Maura Hegarty

Email: mshegart@mit.edu   **LinkedIn**: www.linkedin.com/in/maurahegarty

Research Interests	Optimization, Algorithms, Machine Learning

Education	**Massachusetts Institute of Technology**	May 2024
	SM in Operations Research Advisor: Professor Dimitris Bertsimas	
	University of Massachusetts Amherst	May 2022
	BS in Mathematics Advisor: Professor John Staudenmayer	*GPA: 3.86*

Coursework	Multivariate Calculus	Linear Algebra
	Statistics	Intro to Programming
	Fundamental Concepts of Math	Differential Equations
	Discrete Math	Mathematical Modelling
	Predictive Analytics	Python for Data Scientists
	Programming with Data Structures	Abstract Algebra I
	Scientific Computing	Real Analysis I
	Complex Analysis	Introduction to Algorithms

Work Experience	Peer Advising	Spring 2022 Semester
	Tutoring in Mathematical Modelling	Fall 2021 Semester
	Grading Linear Algebra	Spring 2021 Semester
	Tutoring in High School Geometry	Winter 2020 Semester

Honors and Scholarships	Dean's List (College of Natural Sciences)	Spring 2019–Fall 2020
	William Lee Science Impact Program	Summer 2020–Present

Publications	**A Mathematical Model of Breast Tumor Progression Based on Immune Infiltration** Navid Mohammad Mirzaei, Sumeyye Su, Dilruba Sofia, Maura Hegarty, et al. *Journal of Personalized Medicine, 2021.*

Talks	**The Pitman-Stanley Polytope and Flow Polytopes**	
	Math Club Talk	December 7, 2021
	UMass Discete Math Seminar	September 17, 2021
	William Lee SIP Poster Presentation	August 6, 2021

Skills

Programming

Proficient: Microsoft Suite (Word, PowerPoint, Excel), Python, Jupyter Notebook, Sage.

Familiar: Java.

Programming Packages

Proficient: Pandas, Gurobi.

Familiar: Scikit Learn, NumPy, SciPy.

Research and Project Experience

The Pitman-Stanley Polytope and Flow Polytopes

Mentor: Professor Alejandro Morales   June 2021–Present

UMass Amherst

Project Abstract

In 1999, Pitman and Stanley introduced the Pitman-Stanley polytope along with its volume formula and lattice point formula. The Pitman-Stanley polytope is well studied due to its connections to probability, parking functions, the generalized permutahedra, and flow polytopes. Its lattice points correspond to plane partitions with entries 0 and 1. Pitman and Stanley remarked that their polytope can be generalized so that lattice points correspond to plane partitions with entries $0, 1, ..., m$. This generalization has since been untouched. We study this generalization, its lattice points, and its volume. We also realize the generalized Pitman-Stanley Polytope as a flow polytope which opens the door to new tools for studying this polytope.

Shahriyari Lab: Data Science, Bioinformatics, Mathematical Biology

Mentor: Professor Leili Shahriyari   May 2020–May 2021

UMass Amherst

Project Contents

Modelled breast cancer tumor microenvironment dynamics with differential. Worked with a small cohort in writing paper *A Mathematical Model of Breast Tumor Progression Based on Immune Inflitration.* Learned to analyze on colon cancer patients' genetic and clinical data using Jupyter Notebooks.

Independent Study: Applied Vehicle Routing Problem

Mentor: Professor Annie Raymond   February 2021–May 2021

UMass Amherst

<div align="center">**Project Contents**</div>

Gathered distance and elevation data using mapping APIs. Studied and optimized an example of a vehicle routing problem to produce results for the company Pedal People in Northampton, MA. Worked to improve the runtime of code of past attempts at solving the problem.

Class Project: Ramsey Numbers

Class: Discrete Math   April 2020–May 2020
UMass Amherst

<div align="center">**Project Summary**</div>

With a small group, we studied Ramsey Numbers, their history, the party problem, Ramsey Number bounds, and Ramsey numbers in computer science. We presented this project to the class.

Events Attended

GROW: Graduate Research Opportunities for Women   October 2020
Remotely hosted by the University of Chicago.

GROW: Graduate Research Opportunities for Women   October 2021
Hosted at the University of Illinois-Chicago.

Service and Outreach

Bridging the Divide — Israel Fellowship   January 2020

- Purpose of trip was to expose student leaders to the Israeli-Palestinian conflict and build relationships between a diverse group of students as well as Israelis and Palestinians from the West Bank

- Confronted my own ideas as well as my peers' ideas on religion, politics, etc.

- Explored Holy sites and learn about each of the three Abrahamic religions

---

Activities

Integreated Math Majors   October 2020–present
Founding Member, President

- A group of undergraduate students along with myself took the initiative to start an organization designed at making the path for math majors more accessible.

- Hosted a Senior Concentration Q&A where strong performing seniors from each math concentration spoke about their experience in their undergraduate years

- Successful turnout led us to organize a club to address the need to guide freshman and answer their many questions about what being a math major at UMass is like

- Organized Careers in Math event this fall semester with a panel of faculty and graduates students with industry background

UMass Gospel Choir

Vice President   September 2020 – August 2021

- Worked with other executive board members to maintain and continue to build the uplifting community of gospel choir

- Organized virtual outreach to a local nursing home with the knowledge of the hardship such a community faces during lockdown

Outreach Coordinator   September 2019-August 2020

- First Outreach Coordinator of the Gospel Choir Eboard

- Suggested the position to spread the word about choir because I noticed a campus-wide lack of awareness

- Coordinate with other Christian and musical organizations on campus to develop relations

- The choir leads worship for other Christian clubs, performs at a variety of events, and hosts annual Spring Concert