DDA 4230: Reinforcement learning **CUHKSZ**

Assignment 3

TA: Bo Yue, Hengming Zhang

Due Date: Nov. 30th, 11:59 pm
Total points available: 100 points

Note: *Please note that external references are allowed only if you give an appropriate reference. There is no required format of reference. Please elaborate on your answers as well (do not just give a number, etc).*

Problem 1: Value and Policy Iteration Implementation [50 points]

You are going to implement value and policy iteration and perform experiments with the OpenAI Gym environment. Code skeleton (in Python) is provided through Google Colab (you can use it for free with the computation demands of this assignment), and here is the link to the skeleton code. You may *create a copy of this colab notebook and revise it in your own Google Drive.*

1. Please implement both value and policy iteration. [25 points]
   Submit your file in .ipynb. Do not revise the original code lines in the provided link. No mark will be awarded if your code cannot be run.

2. Please try to play around with the Frozen Lake environment with different configurations (gamma, improvement/evaluation iterations, random seed) and with value and policy iteration. Please try your best to get a policy with a score as high as possible (though your grades will not be affected by this score). Repeat each experiment with 5 different random seeds, then report the highest score you've achieved across the 5 repeats with 1 standard deviation, and write a few sentences to compare the two iteration methods. Please implement both value and policy iteration. [25 points]

Problem 2: Q Learning Implementation [30 points]

You are going to complete the Q-Learning algorithm following the instructions in the notebook. Code skeleton is given at `https://colab.research.google.com/drive/1JV0pNhMGVMrm0W2J-3HDxaVPXgznehAK?usp=sharing`. You may *create a copy of this colab notebook and revise it in your own Google Drive. Submit your file in .ipynb. Do not revise the original code lines in the provided link. No mark will be awarded if your code cannot be run.*

Problem 3: REINFORCE Implementation [20 points]

You are going to complete the REINFORCE algorithm following the instructions in the notebook. Code skeleton is given at `https://colab.research.google.com/drive/1JlP3PO6vc1baeF3FtfCpwQndW8-3zdPP?usp=sharing`. You may *create a copy of this colab notebook and revise it in your own Google Drive. Submit your file in .ipynb. Do not revise the original code lines in the provided link. No mark will be awarded if your code cannot be run.*