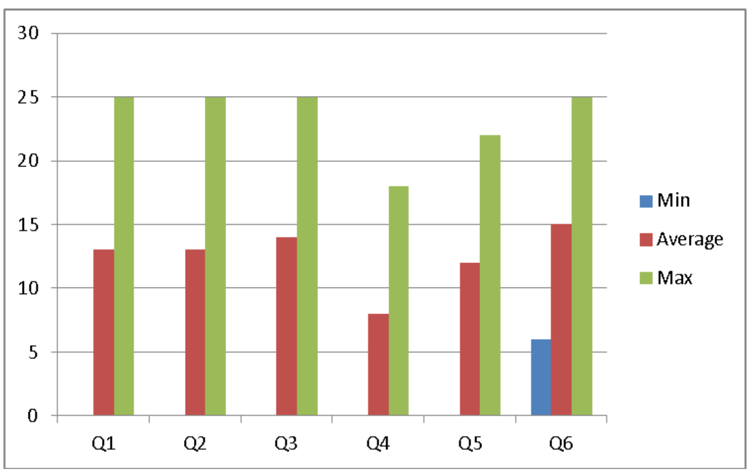
G51IAI Exam Feedback 2011/2012

Statistics for each question

	Q1	Q2	Q3	Q4	Q5	Q6	Overall
No. of students	124	107	90	29	77	91	131
Min	0	0	0	0	0	6	0
Max	25	25	25	18	22	25	99
Average	13	13	14	8	12	15	53

Most students have chosen questions 1 heuristic search, 2 game playing, 3 neural networks and 6 basics of search techniques, on which some received the full mark. On average, students performed the best on question 2 neural networks (average of 14%), which is better compared to previous years. Questions 4 and 5 AI basic I&II received the lowest average. The highest overall mark this year is 99%. The overall average of the class is 53%, lower compared to 59% in 2010/2011.

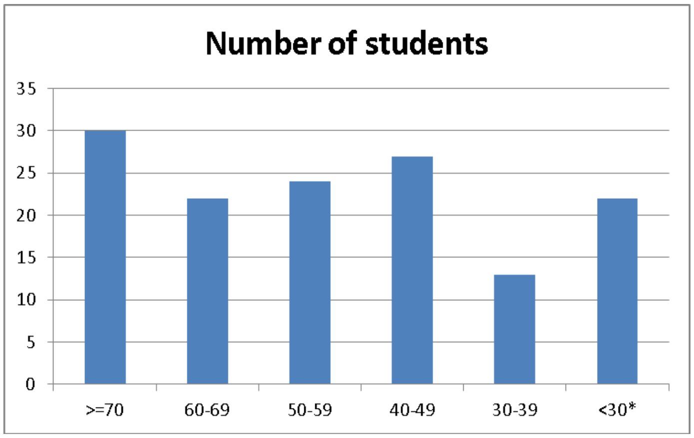


Statistics for marks

No. of students	30	22	24	27	13	22
Mark range	>=70	60-69	50-59	40-49	30-39	<30*

* 7 students have not taken the exam, thus received 0

The performance of students are very difference across the class this year. In total 28 students (plus 7 absent from the exam) failed the exam. On the other hand, 30 students performed excellent in the exam, received above 70%.



Feedback on each question, and suggestions for reassessment

Students are encouraged to have a look at the below feedback to G51IAI exam 2011/2012, also available at the module's web page http://www.cs.nott.ac.uk/~rxq/g51iai.htm. This will give you a rough idea of the average performance of 2011/2012 exam, and information of some common mistakes made by students in the exam.

The G51IAI reassessment exam will be at the same difficulty level, in the exact same format as the first sit paper, i.e. students should choose 4 out the 6 questions; each question accounts 25% of the mark. Questions could be based on either a specific part of the module, or mixed with sub-questions on different parts. The reassessment method will be the same, i.e. 100% on the exam. All content covered during the lectures may be assessed in the exam, so it's crucial that students carry out a good revision on all the lecture slides, and fully understand the techniques and basics covered. All lecture slides can be downloaded from the module's web page.

Question 1: Heuristic Search

(a). A* search.

Most students provided the correct search tree. However, some students failed to indicate the correct route. They are confused with the correct route (the final solution) with the list of nodes that are expanded (solutions explored during the search). Some students don't understand how to calculate g(n) correctly. Instead of calculating the total cost for the current node, some students only consider the sole cost of the current node.

Suggestion: study the basic of A* to fully understand how it works; go through the animation of the lecture slides; try to run A* on different examples.

(b). A* basics: admissible

i) Most students can define one admissible heuristic. Some students either provide a wrong admissible heuristic or reiterate the same heuristic in different words for the second admissible heuristic. A few students did not attempt to answer this question.

ii) The majority of students can define “admissible” and receive most of the mark for this question.

iii) A few students failed to differentiate which heuristics described in (i) is better. Some students seemed to be confused with the question and provide the answer in a broad sense such as heuristics are better than complete search (BFS, DFS).

Suggestion: go through the definition of admissible; try to design different heuristics for examples provided in the lectures.

Question 2: Game Playing

(a). Nim.

More than half of the class could draw the search tree for Nim; however sometimes students missed some branches. In calculating the utility value, many students provided wrong values for parts of the states.

Suggestion: fully understand the example of Nim in the lectures; try to build the search tree for a variant of the game.

(b). alpha-beta pruning

Only a few students succeeded to clearly show how the alpha-beta pruning algorithm works. More than half of class only generally knew how it works. Some common problems include: 1) didn’t know to mark who plays first (i.e. MAX/MIN) on the tree, because it would result into different searching process. 2) confused with alpha-cut and beta-cut.

Suggestion: fully understand the example in the lectures; try a different example to know how alpha-beta pruning works.

(c). history of game playing.

This is knowledge of game playing history, more than half of class received full marks.

Question 3: Neural Networks

(a). learning by using a perceptron

The majority of students understood the concept perception and received full marks. Some key points need to be provided in a correct answer: a figure is needed to show that it is (not) possible to draw straight lines to separate different groups; students need to tell if the function is **linearly separable**.

Suggestion: fully understand the concept of linearly separable.

(b). implement a logical function, i.e. XOR, OR, AND, etc.

Many students gave up this question. A few students not only present a valid network, but also demonstrate how it’s built by using a truth table.

Suggestion: fully understand how the basic logic function is implemented using a perceptron. There are different settings using the perceptron to implement a function. Any valid perceptron would be awarded the corresponding mark.

(c). complete the perceptron to implement a given function.

More than half of the class received full marks in calculating the weights to implement the AND function, showing they have understand how perceptrons work. There are many different combinations of weights, providing one valid combination is sufficient to receive the corresponding mark.

Suggestion: fully understand how a neuron (perceptron) works.

(d). learning rate.

Most of the students could provide the key statement where the learning rate affects the learning process for training an ANN. However, some students failed to receive full marks by discussing in details **how** it affects the learning, i.e. under the condition that the learning rate is too high or too low.

Question 4: AI Basics I

(a). definition of AI

Many students are able to provide the correct four categories of AI definitions. However, they are not able to categorize the weak AI and strong AI correctly. Moreover, some students failed to provide the statement why AI is difficult to define.

Suggestion: review the corresponding section of the AIMA textbook.

(b). decision tree

The majority of the class answered this question correctly. However, a few students seemed to be confused on how the decision tree works. They provide wrong decision trees with wrong edges and nodes.

Suggestion: review the decision tree section of the lecture slides; fully understand how to build a decision tree based on given rules, and vice versa.

(c). knowledge representation

Many students seem to be confused on what are the four representation types in Knowledge Representation. Most students do not even attempt to answer this question. Only a few students can provide the correct answer.

(d). ANN learning algorithm

Most students can provide the correct pseudo-code of the learning algorithm in neural network. However, a few students did not write anything down for this question.

Question 5: AI Basics II

(a). prove by resolution

Most students lost their marks. The suggested correct answer includes two steps. The first step is to put each hypothesis in conjunctive normal form (CNF). The second step uses resolution to derive the conclusion.

Suggestion: go through the lecture slides; fully understand the basics of CNF by studying the examples given in the slides.

(b)-(c). Memorizing questions, half of the class obtained full marks.

(d). hierarchical frames

Most of the students only lost a few marks. One should know that “cars” is a subclass of “things” and VW is a subclass of “cars”.

(e). basics of DFS and BFS

Most students earned full marks.

Question 6: Basics of Search Techniques

(a). define 8-puzzle as a search problem

Most students received full marks.

Suggestion: review the basic definition of states, operators, etc. in search techniques; try to define different examples given in lectures

(b). operators in search problems

Many students attempted to answer this question, however, only a few received full marks. When considering the definition of operators for the 8-puzzle, 8-Queen or other problems, students have to follow the rules of the games. The operators are designed to play games but not to create new rules. For example, for the 8-puzzle problem, one can slide the empty tile to a valid place or slide tiles next to the empty position into the empty position. For the 8-queen problem, one can either add one more queen to the left-most and upper-most feasible positions or add one more queen to any possible position.

Suggestion: understand the role of operator in search techniques; understand the consequence of the operator in building the corresponding tree.

(c). evaluation search techniques

Students performed well on this question. Most of them obtained full marks. However, a few students didn't know the four evaluation criteria for search techniques, i.e. optimality, completeness, time complexity and space complexity. For question c.iii, one was expected to quantify the time complexity and space complexity.

Suggestion: remember the four evaluation criteria for search techniques; understand how the time and space complexity are obtained. Students are not required to prove the complexity.

(d). definition of combinatorial explosion

Most students could explain clearly the meaning of combinatorial explosion and know the size of possible solutions for travelling salesman problem is n! (n factorial), given n as the number of elements in the problem (cities in TSP). However, many of them couldn't provide a correct search tree. Note that the search tree of the travelling salesman problem is not a binary tree (assuming that $n>3$).

Suggestion: review lecture slides on the basics of combinatorial explosion by using the examples provided in the lectures.