

## Kuikui Liu

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### RESEARCH INTERESTS

Markov chains, algorithms, high-dimensional geometry

### EDUCATION

University of Washington (UW), Seattle, WA

**Ph.D., Computer Science, Sept. 2018– Present**

Advisor(s): Professor Shayan Oveis Gharan

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

B.Sc., Mathematics and Computer Science, Sept. 2013– June 2017

### AWARDS AND HONORS

**STOC 2019 Best Paper Award**

**UW CSE Best Senior Thesis Award:** “The Method of Interlacing Polynomials”

Advisors: Professors Shayan Oveis Gharan (UW CSE) and Rekha Thomas (UW Math)

**Hacherl Endowed Fellowship:** 2018-2019

**Mathematics Departmental Honors:** June 2017

**Cum Laude and Dean’s List (Every Quarter)**

**UW Academy:** Matriculated into UW two years early via Robinson Center for Young Scholars UW Academy Program.

### PUBLICATIONS

- [1] Nima Anari, Kuikui Liu, Shayan Oveis Gharan, and Cynthia Vinzant. Log-Concave Polynomials II: High-Dimensional Walks and an FPRAS for Counting Bases of a Matroid. *STOC*, 2019. **Awarded Best Paper.**
- [2] Nima Anari, Kuikui Liu, and Shayan Oveis Gharan. Spectral Independence in High-Dimensional Expanders and Applications to the Hardcore Model. *FOCS*, 2020. **Invited to SICOMP Special Issue for FOCS 2020.**
- [3] Nima Anari, Kuikui Liu, Shayan Oveis Gharan, Cynthia Vinzant, and Thuy-Duong Vuong. Log-Concave Polynomials IV: Approximate Exchange, Tight Mixing Times, and Near-Optimal Sampling of Forests. *STOC*, 2021.
- [4] Zongchen Chen, Kuikui Liu, and Eric Vigoda. Rapid Mixing of Glauber Dynamics up to Uniqueness via Contraction. *FOCS*, 2020.
- [5] Zongchen Chen, Kuikui Liu, and Eric Vigoda. Optimal Mixing of the Glauber Dynamics: Entropy Factorization via High-Dimensional Expansion. *STOC*, 2021. **Invited to SICOMP Special Issue for STOC 2021.**
- [6] Kuikui Liu. The Method of Interlacing Polynomials, 2017. Advised by Shayan Oveis Gharan and Rekha Thomas, **Awarded Best Senior Thesis.**

### PREPRINTS

- [7] Dorna Abdolazimi, Kuikui Liu, and Shayan Oveis Gharan. A matrix trickle-down theorem on simplicial complexes and applications to sampling colorings. *arXiv preprint arXiv:2106.03845*, 2021. Submitted.
- [8] Nima Anari, Kuikui Liu, Shayan Oveis Gharan, and Cynthia Vinzant. Log-Concave Polynomials III: Mason’s Ultra-Log-Concavity Conjecture for Independent Sets of Matroids. *arXiv preprint arXiv:1811.01600*, 2018.
- [9] Zongchen Chen, Kuikui Liu, and Eric Vigoda. Spectral independence via stability and applications to holant-type problems. *arXiv preprint arXiv:2106.03366*, 2021. Submitted.
- [10] Kuikui Liu. From coupling to spectral independence and blackbox comparison with the down-up walk. *arXiv preprint arXiv:2103.11609*, 2021. Submitted.

INVITED TALKS	<b>Optimal Mixing of Glauber Dynamics: Entropy Factorization via High-Dimensional Expansion</b>	STOC 2021 Conference, Virtual	June 2021	
	<b>Markov Chain Analysis Through the Lens of High-Dimensional Expanders</b>	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	
		<b>Spectral Independence in High-Dimensional Expanders and Applications to the Hardcore Model</b>		
		FOCS 2020 Conference, Virtual	Nov. 2020	
		Columbia University Theory Lunch, New York City, NY	Feb. 2020	
		Institute for Advanced Study CSDM Seminar, Princeton, NJ	Feb. 2020	
		Georgia Tech ARC Colloquium, Atlanta, GA	Jan. 2020	
		UW CSE Theory Seminar, Seattle, WA	Jan. 2020	
		<b>Log-Concave Polynomials, High-Dimensional Expanders, and an FPRAS for Counting Bases of a Matroid</b>		
		STOC 2019 Conference, Phoenix, AZ	June 2019	
		Microsoft Research MLO Group Meeting, Seattle, WA	Feb. 2019	
		Simons Institute “Beyond Randomized Rounding”, Berkeley, CA	Feb. 2019	
		Simons Institute Two-Lecture Mini-Course, Berkeley, CA	Feb. 2019	
		UW CSE Theory Seminar, Seattle, WA	Dec. 2018	
		<b>Miscellaneous</b>		
		UW CSE Theory Lunch “Lewis’s Lemma and Applications”	Feb. 2021	
		UW CSE Theory Lunch “The Correlation Decay Algorithm for Independent Sets”	Oct. 2019	
		UW CSE Theory Lunch “Strongly Log-Concave Polynomials and Mason’s Conjecture”	Oct. 2018	
		UW CSE Theory Lunch “Some Extremal Properties of Chebyshev Polynomials and Applications”	Mar. 2018	
		UW CSE Theory Lunch “Building Bipartite Ramanujan Multigraphs in Polynomial Time”	June 2017	
RESEARCH VISITS	<b>Institute for Advanced Study</b>	Princeton, NJ	Feb. 2020	
	<b>Simons Institute for the Theory of Computing</b>	Berkeley, CA	Geometry of Polynomials Jan.– Mar. 2019	
INDUSTRY EXPERIENCE	<b>Software Engineer Intern</b>		Facebook	
	June 2017– Sept. 2017	Search Natural Language Processing Team	Menlo Park, CA	
	<b>Software Engineer Intern</b>		Amazon	
	June 2016– Sept. 2016	Supply Chain Simulations Team	Seattle, WA	
TEACHING ASSISTANTSHIPS	<b>Design and Analysis of Algorithms:</b>	Graduate Level	Sept.–Dec. 2019, 2020	
	<b>Programming Concepts and Tools:</b>	Nonmajors	Sept.– Dec. 2015	

<b>Data Structures and Algorithms:</b> Nonmajors	Jan.– Mar. 2016
<b>Introduction to Algorithms:</b> Majors	Apr.– June 2016
<b>Algorithms and Computational Complexity:</b> Nonmajors	Jan.– Mar. 2017
<b>Induction, Infinity, and Invariants:</b> Summer Stretch	June– Aug. 2014

SERVICE

**External Reviewer for:**

STOC 2019, APPROX 2019, FOCS 2019, RANDOM 2020, MFCS 2020, SODA 2021, Journal of Functional Analysis (2021), Bernoulli Journal (2021), RANDOM 2021, FOCS 2021

**Volunteer Teaching Assistant for:**

Stanford CS106A Code-In-Place (Introduction to Python)	Apr.– May 2020
Prague Summer School on Discrete Mathematics “The Polynomial Paradigm in Algorithm Design”	Aug. 2020

**Miscellaneous**

ITCS 2020 Helper	
UW CSE Ph.D. Application Volunteer Reader	Jan. 2021
UW CSE Theory Group Webmaster	