CT5134 & CT5130: Agents, Multi-Agent Systems & Reinforcement Learning

Exam Revision Sheet 2021

Section A

NB: All answers must be in your own words, and fully explained to demonstrate your own understanding of the learning outcomes.

1. Outline in your own words, a summary of what you understand as being the meaning of the two terms "*Agent" and "Multi-Agent Systems"*. You are asked to make reference to each of the following:

- Agent
- Multi-Agent System
- Rational Actions
- The Prisoner's Dilemma
- Nash Equilibrium

2. In your own words how would you explain each of the following:
   a. Prisoner's Dilemma and how this game can be considered correctly represented.
   b. The difference between a zero-sum game and a non-zero-sum game.

3. One of the key assumptions of Game Theory is that an agent will always act in a self-interested and rational manner. In your own words, how would you outline the effect and limitations of this assumption when designing agents for the real world?

4. David Axelrod undertook a significant tournament that is widely cited as prompting new attention to agent interactions and the emergence of cooperation. In our own words, can you outline the key strategies and outcomes that were identified from the tournament.

5. With the aid of suitable examples, and in your own words outline the key differences and similarities between the following:

- Zero-sum games Vs Non-Zero-sum games.
- Two Player Games Vs N Player Games

6. Agent learning has been successfully shown to assist in a number of real world. In your own words, can you outline how you would apply an agent learning agent to a sample real world problem? *Hint:* You should reference terms such as *Rewards, States, Actions.*

7. Cooperation has been found to emerge under a number of circumstances in a Prisoners Dilemma Game. In your own words, outline what are the key factors that influence this?

8. In John Maynard Keynes proposed a simple game known as the "Keynes Beauty Contest Game". This represents how a population of players might perceive the average choice of their peers. Each player is asked to pick a number between 1 and 100. The player that names a number closest to two thirds the average of all numbers chosen will then be announced the winner, all others receive nothing. In your own words, explain how the game would progress, and the role of the Nash equilibrium in driving behaviour. In your answer explain what you understand to be the meaning of the Nash Equilibrium and how it effects this and other games.

9. Auctions have been commonly used as examples of agent environments, in your own words what are the key considerations of auction design?

10. Some authors would argue that a simple thermostat can be considered to be an agent. In your own words, would you agree with this belief? What evidence can you provide for your answer?

11. Machine learning techniques are commonly categorised as either *supervised* or *unsupervised*. In your own words, can you explain the differences between these and how reinforcement learning can be categorised?