

The logo for MORL is a light blue rounded rectangle containing the text 'MORL' in a blue sans-serif font. A thin blue line forms a partial circle around the 'O' and 'R'.

MORL

Multi-objective Reinforcement Learning



Who We Are

Team Members

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Background

- Reinforcement Learning involves a program learning what action(s) to perform in a given state based on its experience (robotics, navigation, task-learning, data classification, etc.)
- Many complex problems require the program to learn multiple things (which can be defined by as having multiple objective reward functions)
- This is usually accomplished by taking a linear combination of the functions as a single function and learning from that
- This solution requires tuning reward coefficients and doesn't always provide the best results
- We seek to utilize filter methods (a form of multi-objective optimization) to provide a better method of solving these problems

Intellectual Merits

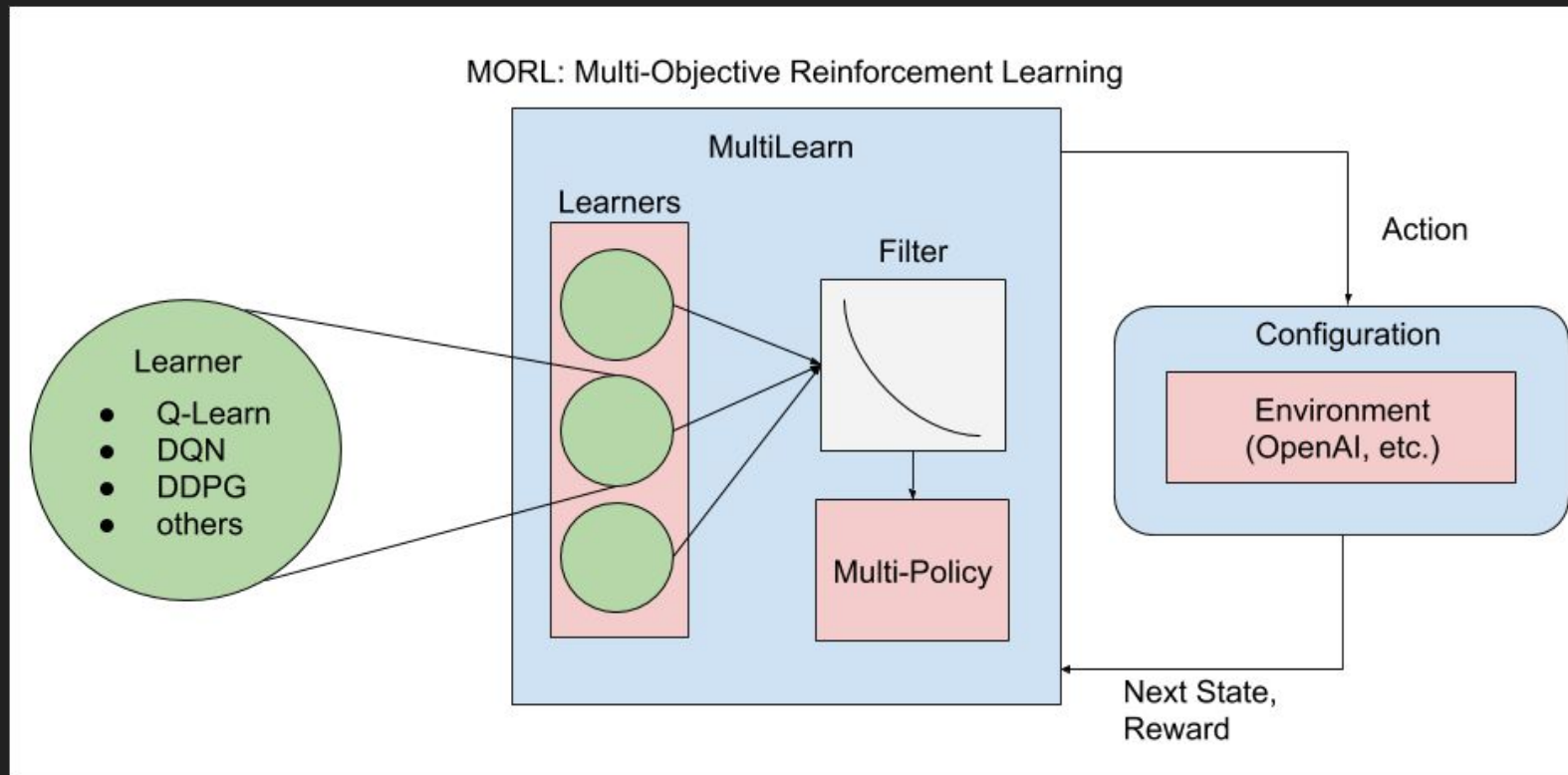
1. Novel multi-objective optimization method for Reinforcement Learning
2. UI and GUI tool for use by non-coders
3. Extensible Framework for Reinforcement Learning
 - a. Abstracts away and standardizes the learning process to allow the developer to focus on the learner itself
 - b. Allows developers to create their own environments or alter others (OpenAI) to fine-tune to their needs
4. Comparing Performance & Results
 - a. Compare MultiLearn's performance with individual learners of aggregate rewards

Broader Impacts

Improvements to complex multi-objective environments

- **Robotics**
 - Locomotion, navigation
 - Other "human" behaviors (speech, conversation)
- **Businesses/Finance**
 - Complex multi-objective systems within a company
 - Could improve learning/optimization with stocks, marketing
- **Medicine/Biology**
 - Biological functions are often multiobjective optimization problems
 - Protein folding, Gene regulation

Design Specifications



Technologies

1. Core Framework built using Python and standard data types
2. Easily Integratable with most/any NN system
 - a. Examples using TFlearn and Keras, API's for Tensorflow
3. Open-Source Repo on Github
4. Core examples done using OpenAI's Gym library for Python
 - a. Not limited to using OpenAI, can allow users to create their own
5. Demo utilizes MuJoCo - Closed-Source Physics library
6. Other Libraries
 - a. Numpy, Scikit-Learn

Milestones

Preliminary Research and Planning	Literature Review	December 2017
Development	CLI Tool	January 2018
Testing	GUI Demo Tool, Test Results	March 2018
Dissemination	Visual Aids, Paper	Expo/Post-Expo

Demo

