

RESEARCH INTERESTS

My interests focus on the intersection of reinforcement learning and natural language. I am interested in leveraging large data sets and the supervised models trained on them (e.g. GPT-X) to improve reinforcement learning. I am also interested in the role of reinforcement learning in discovering both natural language and structured programming languages (program synthesis). Finally, I am interested in understanding the limits of language in capturing actionable knowledge.

PUBLICATIONS

- [1] **Brooks, Ethan**, J. Rajendran, R. L. Lewis, and S. Singh, “Reinforcement learning of implicit and explicit control flow instructions”, in *Proceedings of the 38th International Conference on Machine Learning*, M. Meila and T. Zhang, Eds., ser. Proceedings of Machine Learning Research, vol. 139, PMLR, 18–24 Jul 2021, pp. 1082–1091.
- [2] E. Brooks, “Hazing versus challenging”, *Marine Corps Gazette*, vol. 98, no. 8, pp. 24–25, 2014.

PROJECTS

Current Research (Deep RL, Multi-task RL, GPT-2, NLP)

Exploring applications of pretrained Foundation Models (e.g. GPT-2) to reinforcement learning. 2020-current
In particular, studying the psychological phenomenon of “internal monologue” in terms of utility.
Currently investigating problems relating to generalization, hierarchy, and exploration. (In collaboration with Logan Walls, Richard Lewis, and Satinder Singh.)

DARPA L2M Grant (Deep RL, Multi-task RL, Jax, Pytorch, Docker)

Application of lifelong reinforcement learning algorithms to the Habitat AI simulation platform 2020-current

Run Tracker (Docker, Hasura, Postgres, React, Rescript)

github.com/run-tracker
Utilities for launching hyperparameter sweeps, logging metadata, and visualizing runs 2021

Off-Policy RL that Prioritizes Value Function Improvement for Speedup (Deep RL)

Study of distributed learning of off-policy value-functions. (<https://ethanabrooks.github.io/speedup.pdf>). 2019

Reproduction of “Exploration in Policy Mirror Descent” (Deep RL, Optimization)

Reproducibility study (<https://ethanabrooks.github.io/reproduction.pdf>). 2019

Python MuJoCo Wrapper (MuJoCo, Cython)

github.com/mujoco
Minimal Python bindings for the MuJoCo physics simulator. 2017

SKILLS

Machine Learning: Python, Jax, Pytorch, Tensorflow

Web programming: React, CSS, Javascript, Postgres

Functional Programming: Haskell, OCaml, Scala

EDUCATION

University of Michigan Ph.D. in Computer Science, Advisor: Satinder Singh	Ann Arbor, MI 2018–Current
University of Pennsylvania Masters of Computer and Information Technology, GPA: 3.81/4.00	Philadelphia, PA 2015–2016
St. John's College B.A. in Philosophy / History of Mathematics, GPA: 3.48/4.00	Annapolis, MD 2005–2010
Thesis: “Continuity in Dedekind’s <i>Essays on the Theory of Numbers</i> ”	

WORK EXPERIENCE

University of Michigan (MuJoCo, Robotics, Deep RL) Research Engineer under Satinder Singh	Ann Arbor, MI Fall 2017
Applied reinforcement learning to simulated robotic grasping using MuJoCo (click for video of block manipulation).	
Google (Data Science, Machine Learning) Intern with Android Location and Context Team	Mountain View, CA Summer 2017
Used machine learning to determine the most battery-efficient times for Android location scans.	
Apple (Natural Language Processing, Deep Learning) Intern with Siri Natural Language Team	Cupertino, CA Summer 2016
Built attention-based deep learning algorithms in Torch to improve sentence classification.	
United States Marine Corps Intelligence Officer (Rank: Captain)	2010-2015
Established a new intelligence section that oversaw intelligence analysis and security management.	

TEACHING

Graduate Student Instructor at University of Michigan Helped develop brand new Programming Languages course (EECS 490). This course covers the design and use of modern programming languages, starting from mathematical first principles.	Spring 2020
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EXTRACURRICULAR ACTIVITIES

Philosophy and Literature Reading Group	2019 - Current
Read <i>Ulysses</i> (James Joyce), volumes 1 and 2 of <i>In Search of Lost Time</i> (Marcel Proust), <i>The Invisible Man</i> (Ralph Ellison), and essays by Gilles Deleuze, Walter Benjamin, Ralph Waldo Emerson, and Michel de Montaigne.	
Turing <i>Entscheidungsproblem</i> Reading Group	Fall 2020 - Summer 2021
Led reading group on Alan Turing’s “On Computable Numbers, with an Application to the Entscheidungsproblem”.	
Staff Mentor with University of Michigan Mentorship Program	2018–2019
Organized and led mentorship activities with 6-8 undergraduates	