KEY TERM

Deep learning: where a system uses an artificial neural network with an exceptionally large number of hidden layers

Reflection Point:

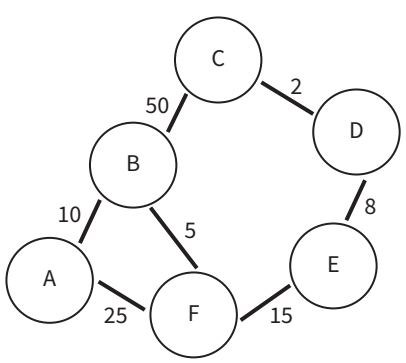
Could you create a hierarchical chart to show how the various approaches discussed in this chapter are related to each other?

Summary

- A graph can be constructed from nodes and edges where the edges carry numerical value labels.
- Algorithms are available to find the shortest path between two nodes in a graph.
- Machine learning can be supervised or unsupervised.
- Regression analysis involves finding a mathematical equation which is a best fit to sample data.
- Artificial neural networks are modelled using nodes which receive input and provide output.
- Back propagation of errors can be used for machine learning using artificial neural networks.

Exam-style Questions

1 The diagram below shows a graph representing the cost of journeys between railway stations identified by A, B, C, D, E and F.



Dijkstra's algorithm is to be used to find the total cost for journeys from station A to each of the other stations. A record structure is to be used to store for each station the cost for the travel so far and the list of stations so far visited in the order visited. Complete the table below to record the progress of the algorithm by identifying which nodes are in the ShortestPath set and what would be stored in the record at each step of the algorithm.

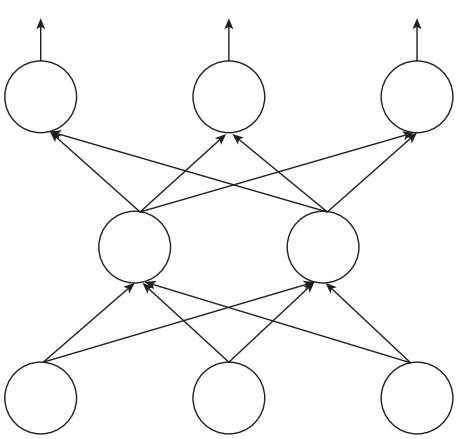
The first two rows of the table have been completed for you.

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
	A	B	C	D	E	F
	A	B	C	D	E	F
	A	B	C	D	E	F
	A	B	C	D	E	F
	A	B	C	D	E	F

[7]

2 The diagram below represents an artificial neural network.

a Give as full a description as you can of what the parts of the diagram represent. If you wish you can label the diagram then use the labels in your answer. [5]



b Identify the steps involved when a backward propagation of errors algorithm is used. [4]

3 **a** Give a brief explanation of each of the following terms:

Machine learning

Artificial neural network

Deep learning [9]

b Explain which approach uses back propagation of errors. [2]