

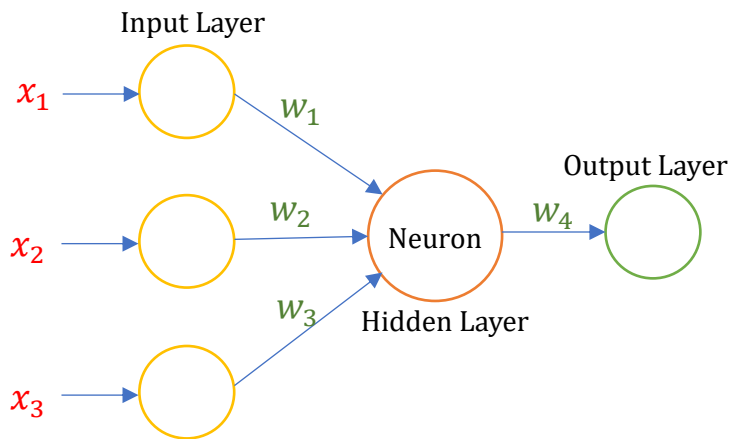
# Neural Network Working

1. NN working.
2. Internal work of neuron



## 1. Neural Network Working

Consider simple neural network example as show in below:

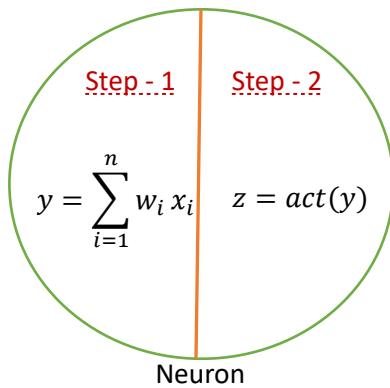


Here  $x_1, x_2, x_3$  are input features.  $w_1, w_2, w_3$  are connection weights features.

The  $x_1, x_2$  and  $x_3$  are the input features to neural network, these features also known as independent variables.

- The input features  $x_1, x_2$  and  $x_3$  are providing to input nodes in input layer. These features will go to neuron through weighted connections  $w_1, w_2$  under  $w_3$ .
- Once the feature inputs and the weights received to the neuron, it will start the mathematical operations and will generate the activation signal.
- The generated output signal passed to the output node through weighted output connection  $w_4$ .
- For example, if we kept a hot object on the hand then all hand related neurons immediately activated and weighted, that information passed to the brain through neurons.
- Consider here the hot object is input  $x$ , and neuron activation weight is  $(w)$ . when weight is occurred then neuron will be activated.
- Here the big question is, how to know weight it is occurred or not it? can be known by activation function result.

## 2. Internal Work of Neuron:



The Neuron performs mainly two works are shown as step-1 and step-2 in the diagram. Let's learn about those two steps now:

### Step -1:

In this stage the neuron generates the y values by adding the multiply values of weights (w) and feature (x) values at each i<sup>th</sup> index (i<sup>th</sup> row in dataset).

It receives the weights (w1, w2, w3, ...) from connections and feature values (x1, x2, x3,...) from input node or from previous neurons.

$$y = \sum_{i=1}^n w_i x_i + bias$$

$$y = w_1 x_1 + w_2 x_2 + w_3 x_3 + \dots \dots \dots + w_n x_n + bias$$

### Step -2:

In the second step it will generate activation value of the Y by applying the activation function. This activation value (z) tells that neuron is activated or not. If the Z value is zero or similar to zero, then the neuron is in off state otherwise it is on state.

$$z = act(y)$$