Emily Zhang

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Education

Massachusetts Institute of Technology   Cambridge, MA
Ph.D. Student in Operations Research, GPA: 4.9/5.0   September 2021 – Present
Advisors: Prof. Georgia Perakis and Prof. Retsef Levi

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

Research Interests

Topics: Optimization, machine learning, economics, statistics, causal inference, interpretability, combinatorial optimization

Applications: Sustainable operations, public-sector/nonprofit operations, nutrition assistance programs, food bank operations, inventory planning

Publications/Completed Manuscripts

1. **Approximation Algorithms for Inventory Problems with Decomposable Submodular Ordering Costs.**
   Retsef Levi, Georgia Perakis, Emily Zhang. Soon to be submitted to *Mathematics of Operations Research*.

2. **Heterogeneous Treatment Effects in Panel Data.**
   Retsef Levi, Elisabeth Paulson, Georgia Perakis, Emily Zhang. Major Revision at *Manufacturing & Service Operations Management*.

   - Accepted for presentation at *2025 MSOM Sustainable Operations SIG*

3. **Reducing Food Waste through a Reservation Scheme.**
   Retsef Levi, Georgia Perakis, Emily Zhang. Major Revision at *Management Science*.

4. **On the Broadcast Dimension of a Graph.**
   Emily Zhang, *Australasian Journal of Combinatorics* **85**(3) (2023), 313–339.

5. **An Upper and Lower Bound for the Convergence Time of House-Hunting in *Temnothorax* Ant Colonies.**
   Emily Zhang, Jiajia Zhao, and Nancy Lynch, *Journal of Computational Biology* **29**(4) (2022), 344–357.

6. **CDFShop: Exploring and Optimizing Learned Index Structures.**
   Ryan Marcus, Emily Zhang, and Tim Kraska, *ACM SIGMOD* 2020.

Working Papers

1. **The Categorical Joint Replenishment Problem.**
   Retsef Levi, Georgia Perakis, Emily Zhang. Working paper.

2. **Optimizing Food Allocation in the Met Council Pantry Network.**
   Retsef Levi, Georgia Perakis, Emily Zhang. Working paper.

Talks

1. **Heterogeneous Treatment Effects in Panel Data**
   - 2025 MSOM Sustainable Operations Management SIG Conference
   - 2025 Annual POMS Conference
   - 2024 INFORMS Annual Meeting
   - 2024 Manufacturing & Services Operation Management Conference

2. **Reducing Food Waste through a Reservation Scheme**
   - 2025 Data, Models, and Decisions for MIT Executive MBAs
   - 2023 INFORMS Annual Meeting

3. **An Upper and Lower Bound for the Convergence Time of House-Hunting in Temnothorax Ant Colonies**
   - 2021 8th workshop on Biological Distributed Algorithms

4. **On the Broadcast Dimension of a Graph**
   - 2020 AMS Virtual Sectional Meetings

5. **Optimization Algorithms Given by Discretizations of the Euler-Lagrange ODE**
   - 2019 MIT IEEE Undergraduate Research Technology Conference
   - 2019 Georgia Tech REU Poster Session
   - 2019 Young Mathematicians Conference at The Ohio State University

Teaching Experience

Teaching Assistant at MIT Sloan School of Management   Spring 2025
Data, Models, and Decisions (15.730)

- MIT Sloan Executive MBA core curriculum course with 120+ EMBA students
- Taught recitations, delivered plenary presentation on causal inference, held office hours, and graded cases. Student rating: 6.72/7.0

Teaching Assistant at MIT Sloan School of Management   Summer 2024
Introduction to Operations Management (15.734)

- MIT Sloan Executive MBA core curriculum course with 120+ EMBA students
- Taught recitations, ran online competitive simulation game, held office hours, and grade cases. Student rating: 6.79/7.0

Instructor at MIT Operations Research Center   Winter 2024
Computing in Optimization and Statistics (15.S60)

- Taught a 3-hour data analytics session using R for first-year doctoral students.

Grader at MIT Department of Mathematics   Spring 2020
Probability and Random Variables (18.600)

Laboratory Assistant at MIT Department of EECS   Fall 2019
Introduction to Machine Learning (6.036)

Research Experience

MIT Operations Research Center (ORC) Cambridge, MA
Doctoral Research Assistant Sept 2021 – Present

- Developing new analytical methods aimed at reducing food waste and optimizing food subsidy programs.

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 of an agent-based model for house-hunting.

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

- Conducted research in graph theory.
- Derived an asymptotically optimal lower bound on the broadcast dimension of acyclic graphs.

MIT Computer Science & Artificial Intelligence Laboratory (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.

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 and determined its orbit.

Professional Service

MIT ORC Seminar Series Cambridge, MA
Coordinator Fall 2024

MIT ORC Independent Activities Period (IAP) Seminar Cambridge, MA
Coordinator IAP 2024

MIT Undergraduate Society of Women in Mathematics (USWIM) Cambridge, MA
Publicity Chair 2019 – 2021

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

Scholarships and Awards

Accepted for presentation at MSOM Sustainable Operations SIG 2025

NSF Graduate Fellowship 2021

Ida M. Green Fellowship 2021–2022

Additional Information

Languages: English (native), Mandarin Chinese (fluent), French (conversational), Spanish (basic)

Technical skills: Python, R, Java, Julia, SQL, JuMP, Gurobi, LaTeX