Kuikui Liu

Stata Center, 32–D632
Cambridge, MA, 02139

liukui@mit.edu
Last Updated: Sept. 2023

RESEARCH INTERESTS
Markov chains, algorithms, statistical physics, high-dimensional statistics and geometry

APPOINTMENTS
Massachusetts Institute of Technology
Department of Electrical Engineering and Computer Science

Assistant Professor, LIDS & CSAIL — Sept. 2023 –
FODSI Postdoctoral Fellow, CSAIL — Sept. 2022 – Aug. 2023

EDUCATION
University of Washington, Seattle, WA
Paul G. Allen School of Computer Science & Engineering

Ph.D. Computer Science — Sept. 2018 – June 2022
Advisor: Shayan Oveis Gharan
Thesis: "Spectral Independence: A New Tool to Analyze Markov Chains"
EATCS Distinguished Dissertation Award
William Chan Memorial Dissertation Award

M.Sc. Computer Science — Sept. 2017 – June 2018

B.Sc. Mathematics and Computer Science — Sept. 2013 – June 2017
Advisors: Shayan Oveis Gharan and Rekha Thomas
Thesis: "The Method of Interlacing Polynomials"

AWARDS AND HONORS
2023 EATCS Distinguished Dissertation Award
2022 William Chan Memorial Dissertation Award
2019 STOC Best Paper Award
2018–2019 Hacherl Endowed Fellowship
2017 UW CSE Best Senior Thesis Award

PUBLICATIONS

[1] Chen, Zongchen ; Liu, Kuikui ; Mani, Nitya ; Moitra, Ankur: Strong spatial mixing for colorings on trees and its algorithmic applications, 2023 (FOCS)

[2] Chen, Zongchen ; Liu, Kuikui ; Vigoda, Eric: Spectral Independence via Stability and Applications to Holant-Type Problems, 2021 (FOCS)

[3] Abdolazimi, Dorna ; Liu, Kuikui ; Oveis Gharan, Shayan: A Matrix Trickle-Down Theorem on Simplicial Complexes and Applications to Sampling Colorings, 2021 (FOCS)

[4] Liu, Kuikui: From Coupling to Spectral Independence and Blackbox Comparison with the Down-Up Walk, 2021 (RANDOM)

[5] Chen, Zongchen ; Liu, Kuikui ; Vigoda, Eric: Optimal Mixing of the Glauber Dynamics: Entropy Factorization via High-Dimensional Expansion, 2021 (STOC). – *Invited to SICOMP Special Issue for STOC 2021*

[6] Anari, Nima ; Liu, Kuikui ; Oveis Gharan, Shayan ; Vinzant, Cynthia ; Vuong, Thuy-Duong: Log-Concave Polynomials IV: Approximate Exchange, Tight Mixing Times, and Near-Optimal Sampling of Forests, 2021 (STOC)

[7] Chen, Zongchen ; Liu, Kuikui ; Vigoda, Eric: Rapid Mixing of Glauber Dynamics up to Uniqueness via Contraction, 2020 (FOCS)

[8] Anari, Nima ; Liu, Kuikui ; Oveis Gharan, Shayan: Spectral Independence in High-Dimensional Expanders and Applications to the Hardcore Model, 2020 (FOCS). – *SICOMP Special Issue for FOCS 2020*

[9] Anari, Nima ; Liu, Kuikui ; Oveis Gharan, Shayan ; Vinzant, Cynthia: Log-Concave Polynomials II: High-Dimensional Walks and an FPRAS for Counting Bases of a Matroid, 2019 (STOC). – *Awarded Best Paper, Annals of Mathematics*

PREPRINTS

[1] Anari, Nima ; Liu, Kuikui ; Oveis Gharan, Shayan ; Vinzant, Cynthia: Log-Concave Polynomials III: Mason's Ultra-Log-Concavity Conjecture for Independent Sets of Matroids. (2018). – Second round of review for the Proceedings of the American Mathematical Society

[2] Liu, Kuikui: *The Method of Interlacing Polynomials.* 2017. – Survey article advised by Shayan Oveis Gharan and Rekha Thomas, *Awarded Best Senior Thesis*

SELECTED TALKS

Spectral Independence: A New Tool to Analyze Markov Chains

Joint Mathematics Meetings AMS Special Session "Recent Progress in Inference and Sampling", San Francisco, CA	Jan. 2024
Simons Institute "Analysis and TCS" Bootcamp, Berkeley, CA	June 2023
FODSI "Computational Complexity of Statistical Problems" Workshop, Cambridge, MA	June 2023
MIT IDSS Stochastics and Statistics Seminar, Cambridge, MA	Mar. 2023
MIT Theory Reading Group, Cambridge, MA	Nov. 2022
Workshop on Large-Scale Stochastic Dynamics, Oberwolfach, Germany	Sept. 2022
BIRS "Markov Chains with Kinetic Constraints and Applications" Workshop, Banff, Canada	July 2022
TCS+, Virtual	Nov. 2021
MPS Conference on High-Dimensional Expanders, New York City, NY	Oct. 2021
CMU Theory Seminar, Virtual	Oct. 2021
MIT Theory of Computing Colloquium, Virtual	Sept. 2021
Minisymposium on Reconfiguration at CanaDAM, Virtual	May 2021
Northwestern Junior Theorists Workshop, Virtual	Dec. 2020
U. Chicago/TTIC Theory Reading Group, Virtual	Dec. 2020
Simons Institute "Probability, Geometry, and Computation in High Dimensions" Reading Group, Virtual (3 Hours)	Dec. 2020
UC Berkeley Theory Lunch, Virtual	Dec. 2020
Simons Institute "Geometry of Polynomials Reunion", Virtual	Sept. 2020
STOC "New Frontiers in Approximate Counting" Workshop, Virtual	June 2020

RESEARCH VISITS

Institute for Advanced Study
Princeton, NJ — Feb. 2020

Simons Institute for the Theory of Computing — Geometry of Polynomials
Berkeley, CA — Jan.– Mar. 2019

TEACHING

MIT EECS 6.S891: Algorithmic Counting and Sampling (Fall 2023)

Assistant: Prague Summer School on Discrete Mathematics (2020), Stanford CS106A Code-In-Place (2020), Design and Analysis of Algorithms (2016, 2017, 2019, 2020), Programming Concepts and Tools (2015), Data Structures and Algorithms (2016), Induction, Infinity, and Invariants (2014)

SERVICE

Program Committee:
SODA 2024

Reviewing:
Conference: STOC (2019, 2022, 2023), FOCS (2019, 2021, 2022, 2023), SODA (2021, 2022), ICALP (2022, 2023), ITCS 2023, APPROX 2019, RANDOM (2020, 2021), MFCS 2020
Journal: JFA (2021), Bernoulli (2021), TALG (2021, 2023), IPL (2021), IMRN (2021), TCS (2022), SICOMP (2023)