Homework 2 Genetic Algorithm (GA) with Neural Network (NN)

Due: 05/31/22

Total points: 10

You can work in groups of 1-2 persons

**Homework Description**: in this homework, you are going to use GAcombined with a NN for solving problems in the open AI Gym environment. The inputs to the NN are the observations (obs) from the environment. The output is the action the agent should take. You should use the "CartPole-v0" environment, plus one environment of your choice from the “Box2D” or “Atari” categories. If you choose to work with Atari games, make sure to choose one that provides RAM as your observation.

For **each** environment, your goal is to maximize your final reward. For doing this task, you need to perform the following experiments:

1. Vary your strategy for doing recombination or mutation including mutation rate. At least, try 2 strategies.
2. Vary your parent selection strategy. At least, try 2 variations. One of them should be tournament.

This will create 2\*2 = 4 experiments. To balance the influence of random initialization, you should run each experiment 3 times, and use their averaged performance as the performance of the condition (experiment).

In your homework report, plot results from all the experiments for each game on a single chart, and compare their performances. When plotting the results, you should use the Matplotlib library. See this colab notebook for examples: <https://colab.research.google.com/drive/1I-8gq1BuMLGdvHxAbxV7IaEjMmptnoPv?usp=sharing>

In addition, record a video of your best performing agent for each game.

Around 10% of your final grade will be graded based on how well your agent performs against your classmates’ agents using the "CartPole-v0" environment.

You can receive up to 5 additional points for performing additional and meaningful explorations, e.g. change the network’s configuration.

**Turn in:**

Your google colab file. The discussions and report of experiment results can either be included in the colab file or be a separate file.