Peirong Liu

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Education	**University of North Carolina at Chapel Hill**	Chapel Hill, U.S.

Education

University of North Carolina at Chapel Hill   Chapel Hill, U.S.
Ph.D. Candidate in Computer Science   Aug 2018 – Present
Shanghai University   Shanghai, China
B.S. in Mathematics   Sep 2014 – Jun 2018
- GPA: 3.94/4.00 (Rank: 1/305); President's List (Top 10); National Scholarship (Top 1%)

Summary

My research interests lie in computer vision, machine learning and medical imaging. Recent research include exploring physics-constrained, PDE-integrated algorithms for understanding real-word transport (especially fluid flow and mass diffusion) time-series. Applications include fluid flow simulation, lesion detection and localization.

Industry Experience

Computer Vision, Facebook AI   New York, U.S.
Research Intern, Supervisor: Dr. Rui Wang   May 2021 – Aug 2021

Research Experience

Department of Computer Science, University of North Carolina at Chapel Hill   Chapel Hill, U.S.
Research assistant, Supervisor: Dr. Marc Niethammer   Feb 2019 – Present
- Proposed a general learning framework for constraint-free representation learning of physics fields from mass transport time series. **[CVPR'21 Oral]**
- Built a PyTorch advection-diffusion PDE solver toolkit (in 1/2/3D) with various boundary conditions, which can be used for both numerical solutions and data simulation.
- Created a 3D brain advection-diffusion simulator, which integrates (1) brain vessel segmentation, blood flow estimation; (2) diffusion tensor estimation; (3) advection-diffusion transport simulation.
- Proposed a data-assimilation approach (PIANO) which estimates the divergence-free velocity and isotropic diffusion fields of the contrast agent in perfusion imaging via variable-coefficient advection-diffusion PDEs. **[MICCAI'20 Oral**, **IEEE TMI (In revision)]**

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 and its application on mesh structured data.
- Proposed a graph-convolution-based deep learning framework for longitudinally prediction of infant cortical growth, integrated with spatial-temporal constraints. **[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.
- Assisted in teaching graduate course *Shape Spaces*.

Publications

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

Peirong Liu, Yueh Z. Lee, Stephen R. Aylward, Marc Niethammer. "Perfusion Imaging: A Data Assimilation Approach". *IEEE Transactions on Medical Imaging (In revision).* [paper] [code]

Peirong Liu, Yueh Z. Lee, Stephen R. Aylward, Marc Niethammer. "PIANO: Perfusion Imaging via Advection-diffusion". *Medical Image Computing and Computer Assisted Intervention (MICCAI)*, 2020. (Oral, early accept - 13% acceptance rate, student travel award) [paper] [code]

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]

Zhipeng Ding, Xu Han, **Peirong Liu**, Marc Niethammer. "Local Temperature Scaling for Probability Calibration". *CoRR*, 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% acceptance rate, IPMI scholarship) [paper] [code]

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

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)

Interests:
- Guzheng: Professional level-10 certificate ("Distinction"), Duke Music Ensemble member
- Piano; Keyboard; Hiking; Running; Table tennis