Project proposal

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Which tasks or problems will you study?

There are three possible sources for a reward function: hard-coded domain-specific reward function (typical RL); inferred reward function (inverse RL); domain-general reward function (intrinsic motivation). We propose to study RL with domain-general reward functions.

More concretely, we plan to start by running and tweaking previous work such as Diversity is All You Need, then try out other possible domain-general reward functions that we will think up. We would compare these ideas with the previous works, as well as compare their finetuned performance to baselines (such as PPO) trained directly on domain-specific reward functions.

Where will you get your data or simulator?

The data will be simulated, most likely in OpenAI Gym. We would start on simple environments like gridworld, then progress to more complex environments like the Mujoco environments.

What is the main research hypothesis your project will investigate?

From weak to strong:

- What other domain-specific reward functions can we think up that improve upon previously published ones?
- Is training on domain-general, then finetuning on domain-specific reward functions, sufficient to reach equal or better performance over agents trained only on domain-specific reward functions?

How does the topic of your project relate to deep RL?

The project studies a fundamental issue in RL. We plan to use deep neural networks as functional approximators for all trainable components for the agents we will experiment with. Thus, it is a project in deep RL.

Within this project, we aim to explore deep RL with domain-general reward functions. We hope to investigate whether deep RL models, and more specifically, their reward functions, can generalize well enough to begin to represent the human brain especially within the early stages of childhood development.