Corrine Yap

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Research Interests

My research interests lie broadly in discrete mathematics, and more specifically in extremal and probabilistic combinatorics, and intersections of combinatorics and statistical physics.

Positions

Georgia Institute of Technology | Aug. 2023–present

       Visiting Assistant Professor, School of Mathematics

       Postdoctoral Fellow, Algorithms and Randomness Center (ARC)

Education

PhD in Mathematics | Rutgers University, New Brunswick, NJ | May 2023

· Advisor: Bhargav Narayanan

· Dissertation: Several Problems in Extremal and Probabilistic Combinatorics

Bachelor of Arts | Sarah Lawrence College, Bronxville, NY | May 2016

· Concentrations in Mathematics and Theater
· Attended Budapest Semesters in Mathematics and Moscow Art Theatre School for one semester each.

Papers

[10] **Fast and Slow Mixing of the Kawasaki Dynamics on Bounded-Degree Graphs**, with A. Kuchukova, M. Pappik, and W. Perkins. *Submitted.* [arXiv]

[9] **Reconstructing Random Pictures**, with B. Narayanan. *Submitted.* [arXiv]

[8] **Trees Maximizing the Number of Almost-Perfect Matchings**, with S. Cambie, B. McCoy, G. Sharma, and S. Wagner. *Submitted.* [arXiv]

[7] **Algorithms for the Ferromagnetic Potts Model on Expanders,** with C. Carlson, E. Davies, N. Fraiman, A. Kolla, and A. Potukuchi. To appear in *Combinatorics, Probability and Computing.* Extended abstract in *Proceedings of 63rd Annual IEEE Symposium on Foundations of Computer Science (FOCS 2022),* 344-355. [[doi](doi)] [arXiv]

[6] **Bounding Mean Orders of Sub-k-Trees of k-Trees**, with S. Cambie, B. McCoy, and S. Wagner. *The Electronic Journal of Combinatorics,* 31(1): P1.62 (2024). [[doi](doi)] [arXiv]

[5] **Tower Gaps in Multicolour Ramsey Numbers**, with Q. Dubroff, A. Girão, and E. Hurley. *Forum of Mathematics: Sigma,* 11: E84 (2023).
Extended abstract in *Proceedings of European Conference on Combinatorics, Graph Theory, and Applications (EUROCOMB '23).* [[doi](doi)] [arXiv]

[4] **Simplicial Homeomorphs and Trace-Bounded Hypergraphs**, with J. Long and B. Narayanan. *Discrete Analysis,* 2022:6. [[doi](doi)], [arXiv]

[3] **Properties for the Fréchet Mean in Billera-Holmes-Vogtmann Treespace**, with M. Anaya, O. Anipchenko-Ulaj, A. Ashfaq, J. Chiu, M. Kaiser, M. S. Ohsawa, M. Owen, E. Pavlechko, K. St. John, S. Suleria, K. Thompson. *Advances in Applied Mathematics*, 120 (2020). [[doi](doi)]

[2] **Unipancyclic Matroids**, with W. Agnew-Svoboda, A. Huszar, E. McNicholas, J. Schreiner-McGraw, and C. Starr. *Discrete Mathematics*, 342(8):2254–2269 (2019). [[doi](doi)]

[1] **On Determining if Tree-Based Networks Contain Fixed Trees**, with M. Anaya, O. Anipchenko-Ulaj, A. Ashfaq, J. Chiu, M. Kaiser, M. S. Ohsawa, M. Owen, E. Pavlechko, K. St. John, S. Suleria, and K. Thompson. *Bulletin of Mathematical Biology*, 78(5):961–969, 2016. [doi], [arXiv]

Awards & Fellowships

· University & Louis Bevier Dissertation Completion Fellowship, Rutgers University (2022–23)
  awarded annually to 16 Rutgers PhD students across all disciplines, provides stipend for final year

· AMS Graduate Student Travel Grant (2022)

· AMS Rutgers Student Chapter Prize for Leadership (2018, 2021)
  for "leadership and service to the department and to other mathematical communities, institutions, and initiatives [that is] exemplary and outstanding in its scope, efficacy, and impact."

· Association for Women in Mathematics Student Chapter Award for Fundraising & Sustainability (2021)
  awarded to chapter while president, for "success in increasing membership and diversity of events"

· Janice Pattwell Annual Mathematics Fellowship Award, Rutgers University (2020)

· TA Teaching Excellence Award, Rutgers Mathematics Department (Spring 2020, Fall 2020)

· NASA New Jersey Space Grant Consortium Scholarship, Rutgers University (2016–17)
  provided funding and stipend for bridge-to-PhD studies

· GAANN Fellowship, Rutgers University (2016–17)
  provided funding and stipend for bridge-to-PhD studies

· Edward Cogan Prize for Mathematics and Sciences, Sarah Lawrence College (2016)
  "to recognize a graduating senior exhibiting excellence in mathematics and science"

Presentations

Invited Lecture Series

· ISM Summer School on Random Trees, Graphs, and Maps	May 2023

  Three lectures on the intersections of statistical physics and combinatorics

Invited Conference and Workshop Talks

· AMS Western Sectional: Special Session on Extremal Combinatorics & Connections	May 2024
· Joint Math Meetings: AMS Special Session on Thresholds in Random Structures	Jan. 2024
· AMS Southeastern Sectional: Special Session on Extremal & Probabilistic Combinatorics	Oct. 2023
· AMS Central Sectional: Special Session on Advances in Graph Theory & Combinatorics	Oct. 2023
· 8th Lake Michigan Workshop in Combinatorics and Graph Theory	May 2023
· AMS Central Sectional: Special Session on Extremal Graph Theory	Apr. 2023
· AMS Western Sectional: Special Session on Graphs, Hypergraphs, and Set Systems	Oct. 2022
· Student Symposium in Combinatorics: Plenary Talk (virtual)	May 2022
· OURFA^2M^2 "Our Stories" Talk (virtual, non-research)	Dec. 2021
· STEM Enrichment Youth: STEM World Virtual Conference (non-research)	Aug. 2021

Invited Seminar Talks

· Auburn University Discrete Math Seminar	Feb. 2024
· Lehigh-Minnesota Joint Probability Seminar (virtual)	Dec. 2023
· Duke Joint Combinatorics and Probability Seminar	Oct. 2023
· Emory Discrete Math Seminar	Aug. 2023
· University of Delaware Discrete Math Seminar	May 2023
· CRM-ISM Montreal Probability Seminar	Feb. 2023
· Carnegie Mellon ACO Seminar	Dec. 2022
· Georgia Tech Combinatorics Seminar	Oct. 2022
· Iowa State University Discrete Mathematics Seminar	Apr. 2022
· New York Combinatorics Seminar (virtual)	Apr. 2022
· University of Illinois Chicago Combinatorics and Probability Seminar	Sept. 2021

- Yale Undergraduate Mathematics Seminar (virtual) — Apr. 2021
- Willamette Undergraduate Colloquium (virtual) — Apr. 2021
- University of Illinois Chicago Combinatorics and Probability Seminar (virtual) — Mar. 2021
- Dickinson College Undergraduate Math/CS Colloquium — Apr. 2019
- Rutgers Graduate Pizza Seminar: Open House for Prospective Students — Mar. 2019

Contributed Talks
- Oberwolfach Workshop: Discrete Geometry — Jan. 2024
- Joint Math Meetings: AMS Special Session on Trees in Many Contexts — Jan. 2023
- Joint Math Meetings: AWM Poster Presentation — Jan. 2023
- BIRS Workshop: Cross-Community Collaborations in Combinatorics — May 2022
- Rutgers Discrete Mathematics Seminar — Feb. 2022, Oct. 2021
- AWM We Speak Series: Lightning Talks (virtual) — Sept. 2021
- Webinar in Additive Combinatorics (virtual) — Mar. 2021
- Oxford Discrete Math and Probability Seminar (virtual) — Mar. 2021
- Webinar in Extremal and Probabilistic Combinatorics (virtual) — Jan. 2021

Research Workshop Participation

- Banff International Research Station Workshop — Aug. 2024
  Topic: Frontiers of Statistical Mechanics and Theoretical Computer Science (upcoming)

- Oberwolfach Workshop — Jan. 2024
  Topic: Discrete Geometry

- Cornell Probability Summer School (TA) — July–Aug. 2022
  Led supplementary problem sessions on Phase Transitions and Counting

- AMS Math Research Community — June 2022
  Topic: Trees in Many Contexts

- Banff International Research Station Workshop — June 2022
  Topic: Cross-Community Collaborations in Combinatorics

- SAMSI Program on Combinatorial Probability (virtual) — Spring 2021
  Research Working Group on Phase Transitions and Algorithms

- Woman and Mathematics, Institute for Advanced Study — May 2017
  Topic: Geometry and Randomness in Group Theory

Teaching Experience

Georgia Tech | Instructor of Record | 2023–present
- 4221: Stochastic Processes I — Fall 2024

- 4032: Combinatorial Analysis — Spring 2024
  *40-student course for math and CS majors, run in an inquiry-based format.
  Assessments consisted of writing projects, problem sets, and a presentation.
  Topics included enumeration, extremal and probabilistic combinatorics, and
  linear algebraic methods.*

- 1711: Finite Mathematics — Fall 2023
  *90-student lecture course for business, policy, and language students. Topics
  included basic counting, probability, statistics, linear algebra, and applications.*

Rutgers University | Instructor of Record | 2020–2021
- 123: Preparation for Calculus — Fall 2021 (hybrid), Spring 2021 (online)
  *Half-semester precalculus course, flipped course format using adaptive
  homework system Knewton Alta*

- 454: Combinatorial Theory — Summer 2020 (online)
  Wrote and incorporated 26 inquiry-based worksheets on the course material.

Rutgers University | Teaching Assistant | 2018–2020

- Head TA — Summer 2020
  Observed other graduate student instructors and gave pedagogical feedback.
- 351: Introduction to Abstract Algebra — Fall 2020 (online)
- 250: Linear Algebra — Spring, Fall 2019
- 152: Calculus II for Mathematics and Physical Sciences — Fall 2019, Spring 2018
- 151: Calculus I for Mathematics and Physical Sciences — Fall 2018, 2019

MathILy and MathILy-Er
| MathILy-Er Director | Sept. 2023–present
| MathILy-Er Lead Instructor | Summers 2023–present
| {MathILy, MathILy-Er} Apprentice Instructor | Summers 2015–22

MathILy, or "serious Mathematics Infused with Levity," is a five-week intensive summer math program for high school students to learn undergraduate-to-graduate level mathematics via inquiry-based instruction. MathILy-Er, or "MathILy Earlier," is a similar program for students with less mathematical preparation.

- As Lead Instructor, developed a two-week IBL course on discrete probability, which includes an introduction to probability, probabilistic methods of proof, thresholds in random graphs, Polya's theorems for random walks, Markov chains, lattice percolation, and simulations of the Ising and hardcore models.

- As Apprentice Instructor, co-taught classes with Lead Instructors on the following topics: discrete math, linear algebra, computational geometry, topological graph theory, persistent homology, mathematics of politics, and non-Euclidean geometry.

- Developed and taught week-long minicourses on the following topics: the probabilistic method, linear algebraic methods in combinatorics, extremal combinatorics, Ramsey theory, random walks, surreal numbers, generating functions, and voting methods.

Service & Leadership

Conference Session Organization

- JMM AMS Special Session on Extremal & Probabilistic Combinatorics — Jan. 2024

- AWM Research Symposium: Special Session on Extremal & Probabilistic Combinatorics — Oct. 2023

Referee
SODA (ACM-SIAM Symposium on Discrete Algorithms), Proceedings of the American Mathematical Society, European Journal of Combinatorics, STOC (ACM Symposium on the Theory of Computation)

Graduate School Activities

- Graduate Student Liaison Committee — 2018–23 (Chair 2020–23)
  Planned and facilitated meetings with graduate director and department chair; assigned tasks to other committee members and oversaw event-planning; communicated student concerns to department; organized Open House for graduate students and mentoring and social events.

- Fellow, Rutgers Academy for the Scholarship of Teaching and Learning (RASTL) — 2019–23
  Selective group of graduate students and faculty across departments that met once a month to discuss pedagogy.

- Founder and President, Association for Women in Mathematics Student Chapter at Rutgers University — 2018–22
  Organized professional development workshops and panels, and community-building events such as weekly lunches and book clubs.

- Fellow, Rutgers PreDoctoral Leadership Development Academy   2021–22
  Selective program of 25 graduate students across departments that met weekly to learn about and discuss leadership in higher education
- TA Orientation Leader, Rutgers School of Graduate Studies Orientation   2019–20

- Seminar Organizer
  - *Discrete Math Seminar (co-organizer, 2021-23)*
  - *Combinatorics Reading Seminar (2020-23)*
  - *Math Teaching Seminar (co-organizer, 2019-23)*
  - *Graduate Combinatorics Seminar (2018-20)*
  - *Graduate Pizza Seminar (co-organizer, 2017-18)*

Mathematical Performance & Outreach
I wrote a one-woman play called *Uniform Convergence* and have performed it off-Broadway (2017), at MAA MathFest (2018), at the Joint Math Meetings (2023), and at 22 different academic institutions since 2017. More information is on my website.