Emily Y. Zhang

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Education

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

Publications

1. **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), 2789–2792.

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

3. **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 — August 2020 – present

- Modelled house hunting in ant colonies from a distributed computing perspective as an algorithm that is both bio-plausible and tractable to rigorous analysis.
- Studied the speed, accuracy, and noise tolerance of the algorithm.

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

- Obtained tight asymptotic lower bounds on the broadcast dimension of graphs and proved results about the change in the broadcast dimension of a graph under a single edge deletion.
- Worked on a problem on extremal pattern-avoiding words.

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

- Explored the potential of the recursive model index (RMI), a learned index structure, 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

- Studied gradient-based optimization algorithms using limiting ordinary differential equations.
- Obtained new families of optimization algorithms by discretizing high-resolution differential equations.
- Presented results at the 2019 Young Mathematicians Conference; published results in 2019 IEEE MIT URTC (Undergraduate Research Technology Conference) Proceedings.

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

- Parsed scientific citation network to extract features that indicated early signs of highly-impactful ideas.
- Created visualizations of graph of scientific literature to detect how infectious ideas are spread across communities.
- Scraped information from different channels and incorporated this additional information into the graph.

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

- Designed and developed literacy games using Unity and C#.
- Programmed social robot Jibo and designed a child-robot interaction paradigm using Robotics Operation System.
- Implemented a database system that can keep track of children's learning performance and interaction history with the robot and the literacy games.

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

- Observed 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; results published by the International Astronomical Union Minor Planet Center.

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.

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.