

<b>1. Module number</b>	<i>SET09122/SET09822</i>
<b>2. Module title</b>	<i>Artificial Intelligence</i>
<b>3. Module leader</b>	<i>Ben Paechter</i>
<b>4. Tutor with responsibility for this Assessment</b> Student's first point of contact	<i>Ben Paechter</i>
<b>5. Assessment</b>	<i>Report</i>
<b>6. Weighting</b>	<i>60% of overall module total:</i>
<b>7. Size and/or time limits for assessment</b>	<i>None</i>
<b>8. Deadline of submission</b> Your attention is drawn to the penalties for late submission	11.00pm 26 November 2021 – Hand in on Moodle
<b>9. Arrangements for submission</b>	Moodle

<b>10. Assessment Regulations</b> All assessments are subject to the University Regulations.	
<b>11. The requirements for the assessment</b>	<i>Please see document below</i>
<b>12. Special instructions</b>	<i>See document below</i>
<b>13. Return of work</b>	<i>within 3 weeks of submission.</i>
<b>14. Assessment criteria</b>	<i>See attached document</i>  <i>Normal academic conventions for acknowledging sources should be followed.</i>

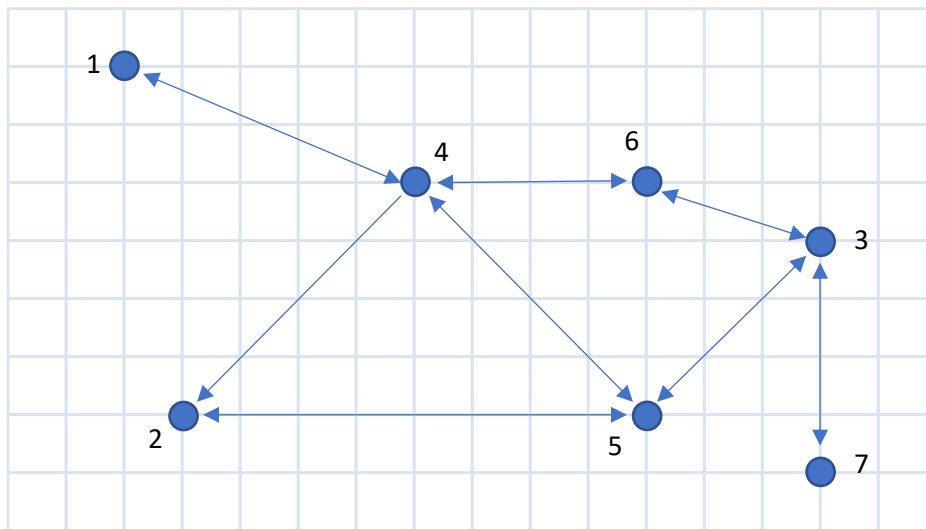
## Artificial Intelligence

### Coursework B

#### Caverns Routing Application

A robot has to navigate through a series of small underground caverns connected by straight tunnels. Some tunnels can only be navigated in one direction. The robot is given a map of the caverns and tunnels which is given as the coordinates of the centre of each cavern, plus a binary matrix showing which caverns can be reached from which other caverns.

For example, the following map:



is represented by the following coordinates for caverns:

(2,8) (3,2) (14,5) (7,6) (11,2) (11,6) (14,1)

and the following matrix to showing the connections:

From		To						
		1	2	3	4	5	6	7
1	0	0	0	1	0	0	0	0
2	0	0	0	1	1	0	0	0
3	0	0	0	0	1	1	1	1
4	1	0	0	0	1	1	0	0
5	0	1	1	1	0	0	0	0
6	0	0	1	1	0	0	0	0
7	0	0	1	0	0	0	0	0

The connection matrix is given in the same order as the coordinates.

The task of the robot is always to navigate from the first cavern in the list to the last cavern in the list – or to identify that the route isn't possible. Finding a shorter route is better.

The distance between any two caverns is the Euclidean distance between the two coordinates:

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

## What to do:

- (a) Describe how you would implement a solution to this problem in a programming language of your choice. You should start by **naming** and **describing in detail** the algorithm that you would use and **why** you chose that algorithm – i.e. why it is more suitable than other algorithms for solving this particular problem.

### Additional Marking Information:

Mark will be given for the choice of algorithm depending on its appropriateness for the particular problem.

Marks will be given for diagrams which help understand the text, and particularly where the diagram is directly relevant to the problem being solved. You can use diagrams from the web, but these will not attract as many marks if they are not directly relevant to your text and the problem. They will receive no marks if not attributed.

You will receive extra marks if your explanation uses the cave map above to demonstrate how the algorithm works.

You can include pseudo-code to enhance your answer, but should ensure that this is written to be relevant to the specific problem being solved (rather than generic pseudocode taken unaltered from the web).

### (30 Marks – Word limit 1500)

- (b) If the problem were to change so that instead of finding the shortest route you needed to find the lowest cost route, with the cost of each path between caverns specified as part of the problem (and possibly different if in different directions) – and is no-longer related to the distance travelled, explain how this might affect your choice of algorithm and identify any difficulties that might occur in this situation.

### Additional Marking Information:

Marks will be awarded for showing understanding of the implication of the change and for demonstrating insight into changes that might be made.

### (10 Marks – Word limit 500)

- (c) Research two other algorithms (not necessarily from the module material) which could be used for solving this problem, **Name** and **describe** them, **specifying in particular the ways in which they differ from the algorithm used in (a)**. **Comparatively evaluate** each of the two algorithms against the algorithm described in (a) for solving the specified caverns problem.

### Additional Marking Information:

Marks will be given for choosing appropriate alternative algorithms which could solve the problem – but these do not need to be specifically good for solving the problem. Marks will be given for the quality of the algorithm description and accurately identifying the differences from the algorithm given in (a). Marks will be given for the quality and depth of the comparative evaluation.

### (20 Marks – Word limit 1000)

**What to hand in on Moodle:**

A single pdf file containing your answers to the questions

**Deadline:** 11pm, 26 November 2021 on Moodle.