

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) Physics-informed deep learning for transport video understanding and anomaly detection; (2) Vision transformer (ViT) based, open-vocabulary image-video object detection, and multi-object tracking; (3) Unsupervised motion transfer and video synthesis; (4) Regularized optimal transport; (5) Fluid-based non-rigid image registration.

Publications

Peirong Liu, Marc Niethammer. “D²-SONATA+: Deep Decompositions for Stochastic Normal-Abnormal Transport”. *In Submission to IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2023.

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

Peirong Liu, Yueh 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]

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. “Self-appearance-aided Differential Evolution for Motion Transfer”. *arXiv*, 2021. [paper]

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

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]

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

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

Peirong Liu, Yueh 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]

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

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]

Industry Experience

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 vision transformer based, open-vocabulary image and video object detection, multi-object tracking. [Paper]

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. [Paper]

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 learning for mass transport, from optimization-based and deep-learning-based perspectives. [MICCAI'20 Oral, IEEE TMI, CVPR'21 Oral, CVPR'22 Oral]
- Research on regularized optimal mass transport (rOMT) and non-rigid fluid-based image registration.
- Built a PyTorch stochastic advection-diffusion PDE solver toolkit (in 2/3D), used for numerical computations, fluid simulations, or served as a general module in deep learning frameworks.

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. [IPMI'19 Oral]

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

Professional Services

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

Skills

Computer: Python, MATLAB, C/C++, \LaTeX , HTML, JAVA, R, MS Office

Libraries & OS: PyTorch, TensorFlow, ITK, Theano; 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; Hiking; Running; Table tennis