Emily Y. Zhang

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Education

Massachusetts Institute of Technology — Cambridge, MA
Ph.D. Student in Operations Research — September 2021 – Present
Advised by Prof. Retsef Levi and Prof. Georgia Perakis

Massachusetts Institute of Technology — Cambridge, MA
B.S. in Computer Science & Mathematics, GPA: 5.0/5.0 — September 2017 – June 2021

Papers

1. **An Upper and Lower Bound for the Convergence Time of House-Hunting in *Temnothorax* Ant Colonies.**
   Emily Zhang, Jiajia Zhao, Nancy Lynch, 2021.

2. **On the Broadcast Dimension of a Graph.**
   Emily Zhang, `arXiv:2008.01056 [math.CO]`, 2020.

3. **Extremal Pattern-Avoiding Words.**
   Natalya Ter-Saakov and Emily Zhang, `arXiv:2009.10186 [math.CO]`, 2020.

4. **CDFShop: Exploring and Optimizing Learned Index Structures.**
   Ryan Marcus, Emily Zhang, and Tim Kraska,
   Proceedings of the 2020 ACM SIGMOD International Conference on Management of Data, 2020.

5. **On the Stability of Optimization Algorithms Given by Discretizations of the Euler-Lagrange ODE.**
   Rachel Walker and Emily Zhang, `arXiv:1908.10426 [math.OC]`, 2019.

Research Experience

MIT Computer Science & Artificial Intelligence Laboratory (CSAIL) — Cambridge, MA
Undergraduate Researcher in the Theory of Distributed Systems Group — Aug 2020 – Aug 2021

- Analyzed the house-hunting process in ant colonies from a distributed computing perspective to inspire swarm robotics research.
- Proved theoretical guarantees on the consensus time and conformity of an agent-based model for house-hunting.
- Presented results at the 8th workshop on Biological Distributed Algorithms.

Duluth Research Experience for Undergraduates (REU) — Duluth, MN
Undergraduate Researcher — Summer 2020

- Derived an asymptotically optimal lower bound on the broadcast dimension of acyclic graphs and proved that edge deletion can both increase and decrease broadcast dimension by an arbitrarily large amount.
- Presented results at the 2020 American Mathematical Society Fall Virtual Sectional Meetings.

MIT CSAIL — Cambridge, MA
Undergraduate Researcher — Sept 2019 – Dec 2019

- Explored the potential of the recursive model index (RMI), a learned index structure tuned to a user's data by machine learning, to outperform traditional index structures in the task of searching over sorted data.

- Built an RMI optimizer on top of the existing RMI codebase.

Georgia Tech Mathematics REU Atlanta, GA
Undergraduate Researcher Summer 2019

- Researched accelerated gradient-based convex optimization algorithms, based on discretizing continuous-time curves converging to the optimum.
- Presented results at the 2019 Young Mathematicians Conference.

MIT Media Lab Cambridge, MA
Undergraduate Researcher in the Molecular Machines Group Jan 2019 – Feb 2019

- Parsed the scientific citation network to extract features that indicate early signs of highly-impactful ideas.
- Created visualizations to understand how infectious ideas are spread across communities.

MIT Media Lab Cambridge, MA
Undergraduate Researcher in the Personal Robots Group Summer 2018

- Designed and developed literacy games using Unity and C#.
- Implemented a data tracking system that tracks children's learning performance and interaction history with a social robot and the literacy games.

Summer Science Program Socorro, New Mexico
Student Researcher working on Asteroid Orbit Determination Summer 2016

- Observed the near-earth asteroid 1999 ML with the C-14 telescope at Etscorn Observatory.
- Determined the orbit of 1999 ML using original photometry, astrometry, and Method of Gauss orbit determination code.

Teaching Experience

- **Laboratory Assistant** at MIT Department of EECS Fall 2019
  Introduction to Machine Learning (6.036)
- **Grader** at MIT Department of Mathematics Spring 2020
  Probability and Random Variables (18.600)

Extracurricular Activities

MIT Undergraduate Society of Women in Mathematics (USWIM) Cambridge, MA
Publicity Chair 2019 – present

- Hosted career-oriented events, outreach events, and social events for female-identifying and nonbinary students interested in math.
- Mentored underclassmen who are interested in majoring in mathematics.

MIT Society of Women Engineers (SWE) Cambridge, MA
Board Member & Technology Chair 2019 – 2020

- Planned and hosted campus-wide technology workshops.
- Oversaw SWEcubator, a program that provides mentorship, resources, and funding to help SWE members start new engineering initiatives.