Allen X. Liu

Personal Information

Email: cliu568@mit.edu
Citizenship: USA
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Education

Massachusetts Institute of Technology
Candidate for Ph.D in Computer Science (expected graduation 2025)
Advisor: Ankur Moitra

Massachusetts Institute of Technology
S.M. in Computer Science, 2022
Advisor: Ankur Moitra

Massachusetts Institute of Technology
B. Sc. in Mathematics, 2020

Awards and Honors

Quantum Information Processing (QIP) Best Student Paper (2024)
Citadel GQS PhD Fellowship (awarded 2024)
Hertz Fellowship (awarded 2021)
NSF Graduate Research Fellowship (awarded 2020)
William Lowell Putnam Mathematical Competition: N1 (2016,17,19), N2 (2018)
International Mathematical Olympiad (IMO): Gold medalist (2014-2016), Perfect score (2016)

Working Experience

Research Intern, Microsoft Research, WA, Summer 2021, 2022**,** hosted by Jerry Li

Student Researcher, Google Research, MA, Summer 2020**,** hosted by Morteza Zadimoghaddam

Research Intern, Google Research, NY, Summer 2019**,** hosted by Jon Schneider and Renato Paes Leme

Quantitative Research Intern, D. E. Shaw & Co., NY, Summer 2018

Trading Intern, Jane Street Capital, NY, Summer 2017

Selected Publications

Research Areas: Theoretical Computer Science, Machine Learning, Quantum Information
*In my field, author order is generally alphabetical denoting equal contribution

High-Temperature Gibbs States are Unentangled and Efficiently Preparable
A. Bakshi, A. Liu, A. Moitra, E. Tang
IEEE Symposium on Foundations of Computer Science (FOCS 2024), to appear

Structure Learning of Hamiltonians from Real-Time Evolution
A. Bakshi, A. Liu, A. Moitra, E. Tang
IEEE Symposium on Foundations of Computer Science (FOCS 2024), to appear

Learning Quantum Hamiltonians at Any Temperature in Polynomial Time
A. Bakshi, A. Liu, A. Moitra, E. Tang
Quantum Information Processing (QIP 2024), ***Invited Plenary, Best Student Paper***
ACM Symposium on Theory of Computing (STOC 2024), pp. 1470-1477
Invited to SIAM Journal on Computing Special Issue

An Optimal Tradeoff between Entanglement and Copy Complexity for Quantum State Tomography
S. Chen, J. Li, A. Liu
ACM Symposium on Theory of Computing (STOC 2024), pp. 1331-1342

Constant Approximation for Individual Preference Stable Clustering
A. Aamand, J. Chen, A. Liu, S. Silwal, P. Sukprasert, A. Vakilian, F. Zhang
Advances in Neural Information Processing Systems (NeurIPS 2023), ***Spotlight***

When Does Adaptivity Help for Quantum State Learning?
S. Chen, B. Huang, J. Li, A. Liu, M. Sellke
Quantum Information Processing (QIP 2023)
IEEE Symposium on Foundations of Computer Science (FOCS 2023), pp. 391-404

The Full Landscape of Robust Mean Testing: Sharp Separations between Oblivious and Adaptive Contamination
C. Canonne, S. Hopkins, J. Li, A. Liu, S. Narayanan
IEEE Symposium on Foundations of Computer Science (FOCS 2023), pp. 2159-2168
Invited to SIAM Journal on Computing Special Issue

Matrix Completion in Almost-Verification Time
J. Kelner, J. Li, A. Liu, A. Sidford, K. Tian
IEEE Symposium on Foundations of Computer Science (FOCS 2023), pp. 2102-2128

Semi-Random Sparse Recovery in Nearly-Linear Time
J. Kelner, J. Li, A. Liu, A. Sidford, K. Tian
Conference on Learning Theory (COLT 2023), pp. 2352-2398

Tensor Decompositions Meet Control Theory: Learning General Mixtures of Linear Dynamical Systems
A. Bakshi, A. Liu, A. Moitra, M. Yau
International Conference on Machine Learning (ICML 2023), pp. 1549-1563

A New Approach to Learning Linear Dynamical Systems
A. Bakshi, A. Liu, A. Moitra, M. Yau
ACM Symposium on Theory of Computing (STOC 2023), pp. 335-348

Robust Voting Rules from Algorithmic Robust Statistics
A. Liu, A. Moitra

ACM-SIAM Symposium on Discrete Algorithms (SODA 2023), pp. 3471-3512

Minimax Rates for Robust Community Detection
A. Liu, A. Moitra
IEEE Symposium on Foundations of Computer Science (FOCS 2022), pp. 823-831

Tight Bounds for Quantum State Certification with Incoherent Measurements
S. Chen, B. Huang, J. Li, A. Liu
Quantum Information Processing (QIP 2023)
IEEE Symposium on Foundations of Computer Science (FOCS 2022), pp. 1205-1213

Robust Model Selection and Nearly-Proper Learning for GMMs
J. Li, A. Liu, A. Moitra
Advances in Neural Information Processing Systems (NeurIPS 2022)

Clustering Mixtures with Almost Optimal Separation in Polynomial Time
J. Li, A. Liu
ACM Symposium on Theory of Computing (STOC 2022), pp. 1248-1261
SIAM Journal on Computing Special Issue 2024 (to appear)

Learning GMMs with Nearly Optimal Robustness Guarantees
A. Liu, A. Moitra
Conference on Learning Theory (COLT 2022), pp. 2815-2895

Settling the Robust Learnability of Mixtures of Gaussians
A. Liu, A. Moitra
ACM Symposium on Theory of Computing (STOC 2021), pp. 518-531
Journal of the ACM 2023, 70(3), pp. 1-53

Variable Decomposition for Prophet Inequalities and Optimal Ordering
A. Liu, R. Paes Leme, M. Pal, J. Schneider, B. Sivan
ACM Conference on Economics and Computation (EC 2021)

Optimal Contextual Pricing and Extensions
A. Liu, R. Paes Leme, J. Schneider
Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2021), pp. 1059-1078

Tensor Completion Made Practical
A. Liu, A. Moitra
Advances in Neural Information Processing Systems (NeurIPS 2020)

Better Algorithms for Estimating Non-Parametric Models in Crowd-Sourcing and Rank Aggregation
A. Liu, A. Moitra
Conference on Learning Theory (COLT 2020), pp. 2780-2829

Fourier and Circulant Matrices are not Rigid
Z. Dvir, A. Liu

Computational Complexity Conference (CCC 2019)
Theory of Computing Special Issue 2020, 16(1), pp. 1-48

Efficiently Learning Mixtures of Mallows Models
A. Liu, A. Moitra
IEEE Symposium on Foundations of Computer Science (FOCS 2018), pp. 627-638.

Teaching

Teaching Assistant for 6.S896 (Algorithmic Statistics) at MIT**,** Fall 2023
Teaching Assistant at USA Math Olympiad Summer Program**,** Summer 2017, 2018

Service

Reviewer for SODA 2025, NeuIPS 2024, FOCS 2024, STOC 2024, ICALP 2024, FOCS 2023, STOC 2023, SODA 2023, FSTTCS 2023, FOCS 2022, SODA 2022, NeurIPS 2021, FOCS 2021,

Chief Problem Writer for Harvard MIT Mathematics Tournament (HMMT) 2017,2018