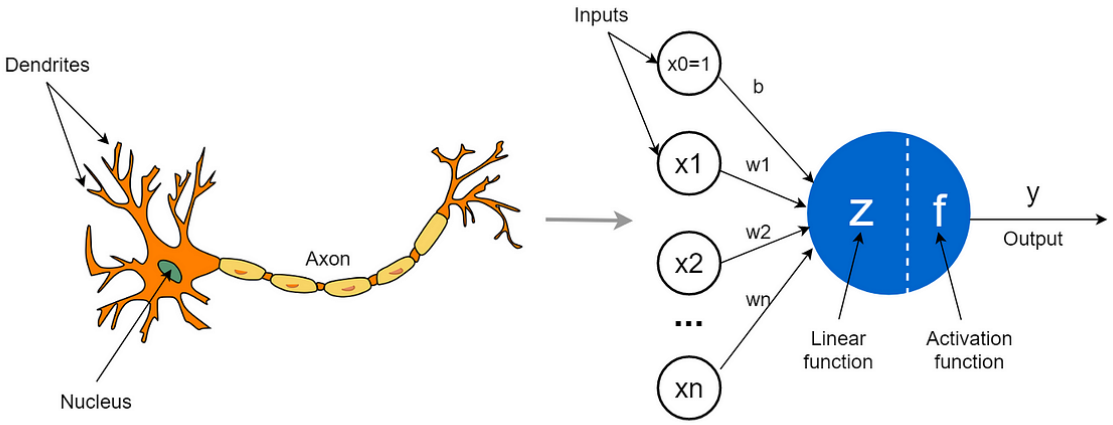
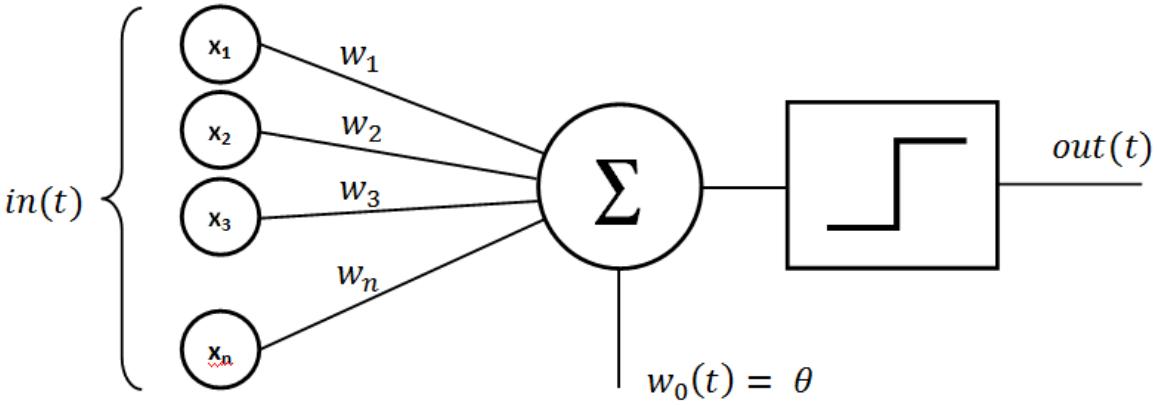
Perceptron :


Dendrites
Axon
Nucleus
Inputs
x0=1
b
x1
w1
x2
w2
...
wn
xn
z
f
y
Output
Linear function
Activation function


$in(t)$
x_1
x_2
x_3
x_n
w_1
w_2
w_3
w_n
Σ
$out(t)$
$w_0(t) = \theta$

Basic Components of Perceptron

Perceptron is a type of artificial neural network, which is a fundamental concept in machine learning. The basic components of a perceptron are:

1. Input Layer: The input layer consists of one or more input neurons, which receive input signals from the external world or from other layers of the neural network.
2. Weights: Each input neuron is associated with a weight, which represents the strength of the connection between the input neuron and the output neuron.
3. Bias: A bias term is added to the input layer to provide the perceptron with additional flexibility in modeling complex patterns in the input data.
4.
5. Activation Function: The activation function determines the output of the perceptron based on the weighted sum of the inputs and the bias term. Common activation functions used in perceptrons include the step function, sigmoid function, and ReLU function.

   The activation function determines whether the neuron will fire or not. At its simplest, the activation function is a step function, but based on the scenario, different activation functions can be used

1. Output: The output of the perceptron is a single binary value, either 0 or 1, which indicates the class or category to which the input data belongs.
2.
3.
4. Training Algorithm: The perceptron is typically trained using a supervised learning algorithm such as the perceptron learning algorithm or backpropagation. During training, the weights and biases of the perceptron

are adjusted to minimize the error between the predicted output and the true output for a given set of training examples.

5. Overall, the perceptron is a simple yet powerful algorithm that can be used to perform binary classification tasks and has paved the way for more complex neural networks used in deep learning today.

Characteristics of Perceptron

The perceptron model has the following characteristics.

1. Perceptron is a machine learning algorithm for supervised learning of binary classifiers.
2. In Perceptron, the weight coefficient is automatically learned.
3. Initially, weights are multiplied with input features, and the decision is made whether the neuron is fired or not.
4. The activation function applies a step rule to check whether the weight function is greater than zero.
5. The linear decision boundary is drawn, enabling the distinction between the two linearly separable classes +1 and -1.
6. If the added sum of all input values is more than the threshold value, it must have an output signal; otherwise, no output will be shown.

perceptron

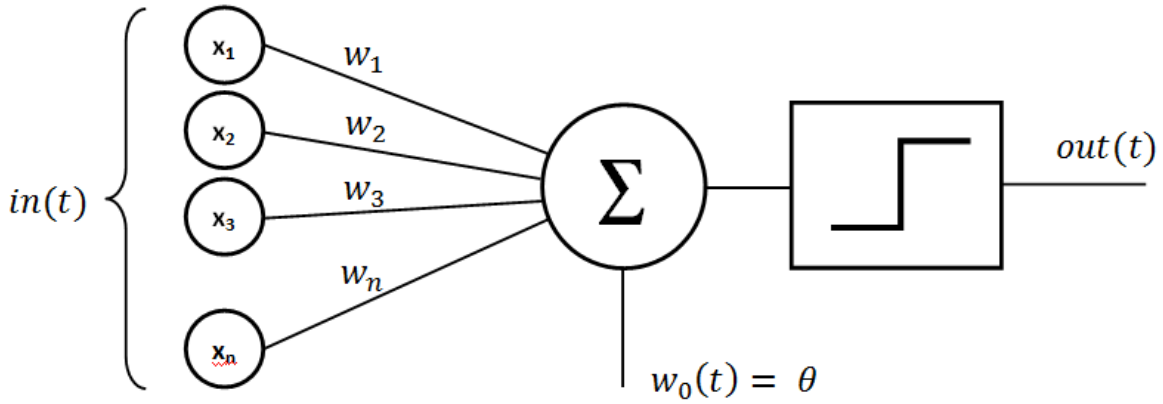
Limitations of Single Layer Perceptron

The single layer perceptron algorithm has several limitations, including:

1. Limited to linearly separable data: The single layer perceptron algorithm can only classify linearly separable data. It cannot classify data that is not linearly separable. This is because the algorithm uses a linear decision boundary to separate the data.

2. Limited to binary classification: The single layer perceptron algorithm is only suitable for binary classification problems.

4. Sensitive to initial conditins: The performance of the single layer perceptron algorithm is sensitive to the initial conditions of the weights. If the weights are not initialized correctly, the algorithm may converge to a suboptimal solution.



Types of Perceptron:

1. Single layer: Single layer perceptron can learn only linearly separable patterns.
2. Multilayer: Multilayer perceptrons can learn about two or more layers having a greater processing power.