Neural Networks

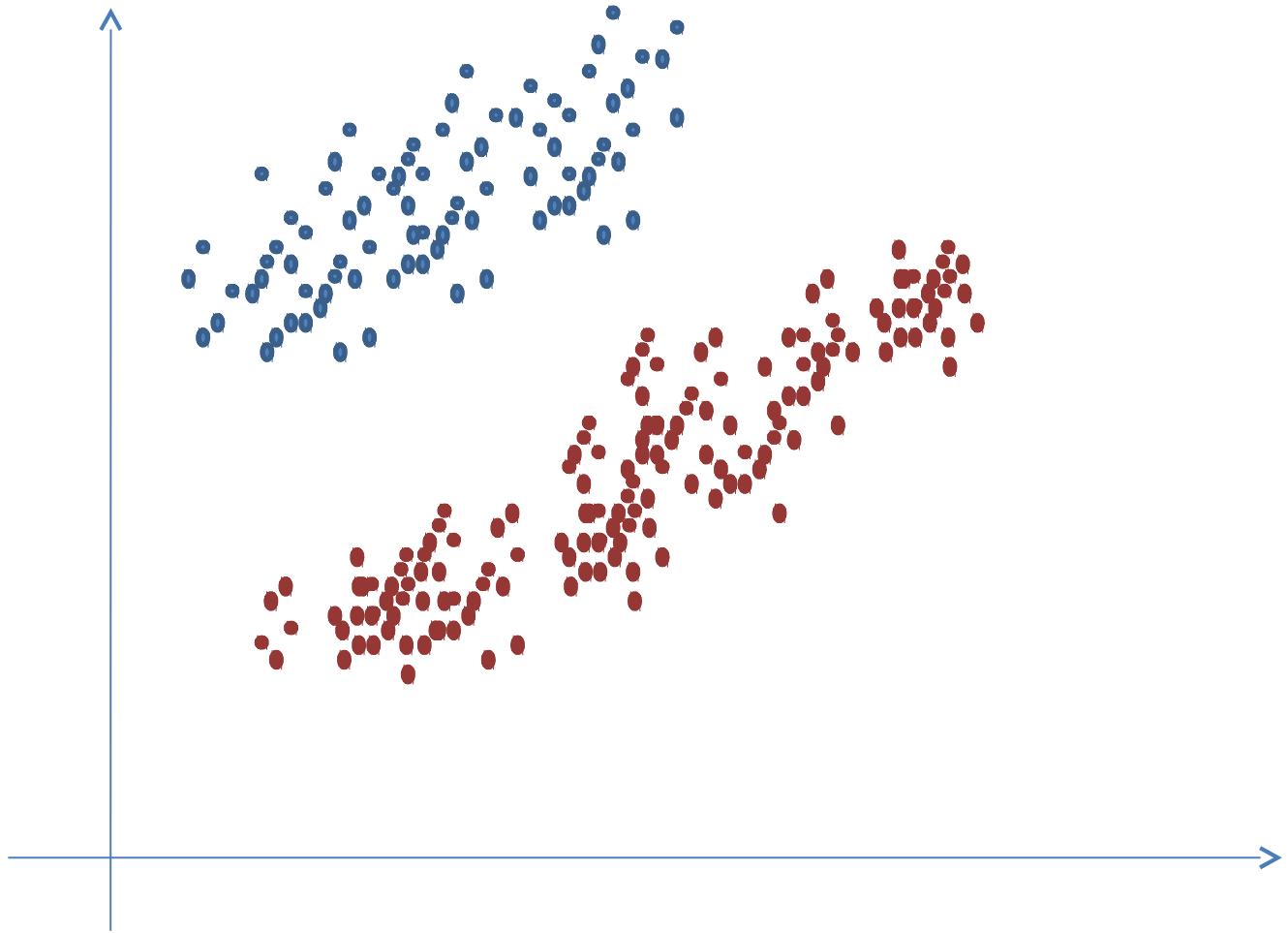## Aplicaciones de Soft-computing en energía, voz e imagen
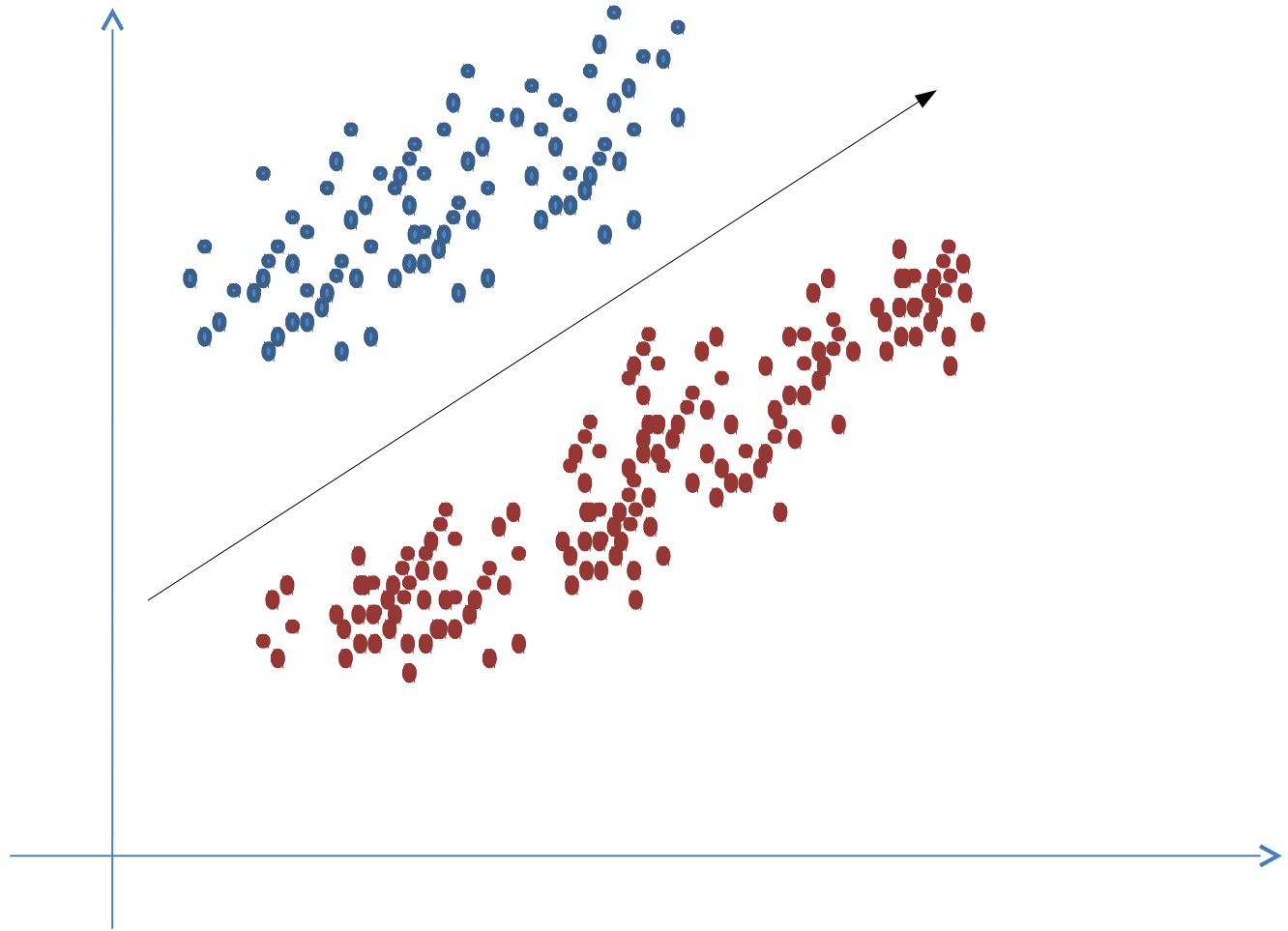
Dept. Teoría de la Señal y Comunicaciones
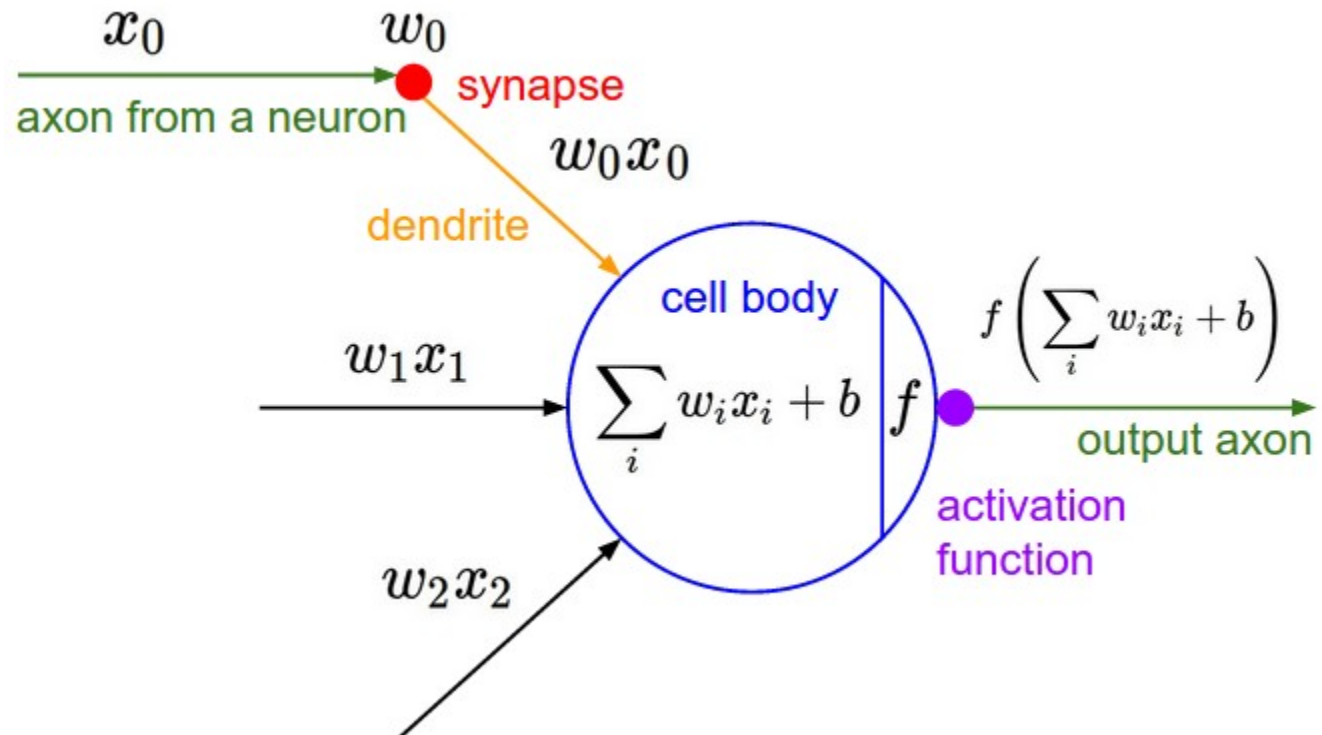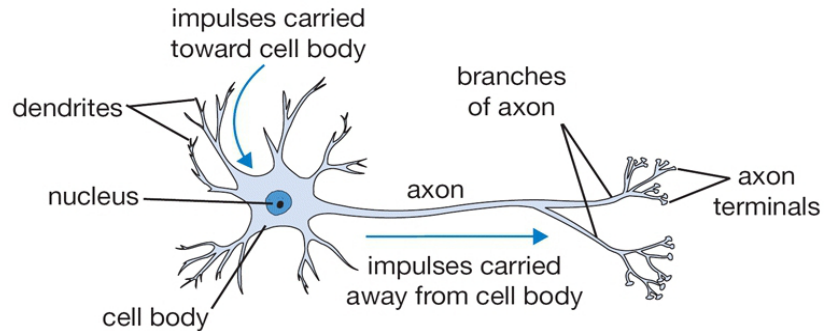
Universidad de Alcalá

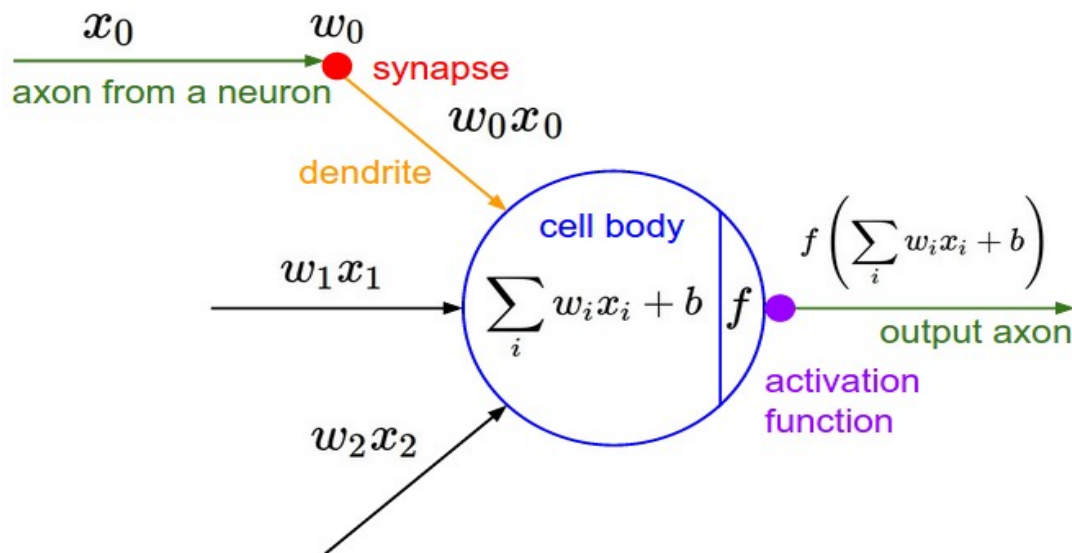# The linear classifier

The linear classifier

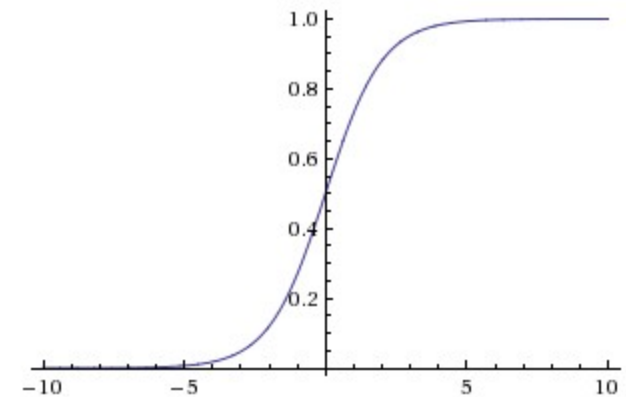$$w_1 x_1 + w_2 x_2 + b = Wx + b = 0$$

The perceptron: not a Deep Neural Network

The perceptron: not a Deep Neural Network

$$f(x) = \frac{1}{1 + e^{-x}}$$

$$s = \sigma(W_1 x)$$
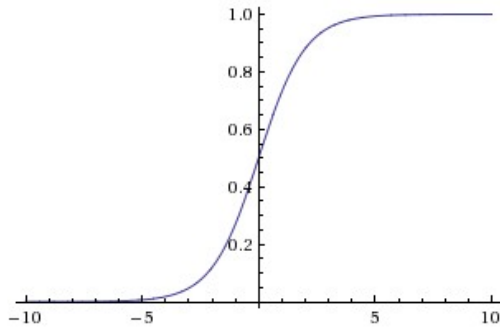
A Single neuron as a linear classifier:

$$f(\sum_i w_i x_i + b) \rightarrow P(y_i = 1 | x_i; w)$$

$$P(y_i = 0 \mid x_i; w) = 1 - P(y_i = 1 \mid x_i; w)$$
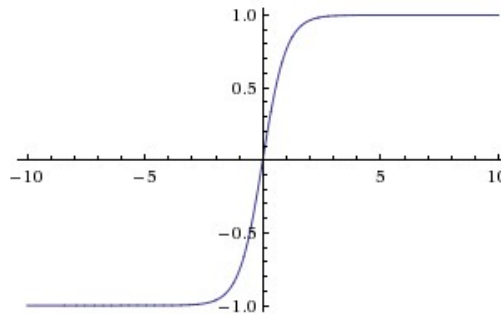
The perceptron: not a Deep Neural Network

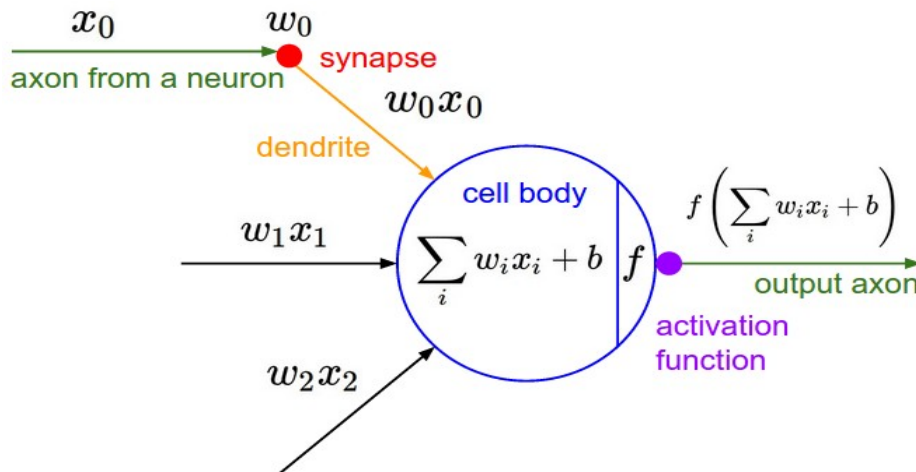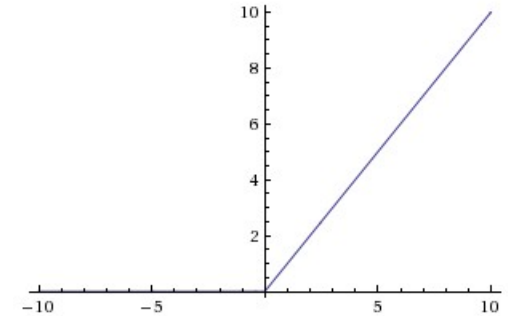Sigmoid

$$\sigma(x) = 1/(1 + e^{-x})$$

Tanh

$$\tanh(x) = 2\sigma(2x) - 1$$
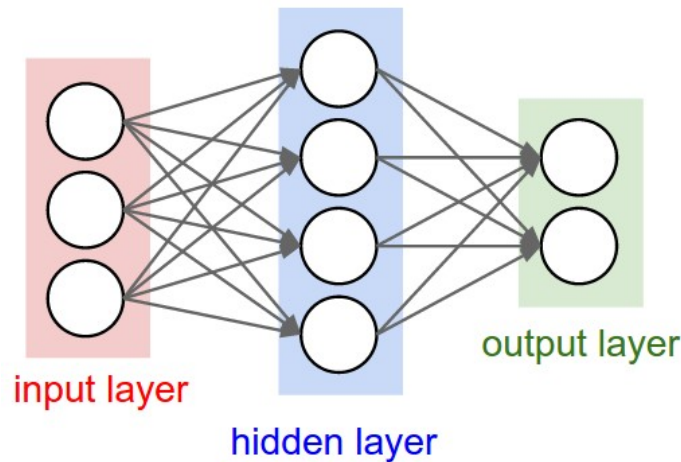
ReLU

$$f(x) = \max(0, x).$$

Max out

$$\max(w_1^T x + b_1, w_2^T x + b_2)$$

Neural Networks

- Neural Networks are modeled as collections of neurons that are connected in an acyclic graph → Multilayer Perceptron

input layer

hidden layer

output layer

Number of learnable parameters: [3 x 4] + [4 x 2] = 20 weights and 4 + 2 = 6 biases, for a total of 26 parameters

¡¡ And the network structure !!

Neural Networks

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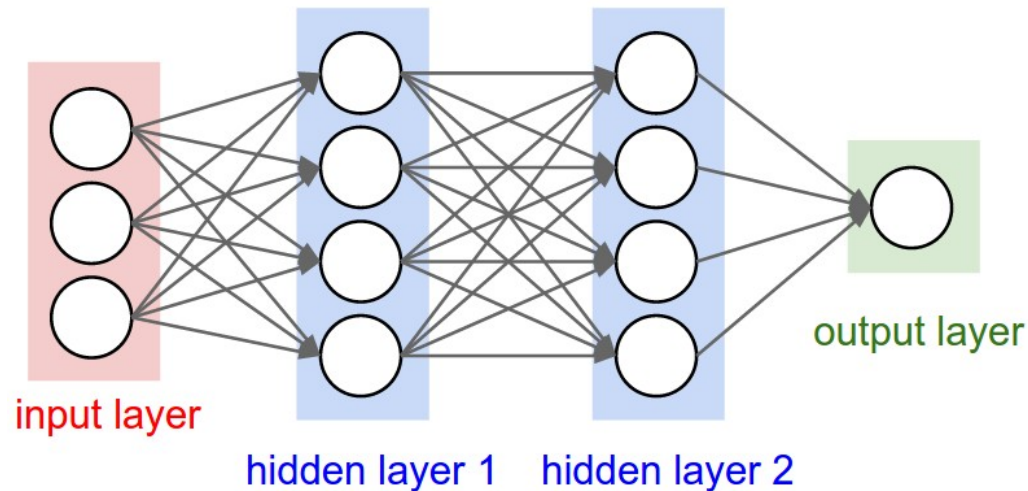

input layer

hidden layer 1   hidden layer 2

output layer

https://cs.stanford.edu/people/karpathy/convnetjs/demo/classify2d.html