

# ETHAN MADER

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## EDUCATION

### Purdue University

Aug 2024 - Present

Computer Science Ph.D. Program

- Funded by Presidential Excellence PhD Award and Research Assistantship, advised by Kent Quanrud
- GPA: 3.85/4.0, member of Theory seminar, Chess Club, Purdue Outing Club
- Research areas: Graph algorithms, complexity theory, convex optimization, algorithmic economics

### University of California, Santa Barbara

Sep 2020 - June 2024

B.S. Computer Science, B.S. Mathematics

- GPA: 3.93/4.0, Theta Tau Professional Engineering Fraternity, Chess Club, Math Club
- Key coursework: Graph theory, combinatorics, advanced algorithms, Markov chains, probability, statistics

## EXPERIENCE

### Purdue Research Assistantship

Sep 2024 - Present

Graph Algorithms Research

- Building on undirected expander decomposition techniques from SW21 and HKPW23 to develop a near-linear directed expander hierarchy algorithm and improve on the state-of-the-art for the max flow problem (BBST24)

### Wyzant

June 2023 - Sep 2024

Math and Computer Science Tutoring

- Remote instruction on competition math and C++ fundamentals, data structures, and algorithms
- 200+ hours and 5-star rating across 30 reviews with one-time and long-term clients

### Polymath Jr. Summer Program

June - Aug 2023

Combinatorial Geometry Research

- Used computer-assisted techniques for novel case analysis automation in the distinct distances problem with 10 other undergraduates under the supervision of Adam Sheffer of CUNY

### UCSB Programming Languages Lab

Jan - June 2023

Programming Languages Research

- Developed metaprogramming techniques in Agda and Coq for automated proofs of bisimilarity between superconducting electronic (SCE) circuits which utilized equational reasoning and coinduction
- Motivated the decision to translate Citrus, a newly developed DSL in Agda, to Coq

## PROJECTS

### AI and ML Programming

May 2022 - May 2024

- Naïve Bayes classifier from scratch in C++ on 1000 testing files to predict future weather classifications given 28 previous times steps and 17 data values both discrete and continuous
- Improved A-star search to beat an adversary in a variation of Rogue with top 7% class performance
- Convolutional neural network in Python using TensorFlow trained on 40,000 training images to classify clothing images from 10 categories with 92% accuracy on 10,000 test images

## SKILLS

- Programming: C++, Python, Java, MATLAB, OCaml, Haskell, Agda, Coq, C
- Tools: NumPy, Matplotlib, pandas, TensorFlow, Mathematica, ChatGPT, Copilot, LaTeX
- Other interests: Quantum computing, DL for math proofs in Lean, Jane street puzzles