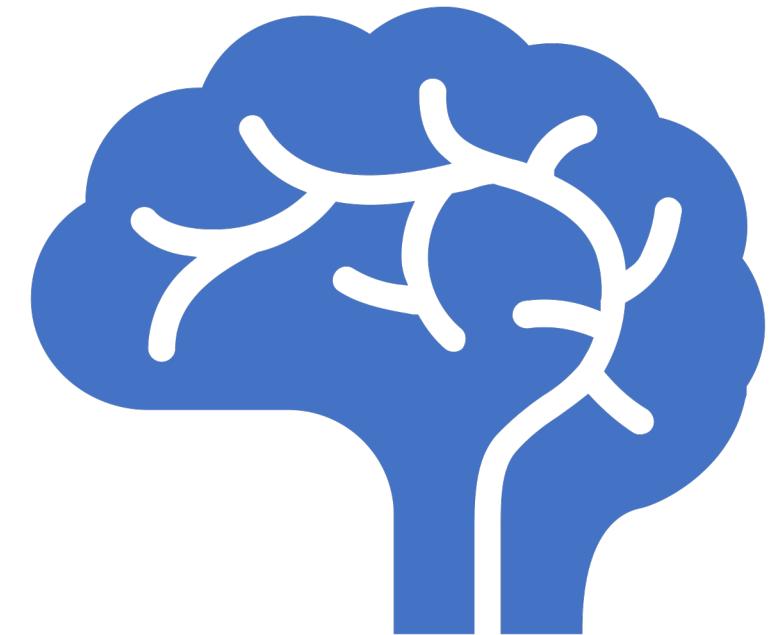


Neural Networks

Hossein Javidnia

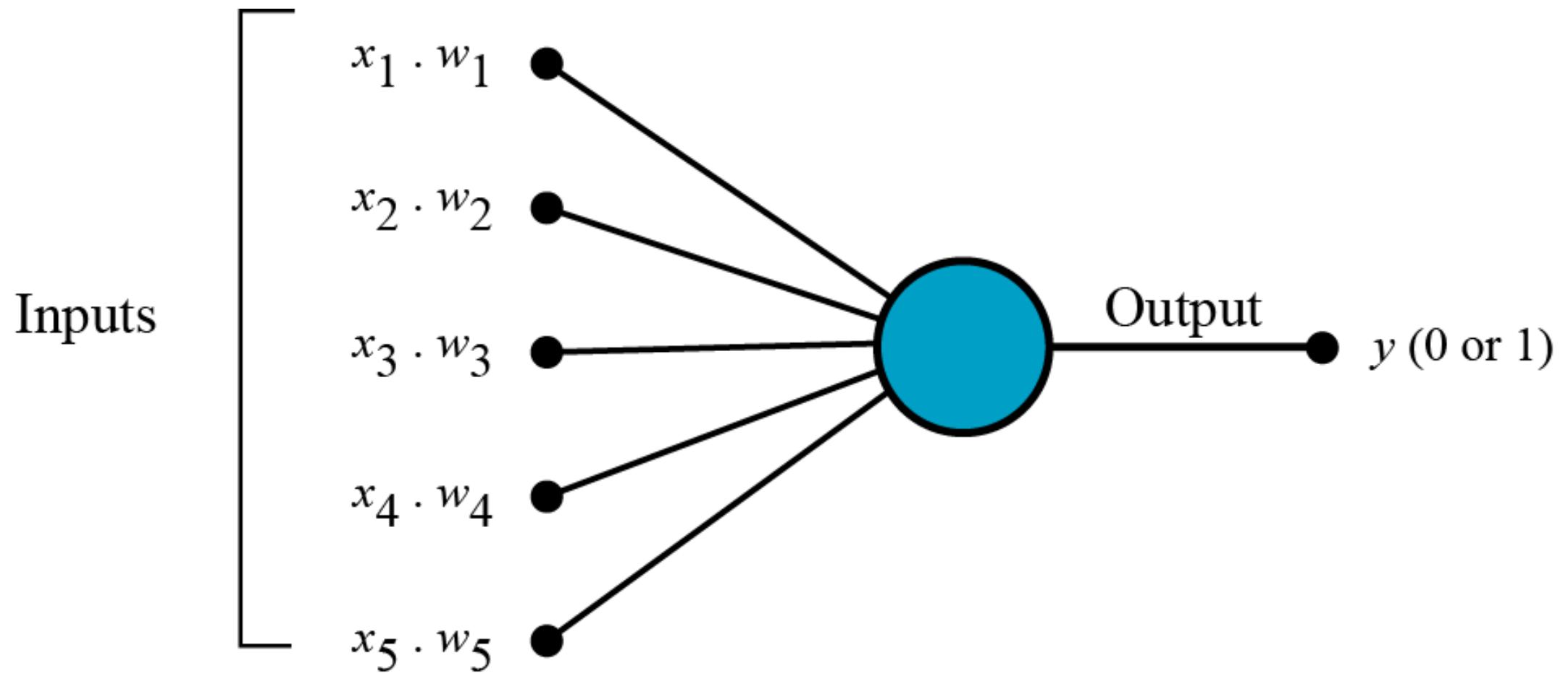
Postdoctoral Research Fellow,
ADAPT Centre, Trinity College Dublin



Perceptron (Neuron)

A perceptron is a simple binary classification algorithm, proposed by Cornell scientist Frank Rosenblatt. It helps to divide a set of input signals into two parts - “yes” and “no”. But unlike many other classification algorithms, the perceptron was modelled after the essential unit of the human brain - the neuron and has an uncanny ability to learn and solve complex problems.

Perceptron (Neuron)



Order of Operations

Each neuron takes in some floating point numbers known as **input**.

1

Input is multiplied by some other floating point numbers known as **weights**.

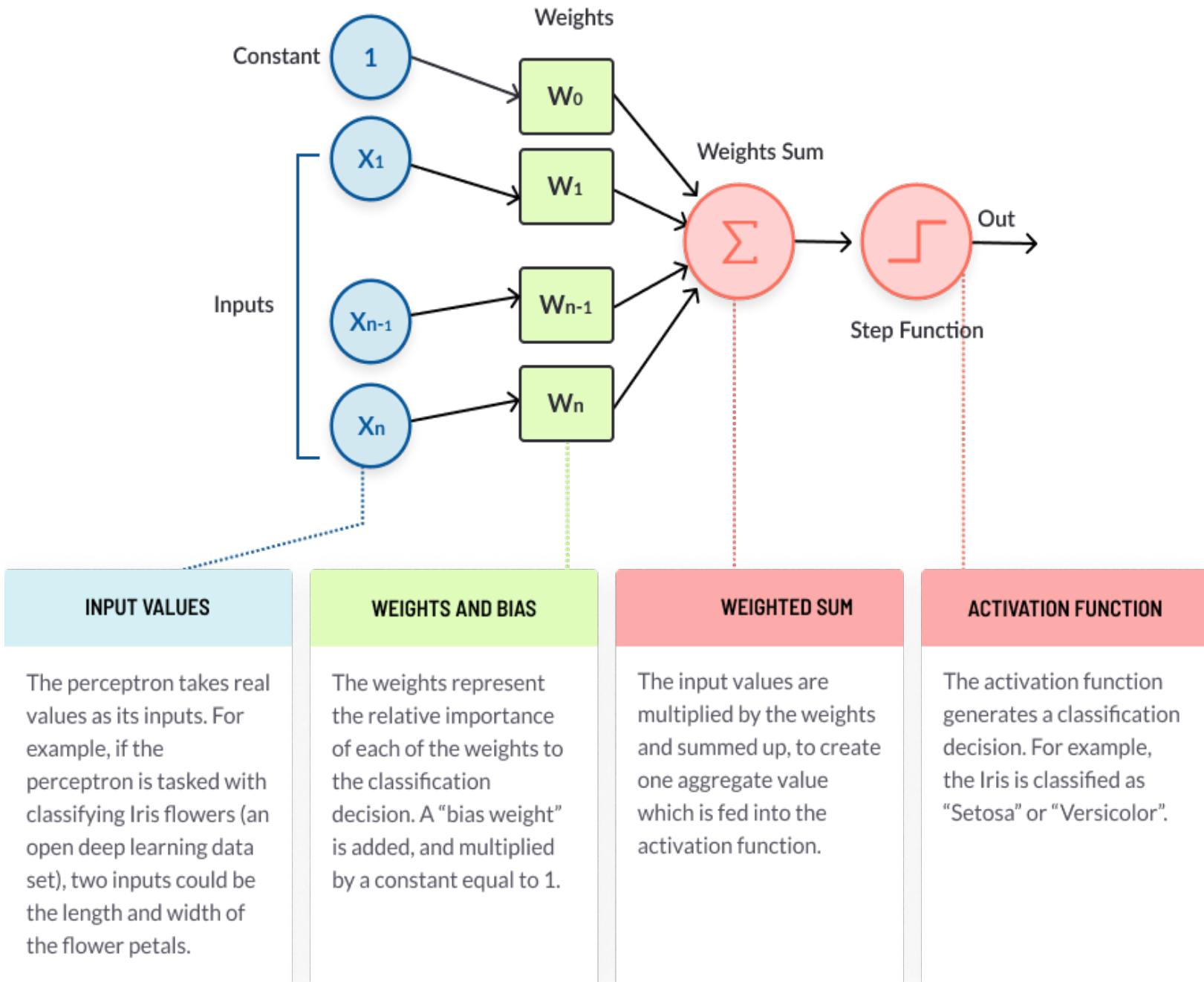
2

The weighted inputs then get summed together along with a bias value.

3

The summed value is now transformed into an output value according to the neuron's **activation function**.

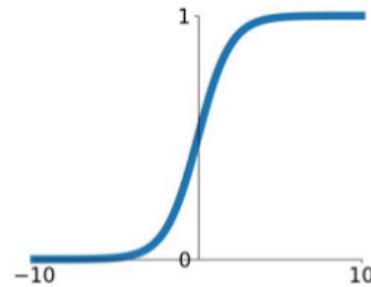
Perceptron Structure



Activation Functions

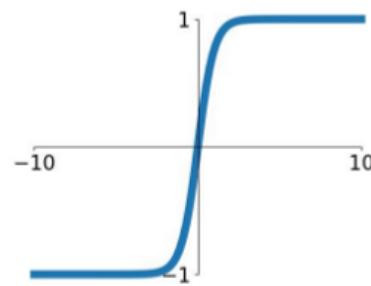
Sigmoid

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



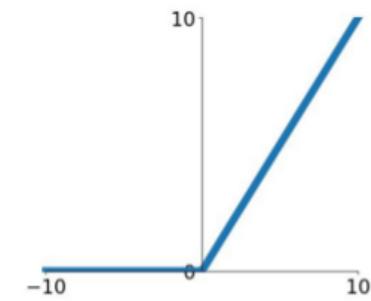
tanh

$$\tanh(x)$$



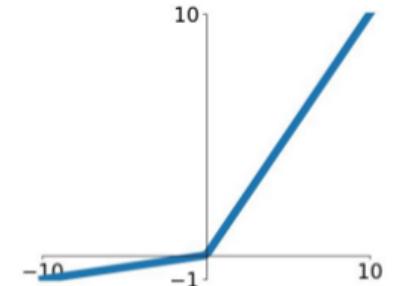
ReLU

$$\max(0, x)$$



Leaky ReLU

$$\max(0.1x, x)$$

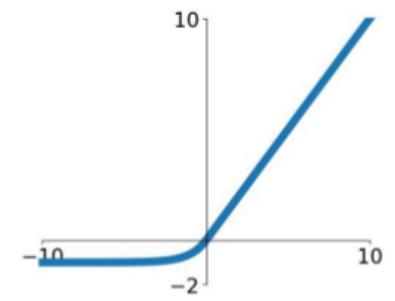


Maxout

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

ELU

$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



Network

