PREVIOUS YEAR SOLVED QUESTION BANK

for

BITS WILP MTECH AIML

DEEP NEURAL NETWORKS

(Until Mid Semester - EC2)

Rohith Raj Reganti | crackbitswilp.in

DNN Previous Year Solved Question Papers

Until Mid Semester - For BITS WILP M.Tech

crackbitswilp.in

1st Edition | 2026

DNN Previous Year Solved Question Papers
Until Mid Semester - For BITS WILP M.Tech

Published by
Printed in India

Contents

CHAPTER 1

Fundamentals of neural network

Q 1.1 *5 Marks, 2026 January*

Given the following truth table for the NOR gate:

$\mathbf{X_1}$	$\mathbf{X_2}$	$\mathbf{Y} = \text{NOR}(\mathbf{X_1}, \mathbf{X_2})$
-1	-1	1
-1	1	-1
1	-1	-1
1	1	-1

Assume the initial weights $w_0 = w_1 = w_2 = 0$, learning rate $\eta = 1$, the activation function is $h = \text{sign}(Z)$, where $Z = w_0 + w_1(x_1) + w_2(x_2)$, and the output Y is computed as $Y = \text{sign}(Z)$.

A) Derive the weights (w_0, w_1, w_2), and the threshold for the perceptron model after applying the perceptron learning algorithm.
B) Verify that the perceptron correctly classifies all inputs
C) Provide a diagram of the perceptron to support your solution

Explanation

A) Derive the weights (wo, w1, w2) and threshold for the perceptron model:
Initial weights: $w_0 = 0, w_1 = 0, w_2 = 0$
Training steps: Apply the perceptron learning rule to adjust weights after each misclassification:

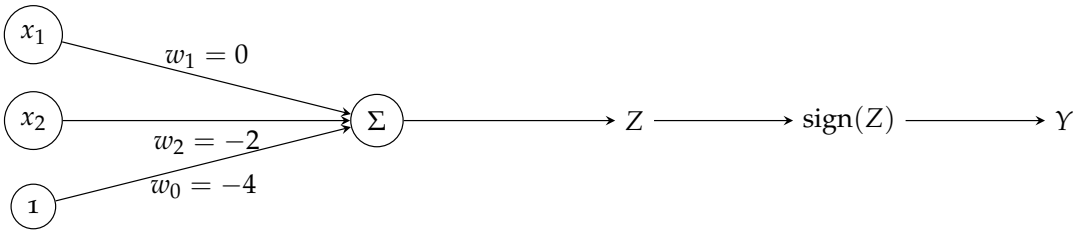
- After 1st example: No update (weights stay $w_0 = 0, w_1 = 0, w_2 = 0$).
- After 2nd example: Update weights to $w_0 = -2, w_1 = 2, w_2 = -2$.
- After 3rd example: Update weights to $w_0 = -4, w_1 = 0, w_2 = -2$.
- After 4th example: No update (weights stay $w_0 = -4, w_1 = 0, w_2 = -2$).

Final weights: $w_0 = -4, w_1 = 0, w_2 = -2$.
Threshold: The threshold corresponds to $Z = 0$, which gives the decision boundary for classification.

B) Verify that the perceptron correctly classifies all inputs:
Input 1: $X_1 = -1, X_2 = -1$, predicted output: $\hat{y} = -1$, expected: $Y = 1$ (misclassified).
Input 2: $X_1 = -1, X_2 = 1$, predicted output: $\hat{y} = -1$, expected: $Y = -1$ (correct).

Input 3: $X_1 = 1, X_2 = -1$, predicted output: $\hat{y} = -1$, expected: $Y = -1$ (correct).
Input 4: $X_1 = 1, X_2 = 1$, predicted output: $\hat{y} = -1$, expected: $Y = -1$ (correct).

C) Provide a diagram of the perceptron to support your solution:



Q 1.2 *2.5 Marks, 2025 January*

What is the purpose of the bias term in a neural network? How does the bias term contribute to the network's ability to learn and make predictions? Provide a brief explanation of how biases are incorporated into the network's computations.

Explanation

Purpose of Bias Term in Neural Networks

- The bias term allows a neural network to shift the activation function, enabling better learning of patterns that do not pass through the origin. It helps the model fit data more flexibly by allowing activation thresholds to be adjusted.

$$y = f\left(w_1 x_1 + w_2 x_2 + \ldots + w_n x_n + b\right)$$

Q 1.3 5 Marks, 2023-2024

Consider a single layer perceptron having 2 inputs and 1 output. Let threshold be 0.5 , learning rate be 0.6 , bias be -2 and weight values $w_1 = 0.3$ and $w_2 = 0.7$. Given the input patterns in the table, compute the value of the output and train using perceptron learning rule for one epoch.

E.g. #	x_1	x_2	y
1	1	1	+1
2	1	0	+1
3	0	1	-1
4	0	0	+1

Explanation

- z − 0.25, h − 0.25, Δ − 0.25, new - 0.25 marks
- Each row in table carries 1 mark each.
- Any wrong equation or wrong computation, reduce appropriately, but maintain a minimum of 0.25 for each row.

$$z = w_1 x_1 + w_2 x_2 + b$$
$$h = \text{sign}(z)$$
$$\Delta w_1 = \eta(t-h)x_1$$
$$\Delta w_2 = \eta(t-h)x_2$$
$$\Delta b = \eta(t-h)$$
$$w_{\text{new}} \leftarrow w_{\text{old}} + \Delta w$$

Epoch 1

x_1	x_2	y	b	w_1	w_2	z	h	y, h	Δ	new b, w_1, w_2
1	1	+1	-2	0.3	0.7	0.3 + 0.7 -2 = −1	-1	N	$\delta b = 0.6(1-(-1)) = 1.2$ $\delta w_1 = 0.6(1+1)1 = 1.2$ $\delta w_2 = 0.6(1+1)1 = 1.2$	$b = -2+1.2 = 0.8$ $w_1 = 0.3+1.2 = 1.5$ $w_2 = 0.7+1.2 = 1.9$
1	0	+1	0.8	1.5	1.9	$1.5+0+0.8 = 2.3$	+1	Y		
0	1	-1	0.8	1.5	1.9	$0+1.9+0.8 = 2.7$	+1	N	$\delta b = 0.6(-1-1) = -1.2$ $\delta w_1 = 0.6(-1-1)0 = 0$ $\delta w_2 = 0.6(-1-1)1 = -1.2$	$b = 0.8-1.2 = -0.4$ $w_1 = 1.5$ $w_2 = 1.9-1.2 = 0.7$
0	0	+1	-0.4	1.5	0.7	$0+0-0.4 = -0.4$	-1	N	$\delta b = 0.6(1+1) = 1.2$ $\delta w_1 = 0.6(1+1)0 = 0$ $\delta w_2 = 0.6(1+1)0 = 0$	$b = -0.4+1.2 = 0.8$ $w_1 = 1.5$ $w_2 = 0.7$

Q 1.4 *4 Marks, 2025 January*

Give two strengths and two weaknesses of neural networks in comparison to other machine learning models.

Explanation

Strengths

- Excellent at automatically learning complex features from raw data, reducing reliance on hand-crafted features (Feature extraction).
- Handles complex, non-linear relationships in data & modeling patterns (non-linearity).
- Handles high-dimensional data in image, text, and speech tasks.
- Adaptable for different types of Data and perform different types of tasks.
- Generalize from large data.

Weaknesses

- Need for Large Datasets.
- Requirement of High Computational Resources.
- Difficult to interpret the inner workings of a neural network leading to a "black box" problem.