

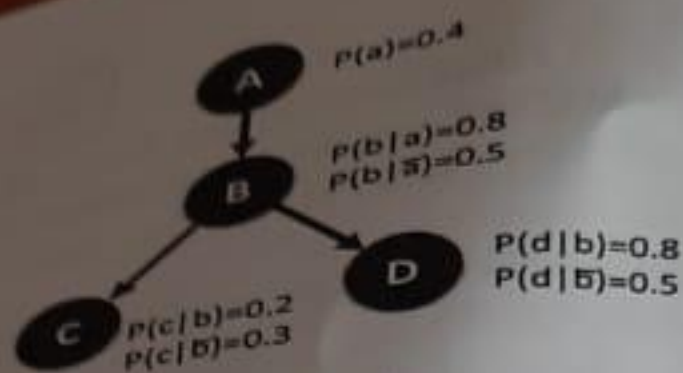


Fig. 2

Suppose a medical test for a certain disease is known to be 99% accurate in detecting the disease when it's present and it has a false positive rate of 5%. This disease is relatively rare, occurring in only 1% of the population. Now, assume that a person takes the test and it comes back positive. What is the probability that this person has the disease?

Suppose you are tasked with analyzing the relationship between the number of hours spent studying and the exam scores obtained by a group of students. You collect data from 30 students, recording the number of hours each student studied and their corresponding exam scores. After performing linear regression analysis, you obtain the following results:

Regression equation: Exam Score = $60 + 5 * \text{Hours Studied}$ Coefficient of determination (R-squared): 0.75. Now, using this information, answer the following questions:

Interpret the slope coefficient in the context of this problem.

- Calculate the predicted exam score for a student who studied for 8 hours.
- How much of the variability in exam scores can be explained by the number of hours studied?
- If a student didn't study at all (0 hours), what would be their predicted exam score?
- Can you conclude that there is a significant relationship between the number of hours studied and exam scores? Justify your answer.

8.(a)

Use K-Means Algorithm (Fig. 3) to create 3 clusters after third iteration, assume A(2, 2), C(1, 1) and E(1.5, 0.5) are the initial cluster centres. Use the Euclidean distance in the clustering technique.

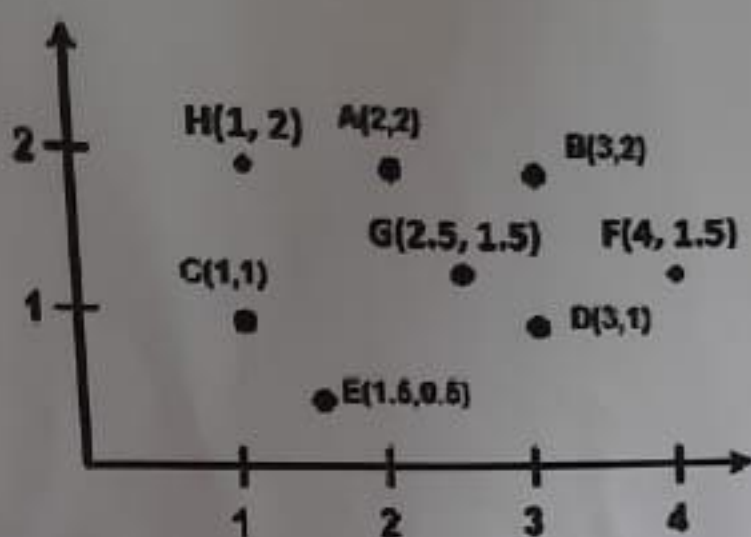


Fig. 3

OR

- 8.(b) There is a 5-dimensional data set. In order to train the machine learning network, dimension needs to be reduced. Explain how dimension reduction can be achieved in this case.

9. Using back-propagation network, find the new weights for the net shown in Fig. 4. It is presented with the input pattern $[0, 1]$ and the target output is 1. Use a learning rate $\alpha=0.25$ and logistic activation function.

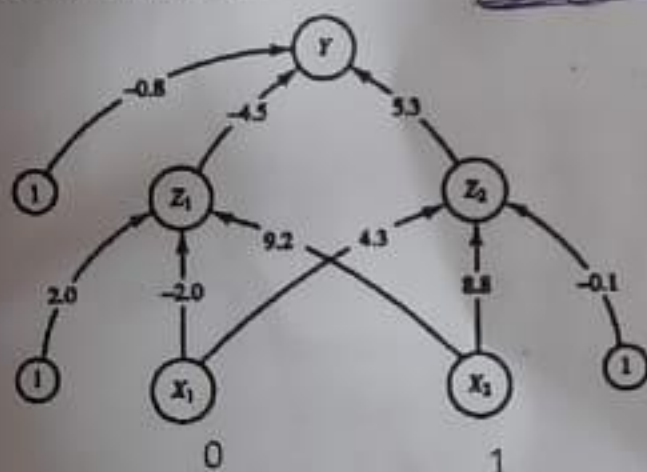


Fig.4

- 10.(a) Suppose we have a fully connected layer with 100 neurons and a previous layer with 256 neurons. If there's no bias term, how many parameters are there in this fully connected layer?

- You are training CNN for image classification. The input images have dimensions of $64 \times 64 \times 3$ (width x height x channels). After applying a convolutional layer with 16 filters of size 5×5 and a stride of 1, what are the dimensions of the output volume?
- In CNN what is the purpose of the activation function?

OR

- 10.(b) Write a note on recurrent neural network and also discuss how it differs from an ordinary CNN.

⇔⇔⇔ N/E/TX ⇔⇔⇔



- KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer ALL Questions

(10 X 10 = 100 Marks)

1. a) Define Artificial intelligence rationally as well as in accordance with human behavior.

b) Explain different types of environments. Demonstrate the types of environments for playing the puzzle SUDOKU.

2. a) Explain a uniform cost search algorithm / technique with an example. Describe the condition when the uniform cost search acts as a breadth-first search technique.

b) Compare the time complexity, space complexity, completeness and optimality conditions for different uninformed search techniques.

3. Determine whether the below argument is valid through resolution in propositional logic.

a) If a Police officer was able to and willing to prevent crime, he would do so.

b) If a Police officer was unable to prevent crime, he would be inefficient.

c) If he were unwilling to prevent crime, he would be malevolent.

d) A police officer does not prevent crime.

e) If a Police officer is not honest, he is either inefficient or malevolent.

Therefore, a Police officer is honest

4. Consider the Markov chain shown in Fig.1 where $R_1 = \{1,2\}$ and $R_2 = \{5,6,7\}$. Assuming $X_0 = 3$. Find the probability of the chain gets absorbed in R_1 .

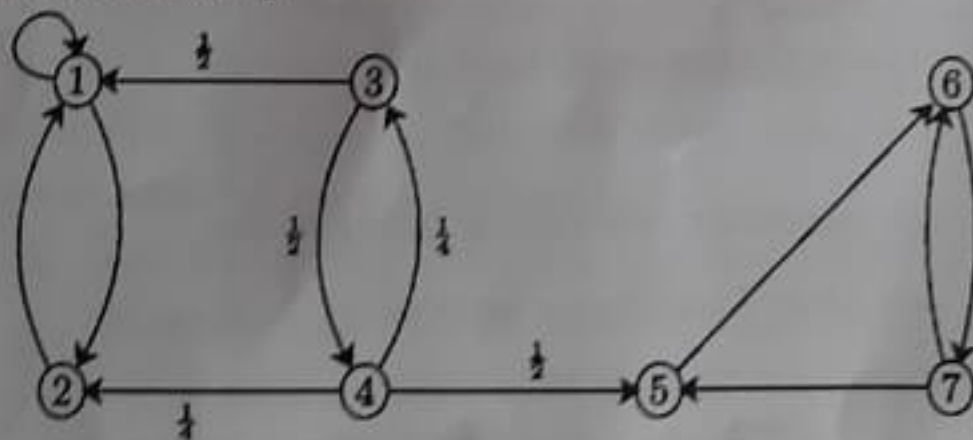


Fig.1

5. If a Bayesian network is provided as shown in the Fig. 2, with corresponding node CPTs (Conditional Probability Table), then find out the probability of 'A=true' provided 'D=true' and 'C=false'.