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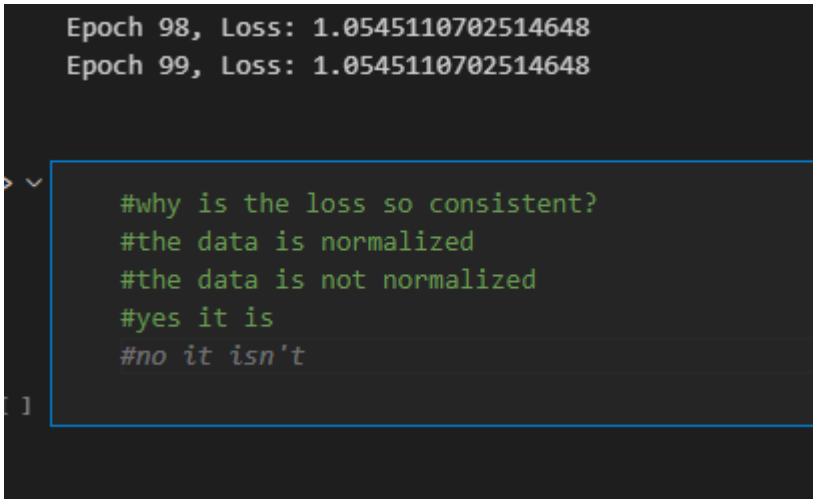
Intro to AI

Q Learners x Gym Project

Part 1 – Professionalism

- What is GitHub Copilot
  - Copilot is a code suggestion tool developed by GitHub in collaboration with OpenAI. It is intended to be used as a tool to help developers write code quicker by providing suggestions for what it thinks you are going to do. They also now have this for most Microsoft apps in the form of Office Copilot.
- What algorithms does it use
  - Copilot uses a combination of Natural Language Processing (NLP) and Deep Learning Algorithms, the most widely known being GPT3, which is a Generative Pre-trained Transformer.
- Where did its training data come from
  - Copilot, like GPT3 was trained on a massive amount of code from public GitHub repositories. It is also trained on code language documentation.
- How was it used in this project
  - In this project, I used GitHub copilot to help me write functions, and I tried to use it to debug as well.
    - To get it to write functions, I would first write a comment in the line above where I wanted the code describing what I wanted (ex. #Help me write the structure of an NN), and on the next line, it will try to suggest the correct code to do what you asked. It is then as simple as pressing tab.
    - I tried to use it for debugging in a comparable way, where I would write a question (Ex: #Why is the loss on this so consistent"), and then it would do its best to try to answer it, but I do not think it can really do that.




- Part 2 – Project Identification

- I chose to use Acrobot, MountainCar, PoleCart, and Taxi to test the learners. I decided to take this route because AcroBot, MountainCar, and PoleCart are all games that rely on physics in some way and teaching algorithms how to work around those physics. Taxi was chosen so they are not all just physics based

- Part 3 – Algorithm Implementation

| Algorithm | Where from | Game | Performance 512 Episodes | P (1024) | P (2048) | P (4096) |
|---|---|---|---|---|---|---|
| DQN | TensorFlow/ Keras | CartPole | Avg: 21.5 Max: 93 | Avg: 22.5 Max: 94 | Avg: 22.5 Max: 121 | Avg: 22.4 Max: 118 |
| Approx Q | Handwritten | CartPole | Avg: 32.84 Max: 163 | Avg: 30.18 Max: 120 | Avg: 27.82 Max: 124 | Avg: 27.49 Max: 139 |
| Q Learner | Handwritten | CartPole | Avg: 32.34 Max: 102 | Avg: 38.57 Max: 113 | Avg:39.78 Max: 200 | Avg: 37.42 Max: 131 |

- Part 4 – Feedback
  - I enjoyed this project greatly. I remember watching people do this with different games or tasks growing up, so to replicate this was very cool. One of my favorite parts was watching the agent learn how to play the game and make progress. The gym framework made this project
  - The only significant issues I had during the process were with writing the agents themselves. The DQN in particular I worked on for days before it worked. Otherwise, my team did not seem to know when this was due, so when Friday night rolled around, I was the only one who had finished any of the agents. (I was still collecting the data for the table though, so I am not innocent here either).