

Alan Sun

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EDUCATION

Carnegie Mellon University

Aug. 2024 – Dec. 2025

Master of Science in Computer Science

Relevant Coursework: Adv. Intro. to Machine Learning, Convex Optimization, Intermediate Statistics

Dartmouth College

Sept. 2021 – June 2024

Bachelor of Arts, Computer Science, Mathematics, *magna cum laude*, high honors

Honors Thesis: Achieving Domain-Independent Certified Robustness via *Knowledge Continuity*

GPA: 3.9/4.0

Relevant Coursework: Machine Learning and Stat. Data Analysis, Information Theory, Probability (Honors), Real Analysis (Honors), Measure Theory, Probability and Statistical Inference, Computer Vision, Data-Driven Uncertainty Quantification, Algorithms, Differential Equations, Computer Architecture, Complex Analysis, Randomized Algorithms, Abstract Algebra (Honors)

PUBLICATIONS

A. Sun, E. Sun, W. Shepard, Algorithmic Phase Transitions in Large Language Models: A Mechanistic Case Study of Arithmetic. *ATTRIB @ NeurIPS (2024)*.

A. Sun, C. Ma, K. Ge, S. Vosoughi, Achieving Certified Robustness via Knowledge Continuity. *NeurIPS (2024)*.

W. Ma, L. Zhao, C.Y. She, Y. Jiang, A. Sun, B. Zhu, D. Balkcom, S. Vosoughi. Automated Soft Modular Robot Design: Simulation-Supervised Generative Language Models. *In Review @ CoRL (2024)*.

W. Ma, H. Scheible, B. Wang, G. Veeramachaneni, P. Chowdhary, A. Sun, A. Koulogeorge, L. Wang, S. Vosoughi. Deciphering Stereotypes in Pre-Trained Language Models. *EMNLP (2024)*.

A. Sun. A Decentralized Insurance Exchange,” *U.S. Patent 63/153,349 Pending*. February 24, 2021.

A. Sun and H. Xiao. ThanosNet: A Novel Trash Classification Method Using Metadata, *IEEE Big Data (2020)*.

HONORS AND AWARDS

- **John G. Kemeny Computing Prize for Innovation (2024)**. Intended to encourage novel uses of computing by undergraduate Dartmouth students. Rewards students who produce original, creative, well-designed, and well-implemented computer programs.
- **Neukom Prize for Outstanding Undergraduate Research–First Prize (2024)**. Recognizes outstanding graduate/undergraduate research in computational sciences at Dartmouth.
- **Francis L. Town Prize for Achievement in Computer Science (2023)**. Presented annually to one exceptional student in computer science at Dartmouth.
- **James O. Freedman Presidential Scholar (2023)**. Provides funding for undergraduate students to work as research assistants with Dartmouth faculty.
- **Goldwater Scholarship Program Nominee (2023)**. One of five students nominated to represent Dartmouth in the national Barry Goldwater Scholar selection.
- **Dartmouth College Second Honors Group (2023; 2022)**. Awarded annually to top 15% of all undergraduates.
- **JHU/APL Achievement Award for Technical Excellence (2022)**. Given to interns who make meaningful technical contributions to their projects, produce work of exception quality.
- **Bronze Medal in Options Trading at UChicago Trading Competition (2022)**. Created a real-time algorithm which makes markets for options sensitive to catastrophic events.
- **Silver Medal for Kaggle Toxic Comment Classification Challenge (2020)**. Achieved a top 4% finish, 72nd out of 1621 teams. Created language models to identify multilingual toxic comments using only English training set.

RESEARCH EXPERIENCE

Bridging AI and Neuroscience Group (Max-Planck Institute for Software Systems) June 2024 – Present

Advisor: Mariya Toneva

- **Mechanistic Interpretability and Brain Alignment.** Language models have been shown to be aligned with brain activity, we seek to uncover the mechanisms (subcircuits) that cause this alignment and analyze the downstream abilities of these mechanisms.

Mind, Machines, Society Group (Dartmouth College)

Sept. 2022 – June 2024

Advisors: Soroush Vosoughi, Chiyu Ma

- **Domain-Independent Certified Robustness via *Knowledge Continuity*** (March 2023 – June 2024)
Formulated a new metric, *knowledge continuity*, which when minimized provably minimizes adversarial robustness while not limiting the expressiveness of the hypothesis class. Constructively demonstrating that robustness and accuracy are not at odds. *Under review at NeurIPS 2024. Awarded John G. Kemeny Computing Prize and the Neukom Prize for Outstanding Undergraduate Research (First Place)*
- **Automated Soft Modular Robot Design** (March 2023 – June 2023)
Created language models trained using policy-gradient methods to automatically assemble soft-lattice robots based on user-specified task and robot deployment environment. This work was done in collaboration with the Dartmouth Robotics Lab. *Under review at CoRL 2024.*

Fu Lab (Dartmouth College)

Aug. 2023 – Jan. 2024

Advisor: Feng Fu

- **Mechanistic Interpretation with Large Language Models** (Aug. 2023 – June 2024)
Developing novel methods to mechanistically interpret neural networks trained to play iterated prisoner's dilemma. The goal is to generate (end-to-end) natural language explanations both at the neuronal and network level using large language models.
- **Information Bottleneck Theory to Explain Adversarial Attacks** (March 2022 – June 2022)
Used information bottleneck theory and the information plane to characterize and explain adversarial robustness of neural networks based on their activation functions. *Awarded Francis L. Town Prize.*

Applied Physics Lab (Johns Hopkins University), Threat Analytics Group

June 2022 – Sept. 2022

Advisors: Sarah Prata, Alex Memory

- Built and designed graph neural networks to detect and predict trends of toxic posts and comments throughout Reddit communities.
- Worked with agency responsible for generating the data on collecting techniques to avoid implicit biases.
- Performed exploratory data analysis on online forum data and proposed novel, graph-based metrics for quantifying post-comment relationships.

TEACHING EXPERIENCE

Probability, Grader (2024), Real Analysis, Grader (2024), Algorithms, Undergraduate Teaching Assistant (2023), Multivariate Calculus, Peer Tutor (2022), Digital Electronics, Undergraduate Teaching Assistant (2022).

STUDENT MENTEES

Ethan Sun (BA, Dartmouth College), Kenneth Ge (BS, Carnegie Mellon University), Chikwanda Chisha (BA, Dartmouth College, E.E Just Summer Research Intern), Ava Carlson (BA, Dartmouth College, Women in Science Project Intern)

SERVICE

Reviewer, ICLR	2025
Reviewer, NeurIPS Workshop on Mathematical Reasoning and AI	2024
Reviewer, NeurIPS Workshop on Attributing Model Behavior at Scale	2024