

KRSSG SOFTWARE TASK ROUND

Task 3

Realm of the Cybernetic Scepter: Loki's Quest for Computational Mastery



In the depths of a mysterious jungle, the mischievous Loki, renowned for his cunning and trickery, embarked on a daring adventure. His quest led him to the legendary Temple of Cryptos, rumored to hold the key to unlocking the secrets of eternal computation—the Cybernetic Scepter. With its power, Loki sought to unravel the mysteries of unsolvable problems and harness the ultimate computational mastery. Joining Loki on this extraordinary journey was his devoted apprentice—you. As you ventured into the temple's depths, you encountered a devious trap—a room housing a peculiar device: a cartpole with a pole balanced precariously atop it. Your task was clear: maintain the pole's balance for a specific duration to unlock the path to freedom. Failure meant risking the collapse of the temple, sealing your fate within its

ancient walls.

Guided by Loki's wisdom, you analyzed the intricate dynamics of the pole, the cart, and the forces at play. Using the power of the scepter, you controlled the cart, striving to keep the pole upright within a narrow 15-degree range for the required number of frames. Success depended on your technical expertise and knowledge of optimization, as you worked to complete the algorithm devised by Loki himself—a predictive model to determine 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 your “mischievous mentor” conveniently left out :)

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 pygame:

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

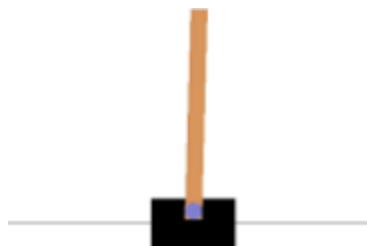
```
$ pip install gym==0.24.1
```

```
$ pip install pygame
```

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.] :)
