Exercise 1 :

You are given the following four domains:

i. A group of people playing poker.

ii. A person driving a car.

iii. A machine detecting chocolate bars weighing less than 50g.

iv. A doctor performing a medical diagnosis.

Classify each of the domains above along domain the properties that we discussed in the lecture by entering yes/no in the cells of the following table:

	Accessible	Deterministic	Episodic	Static	Discrete	Single agent
Poker						
Car						
Machine						
Doctor						

Exercise 2 :

For each of the following assertions, say whether it is true or false and give a short explanation in 1 or 2 sentences for each of your answers.

(a) An agent that senses only partial information about the state cannot be perfectly rational.

(b) There exist task environments in which no pure reflex agent can behave rationally.

(c) There exists a task environment in which every agent is rational.

(d) The input to an agent program is the same as the input to the agent function.

(e) It is possible for a given agent to be perfectly rational in two distinct task environments.

(f) Every agent is rational in an unobservable environment.

(g) A perfectly rational poker-playing agent never loses.

(h) Suppose an agent selects its next action uniformly at random from a set of possible actions. There exists a deterministic task environment in which this agent is rational.

Exercise 3 :

You want to design an agent for playing tic-tac-toe (see e.g. http://boulter.com/ttt/).

- What is the state space the agent needs to reason with?
- How many states are there in the state space?
- Design 2 different feature-based representations of this state space.
- Design one relational representation of this state space.

Exercise 4 :

You want to design a soccer playing robot (see e.g. http://www.robocup.org).

- Compared to the tic-tac-toe problem, is there a single "right" state space?
- Design one possible feature-based hierarchical state representation for the robot.

Exercise 5 (Optional):

Discuss the differences between the problem domains from Exercises 3 and 4 according to the dimensions of complexity summarized in Section 1.5.10 (see Table 1).

Dimension	Values
Modularity	flat, modular, hierarchical
Representation scheme	states, features, relations
Planning horizon	non-planning, finite stage, indefinite stage, infinite stage
Sensing uncertainty	fully observable, partially observable
Effect uncertainty	deterministic, stochastic
Preference	goals, complex preferences
Learning	knowledge is given, knowledge is learned
Number of agents	single agent, multiple agents
Computational limits	perfect rationality, bounded rationality

Table 1: Dimensions of complexity
