Exam Performance Feedback

COMP34120—Questions 1 and 2

2010/2011

The following only concerns Questions 1 and 2 of this exam.

It should be pointed out that the exam mark is not the final mark for this course unit. The final mark is calculated by applying a factor of .4 to the exam mark (taken out of 100), multiplying each of the coursework marks with .3, and adding the three together.General remarks: 35 students answered questions from this part.

Question 1. I was very disappointed with the very low quality of many of the answers for this question. It was marked out of 20, and of the 35 students attempting it 15 received a mark of 7 or lower (that is a failing grade) and only 2 managed a first class mark. The average mark was 8. Students who had marks of five or lower wrote down very little that was both relevant and true.

a) To find pure strategy equilibrium points all one has to do is check whether one player can improve their pay-off by changing their strategy while the other players stick to theirs. There are only two strategies per player. An example for doing this is given in the solution to Exercise 14 (although unfortunately the exercise itself somehow got cut from the notes by mistake). It is possible to find one equilibrium point by using dominance arguments, but that doesn't give the other, so students who did that lost a mark.

   There are two pure strategy equilibrium points in the game, and two marks were awarded for finding those, which the majority of students could do. I then expected a discussion on what would happen if there was actual play, but almost nobody got the two marks for noting the following:

   - Player 2 prefers one of the equilibrium points (which gives a pay-off of 1 over 0), Player 3 prefers the other for much the same reasons.

   - Player 1 gets to choose which equilibrium point they arrive at, but he gets a pay-off of -1 in either case. He would like to move away from them but there's nothing he can do about it! By sticking to their preferred equilibrium point strategies Players 2 and 3 would in each round receive 0 or 1, so over time they should accumulate winnings. Player 1 would be best off by refusing the play.

b) This was really a version of the Prisoner's Dilemma game (discussed on pages 35f of the notes) with a different story and different numbers. The majority of students could carry out the removal of dominant strategies and they arrived at a (1×1)-matrix, gaining 3 marks for doing so. In the second part, for two further marks, students were expected to note that they had found the only pure-strategy equilibrium point, that both parties would be better off by choosing their alternative strategy, but that then there would be the temptation of changing one's mind again due to the possibility of getting an even better pay-off. Almost nobody wrote down all three facts.

c) If we assume that there are two pure strategy equilibrium points say (i, j) and (i', j') then it must be the case that either $i \neq i'$ or $j \neq j'$, so at least one player has two strategies that lead to an equilibrium point. (Many people assumed that im i', j and j' were all automatically distinct, which is not true.) We know from that any mixed combination of equilibrium point strategies for one player paired with any mixed combination of such strategies for the other player gives another equilibrium point, and there are infinitely many of these. Many students at least noted that every pure strategy is a mixed one, so there are at least two mixed strategy ones, but few people got all the marks for this question.

d) Proposition 1.14 tells us what needs to be done, and this is illustrated in detail on pages 47f of the notes, which says that a pair of mixed strategies gives an equilibrium point provided that neither player can improve their pay-off by changing to one of their pure strategies. Many students seemed to want to describe the process but did not manage to do so without mistakes.

e) A number of students did not seem to read the instructions in detail—they talked about under which circumstances it is feasible to describe a game in either form. The question that was asked, however, was what would be a preferable description when the task is to find a good strategy under which circumstances. A game in normal form makes it much easier to find pure strategy equilibrium points. If the game in question is 2-person zero-sum then there is an algorithm for finding mixed strategy equilibrium points for games in normal form. If, on the other hand, it is important to model the decisions made in the course of playing the game, or one wanted to implement the search for a strategy by learning then a game in extensive form would be preferable . There were many wrong statements among the answers given to this question.

Question 2. This question was attempted by 34 students. The average mark was 10 out of 20. Six students got a failing mark and eight managed a first class answer.

a) Almost all students picked a 2-person zero-sum game of perfect information without chance and managed to classify it as such, getting both marks.

b) This was one of the worst answered parts of the exam. In game-theoretic terms a solution to a game is an equilibrium point. I expected students to point out that for games mentioned in a) it is the case that either one of the players has a winning strategy or they can both ensure at least a draw (Theorem 1.10 in the notes). A number of students said that a winning/drawing strategy would be a solution but failed to assert that this is guaranteed to exist. The two students who chose such games *with* chance would have had to remember Proposition 2.12. There were many answers here that completely ignored game theory and did not define solution in a sensible way.

c) Most students talked about a program as described in Chapter 4 of the notes. For these I awarded a maximum of 4 marks each for the topics of move generation and board representation, evaluation function and alpha-beta search, and there were two additional marks for general points. Students who presented alternative approaches were marked on the quality of their description. Most students got a decent percentage of the marks available, but there were many very confused and quite a few outright wrong statements. Students seemed particularly confused about the notion of strategy (doesn't really apply here), 'quality of moves' (the program doesn't try to classify the moves as such, it classifies the positions moves may ultimately lead to), at which point the evaluation function (or heuristics) is employed and how, and what that means for the alpha-beta algorithm. Also, the part of the answer referring to the particular game chosen often was rather weak.