

Mathematics of Reinforcement Learning

Exercise Class 10

Exercise 1. Consider the setting of the optimal investment problem discussed in Exercise Class 2, Task 4. Implement a script in Python that approximates the **optimal strategy in the optimal investment problem** using the **Q-Learning** algorithm (the pseudocode can be found in the Handwritten Lecture Notes 10). Visualise the learned portfolio allocations after 50,000, 500,000 and 5,000,000 episodes, as shown in Figure 1.6 in the lecture notes (see also exercise class 6). **Prog Ex 4**

Use only the Python packages NumPy and Matplotlib and work alone on this task. Make sure that the 3 figures are reproducible, i.e. fix the NumPy seed before running the code (see here).

Submit the Python file (either .py or .ipynb file) and additionally the 3 figures as PNG files (use the command `matplotlib.pyplot.savefig`) to the submission folder on the Mathematics of Reinforcement Learning Moodle website.

Submission Deadline: 9 January 2025 at 10:00.

