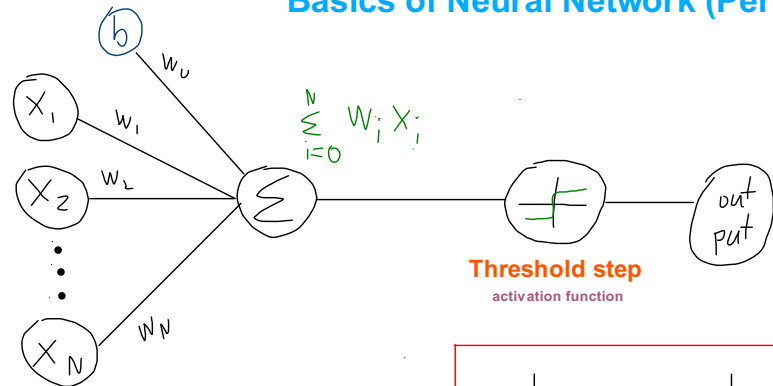


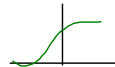
Basics of Neural Network (Perceptron คำนวณ)



$$\theta = \begin{cases} 1, & x \geq 0 \\ 0, & x \leq 0 \end{cases}$$



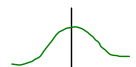
threshold (1)



Sigmoid

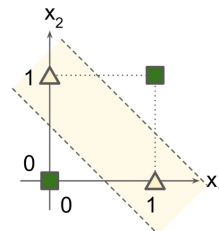


Piecewise Linear

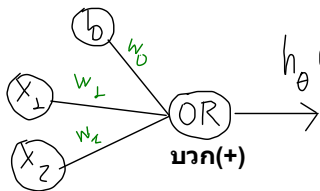


Gaussian

Perceptron ถูกวิจารณ์ว่าไม่สามารถหา XNOR หรือ XOR (OR, AND, NOR) ได้
แต่เป็นต้นแบบที่สำคัญในการนำมาใช้อยู่ในปัจจุบัน



Ex (OR)



$$h_{\theta}(x) = \begin{cases} 1, & x > 0 \\ 0, & x \leq 0 \end{cases}$$

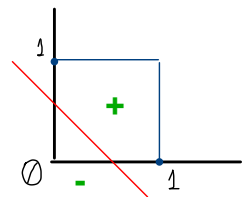
$$h(X) = X_1W_1 + X_2W_2 + bW_0 ; \text{เดาค่าให้ } W = 1, b = -0.5$$

$$h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$$

$$h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$$

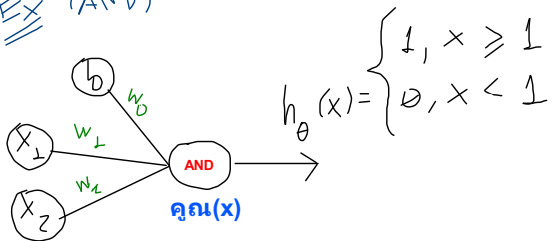
$$h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$$

$$h(x) = (1)(1) + (1)(1) + (-0.5)(1) = 1.5 \Rightarrow 1$$



x_1	x_2	$h_{\theta}(x)$
0	0	0
0	1	1
1	0	1
1	1	1

Ex (AND)



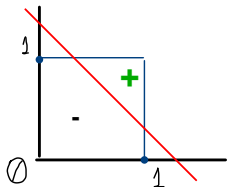
$h(x) = x_1W_1 + x_2W_2 + bW_0$; เค้าค่าให้ $W = 1, b = -0.5$

$h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$

$h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 0$

$h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 0$

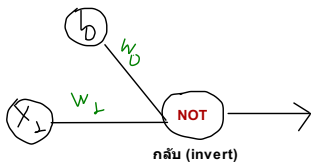
$h(x) = (1)(1) + (1)(1) + (-0.5)(1) = 1.5 \Rightarrow 1$



x_1	x_2	$h_{\theta}(x)$
0	0	0
0	1	0
1	0	0
1	1	1

Ex

(NOT, Negation)



$$h(X) = X1W1 + bW0 ; \text{เดาค่าให้ } W = -1, b = -0.5$$

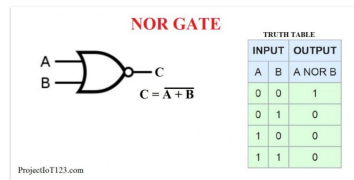
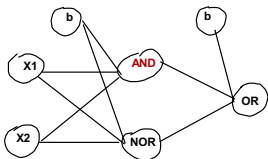
$$h(x) = (1)(-1) + (-0.5)(1) = -1.5 \Rightarrow 0$$

$$h(x) = (0)(-1) + (-0.5)(-1) = 0.5 \Rightarrow 1$$

X_1	$h_{\theta}(x)$
1	0
0	1

Ex

(XNOR)



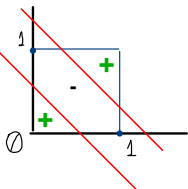
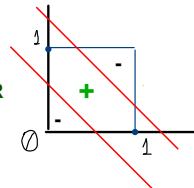
$$\begin{cases} 1, x \leq 0 \\ 0, x > 0 \end{cases}$$

$$h_0(x) = \begin{cases} 1, x \geq 0 \\ 0, x \leq 0 \end{cases}$$

W ของ b = 1 ทุกตัว

$h(X) = X1W1 + X2W2 + bW0$;
 AND กำหนดให้ $W = 1, b = -1$
 NOR กำหนดให้ $W = 1, b = -0.5$
 OR กำหนดให้ $W = 1, b = -0.5$

XOR



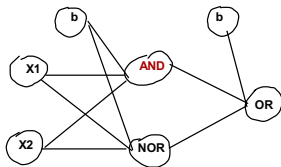
X_1	X_2	$h_0(x)$
0	0	1
0	1	0
1	0	0
1	1	1

(คิด $X1, X2 = 1$) AND $h(x) = (1)(1) + (1)(1) + (-1)(1) = 1 \Rightarrow 1$

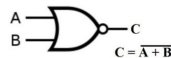
NOR $h(x) = (1)(1) + (1)(1) + (-0.5)(1) = 1.5 \Rightarrow 1$ NOR $\Rightarrow 0$

OR (out) $h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$

(XNOR)



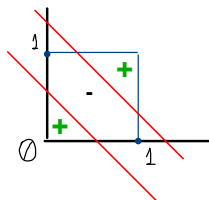
NOR GATE



TRUTH TABLE		
INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

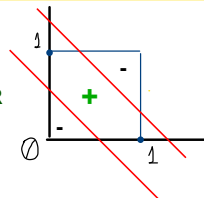
ProjectIoT123.com

$\begin{cases} 1, x \leq 0 \\ 0, x > 0 \end{cases}$



$h(X) = X1W1 + X2W2 + bW0$;
AND กำหนดให้ $W = 1, b = -1$
NOR กำหนดให้ $W = 1, b = -0.5$
OR กำหนดให้ $W = 1, b = -0.5$

XOR



(คิด $X1, X2 = 0$)

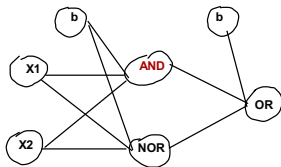
AND $h(x) = (0)(1) + (0)(1) + (-1)(1) = -1 \Rightarrow 0$

NOR $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$ NOR $\Rightarrow 1$

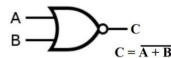
OR (out) $h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$

X_1	X_2	$h_{\theta}(x)$
0	0	1
0	1	0
1	0	0
1	1	1

(XNOR)



NOR GATE

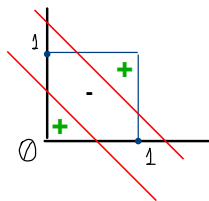


TRUTH TABLE

INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

ProjectIoT123.com

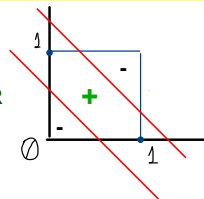
$\begin{cases} 1, x \leq 0 \\ 0, x > 0 \end{cases}$



$h(X) = X1W1 + X2W2 + bW0$;
AND กำหนดให้ $W = 1, b = -1$
NOR กำหนดให้ $W = 1, b = -0.5$
OR กำหนดให้ $W = 1, b = -0.5$

(คิด $X1 = 0, X2 = 1$)

XOR



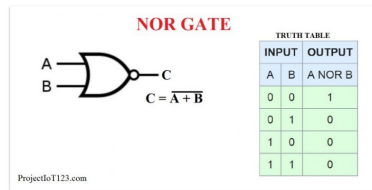
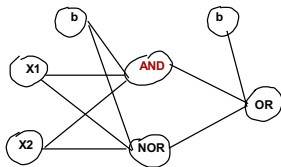
X_1	X_2	$h_{\theta}(x)$
0	0	1
0	1	0
1	0	0
1	1	1

AND $h(x) = (0)(1) + (1)(1) + (-1)(1) = 0 \Rightarrow 0$

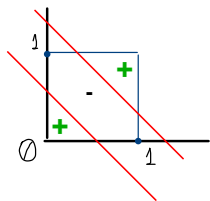
NOR $h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$ NOR $\Rightarrow 0$

OR (out) $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$

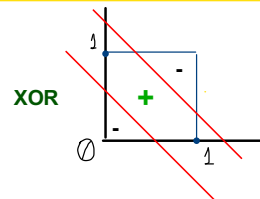
(XNOR)



$\left\{ \begin{array}{l} 1, x \leq 0 \\ 0, x > 0 \end{array} \right.$



$h(X) = X1W1 + X2W2 + bW0$;
 AND กำหนดให้ $W = 1, b = -1$
 NOR กำหนดให้ $W = 1, b = -0.5$
 OR กำหนดให้ $W = 1, b = -0.5$



(คิด $X1 = 1, X2 = 0$)

X_1	X_2	$h_{\theta}(x)$
0	0	1
0	1	0
1	0	0
1	1	1

AND $h(x) = (1)(1) + (0)(1) + (-1)(1) = 0 \Rightarrow 0$

NOR $h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 1 \text{ NOR} \Rightarrow 0$

OR (out) $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$

$h(x) = x_1w_1 + x_2w_2 + bw_0$;
 AND กำหนดให้ $W = 1$, $b = -1$
 NOR กำหนดให้ $W = 1$, $b = -0.5$
 OR กำหนดให้ $W = 1$, $b = -0.5$

x_1	x_2	$h_\theta(x)$
0	0	1
0	1	0
1	0	0
1	1	1

AND $h(x) = (0)(1) + (0)(1) + (-1)(1) = -1 \Rightarrow 0$

NOR $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$ NOR $\Rightarrow 1$

OR (out) $h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$

AND $h(x) = (1)(1) + (1)(1) + (-1)(1) = 1 \Rightarrow 1$

NOR $h(x) = (1)(1) + (1)(1) + (-0.5)(1) = 1.5 \Rightarrow 1$ NOR $\Rightarrow 0$

OR (out) $h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$

AND $h(x) = (1)(1) + (0)(1) + (-1)(1) = 0 \Rightarrow 0$

NOR $h(x) = (1)(1) + (0)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$ NOR $\Rightarrow 0$

OR (out) $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow$

AND $h(x) = (0)(1) + (1)(1) + (-1)(1) = 0 \Rightarrow 0$

NOR $h(x) = (0)(1) + (1)(1) + (-0.5)(1) = 0.5 \Rightarrow 1$ NOR $\Rightarrow 0$

OR (out) $h(x) = (0)(1) + (0)(1) + (-0.5)(1) = -0.5 \Rightarrow 0$