

Past-paper walk-through

Artificial Intelligence (AI) ■ 18.1

eXercise

Questions in this set

- 9618/31 N25 Q7 ■ 6 marks
- 9618/32 N25 Q9 ■ 6 marks
- 9618/12 J25 Q3 ■ 12 marks
- 9618/32 J25 Q6 ■ 6 marks
- 9618/33 J25 Q10 ■ 6 marks
- 9618/11 N24 Q6 ■ 4 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 7

9618/31 N25 ■ Q7 ■ 6 marks

Identify one Artificial Intelligence (AI) algorithm to find the shortest distance between two points on a graph.

- (a)** Identify one Artificial Intelligence (AI) algorithm to find the shortest distance between two points on a graph. [1]
- (b)** Describe Deep Learning. [5]

Solution 7

(a) Mark scheme

- One from:
 - A* algorithm
 - Dijkstra's algorithm
- 1
- A
- BC
- A
- BC

Solution 7

(b) Mark scheme

- One mark for each mark point (Max 5)
- MP1
- Deep learning is a branch of machine learning
- MP2
- It makes use of artificial neural networks
- MP3
- ... to work in a similar manner to the human/biological brain // ... neural networks can be trained to process data

Solution 7

- MP4
- It is a structure consisting of many interconnected layers
- MP5
- ... input, hidden and output // the input layer feeds the first hidden layer, the last hidden layer feeds the output
- MP6
- ... gradually breaking down and analysing the data to find (hidden) patterns
- MP7
- Deep learning's feature extraction/learning involves how to detect features/categories from data
- MP8

Solution 7

- ... and can involve different types of supervision
- MP9
- It works well with large data sets
- MP10
- Deep learning uses back propagation of errors to adjust parameters/weightings to refine its results / improve its accuracy.

Question 9

9618/32 N25 ■ Q9 ■ 6 marks

- (a)(i) State **one** example where Deep Learning is used. [1]
- (a)(ii) Identify how Deep Learning can be made more effective. [1]
- (b) Describe the back propagation of errors method in Machine Learning. [4]

Solution 9

(a)(i) Mark scheme

- One from:
- e.g.
 - ■ Virtual assistants // AI Agents
 - ■ Chatbots
 - ■ Composing music
 - ■ Self-driving cars
 - ■ Natural language processing
 - ■ Fraud detection

Solution 9

- ■ Image colouring // photograph enhancement
- ■ Visual/Image recognition/facial recognition
- ■ Text mining
- ■ Computer assisted translation
- ■ Large language models (LLMs)
- ■ Playing chess
- ■ Grading student exams
- ■ Weather forecasting

Solution 9

(a)(ii)

Mark scheme

- Use / introduce more hidden layers
- 1
- October/November
- 2025

Solution 9

(b) Mark scheme

- One mark per mark point (Max 4)
- MP1
- Initial outputs are compared to expected outputs
- MP2
- ... weightings are adjusted to minimise the difference between actual and expected outputs
- MP3
- Calculus is used to find the error gradient in the obtained outputs

Solution 9

- MP4
- ... the results are fed back into the neural network
- MP5
- ... weightings of each neuron / node are adjusted as a result of the feedback
- MP6
- ... the process repeats until results are more accurate

Question 3

9618/12 J25 ■ Q3 ■ 12 marks

A computer program uses a digital camera to read the words on an item. The program can read the words that are written on the item, translate the words to a chosen language and then output the words as audio. For example, when used in a supermarket, the program can output the words written on the labels on products. The program uses Artificial Intelligence (AI).

(a) Explain how AI is used in the computer program described. [4]

(b) State **two** social benefits of the use of AI in the computer program described.

1. 2. [2]

(c)(i) Describe the features of a commercial software licence. [3]

(c)(ii) Explain the reasons why an open source software licence might not be appropriate for the computer program described. [3]

Solution 3

(a) Mark scheme

- 1 mark each to max 4 e.g.
- ■ Uses image recognition // optical character recognition
- ■ to analyse a photograph/pixels to identify the location of characters within an image
- ■ in order to convert the pattern of pixels into individual characters
- ■ Uses natural language
- ■ to combine the characters into words

Solution 3

- ■ and compare the words to database to identify a match in the language of the writing
- ■ it may also predict what is missing / incomplete / from what has been read
- ■ then compare the words to a database of the user's chosen language to find a match and translate
- ■ Uses text-to-speech
- ■ to generate the audio waveforms corresponding to the words

Solution 3

(b)

Mark scheme

- 1 mark each to max 2 e.g.
- ■ It can help people with visual impairment to identify which products to purchase
- ■ It can help people who cannot understand the language
- ■ It can help to overcome learning / reading difficulties

Solution 3

(c)(i) Mark scheme

- 1 mark each to max 3
- ■ The program is usually sold for a fee
- ■ Users have no access to source code
- ■ It protects the intellectual rights of the programmer / developer
- ■ Users cannot legally alter or share the program
- ■ There are limitations on the use of the software e.g. number of times it can be installed
- ■ Support and maintenance is usually provided e.g. updates, bug fixes etc.

Solution 3

(c)(ii)

Mark scheme

- 1 mark each to max 3 e.g.
 - The source code would be accessible therefore it could be changed
 - which might lead to the program outputting an incorrect response
 - so people could purchase the wrong item
 - which might have serious consequences // by example e.g. allergies

Question 6

9618/32 J25 ■ Q6 ■ 6 marks

- (a)** Describe the structure of a graph as used in an Artificial Intelligence (AI) system. **[2]**
- (b)** Explain how supervised learning and unsupervised learning differ from each other. **[4]**

Solution 6

(a) Mark scheme

- One mark per point (Max 2)
- MP1
- A graph uses vertices/nodes to identify/represent entities such as destinations, people, etc
- MP2
- Edges are used to connect nodes and can represent possible paths between them
// a path is the list of nodes connected by edges between two given nodes
- MP3

Solution 6

- Nodes/edges can be labelled/weighted, and this is a weighting that can be applied and used in the context of the application
- MP4
- A cycle is a list of nodes that return to the same node.

Solution 6

(b) Mark scheme

- One mark per mark point (Max 4)
- MP1
- Supervised learning uses labelled data // Unsupervised learning makes use of unlabelled data.
- MP2
- Labelled data means that known outcomes are applied to specific inputs to help the AI predict outcomes.
- MP3

Solution 6

- Supervised learning requires initial human input/training //
- Unsupervised learning does not require human input/training.
- MP4
- With unlabelled data in unsupervised learning, outcomes are not known
- MP5
- ... the AI has to search for hidden patterns/structures/clusters
- MP6
- ... within the data in order to predict outcomes.

Question 10

9618/33 J25 ■ Q10 ■ 6 marks

- (a)** State the purpose of the A^* and Dijkstra's algorithms. [1]
- (b)** Outline the difference between the A^* and Dijkstra's algorithms. [2]
- (c)** Explain how unsupervised learning takes place in machine learning. [3]

Solution 10

(a)

Mark scheme

- To find the path between two points on a graph using the algorithm.

Solution 10

(b) Mark scheme

- One mark per point (Max 2)
- MP1
- A* tries to find a better path (between two points) by using a heuristic function
// A* finds the adjacent route with the shortest path and continues this until the destination is reached
- MP2
- ... Dijkstra's just explores all possible routes.
- MP3

Solution 10

- The heuristic function on the A^* algorithm gives priority to nodes that are supposed to be better than others / less costly than others.
- MP4
- Dijkstra's algorithm cannot work with negative values/weights // A^* algorithm can work with negative values/weights.

Solution 10

(c) Mark scheme

- One mark for each mark point (Max 3)
- MP1
- Unsupervised learning uses algorithms to analyse / cluster
- MP2
- ... unlabelled data sets
- MP3
- They discover hidden patterns / data groupings / clusters without the need for human intervention.

Solution 10

- MP4
- It is able to discover similarities and differences in data / information.

Question 6

9618/11 N24 ■ Q6 ■ 4 marks

A car park system uses a camera to record the registration number of each car as it enters and leaves the car park.

Explain how artificial intelligence is used in the car park system to identify the car's registration number.

[4]

Solution 6

1 mark for each bullet point (max 4)

e.g.

- It uses image recognition
- The pixels of each image from the camera are stored
- ...and matched to the expected shape/size/colour of registration number
- It uses optical character recognition
- The pixels within the registration number area identified are analysed
- ...and compared to expected characters/letters/numbers