

1 What is a Neural Network?

The human brain can be described as a biological neural network—an interconnected web of neurons transmitting elaborate patterns of electrical signals. Dendrites receive input signals and, based on those inputs, fire an output signal via an axon.

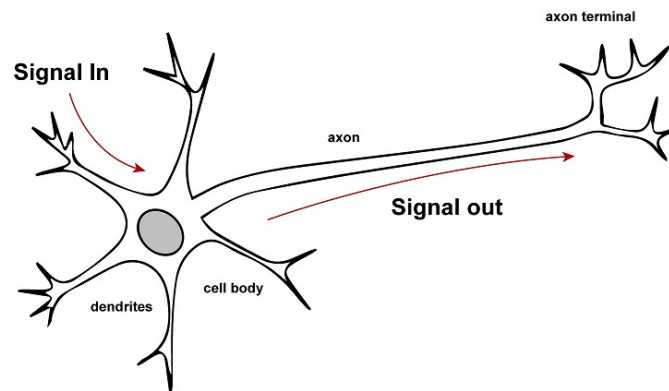


Figure 1

A neural network is a “connectionist” computational system. The computational systems we write are procedural; a program starts at the first line of code, executes it, and goes on to the next, following instructions in a linear fashion. A true neural network does not follow a linear path. Rather, information is processed collectively, in parallel throughout a network of nodes (the nodes, in this case, being neurons).

One of the key elements of a neural network is its ability to learn. A neural network is not just a complex system, but a complex adaptive system, meaning it can change its internal structure based on the information flowing through it. Typically, this is achieved through the adjusting of weights.

2 What is Perceptron?

Invented in 1957 by Frank Rosenblatt at the Cornell Aeronautical Laboratory, a perceptron is the simplest neural network possible: a computational model of a single neuron. A perceptron consists of one or more inputs, a processor, and a single output.

A perceptron follows the “feed-forward” model, meaning inputs are sent into the neuron, are processed, and result in an output. In the diagram above, this means the network (one neuron) reads from left to right: inputs come in, output goes out.

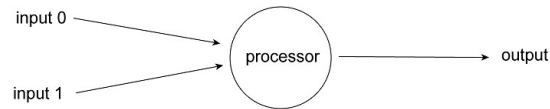


Figure 2

3 The Perceptron Algorithm:

- For every input, multiply that input by its weight.
- Sum all of the weighted inputs.
- Compute the output of the perceptron based on that sum passed through an activation function[1].

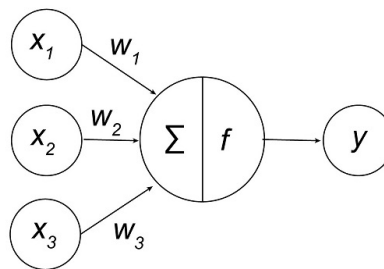


Figure 3

$$y(x) = f(\sum_{i=1}^n w_i x_i)$$

References

[1]Activation functions: https://en.wikipedia.org/wiki/Activation_function