

# Sam Spiro

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## Positions

2022– **NSF Research Fellow**, *Rutgers University*.  
Supervisor: Bhargav Narayanan

## Education

2017–2022 **Ph.D. in Mathematics**, *UC San Diego (UCSD)*.  
Adviser: Jacques Verstraëte

2013–2017 **B.S. in Mathematics and Computer Science**, *University of Miami*.

2016 (Fall) Budapest Semesters in Mathematics.

## Research Interests

My main interests lie in extremal and probabilistic combinatorics, with a particular focus on problems involving  $F$ -free graphs and hypergraphs. I have also worked in many other areas of discrete mathematics such as spectral graph theory, enumerative combinatorics, and elementary number theory.

## List of Papers

1. **Incidence-free sets and edge domination in incidence graphs** (with Sam Adriaensen and Sam Mattheus).  
*Submitted, 2022.*
2. **New Eigenvalue Bound for the Fractional Chromatic Number** (with Krystal Guo).  
*Submitted, 2022.*
3. **Counting Deranged Matchings** (with Erlang Surya).  
*Submitted, 2022.*
4. **Zero Forcing with Random Sets** (with Bryan Curtis, Luyining Gan, Jamie Haddock, and Rachel Lawrence).  
*Submitted, 2022.*
5. **Semi-restricted Rock, Paper, Scissors** (with Erlang Surya and Ji Zeng).  
*Submitted, 2022.*
6. **Complementary Vanishing Graphs** (with Craig Erickson, Luyining Gan, Jurgen Kristchgau, and Jephian C.-H. Lin).  
*Submitted, 2022.*
7. **On  $t$ -intersecting Hypergraphs with Minimum Positive Codegrees**.  
*Submitted, 2021.*
8. **Continuously Increasing Subsequences of Random Multiset Permutations** (with Alexander Clifton, Bishal Deb, Yifeng Huang, and Semin Yoo).  
*Submitted, 2021.*

9. **Saturation Problems in Convex Geometric Hypergraphs** (with Jason O'Neill).  
*Submitted*, 2021.
10. **Maximal Independent Sets in Clique-free Graphs** (with Xiaoyu He and Jiaxi Nie).  
*European Journal of Combinatorics*, Volume 106, 2021.
11. **Linear Bounds for Cycle-free Saturation Games** (with Sean English, Tomas Masarik, Grace McCourt, Erin Meger, and Michael S. Ross).  
*The Electronic Journal of Combinatorics* 29(3), 2021.
12. **A Smoother Notion of Spread Hypergraphs**.  
*Submitted*, 2021.
13. **The Wiener Index of Signed Graphs**.  
*Applied Mathematics and Computation*, Volume 416, 2021.
14. **Online Card Games**.  
*Electronic Journal of Probability*, Volume 27, 2021.
15. **The Maximum Number of Appearances of a Word in a Grid** (with Gregory Patchell).  
*The American Mathematical Monthly*, Volume 129 Issue 5, 2021.
16. **Relative Turán Numbers for Hypergraph Cycles** (with Jacques Verstraëte).  
*Discrete Mathematics* 344 (10), 112542, 2020.
17. **Practical Strategies for Card Guessing with Feedback** (with Persi Diaconis and Ron Graham).  
*The American Mathematical Monthly*, Volume 129 Issue 7, 2021.
18. **Card Guessing with Partial Feedback** (with Persi Diaconis, Ron Graham, and Xiaoyu He).  
*Combinatorics, Probability and Computing*, 1–20, 2021.
19. **Counting Hypergraphs with Large Girth** (with Jacques Verstraëte).  
*Journal of Graph Theory*, Volume 100 Issue 3, 2020.
20. **Relative Turán Problems for Uniform Hypergraphs** (with Jacques Verstraëte).  
*SIAM Journal on Discrete Mathematics* 35 (3), 2170–2191, 2020.
21. **Forbidding  $K_{2,t}$ -traces in Triple Systems** (with Ruth Luo).  
*The Electronic Journal of Combinatorics* P2–4, 2021.
22. **An Averaging Process on Hypergraphs**.  
*Journal of Applied Probability* 1–10, 2020.
23. **Triangle-Free Subgraphs of Hypergraphs** (with Jiaxi Nie and Jacques Verstraëte).  
*Graphs and Combinatorics*, 1–16, 2020.
24. **Ballot Permutations and Odd Order Permutations**.  
*Discrete Mathematics* 343 (6), 111869, 2020.
25. **Subset Parking Functions**.  
*Journal of Integer Sequences* 22(7), 2019.
26. **Slow Recurrences**.  
*Journal of Number Theory* 218, 370–401, 2020.
27. **Counting Labeled Threshold Graphs with Eulerian Numbers**.

*Australasian Journal of Combinatorics*, 2020.

28. **Slow Fibonacci Walks** (with Fan Chung and Ron Graham).  
*Journal of Number Theory* 210, 142–170, 2019.
29. **Random Graphs Induced by Catalan Pairs** (with Daniël Kroes).  
*Journal of Combinatorics* 12(4), 2021.
30. **Saturation Games for Odd Cycles**.  
*The Electronic Journal of Combinatorics* P4–11, 2019.
31. **Polynomial Relations Between Matrices of Graphs**.  
*Journal of Graph Theory* 90 (3), 288–303, 2018.
32. **Forbidden Families of Minimal Quadratic and Cubic Configurations** (with Attila Sali).  
*The Electronic Journal of Combinatorics* 24(2), 2017.

## Teaching Experience

### TA Experience:

Spring 2019 Combinatorics. UCSD  
Winter 2019 Complex Analysis. UCSD  
Fall 2018 Partial Differential Equations. UCSD  
Fall 2018 Graduate Linear Algebra. UCSD  
Spring 2018 Game Theory. UCSD  
Fall 2017 Calculus III. UCSD

## Service

I have served as a referee or mathematical reviewer for more than 26 articles. I have also taken part in the following activities.

2022– Mentor for Directed Reading Program. Rutgers University  
2021–2022 Association for Women in Mathematics mentor. UCSD  
2020–2022 GradAMP mentor (helped undergraduates apply to graduate school). UCSD.  
2018–2022 Co-organizer of the Graduate Student Combinatorics Conference 2022. UCSD.  
2019–2022 Co-organizer of the Graduate Student Seminar. UCSD  
2018–2022 Co-organizer of the Graduate Student Combinatorics Seminar. UCSD.  
2017–2022 Co-organizer of Banach Barski (weekly graduate student social event). UCSD.  
2018–2022 Member of the Graduate Student Council. UCSD.

## Experiences

2022 AMS MRC program: Models and Methods for Sparse (Hyper)Network Science.  
2021 AMS MRC program: Approaches to Inverse Problems using Combinatorics and Linear Algebra (participant and organizer of special section at JMM 2022).  
2019 MSRI Graduate Summer School: The Polynomial Method.  
2019, 2022 Graduate Research Workshop in Combinatorics.

2016 University of Chicago REU Program.

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## Honors and Awards

- 2022– NSF Mathematical Sciences Postdoctoral Research Fellowship.
- 2019–2022 NSF Graduate Research Fellowship.
- 2016, 2017 James McKnight Outstanding Mathematics Major (University of Miami). An award given to one math major each year.

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## Talks

- ILAS - AIM Special Session on The Inverse Eigenvalue Problem for a Graph and Zero Forcing, JMM. January 2023.
- AMS Special Session on Research from Graduate Research Workshop in Combinatorics, JMM. January 2023.
- Combinatorics Seminar, University of South Carolina. October 2022.
- Combinatorics Seminar, University of Delaware. October 2022.
- Special Session on Graphs, Hypergraphs, and Set Systems; AMS Fall Western Sectional Meeting. October 2022.
- Combinatorics Seminar, Rutgers University. September 2022.
- Combinatorics Seminar, Iowa State University. May 2022.
- Combinatorics Seminar, UC Riverside. October 2021.
- Graph Theory and Combinatorics Seminar, UIUC. September 2021.
- SIAM Conference on Discrete Mathematics. July 2021.
- CanaDAM. May 2021.
- Graduate Student Combinatorics Conference. April 2021.
- Combinatorics Seminar, UC Riverside. April 2021.
- Combinatorics Seminar, Iowa State University. November 2020.
- Combinatorics Seminar, University of Delaware. October 2020.
- Combinatorics Seminar, University of Nebraska Lincoln. September 2020.
- Graduate Student Seminar, University of Georgia. July 2020.
- Combinatorics Literature Seminar, UIUC. May 2020.
- Graduate Online Combinatorics Colloquium. April 2020.
- Special Session on Topics in Extremal and Structural Graph Theory, AMS Fall Western Sectional Meeting. November 2019.
- BSM 100/3 Reunion Conference. June 2018.
- Graduate Student Combinatorics Conference. April 2018.
- Joint Mathematics Meetings. January 2018.
- Research seminar, Embry-Riddle Aeronautical University. October 2017.
- 48th Southeastern International Conference on Combinatorics, Graph Theory and Computing. March 2017.
- Graduate Student Seminar, University of Miami. February 2017.