**Summer 2022 Deep Learning**

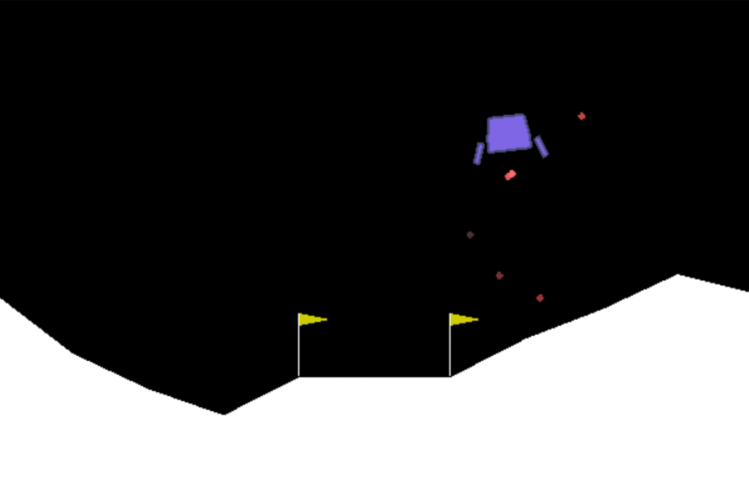
**Report of Lab #6**

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**Part 1: Introduction**

In this lab, our goal was to implement 2 deep reinforcement algorithms, which are the deep Q-network and deep deterministic policy gradient, to get the highest score as we could in LunarLauncher-v2 and LunarLauncherContinuous-v2 correspondingly. The following figure is how LunarLauncher-v2 looked like.



In LunarLauncher-v2, there are 8 possible observations, which are the horizontal coordinate, the vertical coordinate, the horizontal speed, the vertical speed, the angle, the angle speed, the contact of left leg to the moon, and the contact of the right leg to the moon. We can take 4 kinds of actions on the spaceship, which are do nothing, fire left engine, fire main engine, and fire right, based on the 8 possible observations we may obtain.

In LunarLauncherContinuous-v2, the 8 possible observations we can get are the same. However, the actions are different. The main engine can be controlled by a continuous value, when the value is between -1 to 0, the main engine is closed, and when the value is between 0 to +1, the main engine will throttle from 50% power to 100% power. The left and right engine basically work in the same way, but just on and off for their power, which when the value is between -1 to -0.5, the left engine will be fired, when the value is between +0.5 to +1, the right engine will be fired, otherwise, both engines are off.

For the deep Q-network algorithm, we will work on the LunarLauncher-v2, and the output actions will be discrete actions. For the deep deterministic policy gradient, we will work on the LunarLauncherContinuous-v2, and the output acitons will be continuous actions.

**Part 2: Implementation Details**

**Part 2-A: Implementation of Deep Q-Network**

**Part 2-B: Implementation of Deep Deterministic Policy Gradient**

**Part 2-C:**

**Part 3: Experimental Results & Discussions**

**Part 3-A: Best Results**

**Part 3-B: Further Discussions**