

# 272SM: Introduction to Artificial Intelligence

## Homework Assignment: Multi-agent Decision Making

Friday 12<sup>th</sup> May, 2023 - Thursday 25<sup>th</sup> May, 2023

### Instructions

Report your answers to the following exercises and submit them at any time before the exam (latest 25th May 2023). Submitting homework solutions is highly recommended; Correct solutions will be counted as bonus points towards the final grade.

### Exercise 1: Gridworld navigation

For the 4x3 world shown in Figure 1, calculate which squares can be reached from (1,1) by the action sequence [Right, Right, Right, Up, Up] and with what probabilities.

*Hint:* compute the occupancy probabilities at each step by filling in Table 1.

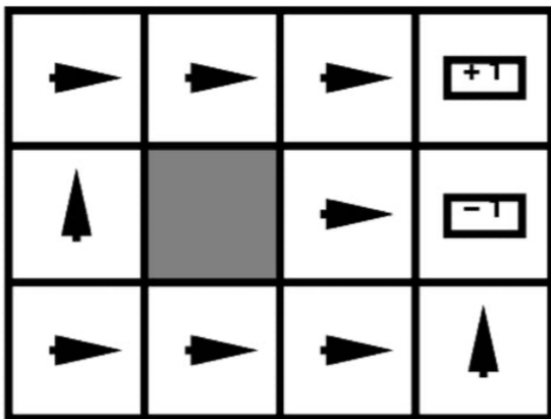


Figure 1: Gridworld

		Right	Right	Right	Up	Up
(1, 1)	1	.1	.02			
(1, 2)		.1	.09			
(1, 3)						
(2, 1)		.8				
(2, 3)						
(3, 1)						
(3, 2)						
(3, 3)						
(4, 1)						
(4, 2)						
(4, 3)						

Table 1: An example table

### Exercise 2: Threshold Policy Optimization

For the environment shown in Figure 1, find all the threshold values for  $R(s)$  such that the optimal policy changes when the threshold is crossed. You will need a way to calculate the *optimal policy* and its value for fixed  $R(s)$ .

*Hint:* Prove that the value of any fixed policy varies linearly with  $R(s)$ .