Comp34120 Exam Feedback – 2018-2019

General comments on the exam

Several students complained after the exam that the exam was too long to complete in 2 hours. We will look into that for next year and try to judge the time required more accurately. The results show, that although it might have been challenging/stressful to complete in 2 hours, the bulk of the students managed it. The unofficial exam average is 64.9% with a standard deviation of 16.8%. This is a comfortably good result, although the standard deviation is a bit large. 46.6% of the students made first-class marks, and of those, 21.6% made marks of 80% and above. Only 19% of the students made marks below 50%. So, most students managed to successfully do the exam and should be proud. On the other hand, the marks do drop monotonically from question 1 to question 4, and about 9% of the students did not do question 4, so we will look into the length for subsequent years.

Part A (semester 1, written by Jonathan Shapiro)

Question 1:

Most students did great on this question. The average mark was 81%.

Part a) i) Using minimax to compute Nash equilibria. There were very few mistakes made on this problem. The mass of students knew what to do and got full marks. Those who did not get full marks did not have a clue. (E.g. player 1 takes the row with the largest number; player 2 takes the column with the smallest number; that’s the equilibrium). Such people got low marks. Some people lost a mark for not providing justification. ii) Again the mass of students knew how to apply dominance. One or two students forgot that for player 2 lower dominates over higher, the opposite of player 1.

Part b) The Malicious Diner problem. i) Most people could correctly write out the game table. The most common mistake was to say this was a game of perfect information. It is a game of imperfect information, because each player has to order the meal without knowing what the others have ordered. This mistake cost 0.5 marks. ii) The majority correctly recognized the only pure strategy equilibrium is for both players to order the £30 meal. If either deviate from that, the deviator will pay £25 for a meal with £20, i.e. a loss of £5. Some students incorrectly picked (£20,£20) as a second equilibrium. The answer with both the correct and the incorrect strategy pair received 1 out of 3 marks. iii) The question was whether there is a mixed strategy equilibrium for this game. The answer is no. This can be argued in words. If Alice plays a mixed strategy, it means she will sometimes order the lower-priced meal. Then Bob’s best response is to always order the £30 meal and will pay less than £30 on average. Then Alice’s best response is to always order the £30 meal as well. By symmetry, the argument works reversing Alice and Bob. More of you did it mathematically, by assuming a mixed strategy existed and deriving a contradiction, such as $1=0$. That is a great way to do it, and I was very pleased to see so many students do it that way. Some made a few math errors, but still got the correct result. One or two misremembered Nash’s theorem and claimed that there is always a mixed strategy. That is wrong. There is always at least one equilibrium, and it could be mixed or pure.

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1 All marks are unofficial because this was written before the examiners meetings.
Question 2:

The unofficial average for this question is 71.6%, so, again, students demonstrated good amounts of knowledge and ability overall.

Part a) This was the most difficult question from Section A of the exam. This was the question from this section with the largest variation of marks and the largest variation of answers. The answer is that Player 2 can always force a win. I though you could do it largely in your head. The reasoning is: if Player 1 moves S2 (and remembering that it does not get an extra move with the pie rule), Player 2 can take the seed in S1 by playing N2, getting the extra turn, and playing N1. This results in three seeds in North’s scoring well and ultimately a win for Player 2. If Player 1 leads with the move S1, then looking ahead we can see that South is two moves away from having no legal move. Thus, if North can stay alive for two moves and avoid depositing seeds on South’s side of the board and not swap, then Player 2 will win. There are several ways for Player 2 to do this, but we only need a way. North can make as its first move N1. Then South must move S2 which deposits a seed in South’s scoring well and a seed in N1. North can now make either move. South now has no legal move, so the game ends with all seeds on the board going to North, and Player 2 wins 3-1. We do not need to work out all possible combinations of moves; we just a set of moves for Player i such that Player i wins not matter what its opponent does.

Some people got the correct answer using reasoning like that above. Some people got the correct answer by writing out the entire game tree. That is a legitimate method, but is complicated and time consuming, and not what I expected. I should have given a hint that you should not need to write out the entire tree. A lot of students tried to write out the entire tree, and either gave up or got the wrong answer. There were a few other conceptual problems. Some people did not seem to understand what solving the game means, and just worked out a range of possibilities: if this, and this, and this, and this, Player 1 wins, but if that, and that, and that, Player 2 wins. That is not solving the game, it is just producing something like the game tree without providing the answer. Some people got confused about the difference between South and North and Player 1 and Player 2 after the swap. So, they proved something like South can always force a win, but in their proof, South was Player 1 for one set of moves and Player 2 for another set of moves. This is not a solution of the game. And, although I provided the rules of the game, a number of students solved the game under the wrong rules. Examples: Used an extra turn on the first move, incorrectly identified which player was on turn after the swap, or incorrectly assigning the seeds when a player lacks a legal move. A correct solution to the wrong rules could get 3 out of 5 marks. Very few correctly identified the solution as a weakly-solved game.

Part b) This is the question about alpha-beta pruning. Most people understood this pruning method and produced perfect answers. Some did not understand it and returned wrong answers, but I cannot identify a common cause of errors. Some answered a different question and produced the values of the nodes, but not the alpha-beta values. Surprisingly, not all students could correctly identify the nodes which are not evaluated, even though that can be done by inspection.

Part c) About heuristics and evaluating/combining them. Most students got 4 or 3.5 or 3 out of 4 marks for this part. Points were docked for vagueness, or for heuristics which were not quantitative. I still get one or two answers about heuristics in A* search; these received 0 marks.
Part B (semester 2, written by Xiaojun Zeng)

General Feedback to Part B (i.e., Question 3 and Question 4):

This part covers the teaching materials taught in the 2nd semester. The average mark for this part is 54%, which is slightly higher than 53% last year. The marks show that some serious improvements are needed in the setting of the exam questions and reduce the lengths of the exam questions.

General Feedback to Question 3:

- 114 students took the exam and so answered this question.
- The average mark for this question is 57% (i.e., 8.5 marks out of 15). This is a little worse than the last year, when the average mark for this question was 59%.
- 34 or 30% students received a 1st class mark of 70% or better (i.e., 11 marks or more).
- 36 or 31.6% students received a 2nd class mark between 50%-69% (i.e., between 7.5 and 10 marks).
- 21 or 18.4% students received a 3rd class mark between 40%-49% (i.e., between 6 and 7 marks).
- 23 or 20% students received a mark of less than 40% (i.e., 5 marks or fewer), which is much higher than 8.7% and 12.5% during the last two years.

Overall, the students’ performance in this question is largely in line with the last year but the number of failing to pass 40% is much higher than the last year. Also the mistakes in calculation are higher than expected. Therefore this is an area needed to improve in teaching, exam paper setting, and advising the exam preparation for the next year.

Detailed Feedback to Question 3:

- Question a). Most students know how to solve the given problem and overall answer this question well. The most common mistake is that the calculation error with around 1/3 students. The second common mistake is without checking at the boundary strategies when deciding the best global strategies.
- Question b). Again most students know how to solve the given problem but about half of the students made various calculation mistakes, especially when changing Player 1 from as the leader to as a follower.

General Feedback to Question 4:

- 114 students took the exam and so answered this question.
- The average mark for this question is 51% (i.e., 7.6 marks out of 15), which is much better than 42% of the last year.
- 36 or 31.6% students received a 1st class mark of 70% or better (i.e., 10.5 marks or more), including that 8 students received the full marks. This is much higher than 17% of the 1st class marks in the last year.
- 24 or 21% students received a 2nd class mark between 50%-69% (i.e., between 7.5 and 10 marks).
• 12 or 10.5% students received a 3rd class mark between 40%-49% (i.e., between 6 and 7 marks).
• 42 or 36.7% students received a mark of less than 40% (i.e., 5 marks or fewer) and 10 students got zero marks (most empty answer). Although it is a little lower than 37.6% last year, the number is certainly still too high and so an area to be improved for the next year. Two possible reasons that so many students got 0 marks are 1) some students spent more time in other questions and left too little time for this question; 2) some students did not spend enough time to revise this part of materials.

General speaking, the students' performance in this question is much better than the last year, in particular much more students got the 1st class marks. Therefore this is a progress from the last year. However, despite such an improvement, this is certainly still an area needed to be improved in teaching, exam paper setting, and advising the exam preparation for the next year.

**Detailed Feedback to Question 4:**
• Question a). Most students answered this question well. The common mistake is incomplete answer to the question, such as only gave one error function rather than the required two or just provided the name of an error function but without any formula or detail.
• Question b). There are three sub-questions (i), (ii), and (iii). Sub-question (i) is best answered (around 2/3 students answered correctly), following by Sub-question (ii), and Sub-question (iii) is worst answered (only around 1/3 students answered correctly). So this is in line with the increasing difficult level among the three sub-questions. The main issue is that some students do not know the answers for sub-questions 1 and 2, and many students do not know the answers for sub-question 3.