision-language model (CLIP) to automatically discover neurons in generative adversarial networks (GAN) as concept segmenters to achieve zero-shot semantic segmentation.
- Distilled zero-shot neuron segmenters by training segmentation models with pseudo annotations.

Carnegie Mellon University

Pittsburgh, PA

Research Intern, advisor: Adam Perer

June 2021 – Aug 2021

- Performed exploratory analysis on 720K+ mammograms, built a patch generation pipeline using OpenCV to extract embedded human annotations, and trained deep neural networks to classify cancerous regions.
- Designed an interactive interpretability system for radiologists to visually probe and label human-interpretable neurons in the trained model to generate customized explanations for clinical support. [22.W1]

Vanderbilt University

Nashville, TN

Data Science Intern, advisor: Yuankai Huo

May 2020 - Aug 2020

- Applied convolutional neural networks for supervised multi-class glomeruli classification, implemented focal loss and a batch sampler to combat imbalanced data distribution, investigated the transferability of large-scale pretrained models on natural images to medical images, improved model acc by 3%.
- Validated the classifier on an external benchmark, achieving 0.994 AUC; integrated the classifier with detection models to form a glomeruli quantification pipeline ready for clinical use. [21.J1]

RESEARCH & PERSONAL PROJECTS

Characterizing Model Performance with Optimal Transport | Advised by Dr. Katia Sycara

- Proposed an Optimal Transport framework to theoretically characterize classifiers' performance on out-of-distribution (OOD) data and achieved state-of-the-art prediction performance. [23.C1]

Concept Learning in Multi-agent RL | Advised by Dr. Katia Sycara

- Implemented concept bottleneck models and an actor-critic algorithm for StarCraft using RLlib.

Set Learning with Sliced Wasserstein Embedding | Advised by Dr. Soheil Kolouri

- Researched Sliced-Wasserstein Embedding to enable non-parametric learning on set data, achieved state-of-the-art performance on three benchmark datasets, and performed ablation analysis on its scalability. [22.J1]

Learn the Optimization Process | Advised by Dr. Soheil Kolouri

- Researched a learn-to-optimize framework to replace algorithmic solvers with a parametric set neural network, which significantly reduces computational time (3x faster on CPU; 100x faster on GPU).
- Implemented classic set learning models (Deep Set) with various pooling mechanisms for the framework.

Neural Volume Visualization | Advised by Dr. Matthew Berger

- Designed an implicit neural representation (INR) model to compress volumetric scalar fields and flow maps that provides state-of-the-art compression performance. [21.C2] [22.C1]

Computational Renal Pathology | Advised by Dr. Yuankai Huo

- Developed the user interface of an open-source renal pathology annotation toolkit in Python [20.W1].
- Extracted glomeruli patches from whole slide images based on annotations stored in XML files [20.C2].
- Implemented a novel contrastive learning method leveraging the multi-view nature of medical images, implemented mixed-precision training to address memory constraints. [21.C1]

Optic Nerve Segmentation | Advised by Dr. Bennett Landman

- Trained a UNet using MONAI to segment optic nerves in brain MRIs, implemented a histogram matching algorithm to standardize input contrast and a denoising step to improve its robustness, significantly reduced segmentation time (100x faster than previous multi-atlas method).

GaokaoPedia | Education Equality

- A project promoting educational equality and future path awareness among high school students in China.
- Co-developed an app on WeChat connecting high school and college students and attracted over 2.2k users.

SELECTED COURSEWORK

- Machine Learning (G), Probabilistic Graphical Models (G), Geometric Deep Learning (G), Deep Reinforcement Learning (G), Deep Learning System (G), Visual Learning & Recognition (G).
- Visual Analytics (G), Data Visualization (UG).
- Data Structures (UG), Algorithms (UG), Operating System (UG), Programming Languages (UG).
- Intermediate Stats (G), Convex Optimization (G), Real Analysis (UG), Graph Theory (UG).

LEADERSHIP & SERVICE EXPERIENCE

AI Mentoring for Underrepresented Student Groups | Mentorship

Pittsburgh, PA

Student Mentor

Aug 2022 – Present

- Paired with undergraduate students from underrepresented groups to expose them to diverse research fields and help them with identifying & apply for research opportunities.

The Wond'ry Center for Innovation and Design

Nashville, TN

Founder at Vanderbilt Innovation and Entrepreneurship Society

Jan 2019 – May 2021

- Won the 1st place among thirty teams in 48 Hour Launch Competition pitching an online spoken English teaching platform that links American college students and overseas English test takers.

Student Advisory Committee Member at Coffee Equity Lab

- Surveyed the third wave coffee industry and learned human-centered design, developed visualizations using D3 to help educate customers, built a Nashville Coffee Atlas using Google My Maps API.

iLEAD

Nashville, TN

PR Chair / Orientation Leader

Aug 2019 – Aug 2020

- Helped new international students adapt to college life by organizing orientation events and bonding activities.
- Designed recruitment and marketing plans, managed social media accounts, and interviewed candidates.

Vanderbilt Student Government

Nashville, TN

Student Service Committee Co-chair

Aug 2019 – May 2020

- Led the committee to promote public transportation usage among the student body