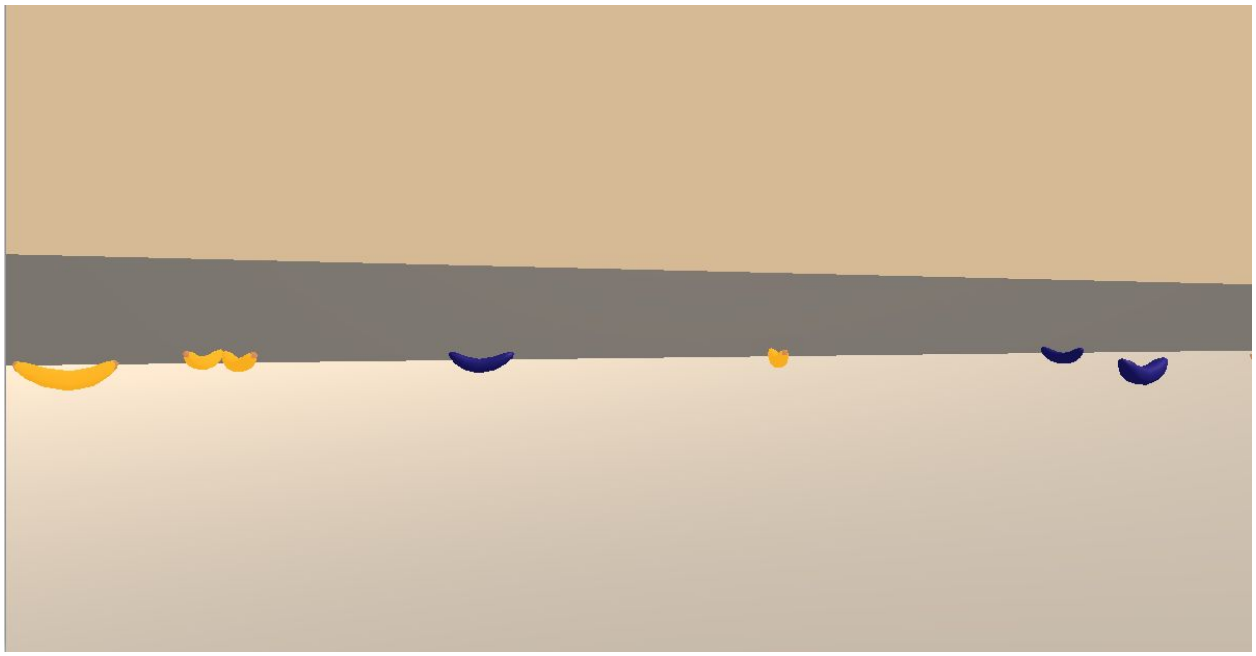

Project Report

Navigation with Double Q-Learning

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Introduction

In this project, Double Deep Q-Learning algorithm is used to solve the Navigation environment. Double Q-Learning is an advanced variation of Q-Learning to overcome overestimation problems. Using the local q network to determine best actions for the next state. The algorithms requires two neural networks(q_local and q_target) and those networks are identical.

Implementation Details

Target models are updated once in every “4” step. During model initialization, the initialized local model’s weights are copied into the target model’s weights to prevent initialization based on high model difference problems. **Neural Networks** :

Actor Networks : State_Size -> 64 -> 64 -> action_size
Output Gate of Actor Network : Linear f(x) = x
Learning Rate : 5e-4

Batch Size : 128
Buffer Type : Classic Experience Replay Buffer
Buffer Size : 1e5

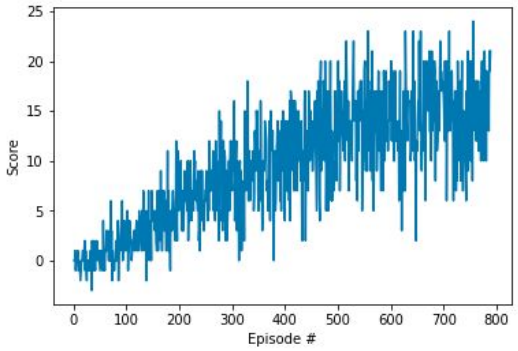
Model Update Rate (Tau) : 1e-3
Weighted Decay : 0
Discount Rate : 0.99

SEED : 1337(LEET FTW!)

Results

The environment is solved in 789 episodes - 689 epochs and the targeted average score was 15.0.

```
Episode 100     Average Score: 0.65
Episode 200     Average Score: 3.51
Episode 300     Average Score: 6.95
Episode 400     Average Score: 9.09
Episode 500     Average Score: 11.79
Episode 600     Average Score: 14.10
Episode 700     Average Score: 14.53
Episode 789     Average Score: 15.03
Environment solved in 689 episodes!     Average Score: 15.03
```



Further Work

- Distributed Training to collect different observations faster. It will allow the agent to learn faster.
- Hyper-parameter Optimization: Better initial hyper-parameters can lead the agent to learn faster.
- Prioritized Replay: Instead of sampling a chunk of observations randomly, we can sample them based on the observation's quality. Observation's quality can force the agent to focus on the cases that it failed very badly. It is kinda adding extra intuition into the model
- Dueling Network: Instead of calculating the Q values directly, we can compute the advantage A(s, a) values by estimating state value and state action vectors. It can force the agent to learn faster by understanding the importance of possible actions in any observed but badly performed state.