Julia Gaudio
Curriculum Vitae

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Academic Positions

2023-   **Assistant Professor**, *Northwestern University*.
Department of Industrial Engineering and Management Sciences and Department of Computer Science (by courtesy)

2021-2023   **Research Assistant Professor**, *Northwestern University*.
Department of Industrial Engineering and Management Sciences and Department of Computer Science (by courtesy)
Patrick and Amy McCarter Fellow

2020-2021   **Applied Mathematics Instructor**, *Massachusetts Institute of Technology*.
Department of Mathematics
Host: Elchanan Mossel

Education

2016–2020   **PhD Operations Research**, *Massachusetts Institute of Technology*.
Thesis: Investigations in High-Dimensional Probability and Statistics
Advised by David Gamarnik and Patrick Jaillet
Microsoft Research PhD Fellow

2015–2016   **MS Computer Science**, *Brown University*.
Thesis: Algorithms for Large-Scale Prescriptive Evacuations
Advised by Pascal Van Hentenryck
Degree completed concurrently with BS in Applied Mathematics

2012–2016   **BS Applied Mathematics**, *Brown University*.
Awarded the Rohn Truell Prize for Undergraduate Excellence (Applied Mathematics)
Phi Beta Kappa

Research Areas

I am broadly interested in probabilistic combinatorics. My recent work is focused on network inference and reconstruction problems, through the lens of random graphs.

Publications

Most author lists are alphabetical.

Accepted Papers

Julia Gaudio and Nirmit Joshi. Community Detection in the Hypergraph SBM: Optimal Recovery Given the Similarity Matrix. *Conference on Learning Theory (COLT)* 2023.

Julia Gaudio, Miklós Rácz, and Anirudh Sridhar. Exact Community Recovery in Correlated Stochastic Block Models. *Conference on Learning Theory (COLT)* 2022.

Souvik Dhara, Julia Gaudio, Colin Sandon, and Elchanan Mossel. Spectral Recovery of Binary Censored Block Models. *Symposium on Discrete Algorithms (SODA).* 2022.

Julia Gaudio and Elchanan Mossel. Shotgun Assembly of Erdős–Rényi Random Graphs. *Electronic Communications in Probability*. 2022.

Julia Gaudio and Yury Polyanskiy. Attracting Random Walks. *Electronic Journal of Probability* 25(73). 2020.

Julia Gaudio and Patrick Jaillet. An Improved Lower Bound for the Traveling Salesman Constant. *Operations Research Letters*. 48(1) 67-70. 2020.

David Gamarnik and Julia Gaudio. Sparse High-Dimensional Isotonic Regression. *Thirty-third Conference on Neural Information Processing Systems (NeurIPS).* 2019.

Julia Gaudio, Saurabh Amin, and Patrick Jaillet. Exponential Convergence Rates for Stochastically Ordered Markov Processes with Random Initial Conditions. *Systems and Control Letters*. Vol 133. 2019.

Julia Romanski and Pascal Van Hentenryck. Benders Decomposition for Large-Scale Prescriptive Evacuations. *Thirtieth AAAI Conference on Artificial Intelligence* (AAAI-16), Phoenix, AZ. 2016.

Kunal Kumar, Julia Romanski, and Pascal Van Hentenryck. Optimizing Infrastructure Enhancements for Evacuation Planning. *Thirtieth AAAI Conference on Artificial Intelligence* (AAAI-16), Phoenix, AZ. 2016.

Preprints

Julia Gaudio, Miklós Rácz, and Anirudh Sridhar. Local Canonical Labeling of Erdős–Rényi Random Graphs. 2023.

Ali Kaan Kurbanzade and Julia Gaudio. The Joint Facility and Demand Location Problem. 2022

Souvik Dhara, Julia Gaudio, Colin Sandon, and Elchanan Mossel. The Power of Two Matrices in Spectral Algorithms. 2022

Souvik Dhara, Julia Gaudio, Colin Sandon, and Elchanan Mossel. Spectral Algorithms Optimally Recover Planted Sub-structures. 2022.

Christian Borgs, Jennifer Chayes, Julia Gaudio, Samantha Petti, and Subhabrata Sen. A Large Deviation Principle for Block Models. 2020. (Revision, *Combinatorics, Probability, and Computing*)

Industry Experience

2019 **Research Intern**, Microsoft Research, Cambridge, MA.
Worked with Jennifer Chayes, Christian Borgs, Samantha Petti, and Subhabrata Sen on large deviations for stochastic block models.

2018 **Research Intern**, Microsoft Research, Redmond, WA.
Worked with Ishai Menache, Luke Marshall, and Ece Kamar to develop an optimization method for real-time shared mobility.

2016 **Software Engineering Intern**, GOOGLE, Mountain View, CA.
As an intern in the Speech Team (part of Google Research and Machine Intelligence), I implemented algorithms for mixed speech separation in reverberant environments.

2015 **Research Intern**, NATIONAL INFORMATION AND COMMUNICATIONS TECHNOLOGY AUSTRALIA, Canberra, Australia.
Working with Pascal Van Hentenryck, I improved NICTA's evacuation planning algorithms, leading to a substantial increase in the number of people who could be evacuated in the event of a major flood.

Invited Talks

Past Talks.
○ UC Davis Probability Seminar (April 2023)
○ University of Wisconsin - Madison Probability Seminar (December 2022)
○ Northwestern IEMS Department Seminar (December 2022)
○ BIRS Workshop on *Learning in Networks: Performance Limits and Algorithms*, held at Casa Matemática Oaxaca (November 2022)
○ Northwestern Probability Seminar (November 2022)
○ Northwestern Kellogg Operations Seminar (October 2022)
○ Simons Institute for the Theory of Computing (Berkeley) Workshop on Graph Limits, Non-Parametric Models, and Estimation (September 2022)
○ UIC Combinatorics and Probability Seminar (September 2022)
○ Southeastern Probability Conference, held at UNC (August 2022)
○ UNC-Duke Probability Seminar (February 2022)
○ Tutorial on Cliques in Random Graphs (Frontiers of Statistical Mechanics and Theoretical Computer Science 2021, UIC) (December 2021)
○ UIC Combinatorics and Probability Seminar (November 2021)
○ INFORMS Invited Session on Random Graphs (October 2021)
○ KTH Probability Seminar (June 2021)
○ Applied Mathematics Colloquium, Brown University Division of Applied Mathematics (November 2020)
○ Institute for Data, Econometrics, Algorithms, and Learning (IDEAL) Seminar, organized by Northwestern University, the University of Chicago, and Toyota Technological Institute at Chicago (October 2020)
○ Brown University Probability Seminar (February 2020)
○ MIT-IBM Watson AI Lab, Cambridge, MA (October 2019)

Teaching

Fall 2022 **Instructor**, *IEMS 490/ CS 496 Topics in Modern Discrete Probability [23 students]*.
This is a graduate-level course focused on techniques and models in modern discrete probability. Topics include: the first and second moment methods, Chernoff bounds, large deviations, martingales, concentration inequalities, branching processes, percolation, and Markov chains. Examples are drawn from random structure and algorithm applications.

Winter 2022 **Instructor**, *IEMS 202 Probability [31 students]*.
A first course in undergraduate probability, covering the axioms of probability, foundational combinatorics, discrete and continuous random variables, conditional probability, expectation, variance, covariance, and correlation.

| Spring 2021 | **Instructor**, *18.204 Undergraduate Seminar in Discrete Mathematics (MIT) [16 students]*. |

This is a seminar course where participants read and present a wide range of theoretical and applied topics in discrete mathematics and probability, with coaching by the instructor. Some examples include spectral analysis, theoretical aspects of machine learning, Markov chains, random graphs, and discrete optimization.

| Fall 2020 | **Instructor**, *18.434 Topics in Theoretical Computer Science (MIT) [16 students]*. |

This is a communication-intensive undergraduate seminar. The topic of the class was randomized algorithms and probabilistic analysis, following the book "Probability and Computing" by Eli Upfal and Michael Mitzenmacher. The course covered probabilistic analysis (Jensen's inequality, Union Bound, coupon collector, concentration inequalities, balls and bins arguments, the Probabilistic Method, Markov chains, martingales, the Lovász Local Lemma) and applications of these techniques to the analysis of randomized algorithms, including Markov Chain Monte Carlo, graph algorithms, and PAC learning.

| Spring 2018 | **Teaching Assistant**, *6.265 Advanced Stochastic Processes (MIT)[$\sim$25 students]*. |

This is an advanced graduate-level discrete probability class. Topics include random graphs, concentration inequalities, large deviations, graphical models, combinatorial optimization on random graphs, and statistical physics. The course emphasizes algorithms and complexity in the context of high-dimensional statistics and machine learning.

Service and Mentoring

Reviewer.
○ *Probability Theory and Related Fields*
○ *Random Structures and Algorithms*
○ *Combinatorics, Probability and Computing*
○ *IEEE Transactions on Information Theory*
○ *Annals of Statistics*
○ *Journal of the Operational Research Society*
○ *IEEE Control Systems Letters (L-CSS)*
○ *Conference on Neural Information Processing Systems* (NeurIPS)
○ *International Conference on Machine Learning* (ICML)
○ *International Conference on Learning Representations* (ICLR)
○ *SIAM Conference on Applied and Computational Discrete Algorithms*

Program Committee.
○ COLT 2022

Research Mentoring.
○ Xiaochun Niu, Northwestern IEMS PhD student
○ Charlie Guan, Northwestern IEMS PhD student
○ Heming Liu, Northwestern IEMS PhD student
○ Madeleine Carter, Northwestern CS undergraduate
○ Ali Kaan Kurbanzade, Northwestern IEMS Masters student
○ Nirmit Joshi, Northwestern CS PhD student (now at TTIC)
○ Victoria Shi, Northwestern undergraduate (Industrial Engineering, Data Science, and Mathematics)
○ High school student from the Illinois Mathematics and Science Academy

Other Mentoring.
○ Organizer (with Samir Khuller and Will Perkins) of the 2023 pre-REU workshop in data science, which aims to involve 50 students from across the country
○ Gave a presentation on balancing work and family life to the Northwestern Graduate Society of Women Engineers (SWE) (October 2021)

Funding