Project Report

Introduction

The reader is assumed to have basic knowledge on Reinforcement Learning and Deep Learning algorithms.

The project aims at training an agent to collect as many yellow bananas while avoiding collecting the blue ones. Currently two different methods were used to solve the tasks : **Deep Q-Learning**[1] and **Double Deep Q-Learning**[2].

The specificity of each algorithm will not be described in this report, links to each related paper are given at the end of this page.

Future Work

A lot of experimentations are planned to get confident with basic reinforcement learning algorithms while being able to compare them on a very specific task. Here are my next objectives:

- Dueling Double Deep Q-Learning
- Prioritized Action Replay
- Rainbow
- Try different architectures and strengthen hyperparameters exploration.

[1] https://storage.googleapis.com/deepmind-media/dqn/DQNNaturePaper.pdf

[2] https://arxiv.org/abs/1509.06461

Implementation Characteristics

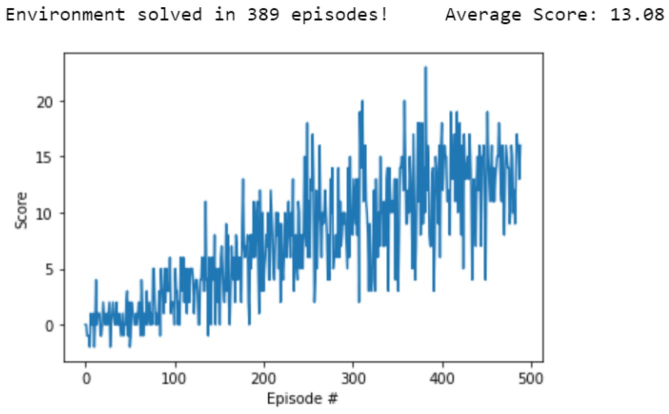
	Deep Q-Learning	**Deep Q-Learning with Fixed Target**	**Double Deep Q-Learning**
Memory Size	10 000	10 000	10 000
Batch Size	64	64	64
Discount Factor	0.99	0.99	0.99
Rate of transfer for soft update	1e-3	1e-3	1e-3
Frequency of update of the local network	Every 4 steps	Every 4 steps	Every 4 steps
Frequency of update of the target network	Every 4 steps (Both are updated during the same step)	Every 8 steps	Every 8 steps
Epsilon Decay	0.995	0.995	0.995
Minimum Epsilon	0.01	0.01	0.01
Max steps in one episode	1000	1000	1000

Model Architecture	Linear(37,64)
	ReLU
	Linear(64,64)
	ReLU
	Linear(64,4)
		Linear(37,64)
		ReLU
		Linear(64,64)
		ReLU
		Linear(64,4)
			Linear(37,64)
			ReLU
			Linear(64,64)
			ReLU
			Linear(64,4)

Learning Rate	5e-4	5e-4	5e-4

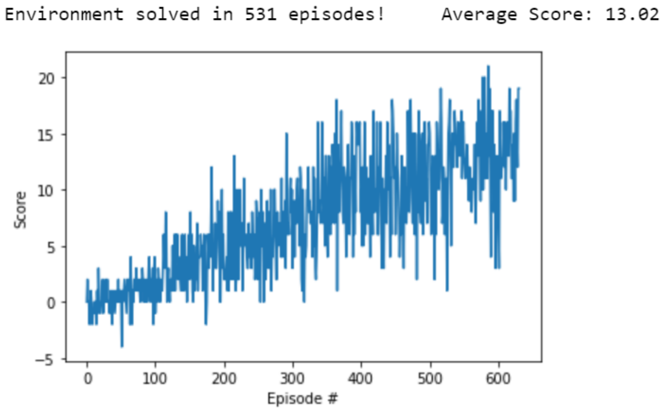
Results

Deep Q-Learning



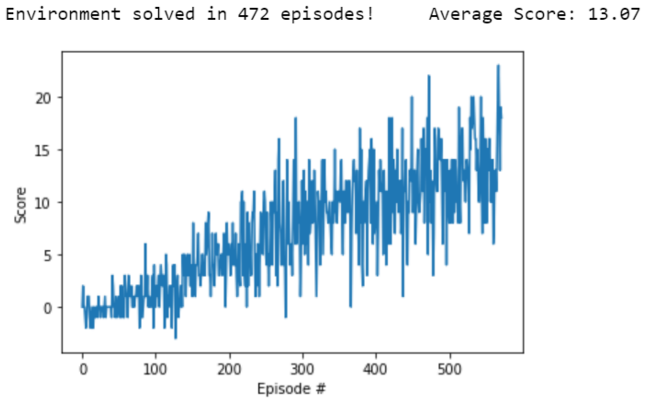
```
Environment solved in 389 episodes!	Average Score: 13.08
```

Deep Q-Learning with Fixed Target



```
Environment solved in 531 episodes!	Average Score: 13.02
```

Double Deep Q-Learning



```
Environment solved in 472 episodes!	Average Score: 13.07
```