Reinforcement Learning

Final Project
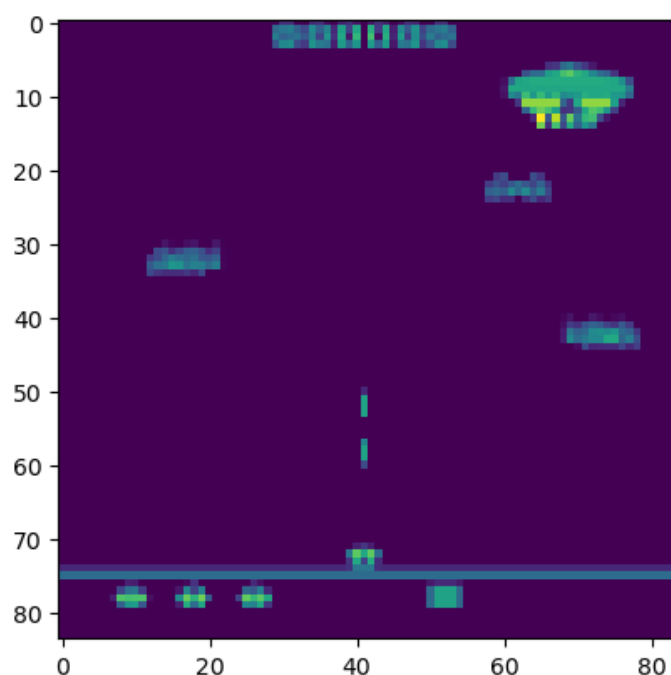
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Environment:

We are solving the Atari Assault-v5 environment as a part of our final project. It is a arcade style shooter game, the player controls the turret character at the bottom of the screen which can move in two directions (left or right) and shoot in three directions (left, right and up). The aim is to shoot down waves of alien invaders can move horizontally and constantly moves downwards trying to attack the turret.

The observation consists of RGB image of size 210 x 160 x 3, and it has an action space of size 7. The aim is to survive for as long as possible and shoot as much enemies as possible racking up the score.
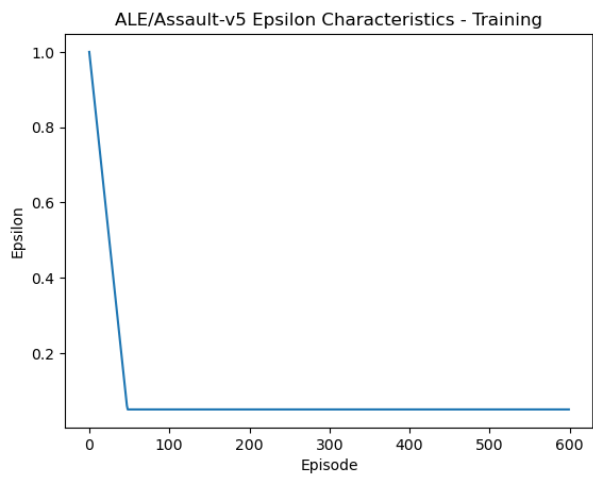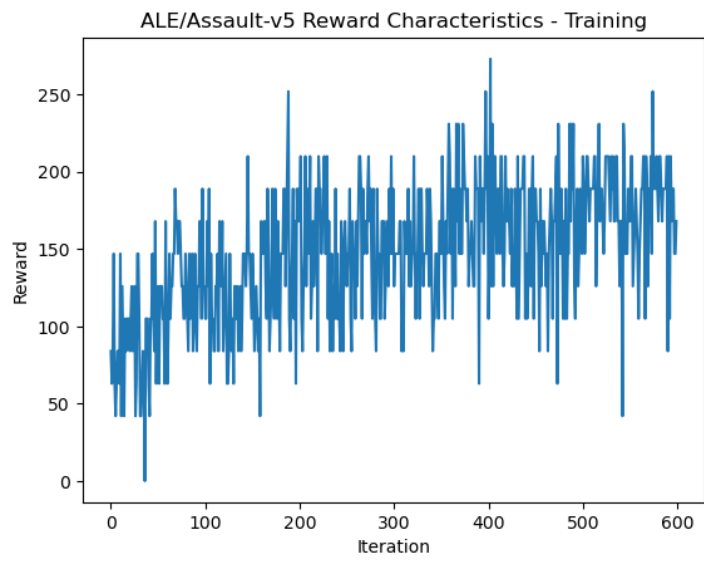

Preprocessing:

The preprocessing part utilizes the AtariWrapper module. This turns the image to grayscale and reshapes them to 84 x 84, we are also skipping 4 frames each time to better visualize the environment changes. The idea is to then stack these images in bundle of 4 before feeding to the neural network which helps the network visualize the motion of the game.

DQN:

The algorithm we are utilizing for our baseline model is DQN. This algorithm utilizes neural networks to predict Q-values and replay memory to train the main model on different batches of the memory.

Below are some results we have obtained by training our baseline model.

ALE/Assault-v5 Reward Characteristics - Training

ALE/Assault-v5 Epsilon Characteristics - Training

Evaluation Over 10 Episodes:

ALE/Assault-v5 Reward Characteristics - Evaluation