What is a Neural Network?

Neural networks is an important area of research in neuroscience. When we, as computer scientists, engineers, or other professionals outside the scope of pure neuroscience refer to neural networks, we actually mean **artificial neural networks**.

The following is a fun short movie that will give you a nice visualization of these **biological** neural networks.

The design of the **Artificial Neural Network** was inspired by the biological one. The neurons used in the artificial network below are essentially mathematical functions.

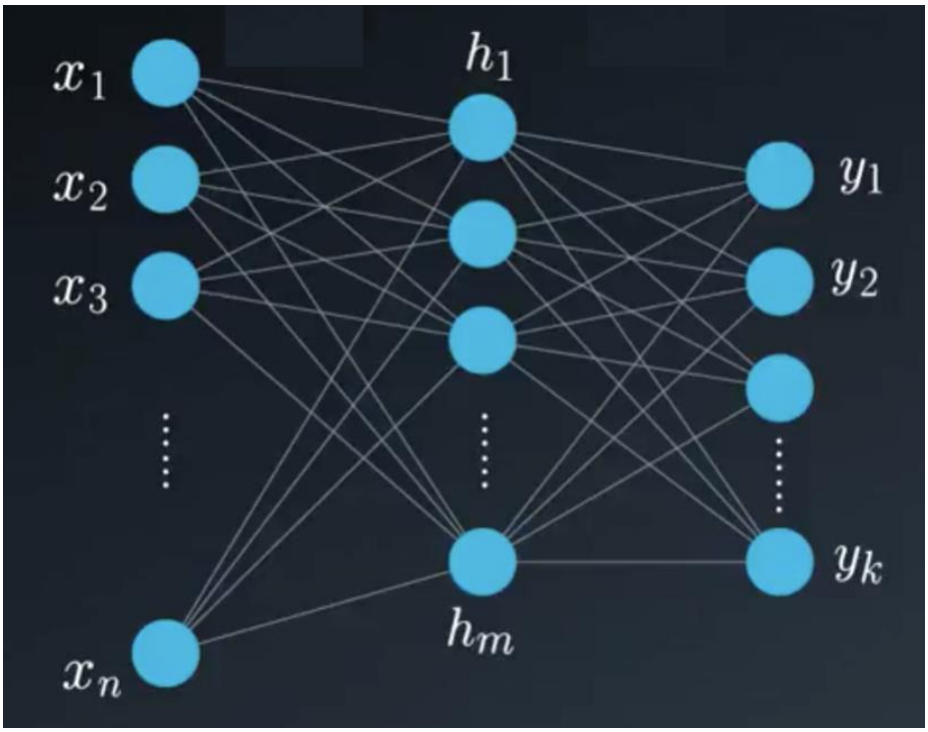
Each network has:

- Input neurons- which we refer to as the *input layer* of neurons
- Output neurons- which we refer to as the *output layer* of neurons

and

- Internal neurons- which we refer to as the *hidden layer* of neurons. Each neural network can have many hidden layers

The following picture is of a simple neural network with a single hidden layer.



Simplified Artificial Neural Network

This version of a simplified artificial neural network is comprised out of:

- An input vector $\vec{x} = [x_1\ x_2\ x_3 \dots\ x_n]$
- A hidden layer vector $\vec{h} = [h_1\ h_2\ h_3 \dots\ h_m]$

and

- An output vector $\vec{y} = [y_1\ y_2\ y_3 \dots\ y_n]$

Each element in the vectors is a mathematical argument which we will elaborate on very soon.

Notice that there is no connection between the number of inputs, number of hidden neurons in the hidden layer or number of outputs.

(The notation we used here is of a row vector, these vectors can be expressed as column vectors as well)