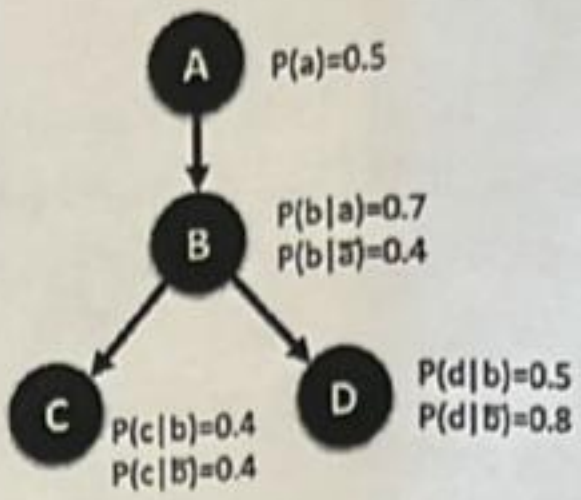

Figure 1

6. a) Describe the data cleaning in machine learning with example.
   b) Explain the characteristics that determine the quality of data in machine learning.

7. Apply K nearest neighbor classifier algorithm to predict the diabetic patient sugar for the given test sample BMI= 43.6, Age=40. The training samples are given in Table 1. Use Euclidean distance and K=3.

BMI	Age	Sugar
33.6	50	1
26.6	30	0
23.4	40	0
43.1	67	0
35.3	23	1
35.9	67	1
36.7	45	1
25.7	46	0
23.3	29	0
31	56	1

Table 1: Training samples of diabetic patients

8.(a) Cluster the following eight points with (x, y) representing locations into three clusters A_1 (2, 10), A_2 (2, 5), A_3 (8, 4), A_4 (5, 8), A_5 (7, 5), A_6 (6, 4), A_7 (1, 2), A_8 (4, 9). Initial cluster centers chosen arbitrarily are: A_1 (2, 10), A_4 (5, 8) and A_7 (4, 9). Use the k-means algorithm to find the three cluster centers after the third iteration. The distance function is the Euclidean distance.

OR

8.(b) Consider a training dataset of six data instances as shown in the Table 2. Use 4 Decision Stumps for each of the 4 attributes. Apply AdaBoost algorithm and Classify the dataset with 'Job Offer' as target attribute.

CGPA	Interactiveness	Practical Knowledge	Communication Skill	Job Profile
≥9	Yes	Good	Good	Yes
<9	No	Good	Moderate	Yes
≥9	No	Average	Moderate	No
<9	No	Average	Good	No
≥9	Yes	Good	Moderate	Yes
≥9	Yes	Good	Moderate	Yes

Table 2: Training dataset of Job offer

9. Using back-propagation network, find the new weights for the net shown in Figure 2. It is presented with the input pattern [0, 1] and the target output is 1. Use a learning rate $\alpha = 0.25$ and binary sigmoidal activation function.

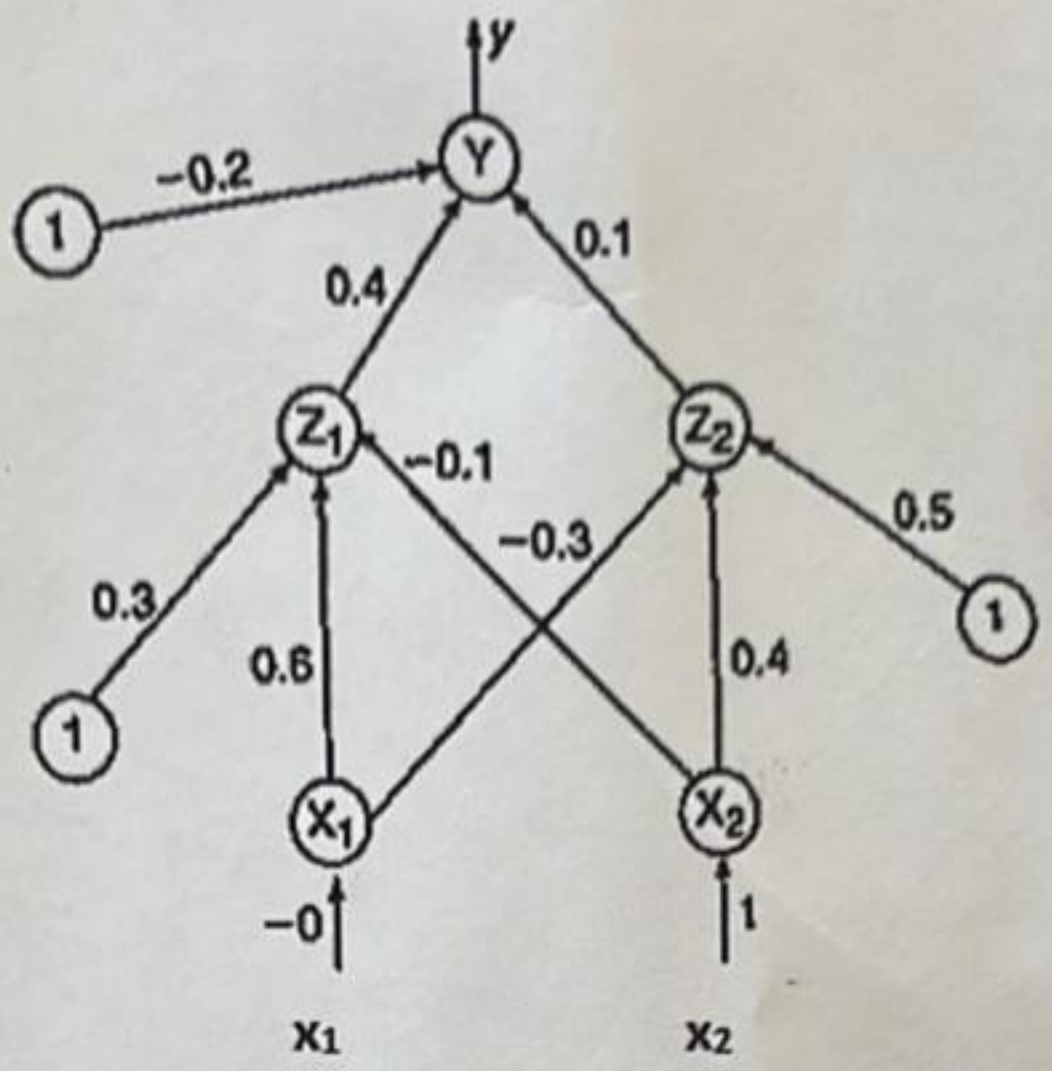

Figure 2

10.(a) Given input image (Figure 3), determine how big the output image size for case 1 and case 2. If the output image size is not equal to input image of case 1 and case 2, mathematically prove the condition to rectify the image for each cases.

Case 1: input image of size 7x7 and kernel of 3x3.

Case 2: input image of size 7x7, kernel of 3x3 and stride is 1.

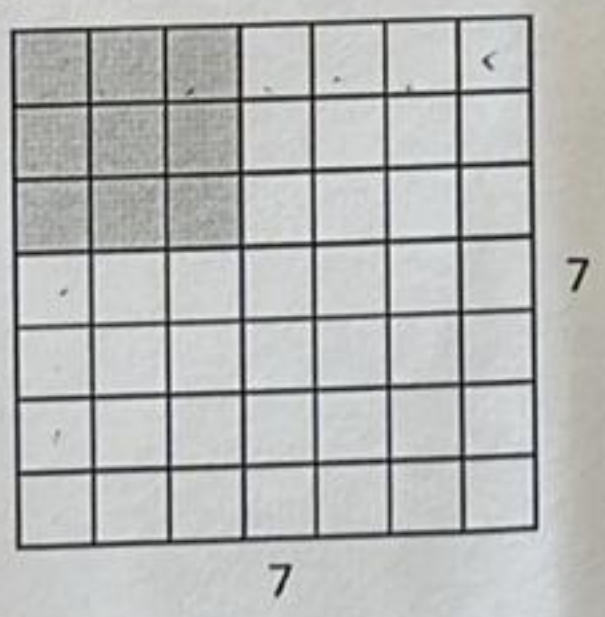

Figure 3

OR

10.(b) Explain the following:

i) Computational Graphs in Deep Learning and their types

ii) Kernel machines

⇔⇔⇔ M/E/TX⇔⇔⇔

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Final Assessment Test – May 2024

Course: **BECE309L - Artificial Intelligence and Machine Learning**

Class NBR(s): **1170 / 1172 / 1176 / 1178 / 1181** Slot: **C1+TC1**

Time: **Three Hours** Max. Marks: **100**

- **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) Explain the sudden rise or upsurge in demand of AI in the industry.

   b) Explain the PEAS description for the task environment. Provide the PEAS details for the following task environments:
   - i) Playing Tic-Tac-Toe
   - ii) Email spam detection
   - iii) Virtual assistants like Siri, Alexa
   - iv) Weather Prediction system
   - v) Traffic management

2. Develop a state space where the start state is number 1 and each state k has two successors: k!+1 and k! + 2. Draw the portion of the state space for states till 26 and list the order in which nodes will be visited for breadth-first search, depth-limited search with limit 3 and iterative deepening search.

3. Consider the following axioms:

   i) All cricketers play cricket.

   ii) Anyone who has a football will not have a bat.

   iii) Football players do not have anything to play cricket.

   iv) Ram is either a football player or a cricketer.

   Solve by Resolution algorithm in First-Order Logic to conclude that "If Ram is a football player, then Ram does not have a bat".

4. Consider the Markov chain with three states, $S = \{1,2,3\}$, that has the following transition matrix $P = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{3} & 0 & \frac{2}{3} \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$

   a) Draw the state transition diagram for this chain.

   b) If we know $P(X_1 = 1) = P(X_1 = 2) = \frac{1}{4}$, $find\ P(X_1 = 3, X_2 = 2, X_3 = 1)$.

5. If a Bayesian network is provided as shown in the Figure 1, with corresponding node CPTs (Conditional Probability Table), then find out the probability of 'A=*true*' provided 'B=*true*' and 'C=*false*'.