Trevor McInroe

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Education

Northwestern University (4.0/4.0) Evanston, IL, USA
MSDS, Artificial Intelligence *2019 – 2021 (expected)*
Thesis: Representation Learning for Data-Efficient Deep Reinforcement Learning

University of North Texas (overall: 3.62/4.0, major: 4.0/4.0) Denton, TX, USA
BBA Economics *2014 – 2017*

Research Interests

I have spent the last four years developing a strong research interest in reinforcement learning through graduate classes, working on research in an industry group, writing papers, and self study. Specifically, I am interested in solving the challenges of applying reinforcement learning to real-world systems. These challenges include sample efficiency, the learning of useful representations of large state spaces, transfer learning, continual learning, and planning. In my opinion, the successful development of real-world reinforcement learning can have a significant positive impact in many areas like agriculture, disaster management, and autonomous transportation systems.

Research Experience and Publications

Analyzing the Hidden Activations of Deep Policy Networks: Why Representation Matters 2021

★**McInroe, Trevor**, Michael Spurrier, Jennifer Sieber, and Stephen Conneely. 2021. "Analyzing the Hidden Activations of Deep Policy Networks: Why Representation Matters". Under review for ECML PKDD 2021.

Analyzed the hidden activations of policy networks and revealed patterns that show how deep RL agents learn to organize their internal representations. Performed systematic study across agents that learn in high-dimensional space and agents that learn on latent representations from auxiliary models.

Removing Rain from Images with Densely-Connected Convolutional Networks 2020

★**McInroe, Trevor**. 2020. "Removing Rain from Images with Densely-Connected Convolutional Networks". Published via Toyota's internal review process.

Designed and implemented a convolutional encoder-decoder with novel "block" structure that is capable of removing rain from images. This process was proven to improve the performance of downstream models across a multitude of tasks. Short form of paper available upon request.

Master's Thesis 2021 (*in progress*)

Development of representation learning method, k-Step Latent, that produces state of the art results on the PlaNet benchmark. Also, a thorough analysis and comparison of latent representations produced by various representation learning methods from the literature. Through this analysis, determined a collection of desirable characteristics of learned representations as they pertain to the reinforcement learning goal.

Anomaly Detection Algorithm for Updating High-Definition Maps 2021

Developed system that ingests high-dimensional telemetry data and performs anomaly detection on driver behavior via seasonal and driver-profile distance matrices. System is currently being tested to support HD maps used by autonomous vehicles. Paper and code belong to funder, Toyota.

Creating Web Ads with Inverse Reinforcement Learning 2019

Designed algorithm based on IRL to learn expert's policy on shot-by-shot video characteristics. Once deployed, agent constructed various 30 second ads by drawing from a pool of one second clips. Paper and code belong to funder, Keurig Dr Pepper.

Industry Experience

Machine Learning Engineer 2020 – Present
Toyota Connected North America *Plano, TX, USA*

- Novel research and implementation of SotA models in computer vision and reinforcement learning
- Development of algorithms and models to assist autonomous vehicles
- Implementation of learning algorithms that are suitable for edge-compute devices, such as those that can run on real-time data streams from autonomous vehicles

Data Scientist 2017 – 2020
Quadratic Insights *Dallas, TX, USA*

- Developed in-house RL library for the team to meet specific needs of given projects
- Developed a multitude of mathematical learning models that solved problems such as real estate selection for nonprofits and optimizing ad buys across time, geography, and channel for international banks

Relevant Coursework

- Intelligent Systems and Robotics
- Computer Vision
- Optimization
  - Linear
  - Nonlinear
  - Multi-objective
  - Metaheuristics
- Maths
  - Calculus
  - Linear Algebra
  - Probability
  - Statistics

Honors and Awards

- President's List (*perfect GPA within a semester*)
  - 3x recipient in undergrad
- Perfect GPA (4.0/4.0)
  - Maintained through 11 graduate classes

Technical Skills

Languages: Python, R, C++, Rust
Frameworks: PyTorch, TensorFlow, NumPy
RL libraries: PyBullet, Gym, PettingZoo, Unity ML-Agents, SuperSuit
Developer tools: Git, anaconda