Peirong Liu

Postdoctoral Researcher
Athinoula A. Martinos Center for Biomedical Imaging
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Education

University of North Carolina at Chapel Hill — Chapel Hill, U.S
Ph.D. in Computer Science — Aug 2018 – Jun 2023
- Advisor: Dr. Marc Niethammer
- Thesis Committee: Dr. Yueh Z. Lee, Dr. Stephen Aylward, Dr. Colin Raffel, Dr. Gedas Bertasius

Shanghai University — Shanghai, China
B.S. in Mathematics and Applied Mathematics — Sep 2014 – Jun 2018
- GPA: 3.95/4.00 (Rank: 1/305)
- Presidential Scholarship; National Scholarship

Summary

My research interest lies in **AI for Healthcare**, at an intersection of machine learning, computer vision, and medical imaging. My recent research topics include
- Partial differential equations, physics-driven learning, optimal transport
- Generative models, modality-agnostic foundation models for medical imaging
- Clinical applications: CT/MR perfusion imaging, low-field MR imaging, stroke diagnosis

Experience

Harvard Medical School & Massachusetts General Hospital — Boston, U.S
Postdoctoral researcher (Host: Dr. Juan Eugenio Iglesias) — Aug 2023 – present
- Modality-agnostic foundation models for medical imaging
- Pathology representation and detection, low-field MR imaging

Department of Computer Science, University of North Carolina at Chapel Hill — Chapel Hill, U.S
Research assistant (Advisor: Dr. Marc Niethammer) — Jan 2019 – Aug 2023
- Partial differential equations, physics-driven learning for perfusion imaging
- Regularized optimal mass transport (rOMT), non-rigid fluid-based image registration

Computer Vision (Generative AI), Meta AI — New York, U.S
Research Intern: open-vocabulary object detection, multi-object tracking — May 2022 – Nov 2022

Computer Vision (Content Understanding), Facebook AI — New York, U.S
Research Intern: unsupervised image synthesis, motion transfer — May 2021 – Nov 2021

Biomedical Research Imaging Center, University of North Carolina at Chapel Hill — Chapel Hill, U.S
Research assistant (Advisors: Dr. Dinggang Shen and Dr. Pew-Thian Yap) — Aug 2018 – Dec 2018
- Geometric deep learning for mesh-structured data

Selected Publications

Journal

Peirong Liu, Yueh Z. Lee, Stephen Aylward, and Marc Niethammer, "Perfusion Imaging: An Advection Diffusion Approach," *IEEE Transactions on Medical Imaging (TMI)*, 2021. [paper] [code]

Refereed Conference

Peirong Liu, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, and Juan E. Iglesias, "Brain-ID: Learning Contrast-agnostic Anatomical Representations for Brain Imaging," *ECCV*, 2024. [paper] [code]

Peirong Liu, Oula Puonti, Annabel Sorby-Adams, William T. Kimberly, and Juan E. Iglesias, "PEPSI: Pathology-Enhanced and Pulse-Sequence-Invariant Representations for Brain MRI," *MICCAI*, 2024. [paper] [code]

Peirong Liu, Yueh Z. Lee, Stephen Aylward, and Marc Niethammer, "Deep Decomposition for Stochastic Normal-Abnormal Transport," *CVPR*, 2022. (Oral - 4.0%) [paper] [code]

Peirong Liu, Lin Tian, Yubo Zhang, Stephen Aylward, Yueh Z. Lee, and Marc Niethammer, "Discovering Hidden Physics Behind Transport Dynamics," *CVPR*, 2021. (Oral - 3.7%) [paper] [code]

Zhengyang Shen, Jean Feydy, **Peirong Liu**, Ariel Hernán Curiale, Ruben San José Estépar, and Marc Niethammer, "Accurate Point Cloud Registration with Robust Optimal Transport," *NeurIPS*, 2021. [paper] [code]

Zhipeng Ding, Xu Han, **Peirong Liu**, and Marc Niethammer, "Local Temperature Scaling for Probability Calibration," *ICCV*, 2021. [paper] [code]

Peirong Liu, Yueh Z. Lee, Stephen Aylward, and Marc Niethammer, "PIANO: Perfusion Imaging via Advection-diffusion," *MICCAI*, 2020. (Early accept; Oral - 5.0%) [paper] [code]

Lin Tian, Connor Puett, **Peirong Liu**, Zhengyang Shen, Stephen Aylward, Yueh Z. Lee, and Marc Niethammer, "Fluid registration between lung CT and stationary chest tomosynthesis images," *MICCAI*, 2020. [paper] [code]

Peirong Liu, Zhengwang Wu, Gang Li, Pew-Thian Yap, and Dinggang Shen, "Deep Modeling of Growth Trajectories for Longitudinal Prediction of Missing Infant Cortical Surfaces," *IPMI*, 2019. (Oral - 10.0%) [paper] [code]

Under Review

Peirong Liu, Oula Puonti, Xiaoling Hu, Karthik Gopinath, Annabel Sorby-Adams, William T. Kimberly, and Juan E. Iglesias, "A Modality-agnostic Multi-task Vision Foundation Model for Brain Imaging," *In Submission to IEEE Transactions on Medical Imaging (TMI)*, 2024.

Peirong Liu, Yueh Z. Lee, Stephen Aylward, and Marc Niethammer, "HARP: Hemisphere-normalized Atlas Representing Perfusion," *In Submission to Radiology*, 2024.

Peirong Liu, Yueh Z. Lee, Stephen Aylward, and Marc Niethammer, "D^2-SONATA+: Deep Decompositions for Stochastic Normal-Abnormal Transport," *In Submission to IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023.

Invited Talks

Perfusion Imaging via Mass Transport
Athinoula A. Martinos Center for Biomedical Imaging, Harvard Medical School, Charlestown, US Mar 2023
Brigham and Women's Hospital, Harvard Medical School, Boston, US Jan 2023
Weill Cornell Medicine, Cornell University, New York, US Dec 2022

Deep Decomposition for Stochastic Normal-Abnormal Transport
CVPR'22, New Orleans, US Jun 2022

Discovering Hidden Physics Behind Transport Dynamics
CVPR'21, Virtual Jun 2021

Perfusion Imaging via Advection-diffusion
MICCAI'20, Virtual Oct 2020

Deep Modeling of Growth Trajectories for Longitudinal Prediction of Missing Infant Cortical Surfaces
IPMI'19, Hong Kong, China Jun 2019

Awards

Rising Stars in Data Science, *UCSD & UChicago & Stanford* 2024
Rising Stars in EECS, *MIT* 2024
MICCAI NIH Award, *Marrakesh* 2024
MICCAI Travel Award, *Lima* 2020
IPMI Scholarship, *Hong Kong* 2019
Presidential Scholarship, *Shanghai University (Highest Honor, Top 10)* 2018
Outstanding Graduate, *Ministry of Education of China* 2018
National Scholarship, *Ministry of Education of China (Top 1%)* 2017
Baogang Outstanding Student Award, *Shanghai (Top 4)* 2017
Finalist Winner, *U.S. Mathematical Contest In Modeling (MCM) (Team leader, Top 0.4%, 36/8843)* 2017
Third Prize, *Shanghai Mathematics Competitions (Math Major)* 2016
Top Grade Scholarship, *Shanghai University (Top 3%)* 2015-2017
Outstanding Student Award, *Shanghai University* 2015-2017
Academic Innovation Award, *Shanghai University* 2015-2016
Public Service Award, *Shanghai University* 2015-2016

DEI

Volunteer research mentor at Talaria Summer Institute, for students of underrepresented genders
Member and guest speaker at UNC GWiCS (Graduate Women in Computer Science)
Reviewer and invited presenter at WiCV WiCV (Women in Computer Vision)

Services

Journals: Computer Graphics Forum, Frontiers in Radiology, PLOS ONE
Conferences: NeurIPS, ICLR, CVPR, ICCV, ECCV, AAAI, WiCV, MICCAI, IPMI, ISBI

Skills

Computer: Python, MATLAB, C/C++, LaTeX, HTML, JAVA, R
Libraries & OS: PyTorch, TensorFlow, ITK, FreeSurfer; Linux (Ubuntu), Mac OSX
Languages:

- Mandarin (Native Proficiency)
- English (Full Professional Proficiency)
  - TOEFL: 116 (R-30, L-30, S-27, W-29)
  - Shanghai Advanced-level English Interpretation Certificate

Misc: Guzheng (Professional Level-10 with Distinction); Piano; Drums; Rock Climbing