

# Introduction to AI

## Assignment 2

March 29, 2023

1. In this question, you need to install OpenAI gym:

- [Installation Instructions](#)
- [Documentation](#)

Once the gym is installed, you have to implement Q-learning for the [FrozenLake-v1 environment](#) in python using the gym library and show the rewards obtained. Use option `is_slippery=True`. Use map size 4x4 (check option `'map_name'`).

You may use a discount factor  $\gamma = 0.95$ . Please provide the following things in your solution for this question:

- (a) Code that implements Q-learning for the FrozenLake-v1 example in the gym? Copy and paste the code in the solution pdf, and provide the actual code file also. A key thing to determine first is what is the size of the state space and action space in this environment to make the appropriate data structures such as the Q-table **[6 points]**
- (b) For each episode, compute the total accumulated reward (also called episode return). Plot the average return (over the last 50 episodes) while your agent is learning (x-axis will be the episode number, y-axis will be the average return over the last 50 episodes). Make sure that you train for sufficiently many episodes so that convergence occurs. **[3 points]**
- (c) What is the epsilon you used for epsilon-greedy exploration and how did you select this epsilon  $\epsilon$ ? What would happen if you use a high epsilon such as  $\epsilon = 0.5$ ? **[1 point]**