ML

LECTURE-25

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Previous Year Question (Neural Network)

❖ 1. Implement AND function using McCulloch–Pitts neuron (take binary data). Consider the below given truth table for AND function.

X1	X2	Y
1	1	1
1	0	0
0	1	0
0	0	0

❖ Ans:

- Consider the truth table for AND function
- The M–P neuron has no particular training algorithm
- In M-Pneuron, only analysis is being performed.
- Hence, assume the weights be w1 = 1 and w2 = 1.

x_1	x_2	y
1	1	1
1	0	0
0	1	0
0	0	0

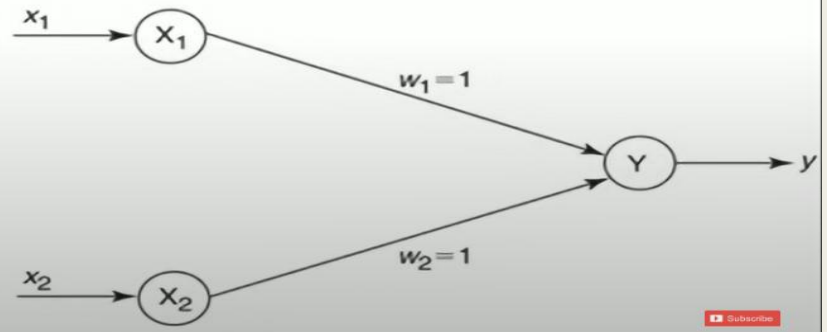
$(1, 1),\ y_{in} = x_1 w_1 + x_2 w_2 = 1 \times 1 + 1 \times 1 = 2$

$(1, 0),\ y_{in} = x_1 w_1 + x_2 w_2 = 1 \times 1 + 0 \times 1 = 1$

$(0, 1),\ y_{in} = x_1 w_1 + x_2 w_2 = 0 \times 1 + 1 \times 1 = 1$

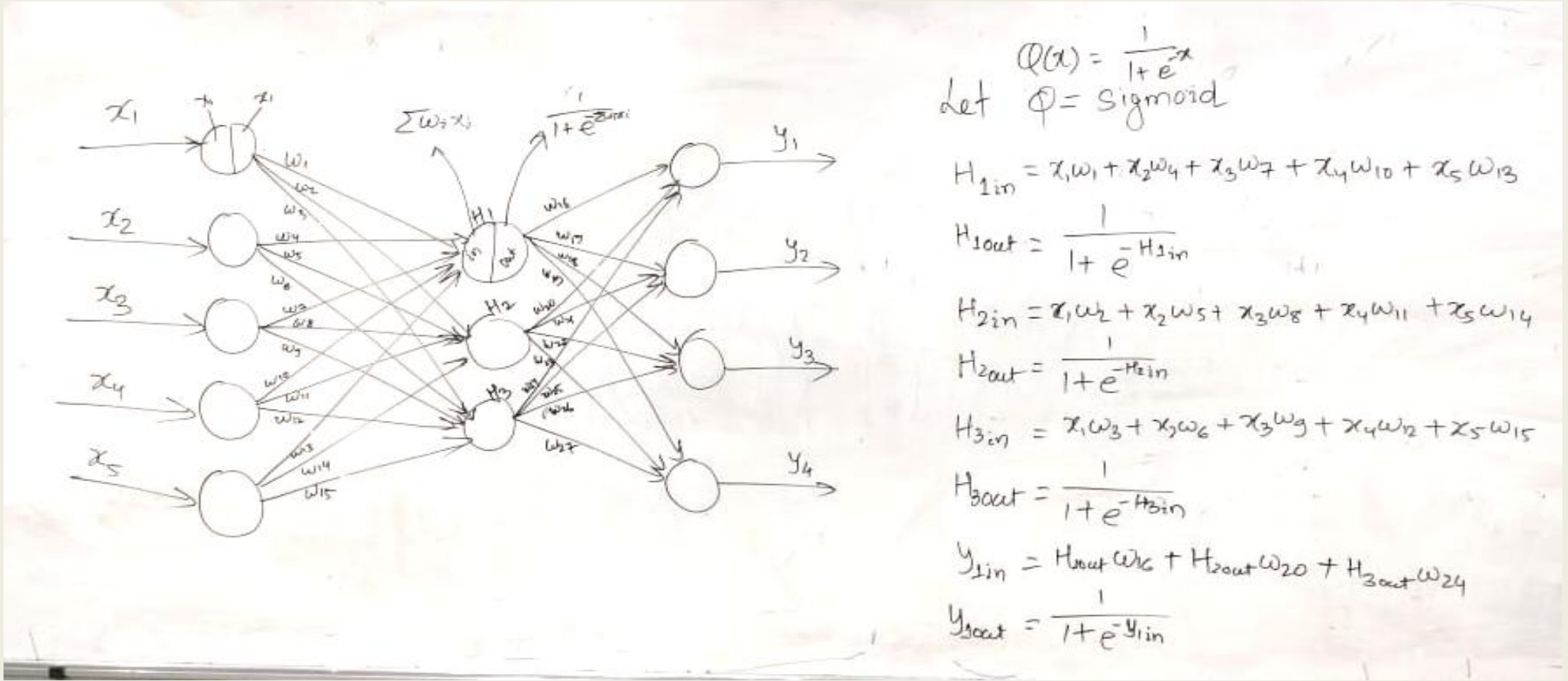
$(0, 0),\ y_{in} = x_1 w_1 + x_2 w_2 = 0 \times 1 + 0 \times 1 = 0$

Threshold value is set equal to 2 (θ = 2).



Previous Year Question (Neural Network)

- 1. Construct a feed-forward network with five input nodes, three hidden nodes and four output nodes with necessary mathematical expressions and explanations.
- Ans:



Previous Year Question (Neural Network)

- 1. Draw an ANN architecture for 3 inputs, 2 hidden layer each with 2 neurons and one output. Derive the estimated output using sigmoid transfer function.
- Ans:

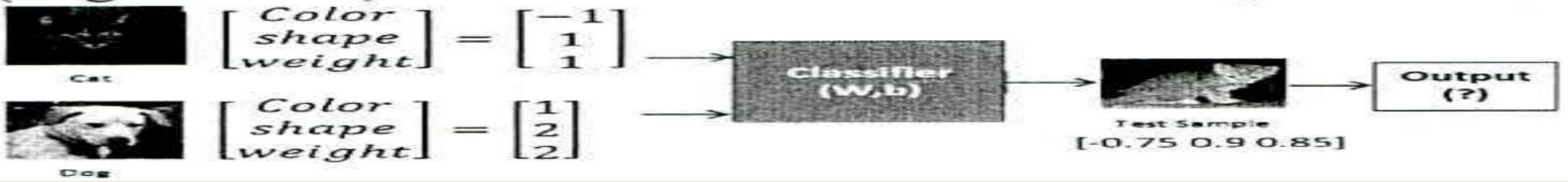
Previous Year Question (Neural Network)

- 1. Differentiate between linearly and non-linearly separable datasets. A two input single output neuron model has weights value [-1.5 2.0] and bias of -2.5. It is given an input [2.23.1]. What will be the output if the binary step function threshold=1 is used?

- Ans: g(x) = 2.2 x -1.5 + 3.1 x 2.0 + (-2.5) = 0.4
- F(x) = Binary step function
- Output = F(g(x)) = F(0.4) = 0

Previous Year Question (Neural Network)

- 1. Solve the problem: Use a Three-Input/Single-Neuron Perceptron with weights $w_{11}=1$, $w_{12}=0.5$ and $w_{13}=1$. Draw the perceptron, decision boundary and compute whether test sample [-0.75 0.9 0.85] is cat (target class 0) or dog (target class 1). Use transfer function hardlim().



- Ans:- Here F(x) = hardlim()
- For Cat case
- g(x) = -1 x 1 + 1 x 0.5 + 1 x 1 = 0.5
- Output = F(g(x)) = F(0.5) = 0 (cat)
- For Dog case
- g(x) = 1 x 1 + 2 x 0.5 + 2 x 1 = 4
- Output = F(g(x)) = F(4) = 1 (dog)
- From above two example, we can see that the threshold should be 1.
- For test sample
- g(x) = -0.75 x 1 + 0.9 x 0.5 + 0.85 x 1 = 0.55
- Output = F(g(x)) = F(0.55) = 0 (cat)

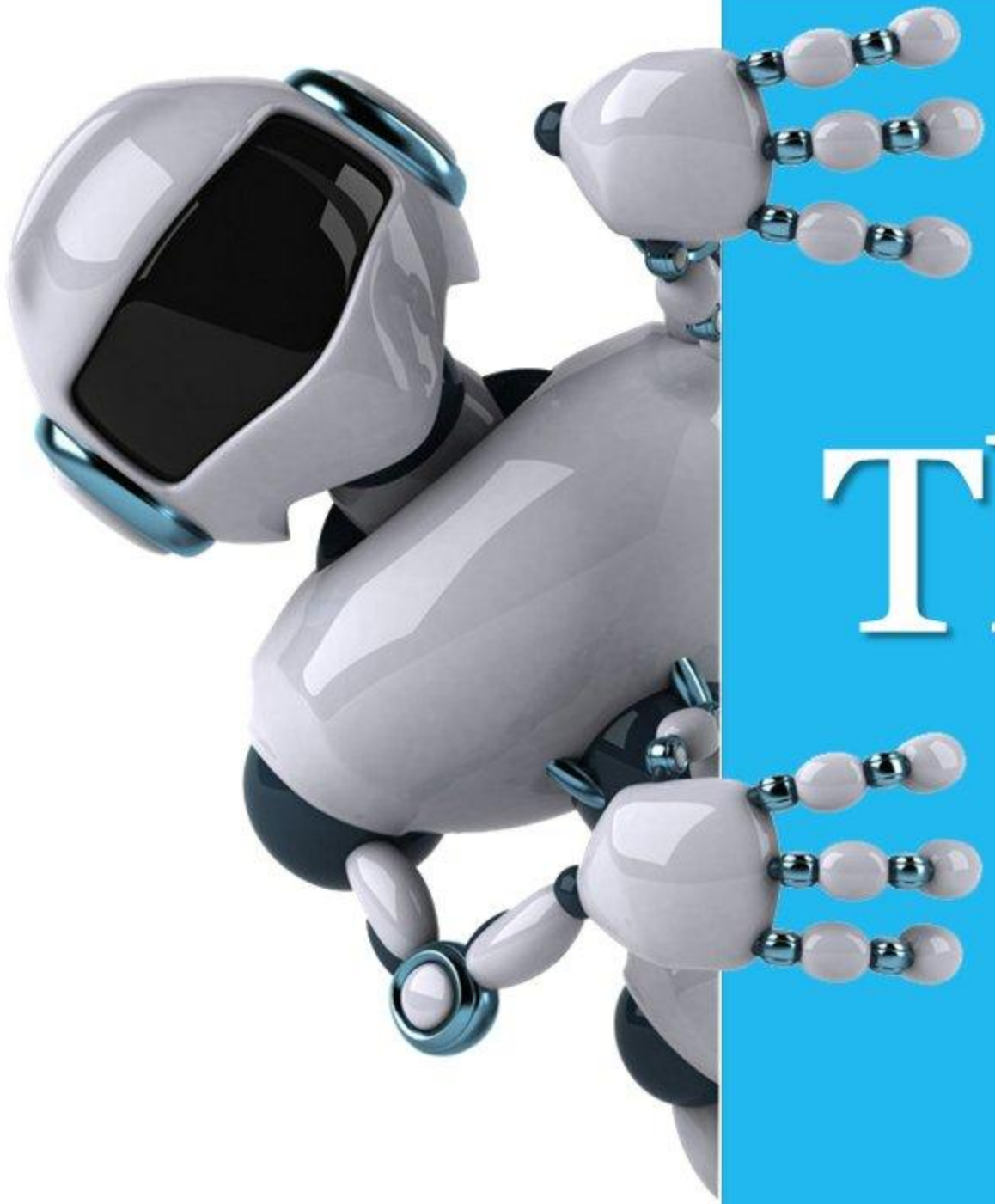
Previous Year Question (Neural Network)

- 1. Design a three inputs, two layers with two-two neurons and one output ANN model with its input to output relationship using F() as an activation function.
- Ans:-

Previous Year Question (Neural Network)

- 1. b) Derive Back propagation algorithm for a NN having 3 inputs, 2 hidden layers each having three neurons and output layer having two neurons. You may ignore the bias term. Sigmoid is used as the activation function in the network. [2+6]

- Ans:-



Thank you