

# Peirong Liu

✉ peirong@cs.unc.edu • ☎ (919)-519-8893 • 🌐 peirong26

## Education

**University of North Carolina at Chapel Hill**

Chapel Hill, U.S.

*Ph.D. Candidate in Computer Science*

Aug 2018 – May 2023

**Shanghai University**

Shanghai, China

*B.S. in Mathematics and Applied Mathematics*

Sep 2014 – Jun 2018

## Summary

My research interests broadly lie in computer vision, machine learning and medical imaging, especially learning-based PDEs, transfer learning, multi-modal and multi-task learning. 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) Fluid-based image registration; (5) CT/MR perfusion imaging, lesion detection and segmentation.

## Publications

**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]

**Peirong Liu**, Marc Niethammer. “Detect Anomalies from Stochastic Transport Perspective”. *In submission to IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2022.

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 Preprint*, 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 preprint*, 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, Meta AI**

New York, U.S.

*Research Intern, Supervisor: 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.

**Computer Vision, Meta AI**

New York, U.S.

*Research Intern, Supervisor: Dr. Rui Wang and Dr. Ser-Nam Lim*

May 2021 – Nov 2021

- Researched on self-supervised, neural-ODE-based general framework for multi-view motion transfer. [arXiv]

## 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 solutions for transport time series, from optimization-based and deep-learning-based perspectives. [MICCAI’20 Oral, TMI, CVPR’21 Oral, CVPR’22 Oral]
- Built a PyTorch stochastic advection-diffusion PDE solver toolkit (in 2/3D), which can be used for numerical solutions, fluid simulation, or as a general module in deep learning frameworks.
- Created a 3D brain advection-diffusion pseudo dataset and simulator which integrates (1) brain vessel segmentation, blood flow estimation; (2) diffusion tensor estimation; (3) brain advection-diffusion transport simulation.

**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

- Researched 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

- Researched on Riemannian spaces of shapes via the diffeomorphism group representation.

<b>Honors</b>	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
<b>Professional Services</b>	Editorial board of Artificial Intelligence in Radiology	
	Review editor of Frontiers in Radiology	
	Reviewer of ICCV'21, CVPR'22, ECCV'22, MICCAI'22	
<b>Skills</b>	<b>Computer:</b> Python, MATLAB, C/C++, L <sup>A</sup> T <sub>E</sub> X, HTML, JAVA, R, MS Office	
	<b>Libraries &amp; OS:</b> PyTorch, TensorFlow, ITK, Theano; Linux (Ubuntu), Mac OSX	
	<b>Languages:</b>	
	<ul style="list-style-type: none"> <li>▪ Mandarin (Native Proficiency)</li> <li>▪ English (Full Professional Proficiency) <ul style="list-style-type: none"> <li>• TOEFL: 112 (R-29, L-29, S-26, W-28), GRE: 327+4.5 (V-157, Q-170, AW-4.5)</li> <li>• Advanced-level English Interpretation Certificate (Same level as Test for English Majors-Band 8 (TEM-8) for students in English major)</li> </ul> </li> </ul>	
	<b>Hobbies:</b>	
	<ul style="list-style-type: none"> <li>▪ Guzheng: Professional level-10 certificate (“Distinction”), Duke Music Ensemble member</li> <li>▪ Piano; Keyboard; Climbing; Hiking; Running; Table tennis</li> </ul>	