

Project proposal

Hierarchical Deep Reinforcement Learning in for playing Atari

The goal of the project is to create a Hierarchical Deep Q-Network (H-DQN) agent to play a game from the atari environment and compare it with Vanilla Deep Q-Network (DQN). Vanilla DQN's algorithms often seem to lack the ability of long-term planning. This is a problem when they're applied to environments with delayed reward signal and in some cases learning is not possible at all. It has been shown that a H-DQN architecture could solve this problem. One example is a notion of an external goal-setter network that sets sub-goals for an intrinsic network where the reward for the intrinsic network is just the rewards set by the external one. The rewards for the external network are the rewards from the environment. One big obstacle for this setting is how to set the goals. One approach as described in [1] is by detecting objects and then learn how valuable coming in touch with those objects. This might be to far fetched and I seek a simpler solution for this project. I will start by developing Vanilla DQN on an Atari game suitable for the task (currently looking at MsPacman) from the gym environment [3]. Then I want to create the architecture described above and compare the two in performance, learning speed and stability etc.

[1] <https://arxiv.org/pdf/1604.06057.pdf>

[2] <https://www2.eecs.berkeley.edu/Pubs/TechRpts/2018/EECS-2018-101.pdf>

[3] <https://gym.openai.com/>