# Feed forward neural networks

Feed forward neural networks are artificial neural networks in which nodes do not form loops. This type of neural network is also known as a multi-layer neural network as all information is only passed forward.

During data flow, input nodes receive data, which travel through hidden layers, and exit output nodes. No links exist in the network that could get used to by sending information back from the output node.

A feed forward neural network approximates functions in the following way:

- An algorithm calculates classifiers by using the formula y = f* (x).
- Input x is therefore assigned to category y.
- According to the feed forward model, y = f (x; θ). This value determines the closest approximation of the function.

Feed forward neural networks serve as the basis for object detection in photos, as shown in the Google Photos app.

What is the working principle of a feed forward neural network?

When the feed forward neural network gets simplified, it can appear as a single layer perceptron.

This model multiplies inputs with weights as they enter the layer. Afterward, the weighted input values get added together to get the sum. As long as the sum of the values rises above a certain threshold, set at zero, the output value is usually 1, while if it falls below the threshold, it is usually -1.

As a feed forward neural network model, the single-layer perceptron often gets used for classification. Machine learning can also get integrated into single-layer perceptrons. Through training, neural networks can adjust their weights based on a

property called the delta rule, which helps them compare their outputs with the intended values.

As a result of training and learning, gradient descent occurs. Similarly, multi-layered perceptrons update their weights. But, this process gets known as back-propagation. If this is the case, the network's hidden layers will get adjusted according to the output values produced by the final layer.

Layers of feed forward neural network

- Input layer:

The neurons of this layer receive input and pass it on to the other layers of the network. Feature or attribute numbers in the dataset must match the number of neurons in the input layer.

- Output layer:

According to the type of model getting built, this layer represents the forecasted feature.

- Hidden layer:

Input and output layers get separated by hidden layers. Depending on the type of model, there may be several hidden layers.

There are several neurons in hidden layers that transform the input before actually transferring it to the next layer. This network gets constantly updated with weights in order to make it easier to predict.

- Neuron weights:

Neurons get connected by a weight, which measures their strength or magnitude. Similar to linear regression coefficients, input weights can also get compared.

Weight is normally between 0 and 1, with a value between 0 and 1.

- Neurons:

Artificial neurons get used in feed forward networks, which later get adapted from biological neurons. A neural network consists of artificial neurons.

Neurons function in two ways: first, they create weighted input sums, and second, they activate the sums to make them normal.

Activation functions can either be linear or nonlinear. Neurons have weights based on their inputs. During the learning phase, the network studies these weights.

- Activation Function:

Neurons are responsible for making decisions in this area.

According to the activation function, the neurons determine whether to make a linear or nonlinear decision. Since it passes through so many layers, it prevents the cascading effect from increasing neuron outputs.

An activation function can be classified into three major categories: sigmoid, Tanh, and Rectified Linear Unit (ReLu).

- Sigmoid:

Input values between 0 and 1 get mapped to the output values.

- Tanh:

A value between -1 and 1 gets mapped to the input values.

- Rectified linear Unit:

Only positive values are allowed to flow through this function. Negative values get mapped to 0.