الموضوع : Lec -1-   التاريخ :   /   / ٢٠٢

'Soft Computing'

Activation function

عدد ال input

خوارزميات لتعليم الشبكات

نعطي input

$$net = \sum^{n} X_i w_i + \theta^{\beta}$$

الوزن

$$= w_1X_1 + w_2X_2 + w_3X_3 + \dots + \theta \, (\beta)$$

input الوزن

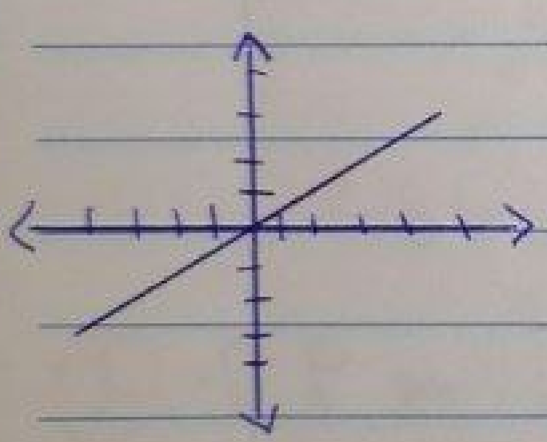
* اذا اعطاها بالسؤال نعوضها واذا لم تعطى فهي =0

θ : threshold , β : bias , w : weight

Type of activation function :

ال output

1) linear ⇒ identity function $y = net$ (Ramp)



$y = net$

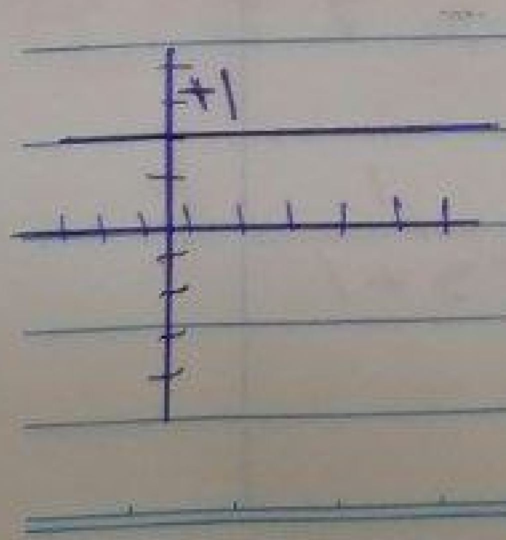
2) hard limiter

a) binary hard limiter ⇒ Unit Step function

يأخذ فقط قيم ال 1,0

$$y = \begin{cases} 0 & \text{if } net < 0 \\ 1 & \text{if } net >= 0 \end{cases}$$

مدى ال 1 ⇐ 0

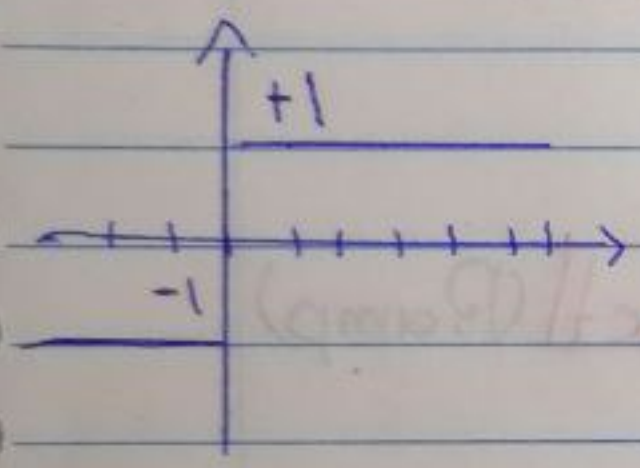


الموضوع : التاريخ / / ٢٠٢

b) Symmetric hard limiter (Shl) =>
double side

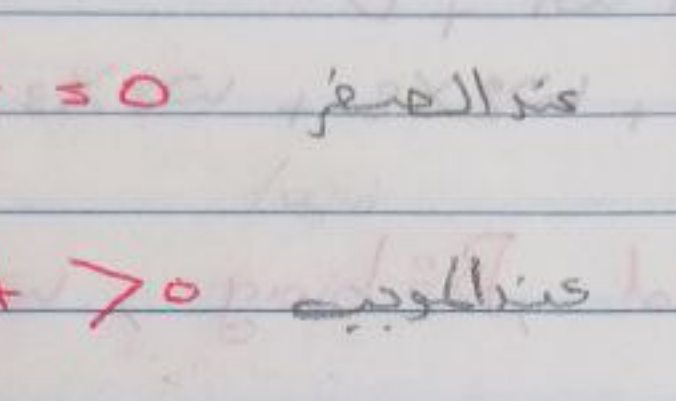
$$y = \begin{cases} -1 & \text{if net} < 0 \quad \text{عند السالب} \\ 0 & \text{if net} = 0 \quad \text{عند الصفر} \\ +1 & \text{if net} > 0 \quad \text{عند الموجب} \end{cases}$$

اكبر من
واقل من



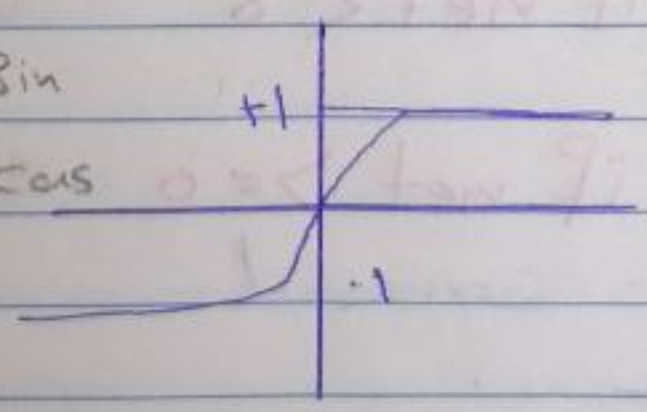
3) Sigmoid

$$y = \frac{1}{1 + e^{-net}}$$



4) Hyperbolic tangent (tank)

$$y = \frac{e^{net} - e^{-net}}{e^{net} + e^{-net}} \quad \begin{matrix} \sin \\ \cos \end{matrix}$$



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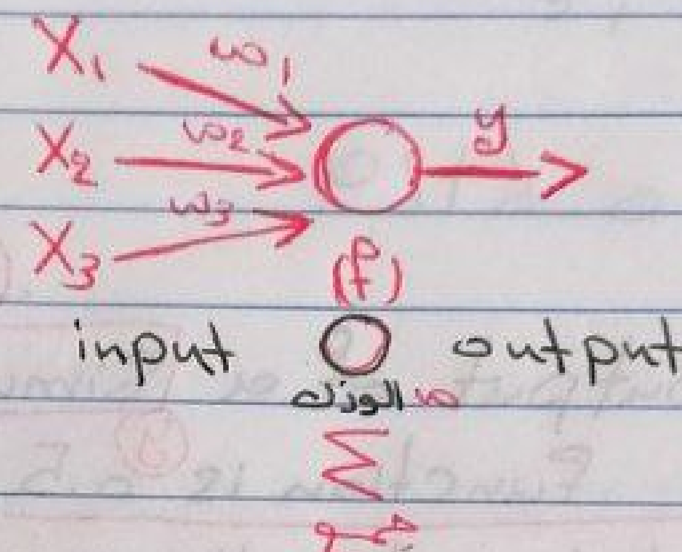
التاريخ / / ٢٠٢ الموضوع :

Ex 1- find y for the following neuron if :-
$X_1 = 0.5$, $X_2 = 1$, $X_3 = -0.7$
$w_1 = 0$, $w_2 = -0.3$, $w_3 = 0.6$



Sol:

$net = X_1 w_1 + X_2 w_2 + X_3 w_3 + \theta$
$= (0.5 * 0) + (1 * -0.3) + (-0.7 * 0.6) + 0$
$= -0.3 + -0.42$
$= -0.72$

إذا أعطى الزاوية θ فنعوض ونجمعها وإذا منعطه فتصير صفر

(1-) if f is linear
$y = net \Rightarrow y = -0.72$

(2-) if f in hard limiter (Symmetric) بـ الماكزمل وزنين

if net < 0 => -1 (اصغر)
$y = -1$

(3-) if f is Sigmoid

$y = \frac{1}{1+e^{-net}} \Rightarrow y = \frac{1}{1+e^{+0.72}} = 0.32$

CLEAR

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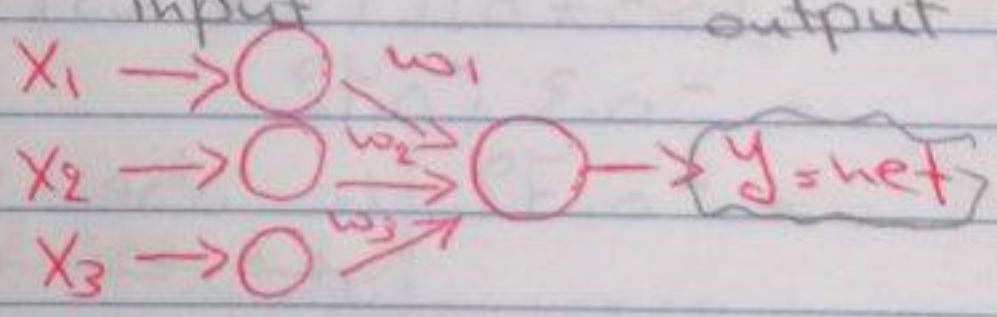
4- if f is tan h

$$y_s = \frac{e^{net} - e^{-net}}{e^{net} + e^{-net}} \Rightarrow y_s = \frac{e^{0.72} - e^{-0.72}}{e^{0.72} + e^{-0.72}}$$

$$y = -0.6769$$

EX2: The output of a Simulated (y) neural using a Sigmoid function is (y) 0.5 find the value of threshold when the input $X_1=1$, $X_2=1.5$, $X_3=2.5$ and have initial weights values: 0.2



Sol: $y = 0.5$, $\theta = ?$

$$y = \frac{1}{1 + e^{-net}}$$ Sigmoid function

$net = w_1x_1 + w_2x_2 + w_3x_3 + \theta$

$net = (1 * 0.2) + (1.5 * 0.2) + (2.5 * 0.2)$

$net = 0.2 + 0.30 + 0.50$

$net = 1$

$$0.5 = \frac{1}{1 + e^{(-1+\theta)}} \Rightarrow 0.5(1 + e^{(-1+\theta)}) = 1$$

$$0.5 + 0.5e^{-(1+\theta)} = 1 \Rightarrow \frac{0.5e^{-(1+\theta)}}{0.5} = \frac{0.5}{0.5}$$

$e^{-(1+\theta)} = 1 \Rightarrow -(1+\theta) = \ln 1 \Rightarrow -1 - \theta = 0$

$-\theta = 1 \Rightarrow \boxed{\theta = -1}$

CLEAR