Peirong Liu

Tenure-Track Assistant Professor
Department of Electrical and Computer Engineering
Whiting School of Engineering
Johns Hopkins University

♀ She/Her/Hers
Google Scholar
peirong@jhu.edu
peirong26.github.io

Summary

My research interests broadly lie in **AI for Healthcare**, at an intersection of machine learning (**ML**), computer vision (**CV**), and medical image computing (**MIC**):

- **ML & CV:** Physics-informed deep learning, representation learning, generative modeling, anomaly detection
- **Applied Math & Physics:** Differential geometry, differential equations, fluid dynamics, optimal transport
- **Fundamental MIC:** Image reconstruction/segmentation/registration, foundation models in medical imaging
- **Clinical Applications:** Neuroimaging, diffusion MRI, functional MRI, cardiovascular diseases

Experience

Whiting School of Engineering, Johns Hopkins University — Baltimore, MD
Tenure-Track Assistant Professor — Jul 2025 – Present
- Department of Electrical and Computer Engineering (Primary)
- Data Science and AI Institute (Secondary)
- Department of Computer Science (Secondary)
- Department of Applied Mathematics and Statistics (Secondary)

Harvard Medical School & Massachusetts General Hospital — Cambridge, MA
Postdoctoral Researcher — Aug 2023 – Jun 2025
- Athinoula A. Martinos Center for Biomedical Imaging

University of North Carolina at Chapel Hill — Chapel Hill, NC
Research Assistant — Aug 2018 – May 2023
- Department of Computer Science

AI Applied Research, Meta (Facebook) — New York, NY
Student Researcher — May 2021 – Nov 2022
- Computer Vision, Generative AI

Education

University of North Carolina at Chapel Hill — Chapel Hill, NC
Ph.D. in Computer Science — Aug 2018 – May 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 (Department & School Rank: 1/85 & 1/305)
- Presidential Scholarship; National Scholarship

Awards

Rising Stars in Data Science, *UCSD & UChicago & Stanford* — 2024
Rising Stars in EECS, *MIT* — 2024
MICCAI NIH Award, *Marrakesh, MICCAI'24* — 2024
MICCAI Travel Award, *Lima, MICCAI'20* — 2020
IPMI Scholarship, *Hong Kong, IPMI'19* — 2019
Presidential Scholarship (Highest Honor), *Shanghai University* — 2018
National Scholarship (Top 1%), *Ministry of Education of China* — 2018
Outstanding Graduate, *Ministry of Education of China* — 2018
Baogang National Scholarship (Top 4), *Shanghai University* — 2017
Finalist Winner (Team leader, Top 0.4%, 36/8843), *U.S. Mathematical Contest In Modeling* — 2017
Third Prize (Math Major), *Shanghai Mathematics Competitions* — 2016
Top Grade Scholarship (Top 3%), *Shanghai University* — 2015-2017
Outstanding Student Award, *Shanghai University* — 2015-2017

Selected Publications

Journal

[Brain Commun] P. Liu, D. Zemlyanker, K. Gopinath, Y. Cheng, Y. He, D. Izquierdo, *et al.*, "The normalizing properties of intracranial volume across race and sex", *Brain Communications*, 2025.

[IEEE TMI] P. Liu, Y. Z. Lee, S. Aylward, and M. Niethammer, "Perfusion Imaging: An Advection Diffusion Approach", *IEEE Transactions on Medical Imaging*, 2021. [paper] [code]

Conference

[CVPR'25] P. Liu, A. L. Aguila and J. E. Iglesias, "Unraveling Normal Anatomy via Fluid-Driven Anomaly Randomization", *CVPR*, 2025. [paper] [code]

[ICLR'25] X. Hu, K. Gopinath, P. Liu, M. Hoffmann, K. V. Leemput, O. Puonti, J. E. Iglesias, "Hierarchical uncertainty estimation for learning-based registration in neuroimaging", *ICLR*, 2025. [paper] [code]

[ECCV'24] P. Liu, O. Puonti, X. Hu, D. C. Alexander, and J. E. Iglesias, "Brain-ID: Learning Contrast-agnostic Anatomical Representations for Brain Imaging", *ECCV*, 2024. [paper] [code]

[MICCAI'24] P. Liu, O. Puonti, A. Sorby-Adams, W. T. Kimberly, and J. E. Iglesias, "PEPSI: Pathology-Enhanced and Pulse-Sequence-Invariant Representations for Brain MRI", *MICCAI*, 2024. [paper] [code]

[ISBI'24] P. Laso, S. Cerri, A. Sorby-Adams, J. Guo, F. Matteen, P. Goebl, J. Wu, P. Liu, H. Li, S. I. Young, B. Billot, O. Puonti, G. Sze, S. Payabvash, A. Dehavenon, K. N. Sheth, M. S. Rosen, J. Kirsch, N. Strisciuglio, J. M. Wolterink, A. Eshaghi, F. Barkhof, W. T. Kimberly, J. E. Iglesias. "Quantifying White Matter Hyperintensity and Brain Volumes in Heterogeneous Clinical and Low-Field Portable MRI", *ISBI*, 2024. **(Oral)** [paper] [FreeSurfer]

[CVPR'22] P. Liu, Y. Z. Lee, S. Aylward, and M. Niethammer, "Deep Decomposition for Stochastic Normal-Abnormal Transport", *CVPR*, 2022. **(Oral - 4.0%)** [paper] [code]

[CVPR'21] P. Liu, L. Tian, Y. Zhang, S. Aylward, Y. Z. Lee, and M. Niethammer, "Discovering Hidden Physics Behind Transport Dynamics", *CVPR*, 2021. **(Oral - 3.7%)** [paper] [code]

[NeurIPS'21] Z. Shen, J. Feydy, P. Liu, A. H. Curiale, R. San José Estépar, and M. Niethammer, "Accurate Point Cloud Registration with Robust Optimal Transport", *NeurIPS*, 2021. [paper] [code]

[ICCV'21] Z. Ding, X. Han, P. Liu, and M. Niethammer, "Local Temperature Scaling for Probability Calibration", *ICCV*, 2021. [paper] [code]

[MICCAI'20] P. Liu, Y. Z. Lee, S. Aylward, and M. Niethammer, "PIANO: Perfusion Imaging via Advection-diffusion", *MICCAI*, 2020. **(Early accept; Oral - 5.0%)** [paper] [code]

[MICCAI'20] L. Tian, C. Puett, P. Liu, Z. Shen, S. Aylward, Y. Z. Lee, and M. Niethammer, "Fluid registration between lung CT and stationary chest tomosynthesis images", *MICCAI*, 2020. [paper] [code]

[IPMI'19] P. Liu, Z. Wu, G. Li, P.-T. Yap, and D. Shen, "Deep Modeling of Growth Trajectories for Longitudinal Prediction of Missing Infant Cortical Surfaces", *IPMI*, 2019. **(Oral - 5.0%)** [paper] [code]

Under Review

P. Liu, O. Puonti, X. Hu, K. Gopinath, A. Sorby-Adams, W. T. Kimberly, and J. E. Iglesias, "A Modality-agnostic Multi-task Vision Foundation Model for Brain Imaging", *Under Review at IEEE Transactions on Medical Imaging*, 2024.

P. Liu, Y. Z. Lee, S. Aylward, and M. Niethammer, "HARP: Hemisphere-normalized Atlas Representing Perfusion", *Under Review at Radiology*, 2024.

P. Liu, Y. Z. Lee, S. Aylward, and M. Niethammer, "D^2-SONATA+: Deep Decompositions for Stochastic Normal-Abnormal Transport", *Under Review at IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2023.

Invited Talks

Physics-Informed Learning For Interpretable Diagnosis
Computer Science & Artificial Intelligence Laboratory (CSAIL), MIT, Cambridge, US Jul 2025

Robust and Interpretable Learning for Modern Healthcare
Pioneer Centre for AI, University of Copenhagen, Copenhagen, Denmark Jun 2025
Center for Biomedical Imaging, University of Lausanne, Vaud, Switzerland Apr 2025

Rising Stars in Data Science, UCSD & UChicago & Stanford, San Diego, US Nov 2024
Rising Stars in EECS, MIT, Cambridge, US Oct 2024

Towards Modality-Agnostic Foundation Models For Brain Imaging
Boston Medical Image Analysis Workshop, MIT EECS, Cambridge, US Oct 2024

Perfusion Imaging via Mass Transport
Athinoula A. Martinos Center for Biomedical Imaging, Harvard Medical School, Charlestown, US Mar 2023
Boston Children's Hospital, Harvard Medical School, Boston, US Feb 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

Services

Reviewing:
- Meta Reviewer (Area Chair): MICCAI
- **Conference**: NeurIPS, ICLR, ICML, CVPR, ICCV, ECCV, AAAI, AISTATS, MICCAI, IPMI, MIDL, ISBI
- **Journal**: IEEE TMI, Medical Image Analysis, Computer Graphics Forum, Frontiers in Radiology

Others:
- Election officer at WiM (Women in MICCAI)
- Research mentor at Talaria Summer Institute
- Member and guest speaker at UNC GWiCS (Graduate Women in Computer Science)
- Volunteer and invited presenter at WiCV (Women in Computer Vision)

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 the Highest Distinction); Piano; Drums; Rock Climbing