

Abigail Raz

Curriculum Vitae

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Employment

- 2021–present **Assistant Professor**, *Department of Mathematics*, Albert Nerken School of Engineering, The Cooper Union for the Advancement of Science and Art, New York City, NY.
- 2019–2021 **Edith T. Hitz Postdoctoral Faculty Fellow**, *Department of Mathematics*, University of Nebraska-Lincoln, Lincoln, NE.
Postdoctoral research and teaching position

Education

- 2014–2019 **PhD in Mathematics**, *Rutgers University*, New Brunswick, NJ.
Advisor: Jeff Kahn
- 2010–2014 **BA in Mathematics**, *Wellesley College*, Wellesley, MA.
Graduated with honors in the major; magna cum laude

Research Interests

I study discrete mathematics. I am especially interested in areas related to graph searching, complex networks, extremal combinatorics, and random graphs.

Teaching

Courses for which I was the instructor

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|----------------------------------|---|
| ◦ Probability | Cooper Union - Fall 2024-2025 |
| ◦ Calculus I | Cooper Union - Fall 2021-2025 |
| ◦ Introduction to Linear Algebra | Cooper Union - Fall 2021-2024 |
| ◦ Discrete Mathematics | Cooper Union - Spring 2023-2026 |
| ◦ Calculus II | Cooper Union - Spring 2022-2026, Fall 2025 |
| ◦ Graph Theory | Cooper Union - Fall 2023 |
| ◦ Calculus III | University of Nebraska - Spring 2021 |
| ◦ Group Theory | University of Nebraska - Fall 2020 |
| ◦ Elementary Analysis | University of Nebraska - Fall and Spring 2020 |
| ◦ Differential Equations | University of Nebraska - Fall 2019 |
| ◦ Probability | Rutgers University - Summer 2018 |
| ◦ Introductory Linear Algebra | Rutgers University - Summer 2017 |
| ◦ Probability | Young Scholars Program - Summer 2017 |
| ◦ Graph Theory | Rutgers University - Summer 2016 |

Courses for which I was a teaching assistant

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|--|---|
| ◦ Introduction to Real Analysis I (honors) | Rutgers University - Spring 2019 |
| ◦ Introduction to Real Analysis I | Rutgers University - Fall 2018 |
| ◦ Multivariable Calculus | Rutgers University - Spring 2016 and 2017 |
| ◦ Calculus II (honors) | Rutgers University - Fall 2016 |
| ◦ Calculus I | Rutgers University - Fall 2015 |

Publications and Preprints

- [1] Christopher Brice, Erin Meger, Nhat-Dinh Nguyen, Allen Rakhamimov, and Abigail Raz. Zero forcing on iterated graph models, 2025. URL <https://arxiv.org/abs/2507.12579>.
- [2] Abigail Raz and Paddy Yang. A path variant of the explorer director game on graphs, 2025. URL <https://arxiv.org/abs/2501.05364>.
- [3] Erin Meger and Abigail Raz. The iterative independent model. *Discrete Applied Mathematics*, 341:242–256, 2023. ISSN 0166-218X. doi: <https://doi.org/10.1016/j.dam.2023.08.015>. URL <https://www.sciencedirect.com/science/article/pii/S0166218X23003232>.
- [4] Pat Devlin, Erin Meger, Abigail Raz, and Polymath REU Participants. The explorer–director game on graphs. *Graphs and Combinatorics*, 39(3):48, 2023. URL <https://doi.org/10.1007/s00373-023-02638-8>.
- [5] Abigail Raz. Structure of the largest subgraphs of $G_{n,p}$ with a given matching number. *Discrete Mathematics*, 344(3):112227, 2021. ISSN 0012-365X. URL <http://www.sciencedirect.com/science/article/pii/S0012365X20304131>.
- [6] Abigail Raz. Tight upper tail bounds for cycles. *SIAM Journal on Discrete Mathematics*, 34(3):1559–1586, 2020. URL <https://doi.org/10.1137/19M1258827>.
- [7] Simona Boyadzhiyska, Karen Lange, Abigail Raz, Rebecca Scanlon, John Wallbaum, and Xueyin Zhang. Classifications of definable subsets. *Algebra and Logic*, 58(5):383–404, 2019.
- [8] Abigail Raz. Note on the union-closed sets conjecture. *Electronic Journal of Combinatorics*, 24(3), 2017.
- [9] Devlin Mallory, Abigail Raz, Christino Tamon, and Thomas Zaslavsky. Which exterior powers are balanced? *Electronic Journal of Combinatorics*, 20(2), 2013.
- [10] John Brown, Chris Godsil, Devlin Mallory, Abigail Raz, and Christino Tamon. Perfect state transfer on signed graphs. *Quantum Information and Computation*, 13(5&6):511–530, 2013.

Advising Undergraduate Research

- Advised an undergraduate research project conducted by a Cooper Union student (EE’27) during Summer 2024. Led to a preprint currently under editorial review.
 - Abigail Raz and Paddy Yang. A path variant of the explorer director game on graphs, 2025+. <https://arxiv.org/abs/2501.05364>.
- Served as a research mentor through the Queen’s Experiences in Discrete Mathematics REU. Through this project I advised a group of three students in a research project related to graph searching on complex networks. At the time of the project one student was at Cooper Union (ChE ’26) while the other two were from schools within the City University of New York (CUNY) system - City College and Borough of Manhattan Community College. Led to a preprint currently under editorial review.
 - Christopher Brice, Erin Meger, Nhat-Dinh Nguyen, Allen Rakhamimov, and Abigail Raz. Zero forcing on iterated graph models, 2025+. <https://arxiv.org/abs/2507.12579>.
- Advised an undergraduate research project conducted by a Cooper Union student (BSE’25) during Summer 2023. Led to a preprint posted on ArXiv.
 - Kengbo Lu and Abigail Raz. Note on the union-closed sets conjecture and reimer’s average set size theorem, 2024. <https://arxiv.org/abs/2405.10639>.
- Advised an undergraduate research project at the University of Nebraska, Lincoln during Spring 2021.

- Co-advised two undergraduate research projects as a part of the Polymath REU during Summer 2020. Led to a publication.
 - Pat Devlin, Erin Meger, Abigail Raz, and Polymath REU Participants. The explorer-director game on graphs. *Graphs and Combinatorics*, 39(3):48, 2023.

Plenary/Keynote Talks

- The explorer-director game on graphs
 - New York Graph Theory Day - November 2023
 - Graph Searching in America Workshop - August 2023

Invited Talks

- Path variant of the explorer-director game on graphs
 - Canadian Discrete and Algorithmic Mathematics Conference - Contributed Minisymposia on Graph Coloring and Labeling - May 2025
 - Hofstra University Math Seminar - March 2025
 - Mina Reese NY Women and Math Conference - March 2025
 - New York Combinatorics Seminar - February 2025
- Zero Forcing on Iterative Graph Models
 - AMS Fall Eastern Sectional - Special Session on Recent Developments in Graph Theory - October 2024
- The iterative independent model
 - Women in Combinatorics Virtual Conference - Network Theory Session - July 2024
 - AWM Research Symposium - Special Session on Extremal and Probabilistic Combinatorics - September 2023
 - AMS Spring Central Sectional - Recent Trends in Graph Theory - April 2023
 - Joint Mathematics Meetings - Special Session on Women in Graph Theory - January 2023
 - New York Combinatorics Seminar - November 2022
- The union-closed sets conjecture
 - Brooklyn College Math Department Colloquium - March 2022
 - Wellesley College Math Department Colloquium - February 2018
- Perfect matchings in the random bipartite geometric graph
 - New York Combinatorics Seminar - October 2021
 - AMS Fall Western Sectional - Special Session on Graphs, Hypergraphs and Set Systems - October 2020
 - AMS Fall Southeastern Sectional - Special Session on Random Discrete Structures - October 2020
 - Women in Combinatorics Virtual Colloquium - July 2020
- Upper tail bounds for cycles
 - AMS Spring Southeastern Sectional - Special Session on Random Discrete Structures - March 2019
 - Yale Combinatorics Seminar - January 2019
- What do the largest subgraphs of $G_{n,p}$ with a given matching number look like?
 - AMS Fall Central Sectional - Special Session on Topics in Graph Theory, Hypergraphs, and Set Systems - October 2018
 - Graduate Student Combinatorics Conference - April 2018
- Exploring graphs and randomness
 - Math League International Summer Tournament - July 2018

Equity and Outreach

- Presentation for the Cooper Union Summer STEM class on Machine Learning July 2022
- Faculty Advisor for the UNL undergraduate AWM chapter Fall 2020-Spring 2021
- Math bowl moderator for the Nebraska Math Day Fall 2019 and 2020
- Networking host at the Nebraska Conference for Undergraduate Women February 2019
- Panelist for the Louis Stokes Alliance for Minority Participation November 2018
- North Jersey Regional Science Fair Judge March 2018

Awards and Grants

- 2023 **Cooper Grant**, *Cooper Union Summer Research Community*.
Led the efforts to apply for a \$3,500 Cooper Grant to support the summer research community at Cooper. Coordinated the programming associated with this grant. Joint with Michelle Rosen, Alice Pisani, and Fabiola Barrios-Landeros
- 2022 **Editor's Choice Award 2022**, *Discrete Mathematics*.
My paper "Structure of the largest subgraphs of $G_{n,p}$ with a given matching number" was selected by the editors as one of the outstanding papers published in Discrete Mathematics in the past year.
- 2020 **Certificate of Recognition for Contributions to Students**, *University of Nebraska, Lincoln*.
- 2019 **Award for best seminar presentation**, *Rutgers University Math Department*.
Title: The Bunkbed Conjecture
- 2017 **Award for best seminar presentation**, *Rutgers University Math Department*.
Title: List Coloring Graphs
- 2015 **Academic Excellence Award**, *Rutgers University Math Department*.

Professional Service

- 2023-present **Admissions Committee Member**, *Cooper Union School of Engineering*.
Representative for Math/Chemistry/Physics
- 2023-present **Steering Committee Member**, *Graph Theory Day*.
Graph Theory Day is a semi-annual conference sponsored by the Metropolitan New York Section of the Mathematical Association of America
- 2022-present **Faculty advisor for Math tutoring**, *Cooper Union School of Engineering*.
Led a reorganization and formalization of the mathematics tutoring.
- 2022-present **Coorganizer of the New York Combinatorics Seminar**.
- 2024-2025 **Faculty Student Senate Member**, *Cooper Union School of Engineering*.
One of two School of Engineering Faculty Representatives
- August 2022 **Judge for the Undergraduate Poster Session at MathFest**.
MathFest is an annual mathematics conference hosted by the Mathematical Association of America.
- 2019-present **Journal referee**.
Various journals in Combinatorics and Graph Theory
- 2019-2021 **Member of the Undergraduate Activities Committee**, *University of Nebraska*.
Help to plan and run events for the undergraduate math club
- 2019-2021 **Organizer of the Random Discrete Seminar**, *University of Nebraska, Lincoln*.
- 2017-2019 **Coorganizer of the Discrete Math Seminar**, *Rutgers University*.
- 2016-2019 **Member of the Graduate Liaison Committee**, *Rutgers University*.

Summer 2017 **Head TA.**
and 2018 Coordinated all math graduate students teaching summer classes. I observed lectures, provided comments, and helped with syllabi and exam writing
2016-2017 **Coorganizer of the graduate combinatorics seminar**, *Rutgers University*.
Spring 2017 **Directed Reading Program mentor**, *Rutgers University*.
2015-2016 **Coorganizer of the graduate student pizza seminar**, *Rutgers University*.

Professional Development

2023 **DELTA Junior Faculty Institute**, *American Society for Engineering Education*.
Selection to the April 2023 cohort of this national professional development program
2020–2021 **Project NExT Fellowship**, *Mathematics Association of America*.
Selection to the 2020 cohort of this national teaching development program