Chapter 22: Artificial Intelligence (AI): Answers to coursebook questions

Exam-style Questions

1

Content of the ShortestPath set	Content of the record					
{}	A	B	C	D	E	F
	0	∞	∞	∞	∞	∞
{A}	A	B	C	D	E	F
	0	10	∞	∞	∞	25
	A	A-B				A-F
{AB}	A	B	C	D	E	F
			60	∞	∞	15
			A-B-C			A-B-F
{ABF}	A	B	C	D	E	F
					30	
					A-B-F-E	
{ABEF}	A	B	C	D	E	F
				38		
				A-B-F-E-D		
{ABDEF}	A	B	C	D	E	F
			40			
			A-B-F-E-D-C			
{ABCDEF}	A	B	C	D	E	F

1 mark for each of the final distance values for B, C, D, E, F; 1 mark for the ShortestPath set column and 1 mark for the paths.

Note that there is a ShortestPath defined from A to each of the other nodes.

2 a

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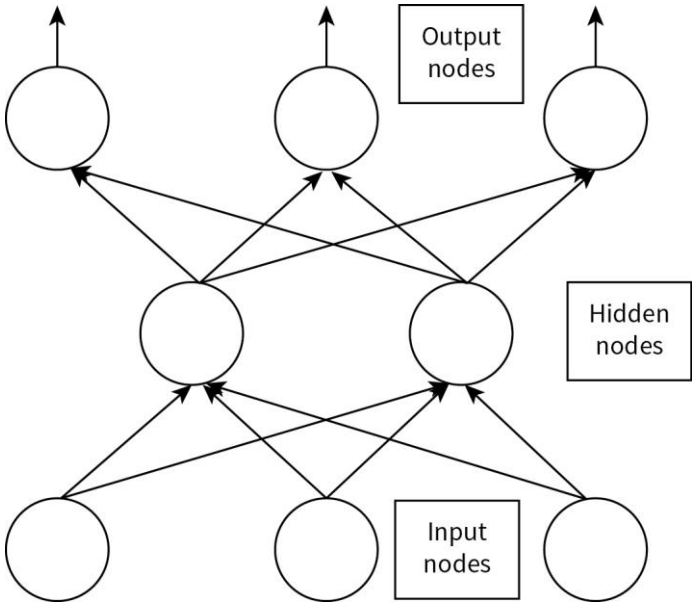

The arrows represent data being transferred (1). All nodes except the input nodes receive data from more than one node (1). There can be several layers of hidden nodes (1). The nodes that receive input from more than one other node apply a weighting to each input (1). The weighted values are summed (1) and the sum is used to calculate an output using an activation function (1). (Max 5)

b There must be some actual data available for checking the output from the system (1). The aim is to adjust all variable parameters to get the best match with the real data (1). In back propagation of errors this begins with the parameters used by the output nodes (1). Then, the same happens successively backwards starting from the topmost layer of hidden nodes (1) and finishing with the input nodes (1). (Max 4)

3 a 1 mark each for any of the following up to a maximum of 3: In machine learning a system has a task or tasks to perform (1) for which the level of success can be judged (1). Depending on the level of success the system can adjust its methods (1) to improve its performance (1). The learning can be supervised or unsupervised (1).

1 mark each for any of the following up to a maximum of 3: An artificial neural network is modelled on how the human brain works (1), the system contains nodes that are artificial neurons (1), which can receive input from other nodes or from outside of the system (1) and can create an output (1) that depends on the inputs (1) and an activation function (1).

1 mark each for any of the following up to a maximum of 3: Deep learning is based on an artificial neural network (1) but one with many hidden layers (1) where the highest-level hidden layers (1) are responsible for more abstract processing (1) in an attempt to match the behaviour of the human brain (1).

b 1 mark each for any of the following up to a maximum of 2: The artificial neural network (1) can use back propagation of errors because of the layering of the nodes (1) so that parameters can be adjusted in a systematic way (1).

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