

Chen Liu

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Education

Yale University, Ph.D. in Computer Science.

New Haven, CT. Aug 2022 - May 2027

Ph.D. Advisor Smita Krishnaswamy, Associate Professor of Computer Science and Genetics

Research Areas Deep Learning, Manifold Learning, Computer Vision, Medical Imaging.

Teaching Fellow (1) Deep Learning on Graphs (Rex Ying), (2) AI Foundation Models (LLM) (Arman Cohan).

Columbia University, M.S. in Electrical Engineering

New York, NY. Aug 2018 - Feb 2020

• Nikola Tesla Electrical Engineering Scholar (“to the most exceptional applicants”, \approx top 10% among those admitted)

Bucknell University, B.S. in Electrical Engineering, Minor in Biomedical Engineering

Lewisburg, PA. Aug 2014 - May 2018

• Tau Beta Pi Honor, Alpha Lambda Delta Honor, ILTM student consultant

Academia Experience

Ph.D. Research @ Yale University

New Haven, CT. Aug 2021 - Jul 2022

As a Ph.D. student, I specialize in the theory and applications of deep learning, with a focus on manifold learning.

Quantifying entropy and mutual information in neural networks: Defined a novel entropy measure leveraging diffusion geometry that can operate robustly at very high data dimensions and is applicable to modern-scale deep neural networks.

Paper #3

Unsupervised multigranular medical image segmentation: Extracted latent representation of images with intra-image contrastive learning and a local reconstruction objective, and coarse-grained into segments using diffusion condensation.

Paper #4

Prediction of longitudinal progression over irregularly-sampled medical images: Proposed a registration-free method to temporally extrapolate images by modeling the time-dependent variations while isolating the confounding factors.

Industry Experience

Senior Research Scientist @ GE Healthcare

San Ramon, CA. Aug 2021 - Jul 2022

Research and development of deep learning solutions in medical imaging.

Keypoint detection: Designed an adversarial objective to improve detection of anatomical landmarks in X-ray images.

Patent #1

Image classification: Classified X-ray images on whether they contain unwanted external objects.

Patent #2

Research Software Engineer @ Matician Inc

Palo Alto, CA. Jan 2021 - Jun 2021

In a team of 3, developed SLAM from scratch in Rust, running 30 times faster than the SOTA ORB-SLAM using only visual input.

Real-time SLAM research & development: Covered re-localization, loop detection, geometric and temporal check, etc.

Research Assistant (Funded by Grant) @ Columbia University Medical Center

New York, NY. Dec 2019 - Nov 2020

Return offer after working in the lab. Led or participated in projects and mentored master students in research.

Authored 10+ publications in conferences or journals.

Image-to-image translation & downstream analysis: Image synthesis to bypass harmful contrast agents in MRI.

Paper #5

Signal processing & signal registration: Designed and developed a software for MR spectroscopy processing.

Paper #6

Semantic segmentation: Improved dense cell segmentation with edge feature enhancement.

Paper #7

Skills

Research Machine Learning, Deep Learning, Information Theory, Computer Vision, Medical Imaging (radiology): MRI, CT, etc.

Programming Python (PyTorch, TensorFlow, Numpy, etc.), \LaTeX , Linux Bash, Git, Docker, Rust, C++

Achievements and Services

active **Reviewer**, *Conferences* NeurIPS 2021-23, ICLR 2022-24, ICML 2022. *Journals* IEEE TNNLS.

2022 **Outstanding Reviewer Award**, International Conference on Machine Learning (ICML)

top 10%

Selected Publications and Patents

- Co-inventor. “System and Method for Obtaining Accurate Measurements and Quantification of X-Ray Image from Estimation of Key Anatomical Locations”. **US Patent App.** GE Healthcare. [Patent]
- Co-inventor. “X-Ray Lead Marker Detection System for X-Ray Imaging System”. **US Patent App.** GE Healthcare. [Patent]
- Danqi Liao*, Chen Liu*, et al. “Assessing Neural Network Representations During Training Using Noise-resilient Diffusion Spectral Entropy”. Presented at the **TAG-ML Workshop, ICML 2023**. Under review at *AISTATS 2024*. [Git]
- Chen Liu*, et al. “CUTS: A Framework for Multigranular Unsupervised Medical Image Segmentation”. Under review. [PDF] [Git]
- Chen Liu*, et al. “Deep learning of MRI contrast enhancement for mapping cerebral blood volume from single-modal non-contrast scans of aging and Alzheimer’s disease brains”. *Frontiers on Aging Neuroscience* (Impact Factor: 5.7). [PDF] [Git]
- Chen Liu, et al. “JET – A MATLAB Toolkit for Automated J-Difference-Edited MR Spectra Processing of in vivo Mouse MEGA-PRESS Study at 9.4 T”. *ISMRM 2021*. [PDF] [Git]
- Nanyan Zhu*, Chen Liu*, et al. “Segmentation with Residual Attention U-Net and an Edge-Enhancement Approach Preserves Cell Shape Features”. *IEEE EMBC 2022*. [PDF] [Git]