FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE
Exercise 12: Learning – Problems Winter Semester 2023/24
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Problem 12.1:

I want to create a decision tree to tell me whether I am likely to enjoy a particular book. Below is the data from 8 books I have read, whether I enjoyed them and the attributes:

1 Fiction/Non Fiction
2 Whether the book has $>$ 500 pages (1) or not (0)
3 Whether the book is about travel (1) or not (0)

Book number	Fiction/NF	$>$ 500 pages?	Travel?	Enjoyed?
1	N	0	0	0
2	F	1	0	0
3	N	0	0	0
4	F	1	1	0
5	N	0	1	1
6	F	0	0	1
7	N	0	1	1
8	F	0	1	1

Problem 12.1.1: Use the decision tree learning algorithm (Lecture 13 slide 16/24) with the information gain heuristic (slide 21/24) to create a decision tree for these data.

Problem 12.1.2: Philip K. Dick's *Do Androids Dream of Electric Sheep* is fiction, 283 pages and not about travel. Am I likely to enjoy it?

Problem 12.2:

Assume we have a robot navigating a maze. The robot is trying to find the goal in the maze. The robot can move in four directions: up, down, left and right. The robot's current state is represented by the coordinates (2,3). The goal is represented by the coordinates (3,3). The robot can take one of the four actions at each state. The reward for taking an action is 1 if the action leads to the goal, 0 otherwise. The Q-table is initialized with all zeros.

Problem 12.2.1: Assume that the robot performs a move to the right. Solve one step of the Q-learning algorithm with learning rate $\alpha = 0.1$.