Daniel Melcer

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Education

Northeastern University

Boston, MA

Khoury College of Computer Sciences

PhD Student in Formal Methods and Reinforcement Learning | GPA: 4.0

Advised by Christopher Amato and Stavros Tripakis

September 2021 - Present (Expected Completion: August 2026)

Bachelors of Science in Computer Science, Minor in Math | GPA: 4.0
September 2017 - May 2021

Publications

Approximately Aligned Decoding

Daniel Melcer, Sujan Gonugondla, Pramuditha Perera, Haifeng Qian, Wen-Hao Chiang, Yanjun Wang, Nihal Jain, Pranav Garg, Xiaofei Ma, Anoop Deoras
To appear at NeurIPS 2025; arXiv:2410.01103

Learned Shields for Multi-Agent Reinforcement Learning

Daniel Melcer, Christopher Amato, Stavros Tripakis
ALA 2025

Incremental Quotient Language Recognition to Improve LLM Code Generation Quality

Daniel Melcer, Nathan Fulton, Sanjay Krishna Gouda, Haifeng Qian
arXiv:2402.17988

Shield Decentralization for Safe Reinforcement Learning in General Partially Observable Multi-Agent Environments

Daniel Melcer, Christopher Amato, Stavros Tripakis
RLC 2024
AAMAS 2024 (Extended Abstract)

Shield Decentralization for Safe Multi-Agent Reinforcement Learning

Daniel Melcer, Christopher Amato, Stavros Tripakis
NeurIPS 2022
Safe RL @ IJCAI 2022
RLDM (Extended Abstract)

Multi-Agent Tree Search with Dynamic Reward Shaping

Alvaro Velasquez, Brett Bissey, Lior Barak, Andre Beckus, Ismail Alkhouri, Daniel Melcer, George Atia
ICAPS 2022

ProofViz: An Interactive Visual Proof Explorer

Daniel Melcer, Stephen Chang
Trends in Functional Programming 2021

Dynamic Automaton-Guided Reward Shaping for Monte Carlo Tree Search

Alvaro Velasquez, Brett Bissey, Lior Barak, Andre Beckus, Ismail Alkhouri, Daniel Melcer, George Atia
AAAI 2021

Verification-Guided Tree Search

Alvaro Velasquez, Daniel Melcer
AAMAS 2020 (Extended Abstract)

Experience

Amazon Web Services
Applied Research Intern
New York, NY
May 2025 - August 2025
- Analyzed recent prompt optimization techniques, designed and executed experiments to show that observed behavior of certain methods are inconsistent with popular explanations of their mechanisms.

May 2024 - August 2024
- Developed sampling method to balance generation latency and quality for difficult to satisfy LLM output constraints, resulting in a significant increase in automated and human-evaluated metrics.

May 2023 - August 2023
- Researched incremental parsing and quotient language generation for context-sensitive programming languages, including those with complex lexing rules and whitespace sensitivity.
- Implemented constrained generation of LLMs for a Python 3 fill-in-middle task, leading to a significant increase in generations which are accepted by a Python parser.

Griffiss Institute
Research Intern for Air Force Research Laboratory
Rome, NY
June 2021 - August 2021
- Extended work on automatically learning a high-level human-interpretable automaton representation of a complex reinforcement learning environment
- Created a method which transfers knowledge between two agents through an automaton representation of a task, using a modified version of the traditional Q-learning loss function

January 2019 - June 2019
- Used Pytorch to implement a formal specification based reinforcement learning mechanism to enable a 50% higher success rate in sparse-reward tasks, with the ability to transfer knowledge to similar tasks
- Researched an exploration method that combines intrinsic curiosity networks and tree search to explore new environments without manually specifying a reward function

Datto
Software Development Intern
Norwalk, CT
January 2020 - May 2020
- Migrated thousands of lines of Javascript to Typescript and formalized shared object types
- Wrote two new chapters for the internal style guide on Typescript type design and SQL best practices
- Designed and prototyped a mock server to simulate external dependencies during automated tests

Forward Thinking Systems
Software Development Intern
Jericho, NY
May 2018 - August 2018
- Analyzed sensor data with Python and Keras to detect potential camera blockages and failures in thousands of commercial vehicle dashcams
- Developed an extensible Typescript Alexa skill for users to perform common administrative tasks

Brookhaven National Laboratory
Summer Research Intern
Upton, NY
July 2017 - August 2017
- Wrote a Python desktop application to sort and search a database of over 1,000 ethernet ports
- Constructed a Django website to improve the efficiency of administering on-site network switches

July 2016 - August 2016
- Increased speed of search for mathematical constants by over 100x by parallelizing search with CUDA

Teaching

Logic and Computation

September 2023 - December 2023
September 2022 - December 2022

Fundamentals of Computer Science 1—Accelerated

September 2019 - December 2019
September 2018 - December 2018

Fundamentals of Computer Science 1

September 2020 - December 2020
January 2018 - April 2018