Learning and Planning

Questions in the homework are related to last two topics you covered in the class, learning and planning.

There is no coding question.

Problem 1 - Planning

Create an example **novel** (that is, not one of the problems in your lecture slides such as blocks world, spare tire, shoe etc...) problem. Your problem may be easy so you can solve it with less amount of steps. Represent this problem with one of the problem description languages you see in the lecture (STRIPS, ADL...), then choose **one of the following**:

1. Solve this problem by applying Partial Order Planning (POP) by hand, your solution **must backtrack at least once** before finding the solution, and you must show each step of the planning clearly.

2. Create a planning graph for the problem **with at least two state levels, excluding starting state level and your final state level must contain 4 different (negations does not count) literals**. Indicate all mutex relations and their type (inconsistent effects, competing needs...) cleary. You do not need to find the solution.

Problem 2 - Decision Tree

You are given the following training set:

	Feature 1	Feature 2	Feature 3	Feature 4	Feature 5	Class
Example 1	T	T	F	F	F	P
Example 2	F	F	T	T	F	P
Example 3	F	T	F	F	F	N
Example 4	T	F	T	F	T	P
Example 5	T	T	F	T	T	N
Example 6	T	F	F	T	F	P
Example 7	F	T	T	T	T	N

(a) Construct the decision tree for the given training set, indicating the steps cleary.

(b) Using the decision tree you have constructed, classify the following example:

Sample	T	T	T	F	F	?

Problem 3 - Learning Agents

Answer the following questions:

1. Explain meaning of the terms *overfit* and *underfit*.

2. Give one example scenario for usage of *supervised learning*, *unsupervised learning*, *reinforcement learning*. For each of the example scenarios, explain why the learning agent in your scenario falls into that particular category.

3. Compare supervised and unsupervised learning, what are the advantages/disadvantages of them with respect to each other?

4. For a fully-observable, strategic, sequential, static (there is no time constraints), discrete and multi-agent (2 agents) environment (i.e., chess, tic-tac-toe...), give an example scenario where a learning agent can perform better than a minimax agent. Explain the reason.

   Hint: No agent can outperform minimax agent in such a 1v1 situation, but you might compare their performance against a third agent which learning agent performs better against.

Submission

Submit your homework files through Ninova. Please upload your report file using filename BLG435E_HW_3_STUDENTID.pdf. You are going to submit:

1. A pdf file containing answers of the questions.

In case of any questions, feel free to send an e-mail to unlut@itu.edu.tr.