Cassandra Marcussen

Contact

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Research Interests

My research is in theoretical computer science and probability, with a focus on sublinear algorithms, random graphs, property testing, and average-case complexity.

Education

Harvard University 2022 - Present
CS Ph.D. student in the Theory of Computation group
Advisor: Professor Madhu Sudan

Harvard University 2022 - 2025
S.M. in Computer Science. GPA 4.0

Columbia University in the City of New York 2018 - 2022
B.A. in Mathematics and Computer Science
Magna Cum Laude. GPA 4.02. John Jay Scholar

Publications

All author names are listed alphabetically unless noted with *****.

Finding the Root in Random Nearest Neighbor Trees, *with Anna Brandenberger, Elchanan Mossel, and Madhu Sudan*, Random Structures & Algorithms, https://arxiv.org/pdf/2411.14336.

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 (2025), https://arxiv.org/pdf/2209.01459.pdf.

A Fast Coloring Oracle for Average Case Hypergraphs, *with Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, RANDOM (2025), Selected contributed presentation – Highlights of Algorithms 2026, https://arxiv.org/pdf/2507.10691.

Characterizing the Distinguishability of Product Distributions through Multicalibration, *with Aaron (Louie) Putterman and Salil Vadhan*, Computational Complexity Conference (2025), https://arxiv.org/pdf/2412.03562.

Errors are Robustly Tamed in Cumulative Knowledge Processes, *with Anna Brandenberger, Elchanan Mossel, and Madhu Sudan*, Conference on Learning Theory (2024), Proceedings of the National Academy of Sciences (2025), https://arxiv.org/pdf/2309.05638.pdf.

Uniformity Testing over Hypergrids with Subcube Conditioning, *with Xi Chen*, Symposium on Discrete Algorithms (2024), https://arxiv.org/pdf/2302.09013.pdf.

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), https://arxiv.org/pdf/2108.09821.pdf.

Preprints

k-Coloring Graphs in Sublinear Average Time, *with Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, (Submitted) 2026

Learning and Testing Convex Functions, *with Renato Ferreira Pinto Jr., Elchanan Mossel, and Shivam Nadimpalli*, (Submitted) 2025, https://www.arxiv.org/pdf/2511.11498

Quality control in sublinear time: a case study via random graphs, *with Ronitt Rubinfeld and Madhu Sudan*, (Submitted) 2025, https://arxiv.org/pdf/2508.16531

The gonality of circulant graphs, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, and Shefali Ramakrishna*, (Submitted) 2025, https://arxiv.org/abs/2508.05761

Beyond Worst Case Local Computation Algorithms, *with Amartya Shankha Biswas, Ruidi Cao, Edward Pyne, Ronitt Rubinfeld, Asaf Shapira, and Shlomo Tauber*, (Submitted) 2025, https://arxiv.org/pdf/2403.00129

Bounds on higher graph gonality, *with Lisa Cenek, Lizzie Ferguson, Eyobel Gebre, Jason Meintjes, Ralph Morrison, Liz Ostermeyer, and Shefali Ramakrishna*, 2022, https://arxiv.org/pdf/2206.06907.pdf.

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.

Honors and Awards

- Awarded the **U.S. DoD NDSEG Fellowship** (2024)
- Awarded the **NSF Graduate Research Fellowship**; declined in favor of NDSEG (2024)
- **Magna Cum Laude**, Columbia College (2022)
- **Dean's List**, Columbia College (all applicable semesters)
- National Center for Women & Information Technology: Collegiate Award – **National Finalist** (2021)
- **AWM Student Chapter Award for Scientific Excellence** (2020)
- **Columbia Oxbridge Scholar** – Selected to study Math and CS at St. Anne's College, Oxford. 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)

Teaching Experience

- TF for **Essential Coding Theory** (Harvard CS 229r) — Fall 2023
- TA for the **PCMI Undergraduate Summer School on Quantum Computation** — Summer 2023
- TA for **Advanced Algorithms** (Columbia COMS 4232) — Spring 2022
- TA for **Introduction to Cryptography** (Columbia COMS 4261) — Spring 2022
- TA for **Analysis of Algorithms I** (Columbia CSOR 4231) — Summer & Fall 2021
- TA for **Artificial Intelligence** (Columbia COMS 4701) — Spring 2021
- TA for **Discrete Mathematics** (Columbia COMS 3203) — Fall 2020

· Lecturer and TA for **Introduction to Proofs** Fall 2020, Fall 2021
4-week workshop for undergraduate students that teaches how to write and construct proofs, run by the Columbia Undergraduate Math Society

Mentorship

Mentored undergraduate research of Easton Singer (Summer 2024) and Dashiell Bhattacharyya (Summer 2024).

Conference and Invited Talks

· STOC Workshop on Testing in the Modern World (upcoming, 2026)
· Tufts 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)
· CCC (2025)
· COLT (2024)
· Invited talk at Harvard Women in SEAS event (2024)
· SODA (2024)
· Young Mathematicians Conference (2021)

Leadership and Seminars

Organizer of **TGINF** September 2022 - May 2026
TGINF is a seminar for CS theory graduate students and postdocs at Harvard.

Founder and Leader of the **Columbia Undergraduate Learning Seminar in Theoretical Computer Science** March 2021 - May 2022

· Developed ten reading groups, running three groups myself and delegating the organization of the other groups to pairs of graduate and undergraduate students.
· Groups that I organized and ran: Analysis of Boolean Functions and Property Testing (Summer 2021); Theorist's Toolkit (Fall 2021); High-Dimensional Probability and Applications to Computer Science (Spring 2022).

Co-President of the **Columbia-Barnard Association for Women in Mathematics** May 2021 - May 2022

Work 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)

Reviewing

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