EE619 PROJECT #2

1 Introduction

In this project, you will implement Deep Q-Network (DQN) and REINFORCEMENT in *Lecture Note 7* and *Lecture Note 8* to train an agent in the Robot-GridWorld environment. We provide the Robot-GridWorld environment you will use.

Next, there are information for this project.

- Due Date: **May 21**(Sun), 2023. Late submission is not acceptable.

- Submission Form: a **single pdf** file containing the contents mentioned in Section "What to Submit". The submission file's title should be 'ID_your name.pdf', e.g. 2023xxxx_JeewonJeon.pdf

- Cautions: this project is a personal project. Do not discuss it with anyone

2 Specifications

- Language to Use: Python (You can use Pytorch or Tensorflow)

- Files: We provide four python files.

  1. main_dqn.py
     This file contains codes helping your experiment with "DQN.py". You need to add **code to plot the returns per episode**.

  2. main_rl.py
     This file contains codes helping your experiment with "REINFORCE.py". You need to add **code to plot the returns per episode**.

  3. DQN.py
     For the Deep Q-Network (DQN). This file is the **main part of this project and you need to fill codes** in this file. You can modify this file whatever you want. (i.e. You don't have to follow the exact same steps as our skeleton code.)

  4. Reinforce.py
     For the REINFORCE. This file is the **main part of this project and you need to fill codes** in this file. You can modify this file whatever you want. (i.e. You don't have to follow the exact same steps as our skeleton code.)

  5. env1.py, env2.py
     For the Robot-GridWorld environment. **Do not modify** this file.

- Required Python Packages: NumPy, Matplotlib, and tkinter. (tkinter is the module for displaying Robot-GridWorld Game)

3 What to Submit

As mentioned before, you have to submit a single pdf file. Please attach your code and we limit your submission up to three pages excluding codes in part (2). There is no limitation for part (2). Most importantly, your submission file should contain the following contents.

1. (15 points) Explain your network structure(DQN and REINFORCE) and how it works.

2. (15 points) Explain difference about DQN and REINFORCE within 4 lines.

3. (5 points) Describe the Robot-Gridword including elements' role.

4. (20 points) Plot the result (i.e. returns per episode) of DQN and REINFORCE when you implement your code on env2.py and env1.py. Therefore, you need to plot 4 results (i.e. DQN from env1, DQN from env2, REINFORCE from env1, REINFORCE from env2.

5. (15 points) From question (4) results, what can you say comparing env1 and env2? Explain why the difference occurs and what you can do to resolve it within 4 lines.

6. (10 points) From question (4) results, what can you say comparing DQN and REINFORCE? Explain why the difference occurs within 4 lines.

7. (20 points) Implement above algorithm, and put your codes in your submission (pdf file). You can see blank space to fill in your codes in main_dqn.py, main_rl.py, DQN.py, and Reinforce.py.