

Theo McKenzie

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APPOINTMENTS

Stanford University, Department of Mathematics, Science Fellow 7/2023-Present
Harvard University, Department of Mathematics, NSF MPS Ascend Postdoctoral Fellow 7/2022-6/2023

EDUCATION

Ph.D. in Mathematics, University of California, Berkeley 8/2017-5/2022
Thesis: *Random Walks and Delocalization through Graph Eigenvector Structure*
Advisors: Prof. Nikhil Srivastava and Prof. Luca Trevisan
A.B. in Mathematics, Harvard University (Cum Laude in Field) 8/2011-5/2015
Secondary Field: The Classics
Thesis: *Real Stable Polynomials: Description and Application*
Thesis Advisor: Dr. Péter Csikvári

RESEARCH INTERESTS

The intersection of statistical physics and combinatorics, specifically the structure of eigenvectors of graphs. Random graphs, random matrices, probability theory, theoretical computer science.

SELECTED FELLOWSHIPS AND SCHOLARSHIPS

NSF Math and Physical Sciences ASCEND Postdoctoral Fellowship 2022
300k support offered (100k support per year for three years. 100k accepted).
NSF Graduate Research Fellow 2019
~\$138k equivalent (12k tuition and fees + 34k per year stipend for three years)
Ford Foundation Predoctoral Fellow 2019
~\$72k equivalent (24k per year stipend for three years)
Math and Physical Sciences Mentorship Award 2018
\$1,800 Award
Berkeley Chancellor's Fellowship Recipient 2017
~\$126k equivalent (tuition and fees + 30k per year stipend for two years)

LIST OF PUBLICATIONS AND PREPRINTS

12. [Optimal eigenvalue rigidity of random regular graphs](#). With Jiaoyang Huang and Horng-Tzer Yau. Preprint, arxiv:2405.12161.
11. [The spectral edge of constant degree Erdős-Rényi graphs](#). With Ella Hiesmayr. Preprint, arxiv:2309.11007 *Submitted*.
10. [Nodal decompositions of a symmetric matrix](#). With John Urschel. *International Mathematics Research Notices* 2024(7), pp. 6224-6258.
9. [Explicit two-sided unique-neighbor expanders](#). With Jun-Ting Hsieh, Sidhanth Mohanty, and Pedro Paredes. *Proceedings of the 56th Annual ACM SIGACT Symposium on Theory of Computing (STOC 2024)*.
8. [Predictive Policing: a mathematical primer](#). With Joseph Johnson and Tian An Wong. *Notices of the American Mathematical Society* 71(7) (2024).

7. [Quantum ergodicity for periodic graphs](#). With Mostafa Sabri. In *Communications in Mathematical Physics* Volume 403, pages 1477–1509, (2023).
6. [Many nodal domains in random regular graphs](#). With Shirshendu Ganguly, Sidhanth Mohanty, and Nikhil Srivastava. *Communications in Mathematical Physics* Volume 401, pages 1291–1309, (2023).
5. [The necessity of conditions for graph quantum ergodicity and Cartesian products with an infinite graph](#). *Comptes Rendus Mathématique*, 360(G4), pages 399–408.
4. [Support of closed walks and second eigenvalue multiplicity of graphs](#). With Peter M. R. Rasmussen and Nikhil Srivastava. In *Proceedings of the 53rd Annual ACM SIGACT Symposium on Theory of Computing (STOC 2021)*, pages 396–407.
3. [High-girth near-Ramanujan graphs with lossy vertex expansion](#). With Sidhanth Mohanty. In *Proceedings of the 48th International Colloquium on Automata, Languages, and Programming (ICALP 2021)*.
2. [A New Algorithm for the Robust Semi-random Independent Set Problem](#). With Hermish Mehta and Luca Trevisan. In *Proceedings of the Fourteenth Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2020)* (pp. 738–746).
1. [Real Stable Polynomials: Description and Application](#). Advisor: Péter Csikvári. Undergraduate Thesis.

TEACHING EXPERIENCE

Principal Instructor of Math 107 <i>Graph Theory</i> , Stanford University	Winter 2024
Instructor of Pre-Calculus and Intermediate Algebra for Mount Tamalpais College (formerly the Prison University Project) at San Quentin State Prison. Lead Instructor 2018-2022.	2018-2023
Lecturer at Boston University Prison Education Program, MCI-Framingham Prison	2022-2023
Graduate Student Instructor at UC Berkeley Mathematics for Math 10B <i>Methods of Mathematics: Calculus, Statistics, and Combinatorics</i>	Spring 2019

MENTORSHIP AND LEADERSHIP

Organized Stanford Probability Seminar	Winter 2024
Harvard Math Includes Mentor (Mentored 5 undergraduates from underrepresented backgrounds interested in math, meeting monthly)	2022-2023
UC Berkeley Mathematics Equity and Inclusion Committee member (activities included serving on hiring subcommittee, helping create a list of potential faculty candidates who had done strong work in diversity)	2021-2022
UC Berkeley STEM First Year Initiative Ambassador (mentored three first year minority STEM Ph.D. students)	2019-2022
Organized UC Berkeley Discrete Analysis Student Seminar	2021
UC Berkeley Getting into Graduate School Mentor (met monthly with two mentees to help them prepare applications for graduate school. Read personal statements, recommended programs)	2019-2020
UC Berkeley Directed Reading Program Mentor (advised two research projects for Berkeley undergraduates, one on spectral graph theory, one on convex optimization)	2017- 2018

PROFESSIONAL EXPERIENCE

Research Intern at Microsoft Research, Machine Learning Foundations Group <i>Redmond, WA</i>	5/2022-8/2022
Trading Analyst at Goldman Sachs & Co. <i>New York, NY</i>	7/2015-5/2017

SELECTED INVITED TALKS

University of Arizona Probability and Mathematical Physics Seminar	Nov. 2024
University of California, Berkeley Spectral Theory Seminar	Oct. 2024, Apr. 2024 & Oct. 2023
Stanford University Probability Seminar	Oct. 2024, Oct. 2023 & Feb. 2021
Carnegie Mellon Probability/Math Finance Seminar	Sep. 2024
San Francisco State Combinatorics Seminar	Sep. 2024
Duke Combinatorics Seminar	Sep. 2024
Duke Probability Seminar	Sep. 2024
University of Strasbourg Mathematics Physics Seminar	Jun. 2024 & Apr. 2022
Texas A&M Mathematical Physics Seminar	Apr. 2024 & Apr. 2022
NYU Abu Dhabi Stochastics Seminar	Apr. 2024
University of California, Davis Probability Seminar	Nov. 2023
Stanford University Analysis & PDE Seminar	Oct. 2023
Stanford University Combinatorics Seminar	Oct. 2023
NYU Probability and Mathematical Physics Seminar	Sep. 2023
Harvard CMSA Workshop on Graphical Models, Statistical Inference, and Algorithms	May 2023
IAS Computer Science and Discrete Mathematics Seminar	May 2023
University of Virginia Operator Theory Seminar	Mar. 2023
MIT Combinatorics Seminar	Feb. 2023
Online Asymptotic Geometric Analysis Seminar	Apr. 2022
Spectral Geometry in the Clouds Young Researcher Showcase	Mar. 2022
JMM Special Session on Applied Combinatorial Methods	Jan. 2022
Berkeley Edge Conference <i>Keynote Speaker</i>	Nov. 2021
Math Analysis Egypt Seminar	Nov. 2021
Georgia Tech Stochastics Seminar	Oct. 2021
Carnegie Mellon Theory Seminar	Oct. 2021
University of Washington CS Theory Seminar	Oct. 2021
University of Washington Probability Seminar	Oct. 2021
CanADAM Minisymposium on Spectral Graph Theory	May 2021
Delaware Discrete Mathematics and Algebra Seminar	Feb. 2021
JMM Special Session on ADJOINT Research Showcase	Jan. 2021
IPAM Quantitative Linear Algebra Program	Dec. 2019
Pacific Math Alliance Conference	Oct. 2019

SELECTED CONTRIBUTED TALKS

World Congress in Probability and Statistics	Aug. 2024
International Congress of Mathematical Physics	Jul. 2024
International Colloquium on Automata, Languages, and Programming	Jul. 2021
Symposium on Theory of Computing	Jun. 2021
Conference of Ford Fellows	Oct. 2020 & Oct. 2019
Symposium on Discrete Algorithms	Jan. 2020