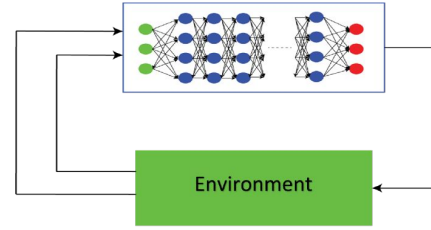# Smart Super Mario

Objective

Train a smart Super Mario agent that can avoid attackers and collect items to gain more short and long term rewards by using reinforcement learning techniques.

Methodology

Utilize a Deep Q-Learning Network to train the agent to traverse the environment. Explore and compare policies such as Boltzmann and Eps Greedy (Linearly Annealed); as well as Double DQN and Dueling DQN Networks.
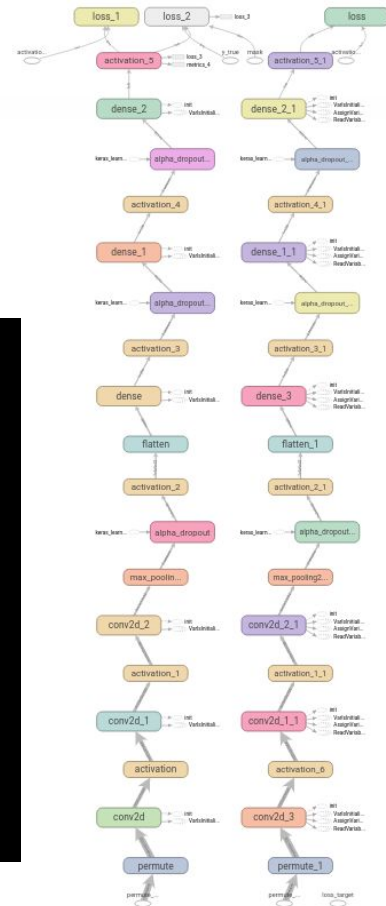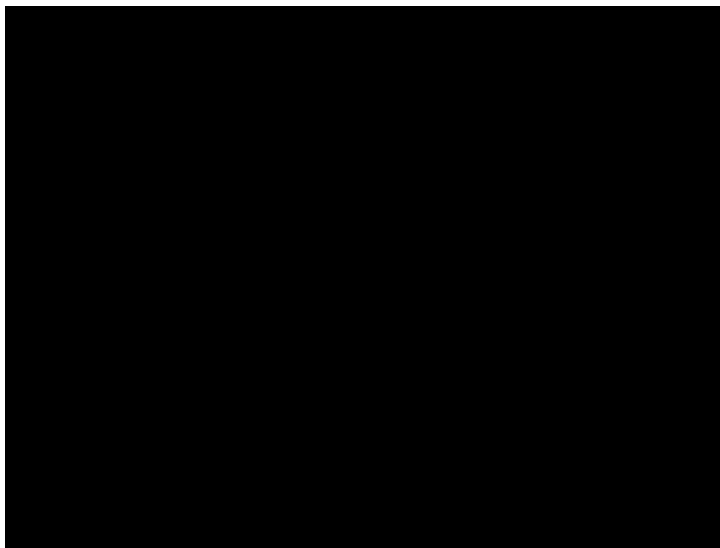
Utilize industry standard frameworks and their interfaces to create the custom environments and the agents: Gym (OpenAI), Keras-RL.

Environment/Agent
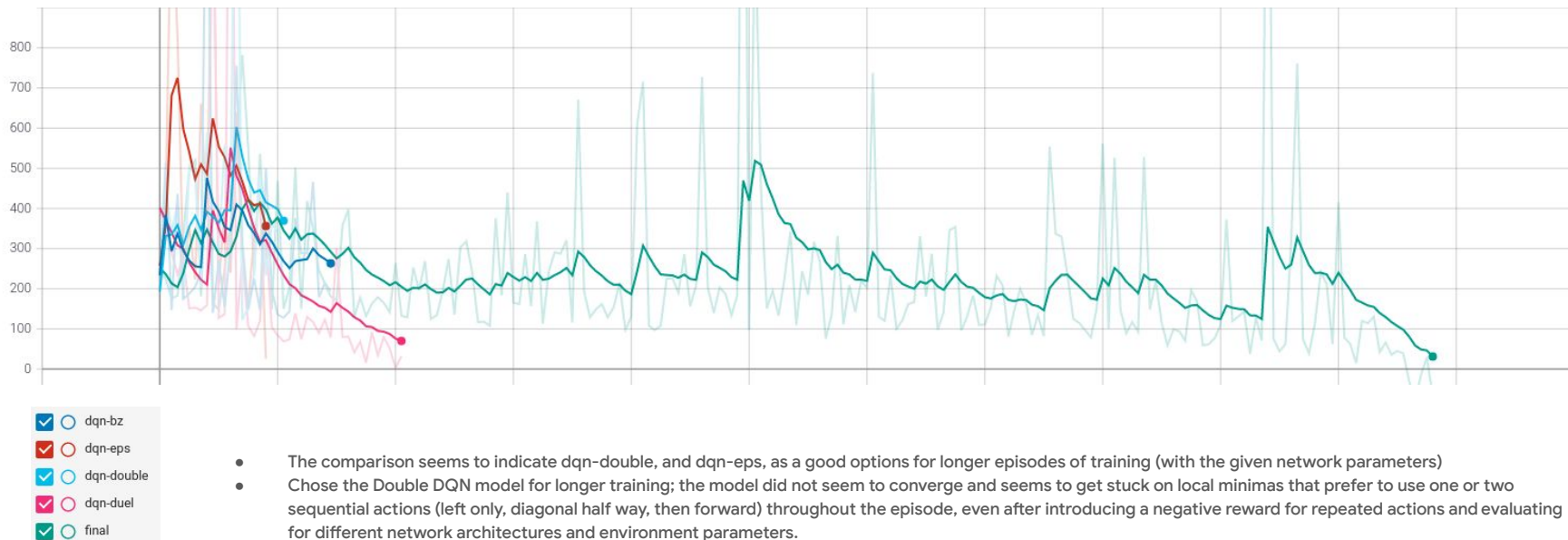
Mario can continue to gain rewards either:

1. until the Fuel runs down from a 1000 to 0 (with each step);
2. or until the Lives run down to 0 (when hit by a bullet)
3. Mushrooms reset fuel to a 1000
4. Stars add more lives +10
5. Bullets are spawned at twice the rate of mushrooms/stars

Agent is a deep neural network with Convnet layers and Dense layers.

Agent Training & Results

epoch_episode_reward

- dqn-bz
- dqn-eps
- dqn-double
- dqn-duel
- final

- The comparison seems to indicate dqn-double, and dqn-eps, as a good options for longer episodes of training (with the given network parameters)
- Chose the Double DQN model for longer training; the model did not seem to converge and seems to get stuck on local minimas that prefer to use one or two sequential actions (left only, diagonal half way, then forward) throughout the episode, even after introducing a negative reward for repeated actions and evaluating for different network architectures and environment parameters.

Questions