KRSSG SOFTWARE TASK ROUND

Task 4

Cybernetic Scepter: The Enigma of Eternal Computation

Deep within the uncharted jungles of a distant land, renowned archaeologist Indiana Jones embarked on yet another perilous adventure. This time, his quest led him to the fabled Temple of Cryptos, a hidden sanctuary rumored to house an ancient artifact capable of unraveling the mysteries of unsolvable problems. Legend whispered that the Cybernetic Scepter held the secrets to harnessing the ultimate power of computational mastery. This enigmatic artifact was said to possess the ability to transcend the boundaries of conventional computing. Eager to unearth the secrets locked within its hallowed walls, you joined him on this extraordinary journey of discovery as his devoted apprentice. The temple, shrouded in mystery and guarded by deadly traps, held secrets that had remained untouched for centuries.

Navigating through the labyrinthine corridors, you stumbled upon a seemingly ordinary room. Little did you know that it was a cunning trap carefully laid out by the ancient architects to test the wit and skill of those who dared to venture within.

Before you stood a peculiar device—a cartpole with a pole perched atop it. The task was clear: keep the pole balanced for a specific period of time in order to unlock the path to freedom. The penalty for failure was dire, as the temple threatened to collapse, sealing your fate within its ancient walls. With Indiana Jones' guidance, You analyzed the delicate interplay between the pole, the cart, and the forces acting upon them as you control the cart using the power of the scepter. It became clear that success hinged on the ability to maintain the pole's upright position, within a 15-degree range, for the required number of frames. With your technical expertise and knowledge of optimisation using Genetic Algorithms, you were required to complete the algorithm suggested by Indiana Jones to prepare a predictive model for determining the optimal actions for maintaining balance.

The Algorithm:

You are required to complete the code of “the algorithm”. The algorithm is basically a Python script which is training an agent in one of the Gym environments, namely “cartpole-v0”. You have to complete the Genetic Algorithm part of this code which got lost during “Inversion :)”.

Setup:

Make sure you have Python 3.6 or above and pip installed. If you don’t, then install Python 3.6 or above before continuing to install the Gym environment.

Installing python3 and pip3:

For linux,

```
$ sudo add-apt-repository ppa:deadsnakes/ppa
$ sudo apt-get update $ sudo apt-get install python3.8.12
$ sudo apt update $ sudo apt install python3-pip
```

For MacOS,

```
$ brew install python3
$ curl https://bootstrap.pypa.io/get-pip.py -o get-pip.py
$ python3 get-pip.py
```

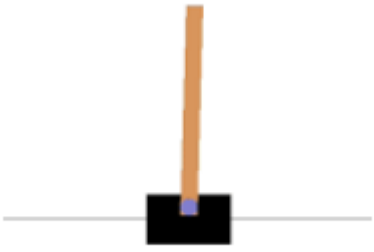
Installing gym and pyglet:

```
$ pip install gym[all]
$ pip install pyglet
```

Understanding the environment:

Cartpole:

A pole is standing upright on a cart. The goal is to balance the pole in an upright position by moving the cart left or right. You lose the game if the angle of the pole with the cart is more than 15 degrees. You win the game if you manage to keep the pole balanced for a given number of frames. For every frame you manage to keep the pole in an upright position, you get a '+1' score.



Training:

The agent is getting trained by a neural network. You are not expected to get into this section of “The Algorithm”. The weights of this neural network are to be trained. You are required to train them using the Genetic Algorithm. More specifically, you are required to complete the codes of the following functions:

- next_generation
- mutation
- crossover
- evolve
- show_fitness_graph

You also have to remove the “pass” statements from all functions

Furthermore, you have to understand the different environments in OpenAI Gym. Checkout the basic gym loop. Inspect the observation and action dimensions by printing them. “The Algorithm” can be found here.

Language: Python

Suggested Reading : Genetic Algorithm, OpenAI Gym (link)

[Tip: Go through your reading task documentation.] :)