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

Stealing That Free Lunch: Exposing the Limits of Dyna-Style Model-Based Reinforcement Learning   Austin, TX
First-author ICML 2025 Paper with Prof. David Fridovich-Keil   2024 - 2025

- Developed a JAX-based training pipeline yielding up to a $40\times$ speedup in wall-clock time for MBPO. Code.
- Showed that model-based RL algorithms like MBPO exhibit strong performance in OpenAI Gym but often fail in DeepMind Control Suite tasks when trained from scratch.
- Investigated several potential explanations for this discrepancy, including model error and mitigation strategies; found that even modern techniques fail to close the gap.

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

- Developed a JAX implementation of the score-based generative diffusion model used in Synthetic Experience Replay paper, enabling a reduction in training time from days to hours. Code.
- Investigated transforming off-policy reinforcement learning into a sample-efficient iterated offline RL framework.
- Investigated usage of fast generative models and synthetic data as a means to mitigate overestimation and overfitting in high update-to-data ratio RL training.

Time Symmetric Data for RL, Austin, TX   Austin, TX
First-Author 2024 L4DC Paper with Profs. David Fridovich-Keil and Amy Zhang   2023 - 2024

- Demonstrated that TSDA can provide SOTA sample efficiency in time symmetric and asymmetric environments.
- 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.

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: Exposing the Limits of Dyna-Style Reinforcement Learning
   Brett Barkley, David Fridovich-Keil | ICML 2025
2. An Investigation of Time Reversal Symmetry in Reinforcement Learning
   Brett Barkley, Amy Zhang, David Fridovich-Keil | L4DC 2024