Formative Assessment - Practice Exam (Groups 7-12)

Started: 4 Oct at 9:52

Quiz instructions

Practice Exam

Department of Computer Science
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Time Restricted Exam: You have 120 minutes to complete the exam. You will not be required to upload any files.

Please ensure you have read and understood the examination instructions below before you start this exam:

Examination Instructions (docx) (https://onlinestudy.york.ac.uk/courses/1284/files/411700?wrap=1)
(https://onlinestudy.york.ac.uk/courses/1284/files/411700/download?download_frd=1)

Read before starting:

1. Once you start the exam, you must complete it within the allocated time. You cannot return to it once the allocated time runs out.
2. You must answer **all** questions.
3. This is an open book examination, which means that you may access academic resources.
4. You are responsible for time-keeping during your exam attempt: we recommend that you use a third-party time-keeping device to manage your time.
5. We recommend using a computer and a reliable internet connection.
6. In the event of connection failure which adversely affects your ability to take the exam, we would recommend capturing evidence.
7. If you experience any technical difficulties when taking the exam, we advise you to contact Canvas support on **support@instructure.com (mailto:support@instructure.com)** or +44 80 0060 8442 (available 24hrs).

Guidance for taking the mock exam:

1. The examination instructions (attached above) are the same as those that you will be given for the summative exam, plus any 'sit as if for the first time' or reassessment exams that you are eligible to sit on this module. **Please ensure you have read and understood these instructions in advance of starting the summative exam**.

2. Please note that late submissions, exceptional circumstances and release of marks DO NOT apply to the practice exam.

Question 1

0 pts

In many practical applications of artificial intelligence, it is possible for people to be harmed or even killed by a deployed AI system. Depending on the application, there can also be financial losses or damage to property. Suppose you are designing an autonomous robot to deliver medical supplies around a hospital building. The robot will share the corridors and lifts of the building with many other users (for example patients, medical staff, and trolleys). Identify one ethical and/or legal issue for delivery robots, and reflect critically on the following questions:

1. How important is the ethical and/or legal issue that you chose? For example, could it prevent the deployment of an AI system, or cause significant harm or loss when an AI system is deployed?
2. Are there potential solutions to the ethical and/or legal issue? How plausible are the potential solutions?

There is no need to include references in your answer.
Your answer is limited to 250 words. Any part of your answer beyond the word limit will not be marked.

Edit View Insert Format Tools Table

12pt Paragraph

could cause significant loss in the form of injuries or damage to property. This issue puts others' lives at risk and also exposes hospitals and manufacturers to significant legal liabilities and financial penalties. Additionally, if such an incident were to occur it could result in the AI system being banned, preventing its future deployment.

One potential solution includes testing and quality control during the development stage. This can be achieved by implementing advanced sensor and obstacle avoidance systems and following recommended guidelines and regulations for robot behavior in shared spaces. Additionally, while the system

p

239 words

Question 2

0 pts

A FIFO (first-in-first-out) queue is used to store the frontier set of which search algorithm?

- ◯ Depth-First Depth-Limited Search
- ◯ Graph Search
- ◯ Depth-First Search
- ◯ Tree Search
- ◯ A* Search
- ◯ Greedy Best-First Search
- ◯ Iterative Deepening
- ◯ Breadth-First Search

Question 3

0 pts

Which of the following search algorithms require a priority queue to store the frontier set? Select **two** algorithms.

- ☐ Graph Search
- ☐ Depth-First Depth-Limited Search
- ☐ Breadth-First Search
- ☐ Iterative Deepening
- ☐ Depth-First Search
- ☐ A* Search
- ☐ Tree Search
- ☐ Greedy Best-First Search

Question 4

0 pts

Suppose you are applying the Tree Search version of Greedy Best-First Search to a search problem. Using an **admissible** heuristic would guarantee:

- ◯ Consistency of the heuristic.
- ◯ None of the above.
- ◯ Termination whenever the set of states is finite.
- ◯ Optimality of the first solution found.

Question 5

0 pts

Give the time and space complexity of the Tree Search version of Depth-First Search (DFS), in terms of the branching factor *b* and the maximum depth *m* of the search tree.

Write your answer using big-O notation, and if you need to use powers then write them in TeX notation. For example, n squared would be written as n^2. If the algorithm has worst-case complexity n squared, it would be written as O(n^2).

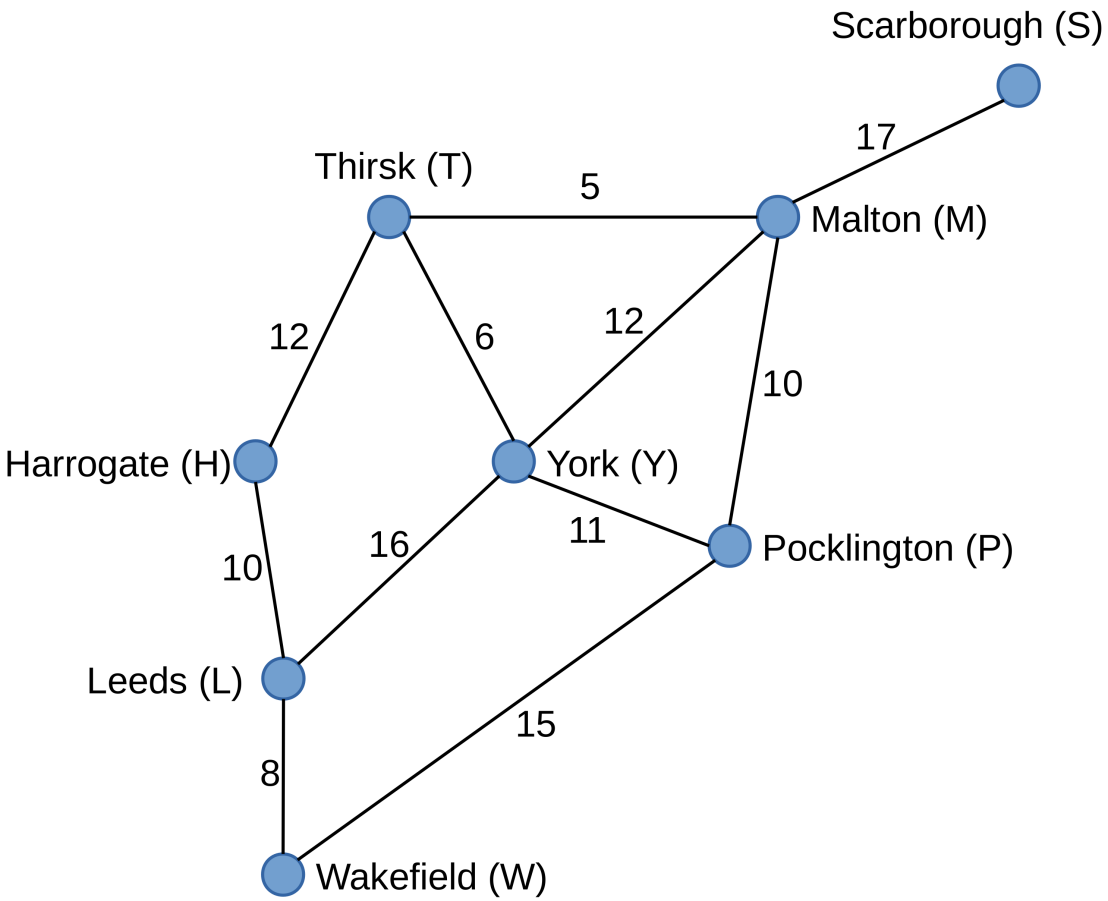
Time complexity:

Space complexity:

Question 6

0 pts

Consider the following map where each connection between two cities is labelled with the distance by road.



The following table contains the distance by road between each pair of cities that are connected by a road.

City 1	City 2	Distance by road
Malton	Scarborough	17
Thirsk	Malton	5
York	Malton	12
Pocklington	Malton	10
Thirsk	York	6
York	Pocklington	11
Thirsk	Harrogate	12
Harrogate	Leeds	10
York	Leeds	16
Pocklington	Wakefield	15
Leeds	Wakefield	8

In addition to the map and table above, the following table contains the Euclidean (straight line) distances from all other cities to Pocklington.

City	Euclidean distance to Pocklington
Scarborough	19
Malton	10
York	8
Thirsk	12
Harrogate	20
Leeds	17
Wakefield	12

This question is about applying the Graph Search version of **Greedy Best-First Search (GBFS)** to find a path from Harrogate to Pocklington. One step of the algorithm consists of selecting a node from the frontier, potentially expanding it and adding any relevant child nodes to the frontier.

The initial frontier will contain only Harrogate (H). Execute GBFS for 4 steps. For each step, specify which node is chosen to be expanded, and give the new frontier as a sequence of states (represented by letters) **in alphabetical order**. For example, **W** is expanded and the new frontier set is **LP**.

Step 1

Node selected:

New frontier in alphabetical order:

Step 2

Node selected:

New frontier in alphabetical order:

Step 3

Node selected:

New frontier in alphabetical order:

Step 4

Node selected:

New frontier in alphabetical order:

Question 7

0 pts

What is the meaning of this symbol: ⊨

- ◯ Inference
- ◯ Sentence
- ◯ Entailment
- ◯ Knowledge base
- ◯ Negation

Question 8

0 pts

What is the meaning of this symbol: ¬

- ◯ Knowledge base
- ◯ Inference
- ◯ Sentence
- ◯ Negation
- ◯ Entailment

Question 9

0 pts

In propositional logic, suppose there are five proposition symbols A, B, C, D, E. How many models are there?

Question 10

0 pts

In propositional logic, using four proposition symbols A, B, C, D, how many models are there of the formula $B \wedge \neg D$? Or, to put it another way, how many models satisfy $B \wedge \neg D$?

Question 11

0 pts

In propositional logic, using four proposition symbols A, B, C, D, how many models are there of the formula $C \vee A \vee \neg C$? Or, to put it another way, how many models satisfy $C \vee A \vee \neg C$?

Question 12

0 pts

In propositional logic, using four proposition symbols A, B, C, D, how many models are there of the formula $A \wedge B \wedge \neg A$? Or, to put it another way, how many models satisfy $A \wedge B \wedge \neg A$?

Question 13

0 pts

Suppose we have two sentences S_1, S_2 in propositional logic, and suppose $S_1 \models S_2$ and $S_2 \models S_1$. Which of the following statements are true?

1. A sound inference algorithm **will** infer S_1 from S_2.
2. A sound inference algorithm **may** infer S_1 from S_2.
3. A sound inference algorithm **will not** infer S_1 from S_2.
4. A sound inference algorithm **will** infer S_2 from S_1.
5. A sound inference algorithm **may** infer S_2 from S_1.
6. A sound inference algorithm **will not** infer S_2 from S_1.

- ◯ 2 and 5.
- ◯ Only 2.
- ◯ Only 3.
- ◯ 3 and 6.
- ◯ 1 and 5.
- ◯ 3 and 4.
- ◯ 3 and 5.
- ◯ 1 and 6.
- ◯ 1 and 4.
- ◯ Only 4.
- ◯ 2 and 6.
- ◯ Only 1.
- ◯ Only 5.
- ◯ 2 and 4.
- ◯ Only 6.

Question 14

0 pts

Consider the following logical statement:

If the battery is OK, and the screen is not cracked, then the phone works.

Suppose we have the following three proposition symbols:

B: The battery is OK.

S: The screen is cracked.

W: The phone works.

Write the logical statement in propositional logic using the three proposition symbols B, S, and W. It should be written as a clause in conjunctive normal form. Use a minus sign for negation (for example, -A means the negation of A). Write disjunction ('or') using the letter 'v'. For example, the clause $\neg B \vee \neg S$ would be written as -Bv-S.

Question 15

0 pts

Consider the following three sentences in propositional logic.

1. $A \vee B$
2. $A \vee \neg B$
3. $A \vee B \vee \neg C$

Apply **one step** of the WalkSAT algorithm with the following assumptions:

- The probability *p* of making a random walk move is set to 0.
- The starting assignment is A=false, B=false, C=true.
- The algorithm chooses clause 3.

For each proposition symbol in clause 3, how many clauses would be satisfied in total if the symbol were flipped?

A:

B:

C:

Which proposition symbol is flipped?

Saved at 10:02 Submit