

---

## Employment

Since 2023 **R. H. Bing Instructor of Mathematics**, *University of Texas at Austin*, Austin, TX

---

## Education

2018–2023 **Ph.D. in Computational and Applied Mathematics**, *University of Chicago*, Chicago, IL

2014–2018 **B.A. in Mathematics, B.A. in Economics and Finance**, *Tsinghua University*, Beijing, China

---

## Honors

2018 **Neubauer Family Distinguished Doctoral Fellowship**, *Chicago*, IL

2017 **Chia-Chiao Lin Gold Medal in Computational and Applied Mathematics, S.-T. Yau College Student Mathematics Contests**, *Beijing*, China

2014 **Tsinghua Freshman Fellowship**, *Beijing*, China

2013 **Gold Medal of China Mathematical Olympiad**, *Nanjing*, China

---

## Papers

- 2025 Z. Lai, L. Lim, "Pierce-Birkhoff conjecture is true for splines", (2025), <https://arxiv.org/abs/2507.07976>
- 2025 Z. Lai, L. Lim, T. Tang, "Stiefel optimization is NP-hard", (2025), <https://arxiv.org/abs/2507.02839>
- 2025 Z. Lai, L. Lim, K. Ye, "Euclidean distance degree in manifold optimization", *preprint (to appear in SIAM Journal on Optimization)*, (2025), <https://arxiv.org/abs/2502.10336>
- 2024 Z. Lai, L. Lim, Y. Liu, "Attention is a smoothed cubic spline," *preprint*, (2024), <https://www.arxiv.org/abs/2408.09624>
- 2024 Z. Lai, L. Lim, K. Ye, "Grassmannian optimization is NP-hard," *preprint (to appear in SIAM Journal on Optimization)*, (2024), <https://arxiv.org/abs/2406.19377>
- 2024 Z. Lai, L. Lim, K. Ye, "Simple matrix expressions for the curvatures of Grassmannian," *preprint (to appear in Foundations of Computational Mathematics)*, (2024), <https://arxiv.org/abs/2406.11821>
- 2024 M. Zhao, Z. Lai, L. Lim, "Stochastic Steffensen method," *Computational Optimization and Applications*, (2024), <https://doi.org/10.1007/s10589-024-00583-7>
- 2023 X. Chen, Z. Lai, H. Li, Y. Zhang, "Online statistical inference for stochastic optimization via Kiefer-Wolfowitz methods," *Journal of the American Statistical Association*, (2023), <https://doi.org/10.1080/01621459.2023.2296703>
- 2022 X. Chen, Z. Lai, H. Li, Y. Zhang, "Online statistical inference for contextual bandits via stochastic gradient descent," *preprint*, (2022), <http://laizehua.github.io/files/bandit.pdf>
- 2022 Z. Lai, L. Lim, K. Ye, "Simpler flag manifold optimization," *preprint*, (2022), <https://arxiv.org/abs/2212.00212>
- 2022 S. Friedland, Z. Lai, L. Lim, "Haagerup bound for quaternionic Grothendieck inequality," *preprint*, (2022), <https://arxiv.org/abs/2212.00208>

- 2020 Z. Lai, L.-H. Lim, K. Ye, "Simpler Grassmannian optimization," *preprint*, (2020), <http://arxiv.org/abs/2009.13502>
- 2020 Z. Lai, L.-H. Lim, "Recht–Ré noncommutative arithmetic-geometric mean conjecture is false," *Proceedings of the 37th International Conference on Machine Learning (ICML)*, PMLR **119**, (2020), pp. 5608–5617

## Talks

- July 2025 International Conference on Continuous Optimization, University of Southern California, Los Angeles, CA
- July 2025 SIAM Conference on Applied Algebraic Geometry, University of Wisconsin-Madison, Madison, WI
- June 2025 Householder Symposium XXII, Cornell University, Ithaca, NY
- Feb 2025 Mathematics in Deep Learning Workshop, University of Texas, Austin, TX
- Feb 2025 Conference on Data Analytics and Topology, Online
- Jan 2025 AMS Special Session on Topological, Algebraic, and Geometric Methods for Safe, Robust, and Explainable Machine Learning, Joint Mathematics Meeting, Seattle, WA
- Oct 2024 Math and Data Seminar, The Department of Mathematics, University of Missouri, Columbia, MO
- Oct 2024 7th Annual Meeting of SIAM Conference Texas-Louisiana Section, Baylor University, Waco, TX
- Oct 2024 Math Machine Learning seminar, Max Planck Institute for Mathematics in the Sciences/UCLA, Online
- Aug 2024 Applied Algebra Seminar, The Department of Mathematics, University of Wisconsin, Madison, WI
- Jun 2024 2024 Workshop: Matrices and Operators, The Department of Mathematics and Statistics, University of Nevada, Reno, NV
- May 2024 Workshop on Statistical Machine Learning for High Dimensional Data, Institute for Mathematical Sciences, National University of Singapore
- Sept 2023 Applied Mathematics Seminar, University of Texas, Austin, TX
- July 2023 SIAM Conference on Applied Algebraic Geometry, Eindhoven University of Technology, Eindhoven, Netherlands
- May 2023 Seminar, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China
- Jan 2023 Center for Computational and Applied Mathematics Seminar, Purdue University, West Lafayette, IN
- July 2022 2nd Young Topologist Seminar, Beijing Institute of Mathematical Sciences and Applications, Beijing, China
- Mar 2022 AMS Spring Central Sectional Meeting, Special Session on Mathematical Foundation of Data Science in Scientific Computing, Purdue University, West Lafayette, IN
- Mar 2022 AMS Spring Central Sectional Meeting, Special Session on Numerical Linear Algebra, Purdue University, West Lafayette, IN
- Jan 2022 Joint Mathematics Meetings, International Linear Algebra Society Special Session on Matrix Analysis and Applications, Seattle, WA
- Nov 2021 4th Annual Meeting of SIAM Conference Texas-Louisiana Section, South Padre Island, TX
- Apr 2021 Optimization and Data Science Seminar, University of California, San Diego, CA
- Jan 2021 Sanya Workshop on Algebraic Geometry and Machine Learning, Tsinghua Sanya International Mathematics Forum, Sanya, China
- Nov 2020 Algebraic Statistics Online Seminar
- Jul 2020 37th International Conference on Machine Learning
- Dec 2019 International Conference on Data Science, Fudan University, Shanghai, China

- Sep 2019 Seminar, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, China
- Sep 2019 AMS Fall Central Sectional Meeting, Special Session on Applications of Algebra and Geometry, University of Wisconsin-Madison, Madison, WI

## Services

### Organizer

- Jun 2025 ILAS 2025 Conference, Minisymposium on *Advances in Matrix Manifold Optimization*, Jun 23–27, 2025
- May 2021 SIAM Conference on Applied Linear Algebra Minisymposium on *Linear Algebra and Differential Geometry*, May 17–21, 2021
- Jun 2019 RTG Summer Lectures on *Numerical Methods in Data Science and Deep Neural Networks*, <http://www.stat.uchicago.edu/events/rtg/>, June 17–21, 2019

### Referee

Annals of Statistics  
 Applied Numerical Mathematics  
 Arnold Mathematical Journal  
 BIT Numerical Mathematics  
 Computational Geometry: Theory and Applications  
 Conference on Neural Information Processing Systems  
 Foundations of Computational Mathematics  
 IEEE Journal of Selected Topics in Signal Processing  
 Information and Inference: A Journal of the IMA  
 International Conference on Learning Representations  
 International Conference on Machine Learning  
 Journal of Machine Learning Research  
 Journal of Mathematical Physics  
 Journal of Scientific Computing  
 Journal of Symbolic Computation  
 Linear Algebra and its Applications  
 Linear and Multilinear Algebra  
 Mathematics of Operations Research  
 Mathematical Programming (2024 Meritorious Service Award)  
 Numerical Algorithms  
 Numerical Linear Algebra with Applications  
 Optimization Methods and Software  
 SIAM Journal on Optimization  
 Transactions on Mathematical Software  
 Vietnam Journal of Mathematics

## Teaching

### The University of Austin at Texas

- Spring 2025 MATH 362M Introduction to Stochastic Processes, Instructor
- Fall 2024 MATH 348 Numerical Analysis, Instructor
- Spring 2024 MATH 362K Probability, Instructor

## The University of Chicago

Spring 2022 STAT 28000 Optimization, Teaching Assistant  
Autumn 2021 FINM 33180 Multivariate Data Analysis via Matrix Decompositions, Teaching Assistant  
Winter 2021 STAT 28000 Optimization, Teaching Assistant  
Autumn 2020 STAT 30900 Matrix Computations, Teaching Assistant  
Spring 2020 STAT 28000 Optimization, Teaching Assistant  
Winter 2020 STAT 31220 Partial Differential Equations, Teaching Assistant  
Autumn 2019 STAT 30900 Matrix Computations, Teaching Assistant