Brett Evan Barkley

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Education

The University of Texas at Austin, PhD — **2022 - Present**
Computer Science — **GPA:** 3.95
Focus in Deep Reinforcement Learning and Robotics

University of Maryland, M.S — **2015 - 2017**
Aerospace Engineering — **GPA:** 3.97
Focus in Control Theory and Dynamical Systems

University of Maryland, B.S — **2010 - 2015**
Aerospace Engineering (*Honors Program*) — **GPA:** 4.00

Research Projects

Deployment and Sample Efficient Iterated Offline Reinforcement Learning via Synthetic Upsampling — Austin, TX
Research Project with Prof. David Fridovich-Keil — 2024

- Investigated transforming off-policy reinforcement learning into a sample-efficient iterated offline RL framework.
- Developed Jax implementations of Synther and MBPO, reducing training time from days to hours. Code.
- Leveraged these fast generative and predictive models to explore mitigation of overestimation and overfitting in high update-to-data ratio RL training.

Translating Open-loop Trajectory Optimization into Closed-Loop Policy Optimization — Austin, TX
Research Project with Prof. David Fridovich-Keil — 2023

- Developed a novel policy optimization algorithm (D4PO) which combined the structure of iLQR/DDP with deterministic policy gradients.
- Hypothesized and validated that incorporating iLQR/DDP feedback gains and value functions improves sample efficiency and reduces sensitivity to exploding gradients in reinforcement learning.
- Demonstrated strong performance in contact-free environments, while highlighting challenges with managing large gradients due to contact dynamics.

Time Symmetric Data for RL, Austin, TX — Austin, TX
Research Project with Profs. David Fridovich-Keil and Amy Zhang — 2023

- Investigated the utility of time reversal symmetry in reinforcement learning. Code. Paper.
- Developed a data augmentation technique (TSDA) that leverages time symmetry across a range of RL problems.
- Demonstrated that TSDA can provide SOTA sample efficiency in time symmetric and asymmetric environments.

Professional Experience

Autonomy Aerospace Engineer, Johns Hopkins University Applied Physics Lab (JHU/APL) — 2017 - 2022

- Efforts culminated in first ever combat tests between AI and human-piloted F-16s in 2023
- JHU/APL's Air Combat Evolution (ACE) deep reinforcement learning (DRL) lead for sub and full-scale aircraft
- Guidance, control, and aerospace simulation subject matter expert (SME) for JHU/APL ADT and ACE teams

Technical Skills

Languages: Python, C++, Cython, Bash, CUDA
Libraries/Software: JAX, Pytorch, Flax, Brax, Git, LaTeX

Selected Publications

1. Stealing That Free Lunch - The MDP Diversity Problem in Model-Based Reinforcement Learning
   Brett Barkley, David Fridovich-Keil | In preparation
2. An Investigation of Time Reversal Symmetry in Reinforcement Learning
   Brett Barkley, Amy Zhang, David Fridovich-Keil | L4DC 2024