# 1 Perceptron Theory

Perceptron is also known as a single neuron. It is used as a binary classifier, and is a type of supervised learning. After training on data, it is able to classify a given input to one of two classes.

It was introduced in 1943 by Warren McCulloch and Walter Pitts. They released a paper in 1958 with all the details of the perceptron https://psycnet.apa.org/doiLanding?doi=10.1037%2Fh0042519.

## 1.1 Requirements

There is limitation for using the perceptron:

- Binary classification only - i.e only two classes in the dataset.
- Training data must be labeled.
- Data has to be linearly separable.

## 1.2 Definition

The perceptron can be defined as a function $f(\vec{x})$, that take a feature vector $\vec{x}$:

$$f(\vec{x}) = h(\vec{w} \cdot \vec{x} + b) \tag{1}$$
$$= h(w_1 \cdot x_1 + w_2 \cdot x_2 + b) \tag{2}$$

Where $\vec{w}$ is the weight vector with the two weights for the perceptron and $b$ is the bias of the network.

Note that we use a activation function called *Heaviside step function*. The output of the activation function is either 0 or 1.

## 1.3 Why do we need a bias?

## 1.4 Training