VIMAL JYOTHI
ENGINEERING COLLEGE
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Assignment Cover Page

Name of the student :- Anjaly Jins	
PRN VML22CS045	Admission No. 8194
Subject Name :- Soft Computing	Subject Code:- CST 444
Assignment Title/No : 1	
Name of the faculty: Ashwathy TV miss	
Assignment Submitted on 23/02/26.	

Late submission rules : Max mark will reduced to 50% for 1-5 working day's delay, no mark will be awarded thereafter.

I am hereby confirming that this assignment is my own and I haven't adopted any unfair means in any steps of its preparation to enhance my performance in this assignment.

Date : 23/02/26

Anjaly Jins
Sign with Name

Assignment subdivision	Maximum Mark	Marks awarded	Remarks
A			
B			
C			

Feed back/suggestions :

Name and sign of the faculty

2. a) Using the Hebb rule, find the weights required to perform the following classification: given that the vectors (1,1,1,1) and (-1,1,-1,-1) are members of same class (target 1) and vectors (1,1,1,-1) and (1,-1,-1,1) are not members of the class (target -1).

b) Implement the following logical function using the M-P Neuron. Use binary data representation:

1) AND
2) OR
3) XOR

Ans: Step 1: List Inputs and Targets

Vector	Input x	Target t
1	(1,1,1,1)	+1
2	(-1,1,-1,-1)	+1
3	(1,1,1,-1)	-1
4	(1,-1,-1,1)	-1

$\Rightarrow w = (0,0,0,0)$

1) $w = w + (+1)(1,1,1,1)$
$= (1,1,1,1)$

2) $w = w + (+1)(-1,1,-1,-1)$
$= (0,2,0,0)$

3) $w = w + (-1)(1,1,1,-1)$
$= (-1,1,-1,1)$

4) $w = w + (-1)(1,-1,-1,1)$

Final weight $= (-2,2,0,0)$

b) DAND

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

$y_{in} = x_1 w_1 + x_2 w_2$

Assume $w_1 = 1$; $w_2 = 1$

$\Rightarrow (0,0)$ $y_{in} = 0 \times 1 + 0 \times 1 = 0$

$\Rightarrow (0,1)$ $y_{in} = 0 \times 1 + 1 \times 1 = 1$

$\Rightarrow (1,0)$ $y_{in} = (1 \times 0) + 0 \times 1 = 1$

$\Rightarrow (1,1)$ $y_{in} = 1 \times 1 + 1 \times 1 = \underline{\underline{2}}$

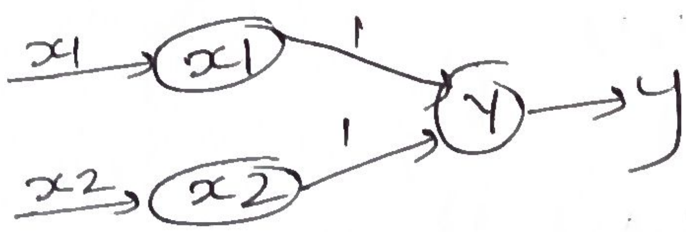
$\theta \geq \cancel{max}\, nw - p$

$n = 2$

$w = 1$

$p = 0$

So $nw - p = 2 \times 1 - 0$
$= \underline{\underline{2}}$



$y = f(y_{in}) = \begin{cases} 1 & \text{if } y_{in} \geq \theta \\ 0 & \text{if } y_{in} < \theta \end{cases}$

2) OR

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

$w_1 = w_2 = 1$

$(0,0) \Rightarrow y_{in} = x_1w_1 + x_2w_2 = 0\times1 + 0\times1 = 0$

$(0,1) \Rightarrow y_{in} = x_1w_1 + x_2w_2 = 0\times1 + 1\times1 = 1$

$(1,0) \Rightarrow y_{in} = x_1w_1 + x_2w_2 = 1\times1 + 0\times1 = 1$

$(1,1) \Rightarrow y_{in} = x_1w_1 + x_2w_2 = 1\times1 + 1\times1 = 2$

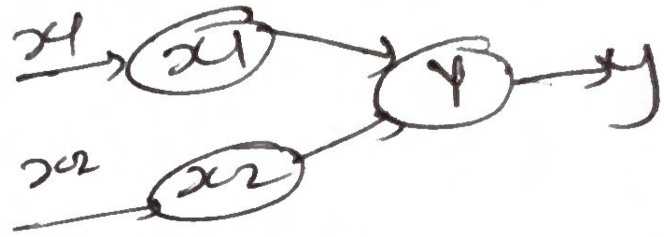
$$Y = f(y_{in}) = \begin{cases} 1 & \text{if } y_{in} \geq \theta \\ 0 & \text{if } y_{in} < \theta \end{cases}$$

$n =$

$$= \begin{cases} 1 & \text{if } y_{in} \geq 1 \\ 0 & \text{if } y_{in} < 0 \end{cases}$$

$\theta = nw - p$

$= \underline{\underline{1}}$



3) XOR

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

$y = x_1\overline{x_2} + \overline{x_1}x_2$

$y = z_1 + z_2$

where $x_1\overline{x_2} = z_1$

$z_2 = \overline{x_1}x_2$

x_1	x_2	z_1
0	0	0
0	1	0
1	0	1
1	1	0

Case 1:

Assume $(w_1 = 1)(w_2 = -1)$

$(0,0) \Rightarrow z_1 = 0\times1 + 0\times1 = 0$

$(0,1) \Rightarrow z_1 = 0\times1 + 1\times1 = 1$

$(1,0) \Rightarrow z_1 = 1\times1 + 0\times1 = 1$

$(1,1) \Rightarrow z_1 = 1\times1 + 1\times1 = 2$

Case 2:

Assume $w_1 = 1$ $w_2 = -1$

$(0,0) \Rightarrow z_1 = 0\times1 + 0\times-1 = 0$

$(0,1) \Rightarrow z_1 = 0\times1 + 1\times-1 = -1$

$(1,0) \Rightarrow z_1 \Rightarrow 1\times0 + 0\times-1 = 1$

$(1,1) \Rightarrow z_1 \Rightarrow 1\times1 + 1\times-1 = 0$

So for z_1; $w_1 = 1, w_2 = -1$, $\theta \geq 1$

$z_2 = \bar{x}_1 x_2$

x_1	x_2	z_2
0	0	0
0	1	1
1	0	0
1	1	

Case 1: Assume $w_1 = 1 = w_2$

$(0,0) = z_2 = 0\times 1 + 0\times 1 = 0$

$(1,0) = z_2 = 1\times 1 + 0\times 1 = 1$

$(0,1) = z_2 = 0\times 1 + 1\times 1 = 1$

$(1,1) = z_2 = 1\times 1 + 1\times 1 = \underline{\underline{2}}$

These 3 cases are not possible.

Case 2: $w_2 = -1$ $w_2 = 1$

$(0,0) = z_2 = 0\times -1 + 0\times 1 = 0$

$(0,1) = z_2 = 0\times -1 + 1\times 1 = 1$

$(1,0) = z_2 = 1\times -1 + 0\times 1 = -1$

$(1,1) = z_2 = (1\times -1) + 1\times 1 = 0$

Thus based on this calculation, possible in

$w_1 = -1$
$w_2 = 1$ $\theta \geq 1$ for z_2 neuron

$\Rightarrow y = z_1$ OR z_2

x_1	x_2	y	z_1	z_2
0	0	0	0	0
0	1	1	0	1
1	0	1	1	0
1	1	0	0	0

Case 1: Assume both weights as excitatory i.e.;

$v_1 = v_2 = 1$

Now

$(0,0)\ y_{in} = 0\times 1 + 0\times 1 = 0$

$(0,1)\ y_{in} = 0\times 1 + 1\times 1 = 1$

$(1,0)\ y_{in} = 1\times 1 + 0\times 1 = 1$

$(1,1)\ y_{in} = 0\times 1 + 0\times 1 = 0$

Here the net input is calculated using

$y = z_1 v_1 + z_2 v_2$

$\Rightarrow w_{11} = w_{22} = 1$ (excitatory)

$w_{12} = w_{21} = -1$ (inhibitory)

$v_1 = v_2 = 1$ (excitatory)