Lichen Zhang

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Cambridge, Massachusetts - 02139, U.S.A.

Education

- **Massachusetts Institute of Technology** *Sep 2022 - Present*
  Ph.D in Applied Mathematics Cambridge, MA
  - Advisor: Jonathan Kelner
- **Carnegie Mellon University** *June 2021 - May 2022*
  M.S. in Computer Science Pittsburgh, PA
  - Advisor: Gary Miller
  - Thesis: **Speeding Up Optimizations via Data Structures: Faster Search, Sample and Maintenance**
- **Carnegie Mellon University** *Aug 2017 - May 2021*
  B.S. in Computer Science Pittsburgh, PA

Research Interests

Machine learning, large language models, optimization, numerical linear algebra, sketching and streaming, differential privacy, quantum computing.

Experience

- **Google Research** *June 2025 - Aug 2025*
  Student Researcher Mountain View, CA
  - Mentors: Fotis Iliopoulos, Gaurav Menghani, Erik Vee
- **Amazon Web Services (AWS)** *May 2024 - Aug 2024*
  Applied Scientist Intern East Palo Alto, CA
  - Mentors: Nina Mishra, Yonatan Naamad, Tal Wagner
- **Simons Institute for the Theory of Computing** *Aug 2023 - Dec 2023*
  Visiting Student Berkeley, CA
  - Data Structures and Optimization for Fast Algorithms program
- **Adobe Research** *May 2023 - Aug 2023*
  Research Scientist Intern San Jose, CA
  - Mentors: Zhao Song, Ritwik Sinha, Raghavendra Addanki
- **University of Washington** *June 2022 - Aug 2022*
  Research Assistant Seattle, WA
  - Advisor: Yin Tat Lee
- **Carnegie Mellon University** *May 2020 - Aug 2020*
  Undergraduate Research Assistant Pittsburgh, PA
  - Advisor: Gary Miller
  - Supported by CMU Summer Undergraduate Research Fellowship (SURF)

Teaching

- **Intro to Numerical Methods (18.335)** *Spring 2025*
  Teaching Assistant MIT
  - Instructor: Shi Chen
- **An Algorithmist's Toolkit (18.408)** *Fall 2024*
  Teaching Assistant MIT
  - Instructor: Jonathan Kelner
- **Intro to Numerical Methods (18.335)** *Spring 2024*
  Teaching Assistant MIT
  - Instructor: John Urschel
- **The Computational Lens (15-155)** *Spring 2022*
  Teaching Assistant CMU
  - Instructors: Pravesh Kothari and Anil Ada
- **Undergraduate Complexity Theory (15-455)** *Spring 2021*
  Teaching Assistant CMU
  - Instructor: Pravesh Kothari

Awards and Scholarships

- **Simons Dissertation Fellowship in Mathematics** *2025 - 2027*
  Simons Foundation
- **Mathworks Fellowship** *2025 - 2026*
  Mathworks
- **Finalist of the Two Sigma Graduate Research Fellowship** *2025*
  Two Sigma
- **Finalist of the Jane Street Graduate Research Fellowship** *2025*
  Jane Street
- **Finalist of the Jane Street Graduate Research Fellowship** *2024*
  Jane Street
- **Reitano Fellowship** *2022 - 2023*
  MIT
- **Summer Undergraduate Research Fellowship** *2020*
  CMU

Talks

- **Faster Algorithm for Structured Linear and Kernel Support Vector Machines**
  - MIT Theory Lunch Seminar *April 2025*
- **Alternating Minimization for Matrix Completion and Beyond**
  - MIT SPAMS Seminar *April 2024*
- **Training Multi-Layer Over-Parametrized Neural Network in Subquadratic Time**
  - MIT SPAMS Seminar *Oct 2024*
  - ITCS 2024 *Jan 2024*
- **Convex Minimization with Integer Minima in $\widetilde{O}(n^4)$ Time**
  - SODA 2024 *Jan 2024*
- **Sketching as a Tool for Fast Optimization**
  - Google Research (Mountain View) Algorithms Seminar *Nov 2023*
  - MIT SPAMS Seminar *Oct 2022*
- **Sketching Meets Differential Privacy: Fast Algorithm for Dynamic Kronecker Projection Maintenance**
  - ICML 2023 *July 2023*
- **Sketching for First Order Method: Efficient Algorithm for Low-Bandwidth Channel and Vulnerability**
  - ICML 2023 *July 2023*
- **A Nearly-Optimal Bound for Fast Regression with ℓ_∞ Guarantee**
  - ICML 2023 *July 2023*
- **Space-Efficient IPM, with applications to LP and Maximum Weight Bipartite Matching**
  - ICALP 2023 *June 2023*
- **Dynamic Tensor Product Regression**
  - NeurIPS 2022 *Dec 2022*
- **Fast Sketching of Polynomial Kernels of Polynomial Degree**
  - Workshop on Algorithms for Large Data (Online) *Aug 2021*
  - ICML 2021 *July 2021*

Services

- **Conference Reviewer**
  - NeurIPS: 2023, 2024, 2025
  - ICML: 2024, 2025
  - ICLR: 2024, 2025
  - AISTATS: 2023, 2024, 2025
  - AAAI: 2025, 2026
  - PODS: 2025
  - ICALP: 2025
  - SODA: 2023, 2026
- **Journal Reviewer**
  - ACM Transactions on Quantum Computing
  - Transactions on Machine Learning Research (TMLR)

PUBLICATIONS (AUTHOR NAMES IN ALPHABETICAL ORDER)

[1] Shiyuan Feng, Ying Feng, George Z. Li, Zhao Song, David P. Woodruff and **Lichen Zhang**. **On Differential Privacy for Adaptively Solving Search Problems via Sketching**. In *Proceedings of the 42nd International Conference on Machine Learning (ICML)*, 2025. **Selected for Oral Presentation (top 1% of submissions).**

[2] Yuzhou Gu, Zhao Song and **Lichen Zhang**. **Faster Algorithms for Structured Linear and Kernel Support Vector Machines**. In *Proceedings of the 13th International Conference on Learning Representations (ICLR)*, 2025.

[3] Zhao Song, Mingquan Ye, Junze Yin and **Lichen Zhang**. **Efficient Alternating Minimization with Applications to Weighted Low Rank Approximation**. In *Proceedings of the 13th International Conference on Learning Representations (ICLR)*, 2025.

[4] Yuzhou Gu, Nikki Lijing Kuang, Yi-An Ma, Zhao Song and **Lichen Zhang**. **Log-concave Sampling from a Convex Body with a Barrier: a Robust and Unified Dikin Walk**. In *Proceedings of the 38th Conference on Neural Information Processing Systems (NeurIPS)*, 2024.

[5] Zhao Song, Junze Yin and **Lichen Zhang**. **Solving Attention Kernel Regression Problem via Pre-conditioner**. In *Proceedings of the 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024.

[6] Zhao Song, Junze Yin, **Lichen Zhang** and Ruizhe Zhang. **Fast Dynamic Sampling for Determinantal Point Processes**. In *Proceedings of the 27th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2024.

[7] Yuzhou Gu, Zhao Song, Junze Yin and **Lichen Zhang**. **Low Rank Matrix Completion via Robust Alternating Minimization in Nearly Linear Time**. In *Proceedings of the 12th International Conference on Learning Representations (ICLR)*, 2024.

[8] Zhao Song, **Lichen Zhang** and Ruizhe Zhang. **Training Multi-Layer Over-Parametrized Neural Network in Subquadratic Time**. In *Proceedings of the 15th Innovations in Theoretical Computer Science (ITCS)*, 2024.

[9] Haotian Jiang, Yin Tat Lee, Zhao Song and **Lichen Zhang**. **Convex Minimization with Integer Minima in $\widetilde{O}(n^4)$ Time**. In *Proceedings of the 35th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2024.

[10] Zhao Song, Xin Yang, Yuanyuan Yang and **Lichen Zhang**. **Sketching Meets Differential Privacy: Fast Algorithm for Dynamic Kronecker Projection Maintenance**. In *Proceedings of the 40th International Conference on Machine Learning (ICML)*, 2023.

[11] Zhao Song, Yitan Wang, Zheng Yu and **Lichen Zhang**. **Sketching for First Order Method: Efficient Algorithm for Low-Bandwidth Channel and Vulnerability**. In *Proceedings of the 40th International Conference on Machine Learning (ICML)*, 2023.

[12] Zhao Song, Mingquan Ye, Junze Yin and **Lichen Zhang**. **A Nearly-Optimal Bound for Fast Regression with ℓ_∞ Guarantee**. In *Proceedings of the 40th International Conference on Machine Learning (ICML)*, 2023.

[13] S. Cliff Liu, Zhao Song, Hengjie Zhang, **Lichen Zhang** and Tianyi Zhou. **Space-Efficient Interior Point Method, with applications to Linear Programming and Maximum Weight Bipartite Matching**. In *Proceedings of the 50th International Colloquium on Automata, Languages and Programming (ICALP)*, 2023.

[14] Lianke Qin, Zhao Song, **Lichen Zhang** and Danyang Zhuo. **An Online and Unified Algorithm for Projection Matrix Vector Multiplication with Application to Empirical Risk Minimization**. In *Proceedings of the 26th International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2023.

[15] Aravind Reddy, Zhao Song and **Lichen Zhang**. **Dynamic Tensor Product Regression**. In *Proceedings of the 36th Conference on Neural Information Processing Systems (NeurIPS)*, 2022.

[16] Zhao Song, David P. Woodruff, Zheng Yu and **Lichen Zhang**. **Fast Sketching of Polynomial Kernels of Polynomial Degree**. In *Proceedings of the 38th International Conference on Machine Learning (ICML)*, 2021.