Madelyn Andersen

Research Interests

Bayesian Statistics, Robustness, Machine Learning, Ring Theory, Number Theory

Leadership & Awards

Awards NSF Graduate Research Fellowship (2022-present), Giovanni Borrelli Fellowship (2021), Robert James Prize (2019), UCLA DataFest Winner (2019), National Merit Scholar (2018)

Leadership President, Women in Math Club (2021–2022); Co-President (2020–2021); Exec. Committee, MIT Ballroom Dance Team (2023–Present)

Academic Background

2022–Present **PhD, Computer Science & Machine Learning**, *MIT*, Cambridge, MA

2018–2022 **B.Sc. in Mathematics**, *Harvey Mudd College*, Claremont, CA
Relevant Coursework: Data Structures, Algorithms, Probability & Statistics, Bayesian Statistics, etc.

Research and Work Experience

Fall 2022–Present **PhD Student**, *MIT*, Cambridge, MA
- Conducting research on variational inference methods to improve computational efficiency in Bayesian hierarchical models.
- Investigating novel strategies for posterior approximation validation, focusing on robust uncertainty quantification in large-scale datasets.

Winter 2020–Spring 2022 **Student Researcher**, *Harvey Mudd College*, Claremont, CA
- Developed theoretical frameworks for trace ideals and trace module conditions in Gorenstein rings, analyzed relationships between finitely presented modules and their syzygies, leading to a publication in preparation.
- Explored zero-sets of graphons using tools from Algebraic Geometry. Derived a novel version of Hilbert's Nullstellensatz for graphon spaces; publication in preparation.

Summer 2020 **Intern**, *Systems & Technology Research*, Woburn, MA
- Researched and developed human pattern-of-life analysis tools using Python, SciKit, and custom clustering algorithms for geospatial mobility data.
- Implemented a proof-of-concept anomaly detection algorithm (Hidden Markov Models) to identify deviations in individuals' movement patterns.
- Built a computational stigmergy tool to compare large-scale behavioral data

Summer 2019 **Intern**, *Systems & Technology Research*, Woburn, MA
- Developed a suite of machine learning and image processing tools for Pan-Tilt-Zoom (PTZ) camera data using Python and OpenCV. Designed and implemented a homography tool to calculate the camera field-of-view and geolocate objects by mapping image coordinates to real-world locations.

Summer 2017 **Intern**, *Olin College of Engineering*, Needham, MA
- Collaborated with a faculty-led team and the Boston Union of Blind Sailors to develop blind match-race sailing technology. Developed a prototype utilizing image contour analysis and thresholding to compute distances for safe navigation.

Skills

Languages Python, SQL, R, Java, C++, JavaScript, HTML, Matlab, AMPL, LaTeX

Tools OpenCV, SciKit, Git, Numba, PyTorch, etc.