Intelligent Agents

Paper Exercise: Uncertainty and Negotiation

Ungraded

Question 1: Consider the game in Figure 1. Let α and β be the uncertain types of agents 1 and 2; they characterize the payoff for playing action A to that agent.

Agent 1 \ Agent 2	A	B
A	α, β	α, 1
B	1, β	1, 1

Figure 1. *An uncertain game*. Each of two players chooses either action A or B. Payoffs α and β are uncertain.

Consider first that for both agents, the type is distributed among the 2 values [0.5, 2.0] with equal probability, and that this distribution is common knowledge. Derive the ex-ante Bayes-Nash equilibria of the game. Does the game have an ex-post Bayes-Nash equilibrium?

Next, consider that agent 1 knows its own type α=0.5. What are the ex-interim Bayes-Nash equilibria?

Consider another variant where the type is distributed among [2,3] with equal probability. Now does the game have an ex-post Bayes-Nash equilibrium?

Question 2: Consider the game in Figure 2. What are the equilibria of this game? What is the Nash Bargaining solution for the case of non-transferable utility?

Player A \ Player B	0	1
0	7,8	3,15
1	10,3	5,5

Figure 2. A game that can use cooperation.

Question 3: For the game in Figure 2, consider a version where utility can be transferred from one agent to another. How does this change the space of possible bargaining solutions? What is the new Nash Bargaining solution?

Question 4: For the game in Figure 2, what is space of utilities achieved by co-related strategies? Suppose, the set of feasible utilities in the bargaining game is the space of utilities obtained by co-related strategies, what is Nash Bargaining solution? What co-related strategy can implement this?
Is this co-related equilibrium?

Question 5: How would you modify the Nash bargaining scheme to so that each agent has a different importance? Hint: consider that agents act for a group of agents and that importance is proportional to the size of the group.