Yuzhe (Bryan) Lu

yuzhelu@cs.cmu.edu / 615-693-5787 / luyuzhe111.github.io

EDUCATION

Carnegie Mellon University — **Pittsburgh, PA**
- M.S. in Machine Learning — Aug 2022 - Dec 2023

Vanderbilt University — **Nashville, TN**
- B.A. in Honors Computer Science & Mathematics • GPA: 3.90 / 4.00 — Aug 2018 - May 2022

HONORS & AWARDS

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

SELECTED PUBLICATIONS

Conference & Workshop

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

[C2] **Lu, Y**., Liu X., Soltoggio, A., Kolouri, S., "Set Locality Sensitive Hashing via Sliced Wasserstein Embeddings." *Association for the Advancement of Artificial Intelligence (**AAAI**) (submitted), 2022.*

[C3] Liu, X., Bai, Y., **Lu, Y**., Soltoggio, A., Kolouri, S., "Wasserstein Task Embedding for Measuring Task Similarities." *Association for the Advancement of Artificial Intelligence (**AAAI**) (submitted), 2022.*

[C4] Liu, X., **Lu, Y**., Abbasi, A., Li, M., Mohammadi, J., Kolouri, S., "Teaching Networks to Solve Optimization Problems." *Asian Conference on Machine Learning (**ACML**), 2022.*

[C5] Sahoo, S., **Lu, Y**., and Berger, M., "Neural Flow Map Reconstruction.", *Eurographics Conference on Visualization (**EuroVis**), 2022.*

[C6] **Lu, Y**., Jiang, K., Levine, J.A., and Berger, M., "Compressive Neural Representations of Volumetric Scalar Fields." *Eurographics Conference on Visualization (**EuroVis**), 2021.*

[C7] Liu, Q., Louis, P. C., **Lu, Y**., ...and Huo, Y. "SimTriplet: Simple Triplet Representation Learning with a Single GPU." *Int. Conf. on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2021.*

[C8] 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.*

[W9] Zhu, Z., **Lu, Y.**, Deng, R., ...and Huo, Y., "EasierPath: 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,*

Journal

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

PROFESSIONAL EXPERIENCE

Lawrence Livermore National Laboratory Livermore, CA
Research Intern, advisors: Shusen Liu, Rushil Anirudh 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 a downstream segmentation model for fast inference.

CMU HCI Institute 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 explore and label human-interpretable neurons in the trained model to generate customized explanations for clinical support. [W1]

Data Science Institute Nashville, TN
Data Science Intern, advisor: Yuankai Huo May 2020 - Aug 2020

- Adapted 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 models pretrained on natural dataset of various scales to medical images, improved model acc by 3%.
- Validated the classifier on an external benchmark, achieving 0.994 AUC, integrated the classifier with glomeruli detection models to form a glomeruli quantification pipeline ready for clinical use. [J1]

RESEARCH & PERSONAL PROJECTS

Computational Optimal Transport | 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. [C2]
- Working on releasing a PyTorch package on Sliced-Wasserstein Distance with tutorials on its scalability and sample complexity as well as its application to k-means clustering and generative modeling.

Learn the Optimization Process | Advised by Dr. Soheil Kolouri

- Researched a radical learning framework to replace the iterative optimization process with a parametric set function, applied the framework to non-linear regression, transport coresets, demand-supply management.
- Implemented classic set learning models including Deep Set and Set Transformer for the framework. [C4]

Neural Volume Visualization | Advised by Dr. Matthew Berger

- Designed an implicit neural representation (INR) model to compress both 3D and time-varying volumetric scalar fields that provides state-of-the-art compression performance. [C5] [C7]
- Investigated the impact of higher-order interpolants in learning implicit neural representations, explored using attention mechanism in Transformers as a learned interpolation scheme.

Computational Renal Pathology | Advised by Dr. Yuankai Huo

- Developed the user interface of EasierPath, an open-source renal pathology annotation toolkit in Python [W8].
- Collected glomeruli annotations stored in XML files and extracted corresponding regions of interests from whole slide images using OpenSlide to train CircleNet, a novel glomeruli detection algorithm. [C9]
- Implemented the training framework for SimTriplet, a novel contrastive learning method leveraging the multi-view nature of medical images, implemented mixed-precision training to address memory constraints. [C6]

Optic Nerve Segmentation | Advised by Dr. Bennett Landman

- Trained a 2D U-Net using MONAI to segment optic nerves in brain MRIs, implemented a histogram matching algorithm to standardize contrast and a postprocessing step finding largest connected components. The model serves as a robust translation of the previous multi-atlas method and is more than 100 times faster.

Large-scale Image / Caption Matching

- Implemented a deep multimodal embedding solution to retrieve texts for images on Wikipedia, investigated the effect of pooling mechanisms in learning the joint embedding space, scored Top 10 on Kaggle competition.

GaokaoPedia | Education Equality

- A project promoting educational equality and future path awareness among high school students in China.
- Co-developed a WeChat mini program that connects high school and college students based on alumni relations that attracts over 2.2k users. Won second place in Tencent Global mini program competition.

SELECTED COURSEWORK

- Machine Learning, Geometric Deep Learning.
- Data Visualization, Visual Analytics.
- Data Structures, Algorithms, Operating System, Programming Languages.
- Multivariate Calculus, Linear Algebra, Mathematical Stats, Probability, Real Analysis, Graph Theory.

LEADERSHIP & SERVICE EXPERIENCE

The Wond'ry Center for Innovation and Design | Design Thinking — 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 | Mentorship — 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 | Service — Nashville, TN

Student Service Committee Co-chair — Aug 2019 – May 2020

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