Yifan Chen

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Education

Caltech — Pasadena, California
Ph.D. Candidate in Applied and Computational Mathematics — 2018–present
Advisors: Profs. Thomas Y. Hou, Houman Owhadi, Andrew M. Stuart

Tsinghua University — Bejing, China
B.S. in Pure and Applied Mathematics, GPA ranked 1st — 2014–2018

Chengdu No.7 High School — Sichuan, China
High School Degree. First prize in math competition, Sichuan — 2011–2014

Research Interests

My research lies in the intersection of **applied & computational mathematics**, **computer science**, and **data science**. My current work centers around integrating *scientific computing* and *probabilistic machine learning* (ML) for rigorous mathematical analysis and automatic/robust/efficient algorithms in scientific ML.

Publications

1. Yifan Chen, Ethan N. Epperly, Joel A. Tropp, and Robert J. Webber. Randomly pivoted Cholesky: Practical approximation of a kernel matrix with few entry evaluations. *Submitted to SIAM Mathematics of Data Science, arXiv:2207.06503*, 2022.

2. Yifan Chen, Thomas Y. Hou, and Yixuan Wang. Exponentially convergent multiscale methods for high frequency heterogeneous Helmholtz equations. *Under revision in Multiscale Modeling & Simulation, arXiv:2105.04080*, 2021.

3. Yifan Chen and Thomas Y. Hou. Multiscale elliptic PDE upscaling and function approximation via subsampled data. *Multiscale Modeling & Simulation*, 20(1):188–219, 2022.

4. Yifan Chen, Bamdad Hosseini, Houman Owhadi, and Andrew M. Stuart. Solving and learning nonlinear PDEs with Gaussian processes. *Journal of Computational Physics*, 447:110668, 2021.

5. Yifan Chen, Houman Owhadi, and Andrew M. Stuart. Consistency of empirical Bayes and kernel flow for hierarchical parameter estimation. *Mathematics of Computation*, 90(332):2527–2578, 2021.

6. Yifan Chen, Thomas Y. Hou, and Yixuan Wang. Exponential convergence for multiscale linear elliptic PDEs via adaptive edge basis functions. *Multiscale Modeling & Simulation*, 19(2):980–1010, 2021.

7. Yifan Chen and Thomas Y. Hou. Function approximation via the subsampled Poincaré inequality. *Discrete & Continuous Dynamical Systems-A*, 41(1), 2021.

8. Yifan Chen and Wuchen Li. Optimal transport natural gradient for statistical manifolds with continuous sample space. *Information Geometry*, 3(1):1–32, 2020.

9. Yifan Chen, Yuejiao Sun, and Wotao Yin. Run-and-Inspect Method for nonconvex optimization and global optimality bounds for R-local minimizers. *Mathematical Programming*, 176(1): 39-67, 2019.

10. Jing Chen, Yifan Chen, Hao Wu, and Dinghui Yang. The quadratic Wasserstein metric for earthquake location. *Journal of Computational Physics*, 373:188–209, 2018.

Teaching

Teaching Assistant at Caltech

- ACM 109: Mathematical Modeling — Spring 2021
- ACM 118: Stochastic Processes and Regression — Winter 2020
- ACM 117: Probability and Stochastic Processes — Fall 2020
- ACM 109: Mathematical Modeling — Spring 2020

Industrial Experiences

Citadel Securities — Miami, Florida
Quantitative Research Intern — 6/2022-8/2022

- Project on Alpha Research: Predicting APAC Market Returns

Microsoft — (virtual) Redmond, Washington
Part Time Researcher, Mentor: Pengchuan Zhang — 9/2021-2/2022

- Project: Stablizing Large Scale Neural Network Training of Vision Transformers

Referee Services

- Reviewer for SIAM on Control and Optimization
- Reviewer for SIAM on Numerical Analysis
- Reviewer for SIAM on Multiscale Modeling and Simulation
- Reviewer for Research in the Mathematical Sciences
- Reviewer for the 4th International Conference on Geometric Science of Information, 2019.

Conferences and Seminars

- Co-organizing the minisymposium "Recent Advances in Kernel Methods for Computing and Learning" in SIAM Mathematics of Data Science, San Diego, September, 2022.
- Southern California Applied Mathematics Symposium, Harvey Mudd College, May, 2022
- Rough Path Interest Group, The Alan Turing Institute (virtual), April, 2022
- SIAM Uncertainty Quantification Minisymposium "New Developments in Gaussian Processes", Atlanta, April 2022
- CMX Student and Postdoc Seminar, Caltech, November, 2020
- Second Symposium on Machine Learning and Dynamical Systems, Fields Institute (virtual), September, 2020
- Bernoulli-IMS One World Symposium (virtual), August, 2020
- Oberwolfach Seminar: Beyond Numerical Homogenization, June, 2019
- Machine Learning for Multiscale Model Reduction Workshop, Harvard University, March, 2019
- Mathematical Model and Computation of Nonlinear Problems, Tsinghua Sanya International Mathematics Forum, January, 2018
- Youth Forum in the 15th Annual Meeting of CSIAM, Qingdao, China, October, 2017

Scholarships and Awards

- Kortschak Scholars Program, Department of Computational and Mathematical Sciences, Caltech 2018–present
- Tsinghua Xuetang Mathematics Program, Department of Mathematical Sciences, Tsinghua University 2015–2018
- Outstanding Undergraduate, Tsinghua University and Beijing 2018
- Baosteel Scholarship, Baosteel Corporation 2017
- Scholarship in Memory of the "12.9" Student Movement, Tsinghua University 2016
- Qualcomm Scholarship, Qualcomm Corporation 2016
- Scholarship in Memory of Mathematics Professor Ou Li, Tsinghua University 2016
- National Scholarship, Ministry of Education of China 2015

Computer Skills

Professional experiences in MATLAB, LaTeX, Python, Julia.

Languages

English (fluent), Chinese (native)