

Mason DiCicco

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Education

- 2020-2025 **Ph.D. Computer Science**, *Worcester Polytechnic Institute*, 4.0 GPA.
Advised by Daniel Reichman
- 2016-2020 **B.S. Computer Science**, *University of Connecticut*, 3.9 GPA.
Concentration: Theory and Algorithms
- 2016-2020 **B.A. Mathematics**, *University of Connecticut*, 3.9 GPA.
Concentration: Pure Mathematics

Coursework

- Graduate Level Mathematics Combinatorics, Analysis, Algebra, AI, Reinforcement Learning, Deep Learning, Networks.
Abstract/Linear Algebra, Differential Equations, Analysis, Topology, Probability.
- Computer Science Systems Programming, Computer Architecture, Algorithms and Complexity, Machine Learning, Computational Geometry, Operating Systems, Modern Cryptography, Numerical Methods.

Research Experience

- September 2020 - Present **Graduate Student**, *Worcester Polytechnic Institute*, Advisor: Daniel Reichman.
Studying topics in theoretical computer science, proving hardness results in communication and learning complexity, statistical inference, and circuit complexity.
- September 2022 **Research Visit**, *Santa Fe Institute*, Host: Cris Moore.
Developed combinatorial methods for proving upper bounds on the expected length of the longest common subsequence of random strings (i.e., the Chvatal-Sankoff constant).

Publications

Accepted papers

- May 2021 - September 2022 **The Learning and Communication Complexity of Subsequence Containment**, *WPI*, CS Department.
Proved tight bounds on the complexity of subsequence detection. (ISIT 2023)
- January 2024 - October 2024 **The Karp Dataset**, *WPI*, CS Department.
Introduced a dataset of NP-hardness reductions. (NeurIPS MATH-AI Workshop 2024)
- November 2023 - January 2024 **Nearest Neighbor Complexity and Boolean Circuits**, *WPI*, CS Department.
Studied the representational complexity of the nearest-neighbor classification rule. (ITCS 2025)

Preprints and other projects

- December 2022 - May 2023 **Inoculation Strategies for Bounded Degree Graphs**, *WPI*, CS Department.
Proved tight bounds on the price of anarchy for an abstract model of epidemic containment. (Submitted to TCS)
- May 2018 - August 2018 **Markov Coupling**, *UConn*, Math Department REU.
Proved upper bounds on the coupling-times of Markov chains under various restrictions.
https://opencommons.uconn.edu/srhonors_theses/709/

Professional Experience

- May 2023 - **Naval Research Lab, Washington, D.C..**
July 2023
 - Implemented physics-informed neural networks, universal differential equations for practical applications.
 - Generalized spectral neural operators to improve performance on localized data.
- June 2019 - **Naval Information Warfare Center, San Diego, CA.**
August 2019
 - Researched topological data analysis approaches to analyzing neural network behavior.
 - Neuromorphic computing: Developed a spiking neural network (SNN) simulator.
- July 2015 - **United Technologies Aerospace Systems, Windsor Locks, CT.**
September 2015
 - Created an accurate computer simulation of the Integrated Fuel Pump Control system.

Talks

- March 2024 **Communication complexity and linear arrangements,**
Discrete Math Seminar, WPI.
- July 2024 **Nearest neighbor comoplexity and boolean circuits,**
CS Theory Seminar, Tufts University.
- November 2023 **Threshold circuit lower bounds from communication complexity,**
Discrete Math Seminar, WPI.
- September 2023 **Introduction to nearest neighbor complexity,**
Discrete Math Seminar, WPI.
- September 2022 **Expected length of the longest common subsequence,**
Discrete Math Seminar, WPI.
- October 2021 **The communication complexity of subsequence detection,**
Discrete Math Seminar, WPI.

Teaching Experience

- (Many instances) **Foundations of Computer Science, Teaching Assistant, WPI.**
Introduction to finite automata, context-free grammars, and Turing machines.
- (Many instances) **Introduction to Machine Learning, Teaching Assistant, WPI.**
Regression, MLE, clustering, neural networks.
- (Many instances) **Algorithms: Design and Analysis, Teaching Assistant, WPI.**
Divide and conquer, dynamic programming, etc., amortized analysis, NP completeness

Specific Skills

- Programming Python, Julia, Java, C, C++, Javascript (node.js)
- Implementations Deep Learning, Convolutional/Recurrent Networks, Reinforcement Learning, Few-Shot Learning, Meta Learning, Evolutionary Algorithms, Neuromorphic Computing (Pytorch, Tensorflow, OpenAI Gym.)