Lab 6. Reinforcement Learning (RL)

**Aims**: This lab provides an opportunity for you to understand how to define an environment for using a reinforcement learning algorithm and how to estimate the utility values using four common RL algorithms, which include three passive RL algorithms: Direct Utility Estimation (DUE), Adaptive Dynamic Programming (ADP) and Temporal Difference (TD) and one active RL algorithm, Q-learning.

**Tasks**:

Task 1. Learn how to define an environment from your tutor’s demo and fill in blanks marked by “Add your code here” in the Part 1 in the notebook “Lab 6 RL-task.ipynb”.

Task 2. Observe the demo of Part 2 in the notebook “Lab 6 RL-task.ipynb” given by your tutor, which is about how to calculate the utility values of states in the environment using the value iteration and policy iteration methods.

Task 3. First, learn from demos (A segment of Part 4 with model-option = 1) given by your tutor how to create a DUE agent and calculate the utility values of states explored using this agent. Then fill in blanks marked by “Add your code here” in the Part 4 with model-option = 1 in the notebook “Lab 6 RL-task.ipynb”.

Task 4. First, learn from demos (A segment of Part 4 with model-option = 2) given by your tutor how to create a temporal difference (TD) gent and calculate the utility values of states explored using this agent. Then fill in blanks marked by “Add your code here” in the Part 4 with model-option = 2 in the notebook “Lab 6 RL-task.ipynb”.

Task 5. First, learn from demos (A segment of Part 4 with model-option = 3) given by your tutor how to create an adaptive dynamic programming (ADP) agent and calculate the utility values of states explored using this agent. Then fill in blanks marked by “Add your code here” in the Part 4 with model-option = 3 in the notebook “Lab 6 RL-task.ipynb”.

Task 5. First, learn from demos (A segment of Part 4 with model-option = 4) given by your tutor how to create a q-learning agent and calculate the utility values of states explored using this agent. Then fill in blanks marked by “Add your code here” in the Part 4 with model-option = 4 in the notebook “Lab 6 RL-task.ipynb”.