Ryan Bahlous-Boldi, Ryan Boldi

RESEARCH INTERESTS

I am interested in the study of human intelligence from the perspective of evolving and learning autonomous systems.

EDUCATION

University of Massachusetts Amherst — Amherst, MA
Bachelor of Science, Computer Science — May 2025
GPA: 4.0
Member of the Commonwealth Honors College
Minors: Philosophy, Psychology

RESEARCH EXPERIENCE

Programs Under Selection and Heredity (PUSH) Lab — Fall 2021–
University of Massachusetts Amherst & Amherst College — Amherst, MA
Advisor: Lee Spector

- ➥ Working on applying lexicase selection to evolutionary computation systems such as genetic programming and evolutionary reinforcement learning, with a focus on exploration and diversity.

Safe, Confident and Aligned Learning + Robotics (SCALAR) lab — Fall 2022–
Manning College of Information and Computer Sciences, — Amherst, MA
University of Massachusetts Amherst
Advisor: Scott Niekum

- ➥ Improving safety and alignment of inverse reinforcement learning from human preferences systems through learning a distribution of reward functions.

Interactive and Collaborative Autonomous Robotics (ICAROS) lab — Summer 2023 -
Viterbi School of Engineering, University of Southern California — Los Angeles, CA
Advisor: Stefanos Nikolaidis

- ➥ Working on integrating Quality Diversity algorithms such as Covariance Matrix Adaptation MAP Annealing with reinforcement learning.
- ➥ Developed a novel technique to create a behavior-conditioned policy from a diverse set of evolved Q-functions.

Biologically Inspired Neural & Dynamical Systems Lab (BINDs) lab — 2021–2022
Manning College of Information and Computer Sciences — Amherst, MA
University of Massachusetts Amherst
Advisor: Cooper Sigrist

- ➥ Selected for the BINDslings program where I explored consequences of and ways to improve the modularity of neural networks.

WORK EXPERIENCE

X-Camp Academy — Fall 2021-
Teacher

- ➥ Helped students to participate in the USA Computing Olympiad (USACO).

Teaching Management Team

- ➥ Communicate needs and expectations to and from development and operation teams.
- ➥ Led the migration to a new teaching platform facilitating effective teaching and scaling of the company.

LEADERSHIP

President, *UMass Machine Learning Club* — Spring 2023-
Team Leader, *Team UMass: ProjectX ML Research Competition Winners* — 2023

PUBLICATIONS

Journal Publications

Ryan Boldi*, Martin Briesch*, Dominik Sobania, Alexander Lalejini, Thomas Helmuth, Franz Rothlauf, Charles Ofria, and Lee Spector. 2023. Informed Down-Sampled Lexicase Selection: Identifying productive training cases for efficient problem solving. https://arxiv.org/abs/2301.01488. In *Evolutionary Computation*. MIT Press.

Conference and Workshop Papers

Ryan Boldi, Li Ding and Lee Spector. 2023. Objectives Are All You Need: Solving Deceptive Problems Without Explicit Diversity Maintenance. In the Workshop on Agent Learning in Open-Endedness at NeurIPS.

Ryan Boldi and Lee Spector. 2023. Can the Problem-Solving Benefits of Quality Diversity Be Obtained Without Explicit Diversity Maintenance? In Genetic and Evolutionary Computation Conference Companion (GECCO '23).

Ryan Boldi, Thomas Helmuth, and Lee Spector. 2022. The environmental discontinuity hypothesis for down-sampled lexicase selection. In The 2022 Conference on Artificial Life - Why it Didn't Work-Shop (ALIFE '22)

Li Ding, **Ryan Boldi**, Thomas Helmuth, and Lee Spector. 2022. Lexicase selection at scale. In Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO '22).

Book Chapters

Lee Spector, Li Ding, and **Ryan Boldi**. 2023. Particularity. In Genetic Programming Theory and Practice XX. New York: Springer. To appear

Posters and Poster Papers

Ryan Boldi, Charles Zhang, Lee Spector. 2023. Encouraging Diversity in Reinforcement Learning with Lexicase Selection. RL at Harvard Workshop 2023.

Ryan Boldi, Ashley Bao, Martin Briesch, Thomas Helmuth, Dominik Sobania, Lee Spector, Alexander Lalejini. 2023. The Problem Solving Benefits of Down-Sampling Vary by Selection Scheme. In Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO '23).

Ryan Boldi, Alexander Lalejini, Thomas Helmuth, Lee Spector. 2023. A static analysis of informed down-samples. In Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO '23).

Li Ding, **Ryan Boldi**, Thomas Helmuth, and Lee Spector. 2022. Going faster and hence further with lexicase selection. In Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO '22).

UNDER REVIEW

Ryan Boldi*, Aadam Lokhandwala*, Edward Annatone, Yuval Schecter, Alexander Lavrenenko, Cooper Sigrist. 2023. Improving Recommendation System Serendipity Through Lexicase Selection. https://arxiv.org/abs/2305.11044

Ryan Boldi, Ashley Bao, Martin Briesch, Thomas Helmuth, Dominik Sobania, Lee Spector, Alexander Lalejini. 2023. Analyzing the Interaction Between Down-Sampling and Selection. https://arxiv.org/abs/2304.07089

IN PREPARATION

Ryan Boldi, Li Ding and Lee Spector. 2023. Solving Deceptive Problems without Explicit Diversity Maintenance.

Ryan Boldi, Matthew Fontaine, Sumeet Batra, Gaurav Sukhatme and Stefanos Nikolaidis. 2024. Generating Diverse Induced Policies for Conditioned Policy Distillation.

PRESENTATION

(*In addition to those listed as conference/workshop papers and posters above*)

Conference

Encouraging Diversity in Reinforcement Learning with Lexicase Selection
Poster: RL at Harvard Workshop 2023 — Cambridge, MA

Think Before You Act: Generating High-Quality Diverse Reasoning Policies
Poster: SoCal Undergraduate Research Symposium 2023 — Los Angeles, CA

The Emergence of Diversity
Emerging Researchers in Artificial Life Lightning Talk
2023 Conference on Artificial Life — Sapporo, Japan

Invited

Evolutionary Computation — Spring 2023
UMass Amherst Guest Lecture — Amherst, MA
COMPSCI 389 - Introduction to Machine Learning

Lexicase Selection and Reinforcement Learning — Fall 2022
Personal Autonomous Robotics Lab (PeARL), UT Austin — Austin, Texas
Autonomous Learning Laboratory, UMass Amherst — Amherst, MA

Lexicase Selection and the Diversity of Quality — Summer 2022
Adaptive and Intelligent Robotics Lab, Imperial College London — London, UK

Evolutionary Algorithms — Fall 2020
United Arab Emirates Ministry of Artificial Intelligence — Dubai, UAE

AWARDS

ProjectX ML Research Competition Winner — $20,000
University of Toronto, 2023

Dean's Merit Scholarship — $1,500
Manning College of Information and Computer Sciences, 2022

John E. and Alice M. Flynn Scholarship — $3,300
University of Massachusetts Amherst, 2022

Imagine Cup Junior Winner
Microsoft, 2020

MEMBERSHIP

International Society for Artificial Life
ACM SIGEVO, Special Interest Group for Genetic and Evolutionary Computation

COMPUTER SKILLS

Languages & Frameworks
Python, Clojure, C++, Java, JavaScript, R, Numpy, PyTorch, Jax, Flax