Alexander Cohen

Curriculum Vitae

Updated July 24, 2026

Employment

2025– **Assistant Professor**, *Courant Institute of Mathematical Sciences, NYU*, New York, NY

Education

2021–2025 (expected) **Ph.D. in Mathematics**, *MIT*, Cambridge, MA, Advisor: Larry Guth

2017–2021 **Dual BS/MS in Mathematics**, *Yale University*, New Haven, CT

Papers

Preprints

17. **Moderate-doubling sets in $\mathbb{F}_2^n$ intersect subspaces**, *with Dmitrii Zakharov*, Submitted, https://arxiv.org/abs/2512.19884
16. **A simple bound on fluctuations in the 3D Coulomb gas**, *with Felipe Hernández*, Submitted, https://arxiv.org/abs/2510.27129
15. **Sylvester–Gallai configurations on algebraic curves in $\mathbb{C}^2$**, Submitted, https://arxiv.org/abs/2508.21241
14. **A new upper bound for the Heilbronn triangle problem**, *with Cosmin Pohoata and Dmitrii Zakharov*, Submitted, https://arxiv.org/abs/2305.18253

Publications

13. **Clustering in typical unit-distance avoiding sets**, *with Nitya Mani*, Acta Mathematica Hungarica 176 (2025), https://link.springer.com/article/10.1007/s10474-025-01556-w
12. **Lower bounds for incidences**, *with Cosmin Pohoata and Dmitrii Zakharov*, Inventiones Mathematicae 240 (2025), https://doi.org/10.1007/s00222-025-01331-2
11. **Fractal uncertainty in higher dimensions**, Annals of Mathematics 202, https://annals.math.princeton.edu/2025/202-1/p04
10. **Every real-rooted exponential polynomial is the restriction of a Lee-Yang polynomial**, *with Lior Alon and Cynthia Vinzant*, Journal of Functional Analysis 286 (2024), no.2, https://doi.org/10.1016/j.jfa.2023.110226
9. **Fractal uncertainty for discrete 2D Cantor sets**, Analysis & PDE 18 (2025), no. 3, https://doi.org/10.2140/apde.2025.18.743

alexcohen@nyu.edu • https://cims.nyu.edu/ ac6074/

8. **Partition and Analytic Rank are Equivalent over Large Fields**, *with Guy Moshkovitz*, Duke Mathematics Journal 172 (2023), no. 12, 2433–2470
7. **Uniqueness of excited states to $-\Delta u + u - u^3 = 0$ in three dimensions**, *with Zhenhao Li and Wilhelm Schlag*, Analysis & PDE 17 (2024), no. 6, 1887–1906, https://doi.org/10.2140/apde.2024.17.1887
6. **Structure vs. randomness for bilinear maps**, *with Guy Moshkovitz*, Discrete Analysis (2022), https://doi.org/10.19086/da.38587
5. **A Sylvester-Gallai result for concurrent lines in the complex plane**, Discrete and Computational Geometry 68 (2022), 172–187, https://doi.org/10.1007/s00454-020-00256-2
4. **A Sylvester-Gallai theorem for cubic curves**, *with Frank de Zeeuw*, European Journal of Combinatorics 103 (2022), https://doi.org/10.1016/j.ejc.2022.103509
3. **Poissonian correlation of higher order differences**, Journal of Number Theory 229 (2021), 463–486, https://doi.org/10.1016/j.jnt.2020.11.017
2. **Sinkhorn limits in finitely many steps**, *with Melvyn Nathanson*, Linear Algebra and its Applications 589 (2020), 1–8, https://doi.org/10.1016/j.laa.2019.12.016
1. **Searching large hypothesis spaces by asking questions**, *with Brenden Lake*, Proceedings of the 38th Annual Conference of the Cognitive Science Society (2016), https://escholarship.org/uc/item/0dz4648h

Talks

Colloquiua

2026 **Developments in projection theory**, *Math Department Colloquium*, Stony Brook University

2025 **Higher dimensional fractal uncertainty**, *Math Department Colloquium*, University of California, Berkeley

2024 **Higher dimensional fractal uncertainty**, *Math Department Colloquium*, Yale University

Seminar talks

2025 **Ruling out periodicity in quantum chaos**, *Analysis seminar*, New York University

2025 **Ruling out periodicity in quantum chaos**, *Analysis seminar*, Université Paris Saclay, Orsay

2025 **Lower bounds for incidences**, *Analysis seminar*, Northwestern University

2025 **Lower bounds for incidences**, *Analysis seminar*, Rice University

2025 **Ruling out periodicity in quantum chaos**, *Analysis seminar*, MIT

2024 **Lower bounds for incidences**, *Harmonic analysis and fractal geometry seminar*, University of British Columbia

2024 **Lower bounds for incidences**, *Analysis Seminar*, Cornell University

2024 **Lower bounds for incidences**, *GLESPA Seminar*, Brown University

2024 **Lower bounds for incidences**, *Analysis seminar*, Yale University

2024 **Lower bounds for incidences and applications**, *Discrete Math seminar*, Princeton University

2024 **Partition rank vs. analytic rank of tensors**, *Random tensors seminar*, Texas A&M

2024 **A higher dimensional fractal uncertainty principle**, *Analysis Seminar*, NYU Courant

2024 **A higher dimensional fractal uncertainty principle**, *Calderon-Zygmund seminar*, University of Chicago

2024 **Finding tiny triangles with fractal geometry**, *NYC Discrete Geometry Seminar*, NYU Courant

2023 **Higher dimensional fractal uncertainty**, *Joint IAS/PU Analysis seminar*, Institute for Advanced Study
Recording: `https://youtu.be/xI5LarlkueE?si=GF4nTywK76iLX9jz`

2023 **Improved bound for Heilbronn's triangle problem and connections to projection theory**, *Combinatorics & Graph Theory Seminar*, National University of Singapore

2023 **Higher dimensional fractal uncertainty**, *Analysis seminar*, Georgia Tech

2023 **Higher dimensional fractal uncertainty**, *Analysis seminar*, Brown University

2023 **Improved bound for Heilbronn's triangle problem and connections to projection theory**, *MIT/Harvard Combinatorics Seminar*, MIT

2023 **Improved bound for Heilbronn's triangle problem and connections to projection theory**, *Copenhagen-Jerusalem Combinatorics Seminar*, University of Copenhagen
Recording: `https://youtu.be/cxxw7CpctIo?si=icUxJZ648Q9p0DL-`

2022 **Fractal uncertainty for discrete 2D Cantor sets**, *Harmonic analysis afternoon*, Institute for Advanced Study

2022 **A fractal uncertainty principle for discrete 2D Cantor sets**, *Harmonic Analysis and Differential Equations Seminar*, University of California, Berkeley

2022 **Partition rank vs. analytic rank of tensors**, *MIT/Harvard Combinatorics Seminar*, MIT

2022 **An optimal inverse theorem for polynomials over large fields**, *Number Theory Seminar*, CUNY Graduate Center
Recording: `https://www.youtube.com/watch?v=ui90gBkLEqc`

2021 **Equivalence of 3-tensor ranks**, *Big Seminar*, Laboratory Of Combinatorial And Geometric Structures at MIPT
Recording: `https://www.youtube.com/watch?v=MxbgwBSsHoU`

2019 **Sinkhorn limits in finitely many steps**, *Number Theory Student Seminar*, CUNY Graduate Center

2019 **A Sylvester-Gallai result for concurrent lines in the complex plane**, *NYC Discrete Geometry Seminar*, NYU Courant

Conference talks

2026 **Induction on scales in projection theory**, *Workshop on Harmonic analysis and applications to Ramsey theory*, Rényi Institute

2026 **Minicourse on lower bounds for incidences**, *Simons School on Harmonic analysis and applications to Ramsey theory*, Rényi Institute

2026 **Ruling out periodicity in quantum chaos**, *Modern Applications of Microlocal Analysis* , University College London

2025 **Lower bounds for incidences**, *Algebraic and Analytic Methods in Combinatorics*, SLMath

2024 **Branching functions in phase space**, *Winter Meeting Session: Incidence Problems in Analysis*, Canadian Mathematical Society

2024 **Tiny triangles, lower bounds for incidences, and fractal geometry**, *Winter Meeting Session: Harmonic Analysis and Geometric Measure Theory*, Canadian Mathematical Society

2024 **A higher dimensional fractal uncertainty principle**, *Dynamical Systems, Number Theory, and Quantum Chaos: New connections and directions*, University of Manchester

2024 **A higher dimensional fractal uncertainty principle**, *LMS-Bath Symposium: Advances in Spectral Theory*, University of Bath

2024 **Improved bound for Heilbronn's triangle problem and connections to projection theory**, *On the Interface of Geometric Measure Theory and Harmonic Analysis*, Banff International Research Station

2022 **Partition rank vs. analytic rank of tensors**, *Tensors: Quantum Information, Complexity and Combinatorics workshop*, Centre de recherches mathematiques thematic semester on *Symmetries: Algebras and Physics*

2022 **An optimal inverse theorem for polynomials**, *Joint Mathematics Meeting*, special session on undegraduate research

2022 **A Sylvester-Gallai theorem for concurrent lines in the complex plane**, *AMS Spring Sectional Meeting*, special session on Discrete Geometry

2021 **Structure vs. randomness for bilinear maps**, *Symposium on the Theory of Computing 2021*
Recording: `https://www.youtube.com/watch?v=HaMuRzdkuFQ`

2020 **Partition rank vs. geometric rank of tensors**, *Young Mathematicians Conference*, The Ohio State University

2020 **A Sylvester-Gallai result for concurrent lines in the complex plane**, *Combinatorial and Additive Number Theory conference*, CUNY

Honors and Awards

2025 Clay Research Fellowship

2022 Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student: Honorable Mention

2022 Hertz Foundation Fellow
2022 NSF Graduate Research Fellowship
2021 Yale University DeForest prize for proficiency in pure and applied mathematics
2020 Yale University Anthony D. Stanley memorial prize for excellence in mathematics
2020 Barry M. Goldwater Scholarship

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