Habib University

Dhanani School of Science and Engineering

Course Project

Course Code: CS 352	Introduction to Reinforcement Learning	Given: 25/4/2023
Due: 10/5/2023	Spring 2023	Maximum Marks: 25

Project Topic and Deadlines

- This project is worth 25% of your final grade which you will do in groups of two. In this project you will implement RL algorithm(s), write a brief report, and make a presentation. You may choose one of the following two options as your project:
  i. Implement SARSA and Q-learning algorithms on the Taxi learning problem from the OpenAI Gym [Toy_text] environment and compare the two in terms of:
     - computational efficiency, i.e., the time taken to converge;
     - maximizing reward: Run the learned policies for the two algorithms from various starting states and calculate the average reward to see which algorithm results in more average reward.

     Choose appropriate values of the learning rate, α, the discount factor, γ, and the exploration rate, ε (in case of ε-greedy policies).
  ii. Choose one of the two algorithms, SARSA and Q-learning, run it for various values of α and compare the two in terms of:
     - computational efficiency, i.e., the time taken to converge;
     - maximizing reward: Run the learned policies for each α value for various starting states and calculate the average reward to see which α value results in the most average reward.
- Write a report on your selected topic according to the guidelines given below.
- Prepare a 10-to-15-minute presentation based on your paper. Submit your code, report, and the presentation, on Canvas, by **10 May.**
- The RO has reserved a slot on 3 May for project presentations. You may make presentation during that slot if you are ready. Alternatively, you may make a presentation at a pre-scheduled time by Friday, 12 May.

Report Format

- The report should be 2 or 3 pages long.
- The report should adhere to IEEE conference style as specified on this page: `https://www.ieee.org/conferences_events/conferences/publishing/templates.html`.
- All citations and references should conform to IEEE style. A brief description is given here `http://www.ijssst.info/info/IEEE-Citation-StyleGuide.pdf` whereas a longer description is available here `https://www.ieee.org/documents/ieeecitationref.pdf`.
- A paper titled "Reinforcement Learning to Play Mario" (although longer than the report required of you and not in IEEE format) is attached as a sample.