

I am interested in the computations that enable intelligence. My research goal is to improve the intelligence of machines so they can more effectively provide safe, ethical guidance and service to humans. To that end, I engage in both theoretical and experimental research in reinforcement learning, modeling, abstraction, exploration, and value alignment.

Education

Brown University

Ph.D. in Computer Science

2021 (*Expected*)

Advisor: George D. Konidaris

M.S. in Computer Science

2018

Advisor: George D. Konidaris

Duke University

Ph.D. student in Computer Science

2015–2016 (*Transferred*)

Advisor: George D. Konidaris

Tufts University

B.S. in Electrical Engineering, *Summa Cum Laude*

2011

Advisors: Ronald Lasser, Eric L. Miller

Research Projects

Mean Actor-Critic

2017–2018

ArXiv paper, unpublished – <https://arxiv.org/abs/1709.00503>

Cameron Allen*, Kavosh Asadi*, Mel Roderick, Abdel-rahman Mohamed, George Konidaris, Michael Littman

Abstract: We propose a new algorithm, Mean Actor-Critic (MAC), for discrete-action continuous-state reinforcement learning. MAC is a policy gradient algorithm that uses the agent’s explicit representation of all action values to estimate the gradient of the policy, rather than using only the actions that were actually executed. We prove that this approach reduces variance in the policy gradient estimate relative to traditional actor-critic methods. We show empirical results on two control domains and on six Atari games, where MAC is competitive with state-of-the-art policy search algorithms.

High-Throughput Viterbi Decoder

2012–2013

<http://camallen.net/files/viterbi.pdf>

- Created parallelized VHDL implementation of a Viterbi decoder, which allowed for arbitrarily high data throughput.
- Code used as part of a reference implementation for a government communications system.

Anomaly Detection in X-ray Backscatter Leg Images

2010–2011

<http://camallen.net/files/grc-anomaly-detection.pdf>

- Designed and implemented a threat detection algorithm in MATLAB using image processing and machine learning techniques, which had a 97% detection rate and less than 5% false-alarm rate for a test set of real and simulated threats in airport X-ray scanner images.
- Presented results at the 2011 Gordon Research Conference in Lucca, Italy.

Memristor Simulator

2010–2011

Capstone Project – <http://camallen.net/files/memristor-report.pdf>

- Wrote an open-source modification of the SPICE circuit simulator that enabled modeling of memristor circuit components and which has been downloaded hundreds of times.

Professional Experience

IBM Research

Yorktown Heights, NY

Research Intern, mentored by Dr. Gerald Tesauro

Summer 2019

- Investigated novel skill-learning techniques to improve the computational efficiency of planning.

The MITRE Corporation

Bedford, MA

Senior Software Engineer

2013–2015

Communications Engineer

2011–2013

- Led software design, algorithm development, and implementation of a self-optimizing mesh network of custom, software-defined UHF radios.
- Demonstrated prototype radios to NATO representatives, and successfully persuaded UK MoD to propose adding the technology to the next SATURN specification revision, which would result in up to 15 times the range and 40 times the data throughput of previous-generation radios.
- Designed and wrote software (C++, Python, Java) and firmware (VHDL) for a variety of government communications systems.

American Science & Engineering

Billerica, MA

Research Intern, mentored by Prof. Eric L. Miller & Dr. Omar Al-Kofahi

Summer 2010

- Researched state-of-the-art image processing techniques for denoising, segmentation, alignment, registration, warping, and filtering.
- Designed and implemented a machine learning algorithm for anomaly detection in MATLAB, which incorporated several open-source image processing libraries.

Tufts University – Child & Family WebGuide

Somerville, MA

Lead Web Developer

2009–2011

Web Developer

2007–2009

- Created and maintained front-end and back-end web software for a curated collection of child development resources.
- Led four-person team through substantial site redesign while maintaining 10-15K visitors per month.

Teaching Experience

Co-Instructor

Workshop on Machine Learning, 20 students, Woods Hole Oceanographic Institution – Fall 2019

Guest Lecturer

Artificial Intelligence, 140 students, Brown University – Fall 2019

Reintegrating AI, 30 students, Brown University – Spring 2018

Artificial Intelligence, 100 students, Duke University – Spring 2016

Teaching Assistant

Learning and Sequential Decision Making, *100 students*, Brown University – *Fall 2019*

Artificial Intelligence, *100 students*, Duke University – *Spring 2016*

Invited Talks

The Memristor Project: Simulation Software for a New Analog Circuit Device

Technology Innovation Series, American Science & Engineering; Billerica, MA

Sept. 2011

Anomaly Detection in X-ray Backscatter Leg Images Using Machine Learning

Gordon Research Conference on Detecting Illicit Substances; Lucca, Italy

June 2011

Awards

2014: Awarded MITRE Director's Award for engineering excellence

2011: Awarded merit-based Amos Emerson Dolbear Scholarship in Electrical Engineering

2010: Awarded merit-based Howard Sample Prize Scholarship in Physics

2009: Elected to Tau Beta Pi and Eta Kappa Nu engineering honors societies

Service

Brown CS

- High-Performance Computing Merc, 2018–2019
- Graduate Student Council Representative, 2018–2019
- New PhD student mentor, 2018–2019