

# Daniel Melcer

daniel@melcer.dev | (631) 682-0560 | github.com/dmelcer9 | linkedin.com/in/dmelcer9/

## 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: May 2026)*

Bachelors of Science in Computer Science, Minor in Math | GPA: 4.0

*September 2017 - May 2021*

## Publications

### **Incremental Quotient Language Recognition to Improve LLM Code Generation Quality**

Daniel Melcer, Nathan Fulton, Sanjay Krishna Gouda, Haifeng Qian

*In Preparation*

### **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 2024 - Present (Expected Completion: August 2024)*

*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
- Experimented with discretized autoencoders in order to obtain a low-dimensional representation of an environment state space for use in downstream classification tasks
- 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

## **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

## **Griffiss Institute**

Research Co-op for Air Force Research Laboratory

Rome, NY

*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
- Experimented with the application of new sequence-modeling methods to predict results of an action

## **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*