Assignment 4

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Questions solved in this Assignment.

① → 2 Examples of Neural Network

2 Questions on Neural Networks

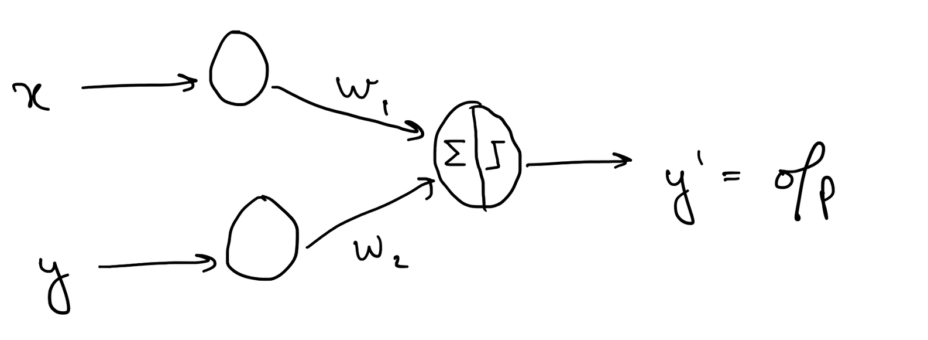
Q Create a neural Network that can solve the problem of OR Gate.

Sol^n Initially w_1 & $w_2 = 0$

$$f(a) = \begin{cases} 0 , & \text{if } a > 1 \\ 1 , & \text{if } a \le 1 \end{cases}$$

Truth table

x	y	o/p
0	0	0
0	1	1
1	0	1
1	1	1



→ $y' = f(w_1 x + w_2 y + b)$ b = 1

$x = 0 \quad y = 0$

$y' = f(0 + 0 + 1)$

$= f(0 + 1)$

$= f(1) \Rightarrow y' = 0$

→ $x = 0 \quad y = 1$

$y' = f(0 + 1 + 1)$

$= f(2) \Rightarrow y' = 1$

→ $x = 1 \quad y = 0$

$y' = f(1 + 0 + 1)$

$= f(2) \Rightarrow y' = 1$

→ $x = 1 \quad y = 1$

$y' = f(1 + 1 + 1)$

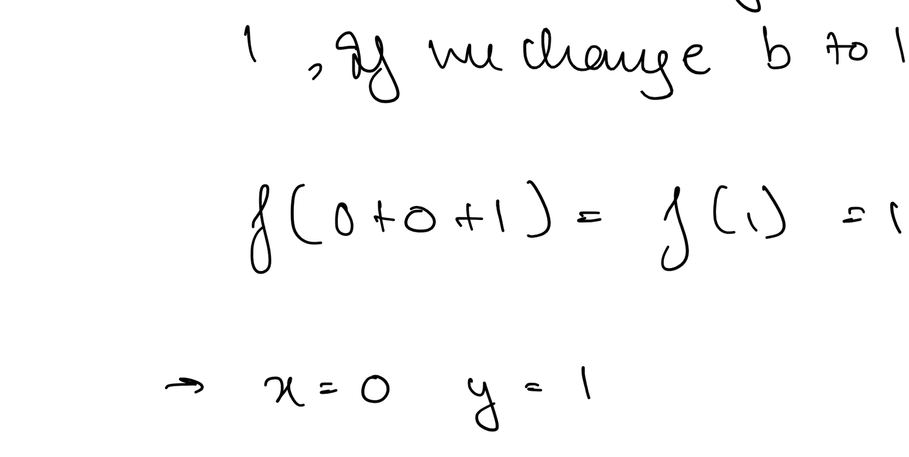
$= f(3) \Rightarrow y' = 1$

Q Create a neural Network that can solve the problem of NAND Gate.

Sol^n Initially w_1 & $w_2 = 1$ & $b = -1$

Truth table

x	y	o/p
0	0	1
0	1	1
1	0	1
1	1	0



→ $y' = f(w_1 x + w_2 y + b)$ $b = -1$

$y' = f(0 + 0 - 1)$

$= f(-1) \Rightarrow y' = 1$

→ from perceptron rule $w_1 x + b \le 0$, then $y' = 0$ then this row is incorrect as o/p should be 1 for NAND Gate.

→ So we want values that will make the input $x = 0$ & $y = 0$ to give y' value of 1, if we change b to 1 we have,

$f(0 + 0 + 1) = f(1) = 1$ this works.

→ $x = 0 \quad y = 1$

$y' = f(0 + 1 + 1) = 2$
$\Rightarrow y' = 1$

correct.

→ $x = 1 \quad y = 0$

$y' = f(1 + 0 + 1) = 2$

$\Rightarrow y' = 1$

correct.

→ $x = 1 \quad y = 1$

$y' = f(1 + 1 + 1) = 3$
$\Rightarrow y' = 1$

this is not correct.

∴ change values of w_1 & w_2 to -1 & b to 2
we get

→ $x = 1 \quad y = 1$

$y' = f((1 \times -1) + (1 \times -1) + 2)$

$\Rightarrow f(-1 - 1 + 2) = f(0)$

$\Rightarrow y' = 0$

correct.

∴ final NAND Gate neural N/w looks like this