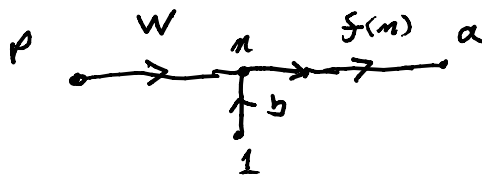


Basic neuron

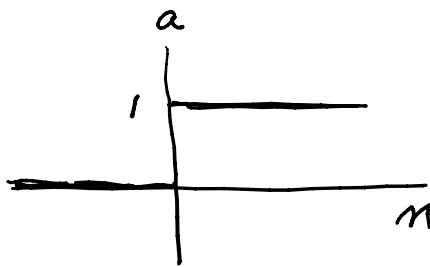


Perceptron neuron — $f(\cdot) = \text{hard lim}(\cdot) \Rightarrow 1(x) = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x < 0 \end{cases}$

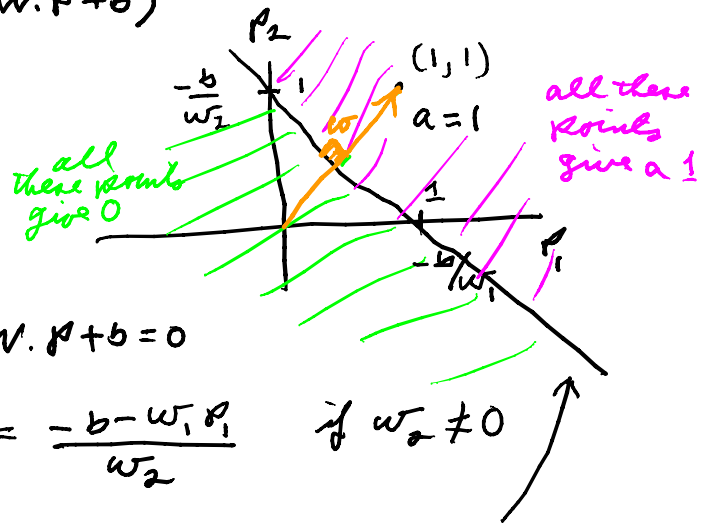
2 input one has $p = \begin{bmatrix} p_1 \\ p_2 \end{bmatrix}$; $w = \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} = [w_1, w_2]$

$$w \cdot p = [w_1 \ w_2] \begin{bmatrix} p_1 \\ p_2 \end{bmatrix} = w_1 p_1 + w_2 p_2 = \text{scalar product}$$

$$w \cdot p + b = n ; \quad a = 1(w \cdot p + b)$$



$n = 0$ when $w \cdot p + b = 0$



$$w_1 p_1 + w_2 p_2 + b = 0 \Rightarrow p_2 = \frac{-b - w_1 p_1}{w_2} \quad \text{if } w_2 \neq 0$$

$p_2 = 0$ if $p_1 = -b/w_1$, a straight line; slope is $-\frac{w_1}{w_2} = \frac{dp_2}{dp_1}$

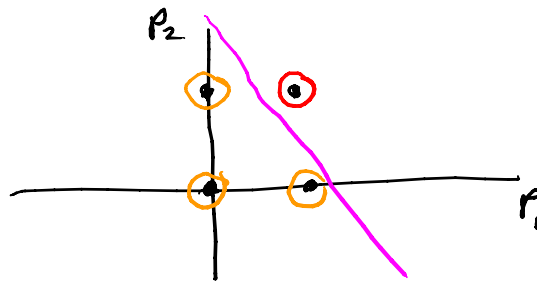
if $w_1 p_1 + w_2 p_2 + b > 0 \Rightarrow a = 1$
 $< 0 \Rightarrow a = 0$

ex: if $w_1 = w_2 = 1$, slope < 0
 if $b = -1$ then $-b/w_1 = 1$

$$p_1 + p_2 - 1 > 0 \text{ if } p_1 = p_2 = 1$$

To be useful must be able to draw a straight line separating inputs into two classes. Choose the weights to do this separation when possible.

$$P1 = \{[0; 0] [0; 1] [1; 0] [1; 1]\};$$



$$0 = 1$$

$$0 = 0$$

$$T1 = \{0 \ 0 \ 0 \ 1\};$$

$$w = [2 \ 1], \quad b = [-3]$$

p^-

$$p = 0 \quad m = -3 \quad 1(-3) = 0$$

$$[2 \ 1] \cdot \begin{bmatrix} 1 \\ 1 \end{bmatrix} + [-3] = [2 \cdot 1 + 1 \cdot 1] + [-3] \equiv 0$$

$$p = \begin{bmatrix} 0.95 \\ 0.23 \end{bmatrix}; \quad [2 \ 1] \begin{bmatrix} 0.95 \\ 0.23 \end{bmatrix} + [-3] = [1.95 + 0.23 - 3] < 0$$