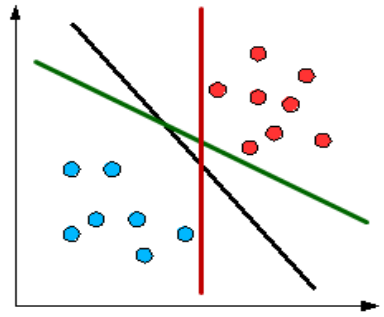
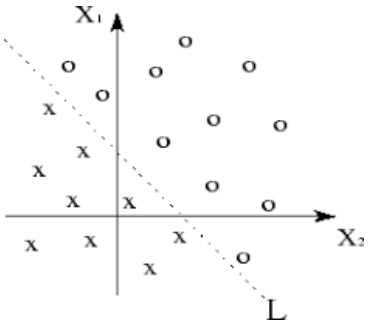
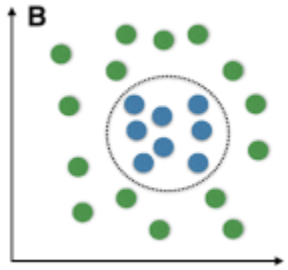
ML - Lab

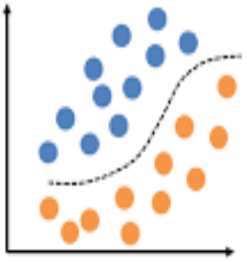
Linearly Seperable:





Non Linearly Seperable:





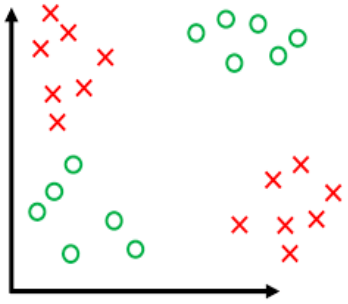


fig1

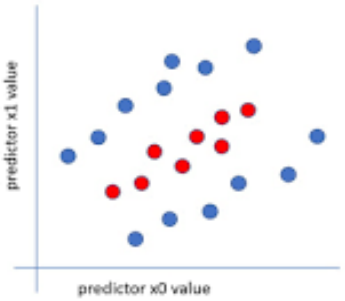


fig2

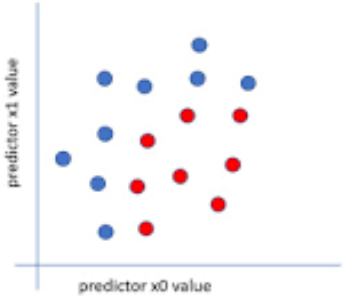
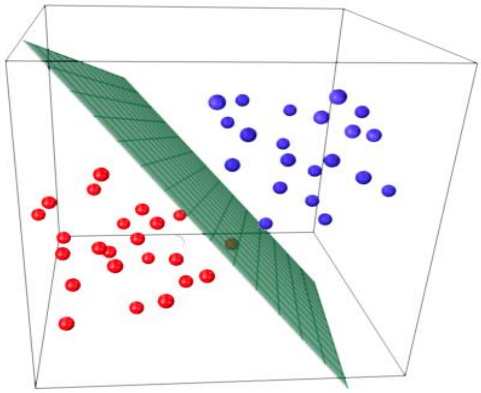
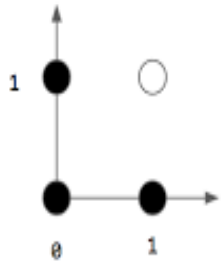


fig3



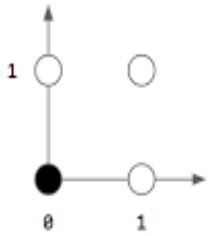
AND

INPUT		OUTPUT
A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1



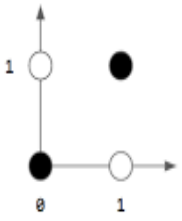
OR

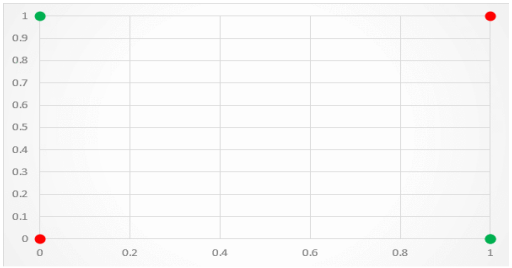
INPUT		OUTPUT
A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1



Ex-OR

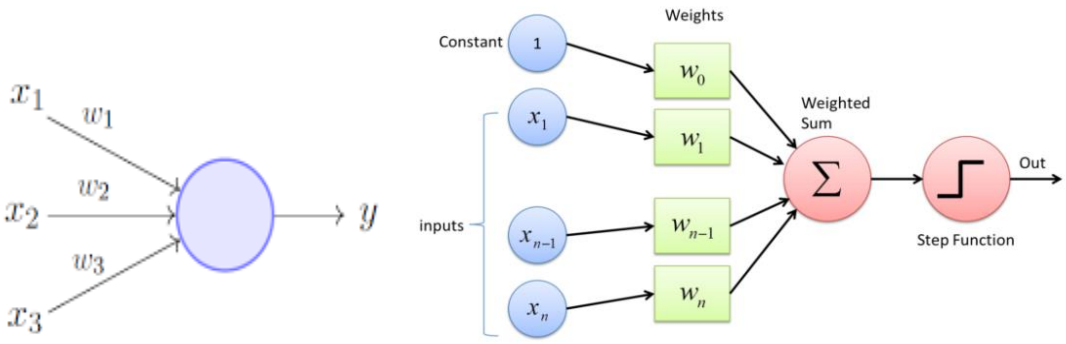
INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0





Perceptron:

- The **Perceptron** is an algorithm for supervised learning of binary classifiers.
- Single layer **Perceptron's** can learn only linearly separable patterns.
- A classification **algorithm** that makes its predictions based on a linear predictor function combining a set of weights with the feature vector.
- The perceptron model is a more general computational model and It takes an input, aggregates it (weighted sum) and returns 1 only if the aggregated sum is more than some threshold else returns 0.
- This algorithm enables neurons to learn and processes elements in the training set one at a time.



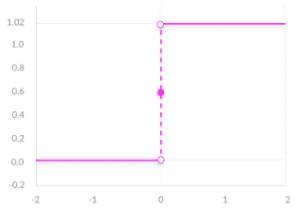
Perceptron Learning Rule:

Perceptron Learning Rule states that the algorithm would automatically learn the optimal weight coefficients. The input features are then multiplied with these weights to determine if a neuron fires or not.

$$y = 1 \quad if \sum_{i=0}^{n} w_i * x_i \geq 0$$
$$= 0 \quad if \sum_{i=0}^{n} w_i * x_i < 0$$

Binary Step Function

A binary step function is a threshold-based activation function. If the input value is above or below a certain threshold, the neuron is activated and sends exactly the same signal to the next layer.



Algorithm 1 Perceptron algorithm

```
procedure PERCEPTRON
    for each node x_i ∈ Data do
        if w_t^T x_i > 0 then
            Predict positive label
        else
            Predict negative label
        end if
        if wrong label then
            if true label is positive then
                w_{t+1} = w_t + x_i
            else
                w_{t+1} = w_t - x_i
            end if
        end if
    end for
end procedure
```

Find weights and threshold for implementing AND, OR, XOR gates using perceptrons.