## CS6482 Deep Reinforcement Learning

## Assignment 2: DQN Classic Control

## Sem2 AY 23/24

**14/Mar/24 – v1.**

## 1. Objectives

To implement a Reinforcement Learning (RL) agent using a Deep Q Network (DQN) applied to the one of the environments in OpenAI Gym for a classic control problem other than the cartpole i.e., mountain car.

## 2. Submission

Submit a Jupyter notebook with commented code, and a pdf describing:

1. Why Reinforcement Learning is the machine learning paradigm of choice for this task (1 marks)
2. The Gym Environment (1 marks):
3. Implementation (4 marks):
    a. Capture and sampling of the data (1 marks),
    b. The network structure and hyperparameters (1 marks),
    c. A very clear and extremely detailed discussion on the Q learning update applied to the weights (2 marks). For example, how is the error calculated and where is the update applied?
4. Evaluation of Results – plots with short accompanying explanations of the information conveyed and analysis (2 marks).
5. Independently researched concepts such as the impact of varying the number of neurons in a layer or decaying epsilon. (2 marks).
6. References (P/F).

**The Jupyter notebook must (a) include output, and (b) be extensively commented. Failure to comply with one or both of these requests will result in the award of 0 marks for the submission.**

## 3. Notes and Guidelines

- You may complete the project in teams of 2.
- **Submission deadline is 23:59** Wed. 10/April/24 (Teaching Week 10).
- The Jupyter notebook and pdf are named CS6482-Assign2--RL-ID1_ID2
  - Where ID1 and ID2 are the student id numbers of the team members
- The first three lines of the **Jupyter notebook** should be comments with:
  1. The first line is the **names and ID numbers** of the team members.
  2. The second line **states if the code executes to the end** without an error.
  3. The third line is **one or more links to any third-party implementations used for the submission**.
- One submission per team.
- The number of pages in the pdf report is left to your discretion. It is quality over quantity, and filler is never appreciated.
- Submission is via the Brightspace Assignment tool.
- You are <u>NOT</u> allowed to use Reinforcement Learning libraries such as TFAgents, KerasRL, RLCoach, Stable Baselines 3 (SB3), etc.
- Programming language is Python.