Cassandra Marcussen

Contact

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Research Interests

Theoretical computer science, probability, and combinatorics, with a focus on sublinear algorithms, random graphs, property testing, learning theory, quasirandomness, and average-case complexity.

Education

Harvard University 2022 – Expected May 2027
Ph.D. candidate in Computer Science
Advisor: Madhu Sudan

Columbia University in the City of New York 2018 – 2022
B.A. in Mathematics and Computer Science
magna cum laude

Publications

Coauthors are listed alphabetically, as is the convention in theoretical CS and mathematics.

Quality Control Algorithms for Pattern Counting, *with Ronitt Rubinfeld and Madhu Sudan*, To appear, SODA (2027), arXiv:2608.03439.

Graph k-Coloring in Sublinear Average Time, *with Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, FOCS (2026), arXiv:2607.26592.

Quality control in sublinear time: a case study via random graphs, *with Ronitt Rubinfeld and Madhu Sudan*, FOCS (2026), arXiv:2508.16531.

Learning and Testing Convex Functions, *with Renato Ferreira Pinto Jr., Elchanan Mossel, and Shivam Nadimpalli*, RANDOM (2026), arXiv:2511.11498.

Finding the Root in Random Nearest Neighbor Trees, *with Anna Brandenberger, Elchanan Mossel, and Madhu Sudan*, Random Structures & Algorithms (2026), arXiv:2411.14336.

Bounds on higher graph gonality, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, and Shefali Ramakrishna*, Australasian Journal of Combinatorics (2026), arXiv:2206.06907.

Scramble number and tree-cut decompositions, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, Shefali Ramakrishna, and Ben Weber*, The Art of Discrete and Applied Mathematics (2026), arXiv:2209.01459.

A Fast Coloring Oracle for Average Case Hypergraphs, *with Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, RANDOM (2025). To appear in Random Structures & Algorithms (2026), arXiv:2507.10691.

Characterizing the Distinguishability of Product Distributions through Multicalibration, *with Aaron (Louie) Putterman and Salil Vadhan*, CCC (2025), arXiv:2412.03562.

Errors are Robustly Tamed in Cumulative Knowledge Processes, *with Anna Brandenberger, Elchanan Mossel, and Madhu Sudan*, COLT (2024), Proceedings of the National Academy of Sciences (2025), arXiv:2309.05638.

Uniformity Testing over Hypergrids with Subcube Conditioning, *with Xi Chen*, SODA (2024), arXiv:2302.09013.

Uniform scrambles on graphs, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, and Shefali Ramakrishna*, Australasian Journal of Combinatorics (2023), arXiv:2108.09821.

Preprints

Geometrically Constrained Learning I: Agnostically Learning Adversarially Robust Classifiers, *with Jane Lange and Arsen Vasilyan*, 2026, arXiv:2611.27852.

Geometrically Constrained Learning II: Agnostic Proper Learning of Lipschitz Functions, *with Jane Lange and Arsen Vasilyan*, 2026, arXiv:2611.27700.

Graph Spectral Sparsification is in Catalytic Logspace, *with Edward Pyne and Ronitt Rubinfeld*, 2026, arXiv:2608.21594.

Recovering Assignments with One-Sided Noise, *with Elchanan Mossel and Colin Sandon*, 2026, arXiv:2607.24073.

The gonality of circulant graphs, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, and Shefali Ramakrishna*, 2025, arXiv:2508.05761.

Beyond Worst Case Local Computation Algorithms, *with Amartya Shankha Biswas, Ruidi Cao, Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, 2025, arXiv:2403.00129.

Honors and Awards

- **NDSEG Fellowship** (National Defense Science and Engineering Graduate Fellowship) (2024)
- **NSF Graduate Research Fellowship**; declined in favor of NDSEG (2024)
- NCWIT Collegiate Award – **National Finalist** (2021)
- **AWM Student Chapter Award for Scientific Excellence** (2020)
- **Columbia Oxbridge Scholar**, selected to study mathematics and computer science at St. Anne's College, Oxford; visit canceled due to COVID-19 (2019)
- **John Jay Scholar**, Columbia University Scholars Program (2018 – 2022)
- **Verizon App Challenge: Best in Nation**, awarded $20,000 (2017)

Seminar and Workshop Talks

- Workshop on "Recent advances on Regularity Lemmas (with and without calibration)" at Stanford (2026)
- FOCS Workshop on "Algorithmic Perspectives on Quasirandomness" (2026)
- University of Waterloo Algorithms & Complexity Seminar (2026)
- Harvard CS Colloquium (2026)
- Brown University CS Theory Seminar (2026)
- STOC Workshop on Testing in the Modern World (2026)
- Tufts CS Theory Seminar (2026)

· Harvard Theory of Computation Seminar – Lightning Talk (2026)
· Chicago Junior Theorists Workshop (2025)
· MIT Algorithms & Combinatorics Seminar (2025)
· MIT Sublinear Reading Group (2025)
· Workshop on Local Algorithms (2025)

Conference Presentations

FOCS (2026), CCC (2025), COLT (2024), SODA (2024), Young Mathematicians Conference (2021).

Teaching Experience

· Teaching Fellow for **Essential Coding Theory** Fall 2023
(Harvard CS 229r, taught by Madhu Sudan)

· Teaching Assistant for **Quantum Computation** Summer 2023
PCMI Undergraduate Summer School, taught by Jamie Pommersheim

· Teaching Assistant for **Advanced Algorithms** Spring 2022
(Columbia COMS 4232, taught by Alexandr Andoni)

· Teaching Assistant for **Introduction to Cryptography** Spring 2022
(Columbia COMS 4261, taught by Tal Malkin)

· Teaching Assistant for **Analysis of Algorithms I** Summer & Fall 2021
(Columbia CSOR 4231, taught by Xi Chen and Alexandr Andoni)

· Teaching Assistant for **Artificial Intelligence** Spring 2021
(Columbia COMS 4701, taught by Ansaf Salleb-Aouissi)

· Teaching Assistant for **Discrete Mathematics** Fall 2020
(Columbia COMS 3203, taught by Ansaf Salleb-Aouissi)

· Lecturer and Teaching Assistant for **Introduction to Proofs** Fall 2020, Fall 2021
Four-week proof-writing workshop run by the Columbia Undergraduate Math Society

Seminars, Workshops, and Organizations

Algorithmic Perspectives on Quasirandomness November 2026
FOCS workshop, co-organized with Ted Pyne, Ronitt Rubinfeld, and Asaf Shapira.

Organizer, **TGINF** September 2022 – May 2026
Harvard seminar for theoretical computer science graduate students and postdocs.

Columbia Undergraduate Learning Seminar in Theoretical Computer Science, Founder and Organizer March 2021 – May 2022
· Established ten reading groups, led three, and recruited pairs of graduate and undergraduate students to organize the others.

Columbia-Barnard Association for Women in Mathematics
Co-President May 2021 – May 2022

Reviewing

ITCS (2026, 2027), FOCS (2026), ICALP (2026), RANDOM (2025, 2026), STOC (2024, 2025), Applied Probability Journals (2025)

Research Experience

· **SMALL REU** – Williams College: Mathematics Researcher (Summer 2021)

Technical Reports

Data Preparation of the nuMoM2b Dataset, *with A. Goretsky, A. Dmitrienko, I. Tang, N. Lari, O. Kunhardt, R. Rashid Khan, A. Catto, D. Mallia, A. Leshchenko, A. Lin, A. Raja, A. Salleb-Aouissi, Itsik Pe'er, R. Wapner, C. Gyamfi-Bannerman*, Technical report, 2021, on medRxiv.

Industry Experience

- **Microsoft Research** – Real-World Reinforcement Learning: Independent Developer in Open Source Fest (Summer 2020)
- **Google**: STEP Software Engineering Intern (Summer 2020)
- **Amazon**: AFE Software Engineering Intern (Summer 2019)