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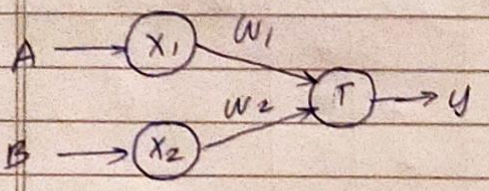
Mcculloch Pitt's Neuron Model

1. AND gate:



A	B	output
0	0	0
0	1	0
1	0	0
1	1	1

$$y_{out} = \begin{cases} 1 & \text{if } \sum_{i=0}^{n} w_i x_i \geq T \\ 0 & \text{if } \sum_{i=0}^{n} w_i x_i < T \end{cases}$$

Assuming $w_1 = w_2 = 2$ (weights) and $T = 1$ threshold.

For $A = B = 0$ $y_{in} = 0 \cdot 2 + 0 \cdot 2 = 0$

$\because y_{in} < T$; $y_{out} = 0$

Hence satisfying our output.

For $A = 0$ and $B = 1$, $y_{in} = 0 \cdot 2 + 1 \cdot 2 = 2$

$\because y_{in} > T$ $\therefore y_{out} = 1$

This is not satisfying our output

$\therefore$ We change the threshold to $T = 4$.

~~For A=~~

For $A = 1$ and $B = 0$, $y_{in} = 1 \cdot 2 + 0 \cdot 2 = 2$

$\because y_{in} < T$, $y_{out} = 0$

Hence satisfying our output

For $A = 1$, and $B = 1$ $y_{in} = 1 \cdot 2 + 1 \cdot 2 = 4$

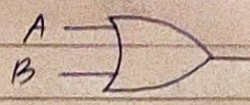
$\because y_{in} = T$, $y_{out} = 1$

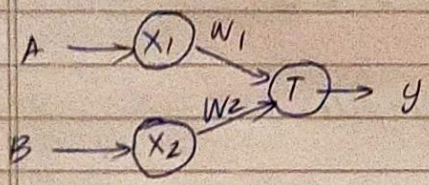
Hence satisfying our output.

∴ The truth table:

Input X_1	Input X_2	output	z_{in}	T	Net output
0	0	0	0	4	0
0	1	0	2	4	0
1	0	0	2	4	0
1	1	1	4	4	1

2. OR gate:





A	B	output
0	0	0
0	1	1
1	0	1
1	1	1

$$y_{out} = \begin{cases} 1 & \text{if } \sum_{i=1}^{n} x_i w_i \geq T \\ 0 & \text{if } \sum_{i=1}^{n} x_i w_i < T \end{cases}$$

Assuming $W_1 = W_2 = 2$ (weights) and $T = 2$ (threshold)

For $A = B = 0$, $y_{in} = 0 \cdot 2 + 0 \cdot 2 = 0$

$\therefore y_{in} < T$; $y_{out} = 0$

∴ satisfies our output.

For A = 0 and B = 1 ; $y_{in} = 0 \cdot 2 + 1 \cdot 2 = 2$

$\because y_{in} \neq T$; $y_{out} = 0$ 1

$\therefore$ satisfies our output.

For A = 1 and B = 0 ; $y_{in} = 1 \cdot 2 + 0 \cdot 2 = 2$

$\because y_{in} = T$; $y_{out} = 1$

$\therefore$ satisfies our output

For A = B = 1 ; $y_{in} = 1 \cdot 2 + 1 \cdot 2 = 4$

$\because y_{in} > T$; $y_{out} = 1$

$\therefore$ satisfies our output.

$\therefore$ The truth table:

Input X_1	Input X_2	output	z_{in}	T	Net output
0	0	0	0	2	0
0	1	1	2	2	1
1	0	1	2	2	1
1	1	1	4	2	1