

# Peirong Liu

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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

**Shanghai University**

Shanghai, China

*B.S. in Mathematics and Applied Mathematics (GPA: 3.95/4; Rank: 1/305)*

Sep 2014 – Jun 2018

## Summary

My research interests broadly lie in computer vision, machine learning and medical imaging. My recent research topics include (1) Visual foundation models for medical imaging; (2) Physics-informed deep learning for perfusion imaging; (3) Open-vocabulary object detection, multi-object tracking; (4) Unsupervised motion transfer, video synthesis; (5) Regularized optimal transport, fluid-based non-rigid image registration.

## Publications

**Peirong Liu**, Oula Puonti, Xiaoling Hu, Daniel C. Alexander, Juan E. Iglesias. “Brain-ID: Learning Robust Feature Representations for Brain Imaging”. *In Submission*, 2023. [paper] [code]

Pablo Laso, Stefano Cerri, Annabel Sorby-Adams, Jennifer Guo, Farrah Matteen, Philipp Goebel, Jiaming Wu, **Peirong Liu**, Hongwei Li, Sean I. Young, Benjamin Billot, Oula Puonti, Gordon Sze, Sam Payabvash, Adam Dehavenon, Kevin N. Sheth, Matthew S. Rosen, John Kirsch, Nicola Strisciuglio, Jelmer M. Wolterink, Arman Eshaghi, Frederik Barkhof, William T. Kimberly, Juan E. Iglesias. “Quantifying White Matter Hyperintensity and Brain Volumes in Heterogeneous Clinical and Low-Field Portable MRI”. *In Submission*, 2023.

**Peirong Liu**, Yueh Z. Lee, Stephen Aylward, Marc Niethammer. “HARP: Hemisphere-normalized Atlas Representing Perfusion”. *In Submission*, 2023.

**Peirong Liu**, Yueh Z. Lee, Stephen Aylward, Marc Niethammer. “D<sup>2</sup>-SONATA+: Deep Decompositions for Stochastic Normal-Abnormal Transport”. *In Submission*, 2023.

**Peirong Liu**, Rui Wang, Pengchuan Zhang, Omid Poursaeed, Yipin Zhou, Xuefei Cao, Sreya Dutta Roy, Ashish Shah, Ser-Nam Lim. “Unifying Tracking and Image-Video Object Detection”. *arXiv*, 2022. [paper]

**Peirong Liu**, Yueh Z. Lee, Stephen Aylward, Marc Niethammer. “Deep Decomposition for Stochastic Normal-Abnormal Transport”. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022. (Oral - 4.0%) [paper] [code]

Maxime Oquab, Daniel Haziza, Ludovic Schwartz, Katayoun Zand, Tao Xu, **Peirong Liu**, Rui Wang, Camille Couprie. “Efficient Conditioned Face Animation Using Frontally-viewed Embedding”. *arXiv*, 2022. [paper]

**Peirong Liu**, Rui Wang, Xuefei Cao, Yipin Zhou, Ashish Shah, Maxime Oquab, Camille Couprie, Ser-Nam Lim. “Differential Motion Evolution for Fine-Grained Motion Deformation in Unsupervised Image Animation”. *arXiv*, 2022. [paper]

**Peirong Liu**, Lin Tian, Yubo Zhang, Stephen Aylward, Yueh Z. Lee, Marc Niethammer. “Discovering Hidden Physics Behind Transport Dynamics”. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021. (Oral - 3.7%) [paper] [code]

Zhengyang Shen\*, Jean Feydy\*, **Peirong Liu**, Ariel Hernán Curiale, Ruben San José Estépar, Raúl San José Estépar, Marc Niethammer. “Accurate Point Cloud Registration with Robust Optimal Transport”. *Conference on Neural Information Processing Systems (NeurIPS)*, 2021. [paper] [code]

Zhipeng Ding, Xu Han, **Peirong Liu**, Marc Niethammer. “Local Temperature Scaling for Probability Calibration”. *IEEE/CVF International Conference on Computer Vision (ICCV)*, 2021. [paper] [code]

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

**Peirong Liu**, Yueh Z. Lee, Stephen Aylward, Marc Niethammer. “PIANO: Perfusion Imaging via Advection-diffusion”. *Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2020. (Oral - 5%, student travel award) [paper] [code]

Lin Tian, Connor Puett, **Peirong Liu**, Zhengyang Shen, Stephen Aylward, Yueh Z. Lee, Marc Niethammer. “Fluid registration between lung CT and stationary chest tomosynthesis images”. *Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2020. [paper] [code]

**Peirong Liu**, Zhengwang Wu, Gang Li, Pew-Thian Yap, Dinggang Shen. “Deep Modeling of Growth Trajectories for Longitudinal Prediction of Missing Infant Cortical Surfaces”. *Information Processing in Medical Imaging (IPMI)*, 2019. (Oral - 10%, IPMI scholarship) [paper] [code]

## Research Experience

- Department of Computer Science, University of North Carolina at Chapel Hill** Chapel Hill, U.S.  
*Research assistant, Supervisor: Dr. Marc Niethammer* Jan 2019 – Present
- Research on PDE/Physics-informed deep learning for perfusion imaging analysis.
  - Research on regularized optimal mass transport (rOMT) and non-rigid fluid-based image registration.
- Computer Vision (Content Understanding), Meta AI** New York, U.S.  
*Research Intern, Supervisors: Dr. Rui Wang and Dr. Ser-Nam Lim* May 2022 – Nov 2022
- Research on open-vocabulary image and video object detection, multi-object tracking.
- Computer Vision (AI Integrity), Facebook AI** New York, U.S.  
*Research Intern, Supervisors: Dr. Rui Wang and Dr. Ser-Nam Lim* May 2021 – Nov 2021
- Research on self-supervised, neural-ODE-based general framework for multi-view motion transfer.
- Biomedical Research Imaging Center, University of North Carolina at Chapel Hill** Chapel Hill, U.S.  
*Research assistant, Supervisors: Dr. Dinggang Shen and Dr. Pew-Thian Yap* Aug 2018 – Dec 2018
- Research on geometric deep learning for mesh-structured data. Proposed a spatio-temporal-aware graph convolution neural network (GCNN) for longitudinal prediction of infant cortical growth.
- Department of Mathematics, Shanghai University** Shanghai, China.  
*Undergraduate researcher, Supervisor: Dr. Shihui Ying* Sep 2016 – Jun 2018
- Research on Riemannian spaces of shapes via the diffeomorphism group representation.

## Honors

- MICCAI Student Travel Award, Lima 2020
- IPMI Scholarship, Hong Kong 2019
- Outstanding Graduate, Shanghai 2018
- President's List, Shanghai University (the Highest honor, Top 10) 2017
- National Scholarship, Shanghai University (Top 1%) 2017
- Baogang Outstanding Student Award, Shanghai (Top 4) 2017
- Finalist Winner, U.S. Mathematical Contest In Modeling (MCM) (36 out of 8843 teams) 2017
- Third Prize, Shanghai Mathematics Competitions (Math Major) 2016
- Top Grade Scholarship, Shanghai University (Top 3%) 2015, 2016, 2017
- Outstanding Student, Shanghai University 2015, 2016, 2017
- Academic Innovation & Leadership & Public Service Award, Shanghai University 2015, 2016, 2017

## Services

- Editorial board of Artificial Intelligence in Radiology
- Review editor of Frontiers in Radiology
- Reviewer of NeurIPS, ICLR, CVPR, ICCV, ECCV, MICCAI, IPMI, ISBI

## Skills

- Computer:** Python, MATLAB, C/C++,  $\LaTeX$ , HTML, JAVA, R, MS Office
- Libraries & OS:** PyTorch, TensorFlow, ITK, FreeSurfer; Linux (Ubuntu), Mac OSX
- Languages:**
- Mandarin (Native Proficiency)
  - English (Full Professional Proficiency)
    - TOEFL: 112 (R-29, L-29, S-26, W-28), GRE: 327+4.5 (V-157, Q-170, AW-4.5)
    - Advanced-level English Interpretation Certificate (Same level as Test for English Majors-Band 8 (TEM-8) for students in English major)
- Hobbies:**
- Guzheng: Professional level-10 certificate (“Distinction”), Duke Music Ensemble member
  - Piano; Keyboard; Drums; Climbing; Biking