

ZIANG CHEN

Department of Mathematics, Massachusetts Institute of Technology

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EMPLOYMENT

- **Instructor in Applied Mathematics** Sept. 2023 – Current
Department of Mathematics, Massachusetts Institute of Technology, MA, USA
Supervisor: Prof. Philippe Rigollet
- **Research Intern** Summer 2022 & 2023
Decision Intelligence Lab, DAMO Academy, Alibaba US, WA, USA
Supervisors: Dr. Wotao Yin and Dr. Xinshang Wang

EDUCATION

- **Ph.D. in Mathematics, Duke University, NC, USA** May 2023
Advisor: Prof. Jianfeng Lu - GPA: 4.0/4.0
Dissertation: Mathematical analysis of high-dimensional algorithms and models
- **M.S. in Computer Science, Duke University, NC, USA** May 2023
Advisor: Prof. Rong Ge - GPA: 4.0/4.0
- **M.S. in Applied Mathematics, Harvard University, MA, USA** May 2020
Advisor: Prof. Na (Lina) Li - GPA: 4.0/4.0 - Ph.D. admitted
- **B.S. in Computational Mathematics, Peking University, Beijing, China** Jul. 2019
Advisor: Prof. Zaiwen Wen - GPA: 3.80/4.0
Elite Undergraduate Training Program in Applied Mathematics (2017 - 2019)
- **B.L. in Chinese Language and Literature, Peking University, Beijing, China** Jul. 2019

RESEARCH INTERESTS

Machine learning, optimization, numerical analysis, scientific computing, applied analysis, applied probability and statistics.

PUBLICATION

Preprints

- **Ziang Chen**, Zhengjiang Lin, Shi Chen, Yury Polyanskiy, and Philippe Rigollet, Residual connections provably mitigate oversmoothing in graph neural networks, arXiv:2501.00762.
- **Ziang Chen**, Xiaohan Chen, Jialin Liu, Xinshang Wang, and Wotao Yin, Expressive power of graph neural networks for (mixed-integer) quadratic programs, arXiv:2406.05938.
- **Ziang Chen** and Jianfeng Lu, Exact and efficient representation of totally anti-symmetric functions, arXiv:2311.05064.

Refereed Journal Papers

- **Ziang Chen**, Jianfeng Lu, Yulong Lu, and Xiangxiong Zhang, Fully discretized Sobolev gradient flow for the Gross-Pitaevskii eigenvalue problem, to appear in *Mathematics of Computation*.
- **Ziang Chen**, Jianfeng Lu, and Anru R. Zhang, One-dimensional tensor network recovery, *SIAM Journal on Matrix Analysis and Applications*, 45(3), 1217–1244 (2024).
- **Ziang Chen**, Jianfeng Lu, Yulong Lu, and Xiangxiong Zhang, On the convergence of Sobolev gradient flow for the Gross-Pitaevskii eigenvalue problem, *SIAM Journal on Numerical Analysis*, 62(2), 667-691 (2024).

- Chongyao Chen, **Ziang Chen**, and Jianfeng Lu, Representation theorem for multivariable totally symmetric functions, *Communications in Mathematical Sciences*, 22(5), 1195-1201 (2024).
- **Ziang Chen**, Yingzhou Li, and Jianfeng Lu, On the global convergence of randomized coordinate gradient descent for non-convex optimization, *SIAM Journal on Optimization*, 33(2), 713-738 (2023).
- **Ziang Chen**, Jianfeng Lu, Yulong Lu, and Shengxuan Zhou, A regularity theory for static Schrödinger equations on \mathbb{R}^d in spectral Barron spaces, *SIAM Journal on Mathematical Analysis*, 55(1), 557-570 (2023).
- **Ziang Chen**, Andre Milzarek, and Zaiwen Wen, A trust-region method for nonsmooth nonconvex optimization, *Journal of Computational Mathematics*, 41(4), 683-716 (2023).
- **Ziang Chen**, Yingzhou Li, and Jianfeng Lu, Tensor ring decomposition: optimization landscape and one-loop convergence of alternating least squares, *SIAM Journal on Matrix Analysis and Applications*, 41(3), 1416-1442 (2020).

Refereed Conference Papers

- **Ziang Chen**, Jialin Liu, Xiaohan Chen, Xinshang Wang, and Wotao Yin, Rethinking the capacity of graph neural networks for branching strategy, to appear in *Advances in Neural Information Processing Systems (NeurIPS) 2024*.
- **Ziang Chen** and Rong Ge, Mean-field analysis for learning subspace-sparse polynomials with Gaussian input, to appear in *Advances in Neural Information Processing Systems (NeurIPS) 2024*.
- Eli Chien, Haoyu Wang, **Ziang Chen**, and Pan Li, Certified machine unlearning via noisy stochastic gradient descent, to appear in *Advances in Neural Information Processing Systems (NeurIPS) 2024*.
- Eli Chien, Haoyu Wang, **Ziang Chen**, and Pan Li, Langevin unlearning: a new perspective of noisy gradient descent for machine unlearning, to appear in *Advances in Neural Information Processing Systems (NeurIPS) 2024 (spotlight)*.
- Lisang Ding, **Ziang Chen**, Xinshang Wang, and Wotao Yin, Efficient algorithms for sum-of-minimum optimization, *International Conference on Machine Learning (ICML) 2024*.
- **Ziang Chen**, Jialin Liu, Xinshang Wang, Jianfeng Lu, and Wotao Yin, On representing mixed-integer linear programs by graph neural networks, *International Conference on Learning Representations (ICLR) 2023*.
- **Ziang Chen**, Jialin Liu, Xinshang Wang, Jianfeng Lu, and Wotao Yin, On representing linear programs by graph neural networks, *International Conference on Learning Representations (ICLR) 2023 (spotlight)*.
- **Ziang Chen**, Jianfeng Lu, Huajie Qian, Xinshang Wang, and Wotao Yin, HeteRSGD: tackling heterogeneous sampling costs via optimal reweighted stochastic gradient descent, *International Conference on Artificial Intelligence and Statistics (AISTATS) 2023*.
- **Ziang Chen**, Jianfeng Lu, and Yulong Lu, On the representation of solutions to elliptic PDEs in Barron spaces, *Advances in Neural Information Processing Systems (NeurIPS) 2021 (spotlight)*.

TEACHING

At Massachusetts Institute of Technology

- 18.03, Differential Equations (recitation) Fall 2024
- 18.065/0651, Matrix Methods in Data Analysis, Signal Processing, and Machine Learning Spring 2024
- 18.02, Calculus (recitation) Fall 2023

At Duke University

- MATH 353, Ordinary and Partial Differential Equations (TA) Spring 2023
- MATH 122L, Introductory Calculus II with Applications (instructor) Fall 2022
- MATH 111L, Laboratory Calculus I (TA) Fall 2021
- MATH 353, Ordinary and Partial Differential Equations (TA) Summer 2021 Term 1
- MATH 531, Real Analysis I (grader) Spring 2021

STUDENTS MENTORING

Undergraduate Students

- Diego Caballero Ricaurte (MIT Class of 2027, UROP student) 2024
- Maanasi A. Limaye (MIT Class of 2026, UROP student) 2024

High School Student

- Qiao (Tiger) Zhang (Sierra Canyon School, MIT PRIMES student) 2024

HONORS AND AWARDS

- Silver Medal (ranked 2nd in Applied & Computational Math), the 6th Alibaba Global Mathematics Competition 2024
- NeurIPS Scholar Award 2024
- Doctor Thesis Silver Prize, ICCM Graduate Thesis Award (formerly New World Mathematics Awards) 2023
- Rudin Prize Nominated Thesis, Department of Mathematics, Duke University 2023
- SIAM Student Travel Award, SIAM Conference on Analysis of Partial Differential Equations 2022
- Bronze Medal (ranked 19th/50000), the 3rd Alibaba Global Mathematics Competition 2021
- Summer Research Fellowship, the Graduate School of Duke University 2021
- Outstanding Graduate, Peking University 2019
- Excellent Research Presenter, Elite Undergraduate Training Program in Applied Mathematics, Peking University 2019
- Yizheng Excellent Scholarship, Peking University 2018
- Learning Excellent Award, Peking University 2018
- First Prize (ranked 13rd nationwide), the 9th China College Student Mathematics Competition 2018
- Leo KoGuan Scholarship, Peking University 2017
- Bronze Medal for Probability and Statistics (ranked top 10 nationwide), the 8th Shing-Tung Yau College Student Mathematics Contest 2017
- Merit Student, Peking University 2016 & 2017
- First Prize, the 33rd China Regional College Student Physics Competition 2016
- May-Fourth Scholarship, Peking University 2016
- The 55th and the 56th International Mathematical Olympiad (IMO) China Team Selection Test Group Member 2014 & 2015
- Gold Medals, the 29th and the 30th Chinese Mathematical Olympiad (CMO) 2013 & 2014
- First Prize in Zhejiang Province, National High School Student Mathematics Competition 2013
- Second Prize in Zhejiang Province, the 30th National High School Student Physics Competition 2013

SERVICES

- Reviewer for journals: Ann. Appl. Math., Commun. Comput. Phys., Commun. Math. Sci., J. Math. Anal. Appl., J. Sci. Comput., IEEE Trans. Neural Netw. Learn. Syst., Mach. Learn., Math. Program., Res. Math. Sci., SIAM J. Math. Data Sci.
- Reviewer for conferences: NeurIPS 2023 & 2024, ICLR 2024 & 2025, ICML 2024, AAAI 2025, AISTATS 2025.
- Math major advisor, Massachusetts Institute of Technology 2023 – Current
- Judge for mathematics competitions: the 16th Chinese Girls' Mathematical Olympiad (CGMO) 2017, China Southeast Mathematical Olympiad (CSMO) 2024.