

# Michael Simkin | Massachusetts Institute of Technology

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CONTACT INFORMATION  
Massachusetts Institute of Technology  
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PERSONAL INFORMATION  
Birthyear: 1985  
Citizenship: Canada, Israel, USA  
Languages: English, Hebrew

RESEARCH INTERESTS  
Probabilistic combinatorics, combinatorial designs, random graphs and hypergraphs, and related computational questions.

EMPLOYMENT

- 2023 - Present: Instructor (Departmental Postdoc), Massachusetts Institute of Technology.
- 2020 - 2023: Postdoctoral fellow, Center of Mathematical Sciences and Applications, Harvard University.

EDUCATION

**Hebrew University of Jerusalem, Israel**

- 2014 - 2020: PhD, Einstein Institute of Mathematics and Federmann Center for the Study of Rationality. Adviser: Prof. Nati Linial.
- 2011 - 2014: MSc **magna cum laude** in mathematics. Adviser: Prof. Gil Kalai.
- 2008 - 2011: BSc **summa cum laude** in Amirim honors program, major in mathematics, concentration in computer science.

FUNDING

2024	NSF Standard Grant DMS-2349024	\$162,172
2022	AMS-Simons Travel Grant	\$6,000

PUBLICATIONS

**Published/Accepted**

- Sampling, counting, and large deviations for triangle-free graphs near the critical density, with Matthew Jenssen, Will Perkins, and Aditya Potukuchi. *65th IEEE Symposium on Foundations of Computer Science (FOCS 2024)*. *arXiv:2410.22951*.
- High-girth Steiner triple systems, with Matthew Kwan, Ashwin Sah, and Mehtaab Sawhney. *Annals of Mathematics*, 200 (3): 1059-1156 (2024).
- The number of  $n$ -queens configurations. *Advances in Mathematics*, 427: 109127 (2023).
- Threshold for Steiner triple systems, with Ashwin Sah and Mehtaab Sawhney. *Geometric and Functional Analysis (GAFA)* 33: 1141-1172 (2023).
- Substructures in Latin squares, with Matthew Kwan, Ashwin Sah, and Mehtaab Sawhney. *Israel Journal of Mathematics* 256: 363-416 (2023).
- A lower bound for the  $n$ -queens problem, with Zur Luria. *Proceedings of the 2022 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2022)*.

- What is learned in knowledge graph embedding?, Michael R. Douglas, Michael Simkin, Omri Ben-Eliezer, Tianqi Wu, Peter Chin, Trung V. Dang, Andrew Wood. *Complex Networks & Their Applications X (CNA 2021)*.
- Perfect matchings in random subgraphs of regular bipartite graphs, with Roman Glebov and Zur Luria. **Journal of Graph Theory**, 97: 208-231 (2021).
- A randomized construction of high girth regular graphs, with Nati Linial. **Random Structures & Algorithms**, 58; 345-369 (2021).
- The threshold problem for Latin boxes, with Zur Luria. **Random Structures & Algorithms**, 55; 926-949 (2019).
- Monotone subsequences in high-dimensional permutations, with Nati Linial. **Combinatorics, Probability, and Computing**, 27(1): 69-83 (2018).

### Preprints

- Lower tails for triangles inside the critical window, with Matthew Jenssen, Will Perkins, and Aditya Potukuchi. *arXiv:2411.18563* (2024).
- Ramsey and Turán numbers of sparse hypergraphs, with Jacob Fox, Maya Sankar, Jonathan Tidor, and Yunkun Zhou. *arXiv:2401.00359* (2024).
- A toolkit for robust thresholds, with Huy Tuan Pham, Ashwin Sah, and Mehtaab Sawhney. *arXiv:2210.03064* (2022).
- $(n, k, k - 1)$ -Steiner systems in random hypergraphs. *arXiv:1711.01975* (2017).

### HONORS AND AWARDS

- 2018 Klein Prize (Fourth year PhD)
- 2015 Klein Prize (First year PhD)
- 2014 Awarded MSc magna cum laude
- 2011 Awarded BSc summa cum laude
- 2011 Dean's prize (third year BSc)
- 2009 Dean's prize (first year BSc)

### TEACHING EXPERIENCE

- 2023 - Present: Massachusetts Institute of Technology
  - Fall 2024, Fall 2023: Combinatorial Analysis (Instructor of Record)
  - Spring 2024: Probability and Random Variables (Teaching Assistant)
  - Research mentor, Undergraduate Research Opportunity (UROP)
- 2022: Research mentor, Harvard CMSA Introduction to Mathematical Research.
- 2015 - 2020: Teaching Assistant, Hebrew University of Jerusalem:
  - Spring 2020: Discrete Mathematics
  - Spring 2019: Linear Algebra 2
  - Fall 2019, Fall 2018, Fall 2017, Fall 2016: Mathematical Tools in Computer Science
  - Spring 2018: Linear Algebra 1
  - Spring 2017, Fall 2015: Advanced Calculus for Computer Science Students
  - Spring 2016, Spring 2015: Calculus 2 for Computer Science Students
- 2016 - 2017: Lecturer, Israeli Ministry of Education for elementary school mathematics teachers.

ADDITIONAL  
EXPERIENCE

2024 - Present    Organizer, MIT combinatorics seminar.  
2021 - 2023      Organizer, Harvard CMSA colloquium.  
2021 - 2022      Organizer, Harvard CMSA combinatorics, physics, and probability  
seminar.  
2017 - 2020      Librarian, Federmann Center for the Study of Rationality.

TALKS

- Symposium on Foundations of Computer Science (FOCS), October 2024.
- Combinatorics Seminar, Georgia Tech, September 2024.
- SIAM Conference on Discrete Mathematics, Spokane, WA, July 2024.
- Discrete Mathematics Seminar, Princeton, February 2024.
- Combinatorics Seminar, Technion, January 2024.
- Combinatorics Seminar, Hebrew University, January 2024.
- Combinatorics Seminar, Tel Aviv University, January 2024.
- Theory Seminar, New York University, November 2023.
- Random Structures and Algorithms Conference, Pittsburgh, June 2023.
- Combinatorics Seminar, Bar-Ilan University, November 2022.
- Combinatorics Seminar, Stanford University, November 2022.
- Discrete Mathematics Seminar, Rutgers University, September 2022.
- Random Structures and Algorithms Conference, Gniezno, August 2022.
- Algorithms, Combinatorics, and Optimization Seminar, Carnegie Mellon University, April 2022.
- Tel-Aviv University combinatorics seminar, April 2022
- Technion combinatorics seminar, April 2022.
- Hebrew University combinatorics seminar, April 2022.
- Bar-Ilan combinatorics seminar, April 2022.
- University of British Columbia discrete mathematics seminar, March 2022.
- Brandeis University combinatorics seminar, January 2022.
- Symposium on Discrete Algorithms (SODA), January 2022.
- Complex Networks & their Applications (CNA), December 2021.
- Worcester Polytechnic Institute Discrete Mathematics Seminar, October 2021.
- University of Bristol Combinatorics Seminar, October 2021.
- Auburn University Discrete Mathematics Seminar, October 2021.
- MIT Combinatorics Seminar, October 2021.
- Copenhagen-Jerusalem Combinatorics Seminar, September 2021.
- Harvard University CMSA Interdisciplinary Science Seminar, September 2021.
- Members' Seminar, Harvard University CMSA, September 2021.
- Combinatorics Seminar, Hebrew University of Jerusalem, Israel, June 2021.
- Combinatorics Seminar, Bar-Ilan University, March 2021.
- Combinatorics Seminar, Georgia Tech, January 2021.
- Members' Seminar, Harvard University CMSA, October 2020.
- Combinatorics Seminar, Hebrew University of Jerusalem, Israel, December 2019.
- Combinatorics Seminar, Tel-Aviv University, December 2019.

- Combinatorics Seminar, Technion, December 2019.
- Random Structures and Algorithms Conference, Zurich, July 2019.
- Annual meeting of the Israel Mathematical Union, Jerusalem, June 2019.
- Combinatorics Seminar, Tel-Aviv University, November 2018.
- Combinatorics Seminar, Hebrew University of Jerusalem, Israel, November 2018.
- Combinatorics Seminar, Bar-Ilan University, November 2018.
- Combinatorics Seminar, University of Oxford, November 2018.
- Algorithms, Combinatorics, and Optimization Seminar, Carnegie Mellon University, October 2018.
- Discrete Mathematics Seminar, Princeton University, October 2018.
- Students Combinatorics Day, Bar Ilan University, July 2018.
- Geometric, Topological, and Computational Aspects of High Dimensional Expanders, Israel Institute of Advanced Study, March 2018.
- Combinatorics Seminar, Hebrew University of Jerusalem, Israel, May 2017.

NON-ACADEMIC EMPLOYMENT      2012 - 2014: Firmware engineer, Intel Corporation.