

1. Rosenblatt's perceptron concept

The Rosenblatt's perceptron is an implementation of McCulloch-Pitts neuron's model. It is a binary single neuron model. The inputs integration is updated through addition of the weighted inputs every epoch of training process. If the sum is larger than the given threshold then the neuron fires else it won't fire. The neuron output equals to 1 when it fires, else it's 0.

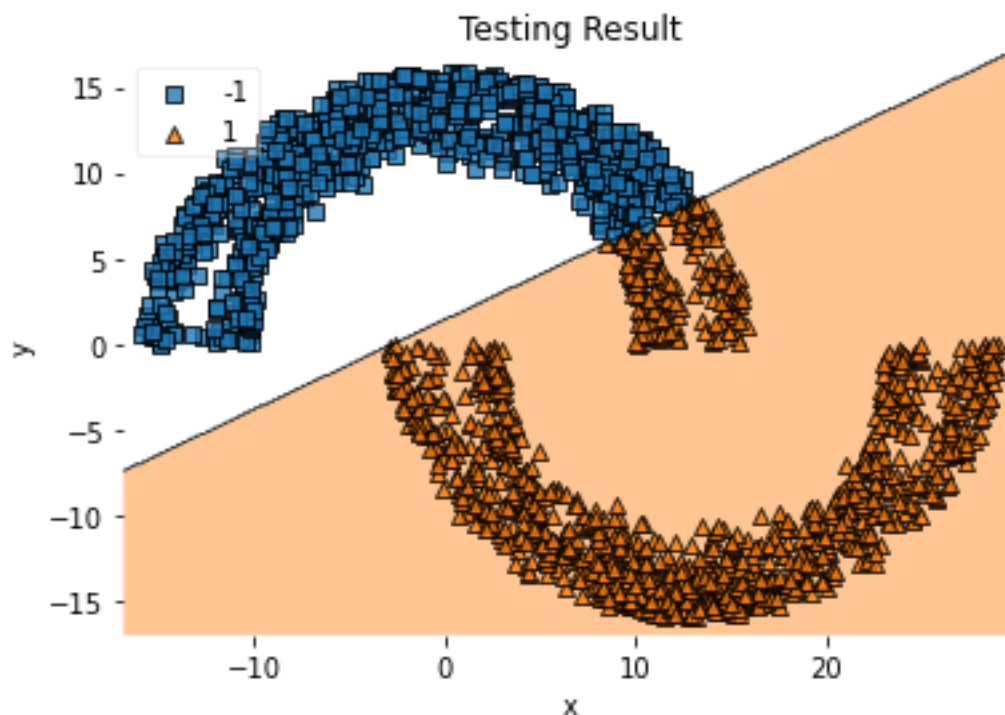
The equation is shown below:

$$H(x) = \begin{cases} 1 & \text{if } w_1*x_1 + w_2*x_2 + \dots + w_n*x_n \geq \theta \\ 0 & \text{if } w_1*x_1 + w_2*x_2 + \dots + w_n*x_n < \theta \end{cases}$$

The model implements the functioning of a single neuron that can classify linear classification problem through a very simple learning algorithm. It is the first generation of artificial neural network.

2.

- The data we have is only coordination of points generated by the moon function.
- We need to create two dataset, one for training, and one for testing.
- The dataset we have which does not have label on it, which is unsuitable for classification task. Every point need to be assigned a label.
- 1s are labeled for points belong to the upper half moon and 0s for the other half moon.
- Then we extract training data and label from the labeled dataset for training purpose.
- Using perceptron algorithm, we can classify these points and test it with test dataset.
- We have the testing result below:



Conclusion: My Perceptron model seems to seriously misclassify the upper half moon with high error rate. I had tried every possible learning rate for the model, but it did not seem to work better. The boundary decision does not clearly divide the two classes. I need to perform some work on reducing error rate of my model.