Assignment 9

DATA 622

Winter 2022

In this assignment, you will apply **Q-learning** to the ***FrozenLake-v0*** environment available in ***OpenAI Gym***. This environment is basically about navigating a partially frozen lake which has holes. The objective is to reach the goal without falling into a hole. A reward of one is given when you successfully reach the goal; otherwise the reward is zero. An episode ends when you either reach the goal or fall into a hole. One thing to note is that your action only partially influences where you actually end up (e.g., when your action is "up", you may actually go "right").

For this assignment, you only need to modify the "Self-driving Cab" code from this week's tutorial. The OpenAI Gym documentation is also a good resource.

Your Python script must meet the following specifications:

- Apply Q-learning and linearly transition from 100% exploration (choose a random action) to 100% exploitation (choose the best action based on the Q-table) over 100,000 episodes. Note that although the "Self-driving Cab" example in the tutorial did not implement this gradual transition from exploration to exploitation, the Gambler in the "Dungeon" example did.
- The Q-learning parameters *alpha* and *gamma* are up to you. Choose reasonable values.
    - It's fine if you want to try different values but your submitted code should implement only your final chosen values. Do NOT do a grid search in the submitted code, for example.
- When the 100,000 episodes are done, print the following to the screen:
    - The entire Q-table
    - The average number of timesteps per episode
    - The total number of times you reached the goal
    - The total number of times you fell into a hole
- Your code should be in a file named ***assignment9_studentid.py/.ipynb***
    - Replace "studentid" in the file name with your student ID

Grading Scheme

- This assignment is worth **5% of your total grade** in the course.
- Submitted Python code must run **error-free**. If your code results in errors and does not execute to completion, a grade of zero will be given. Please test your code before submission.

- If your code executes without error, your code and outputs will be inspected, tested and evaluated. Partial marks will be given if your submission fails to meet some of the specifications.

Deliverable and Deadline

- Submit your ***assignment9_studentid.py/.ipynb*** file to the **Assignment 9 Dropbox on D2L**.
- Due at **5:00pm on Thursday, Mar. 31**.