

Updated Feb, 2023

## EDUCATION

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### Caltech

Ph.D. Candidate in Applied and Computational Mathematics  
Advisors: Profs. Thomas Y. Hou, Houman Owhadi, Andrew M. Stuart

Pasadena, California  
2018–present

### Tsinghua University

B.S. in Pure and Applied Mathematics, GPA ranked 1st

Beijing, China  
2014–2018

## RESEARCH INTERESTS

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My research lies in the intersection of **applied and computational mathematics**, **computer science**, and **data science**. My current work centers around **probabilistic** inference and **multiscale** analysis & algorithms for scientific computing, uncertainty quantification, and machine learning, in physics and data science.

## PUBLICATIONS

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1. Yifan Chen, Daniel Zhengyu Huang, Jiaoyang Huang, Sebastian Reich, Andrew M. Stuart. Gradient flows for sampling: mean-field models, gaussian approximations and affine invariance. *arxiv: 2302.11024*, 2023.
2. 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.
3. Yifan Chen, Thomas Y. Hou, and Yixuan Wang. Exponentially convergent multiscale methods for high frequency heterogeneous Helmholtz equations. *To appear in Multiscale Modeling & Simulation*, 2023.
4. Yifan Chen, Thomas Y. Hou, and Yixuan Wang. Exponentially convergent multiscale finite element method. *arXiv:2212.00823. To appear in Communications on Applied Mathematics and Computation*, 2023.
5. Yifan Chen and Thomas Y. Hou. Multiscale elliptic PDE upscaling and function approximation via subsampled data. *Multiscale Modeling & Simulation*, 20(1):188–219, 2022.
6. 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.
7. 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.
8. 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.
9. Yifan Chen and Thomas Y. Hou. Function approximation via the subsampled Poincaré inequality. *Discrete & Continuous Dynamical Systems-A*, 41(1), 2021.
10. Yifan Chen and Wuchen Li. Optimal transport natural gradient for statistical manifolds with continuous sample space. *Information Geometry*, 3(1):1–32, 2020.
11. 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.

12. 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

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### 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

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### Citadel Securities

Quantitative Research Intern

Miami, Florida

6/2022-8/2022

- Project on Alpha Research: Predicting APAC Market Returns

### Microsoft

Part Time Researcher, Mentor: Pengchuan Zhang

(virtual) Redmond, Washington

9/2021-2/2022

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

## REFeree SERVICES

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- Reviewer for Journal of Functional Analysis
- Reviewer for SIAM on Uncertainty Quantification
- 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

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- Columbia applied math colloquium (virtual), January, 2023.
- The International Conference on New Trends in Computational and Data Sciences, Caltech, December 2022.
- 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

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| • 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

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Professional experiences in MATLAB, LaTeX, Python, Julia.

## LANGUAGES

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English (fluent), Chinese (native)