Introduction to

Neural Networks

Presented by :
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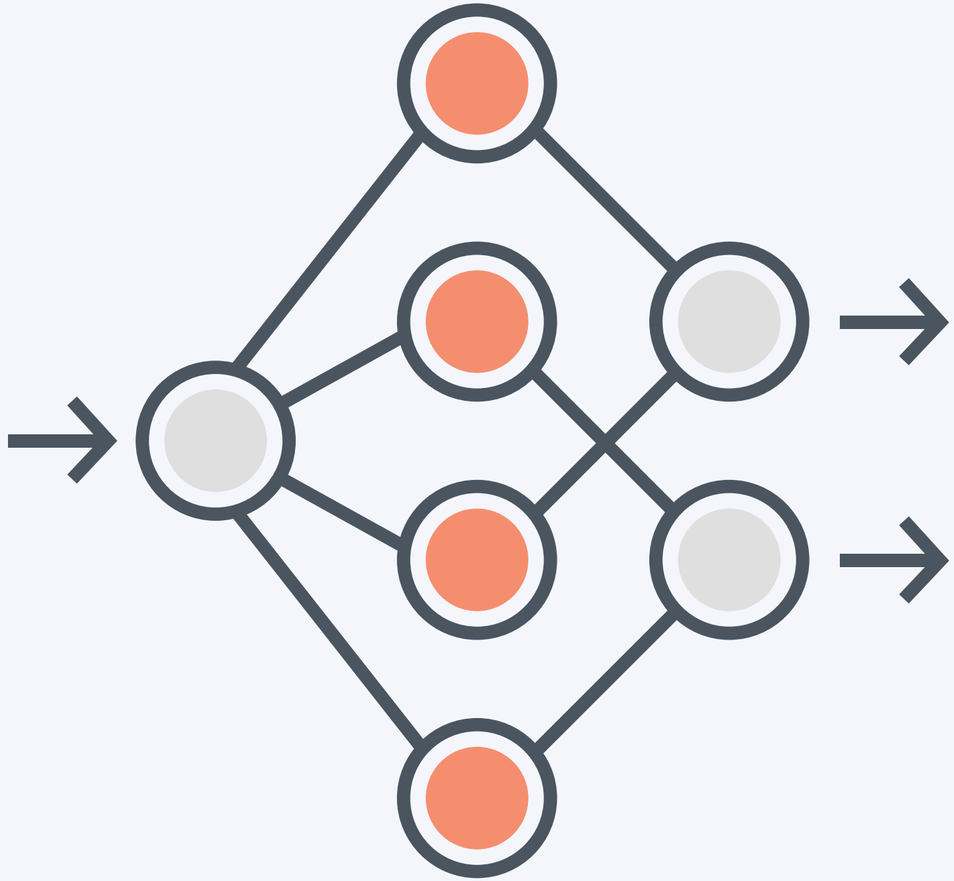
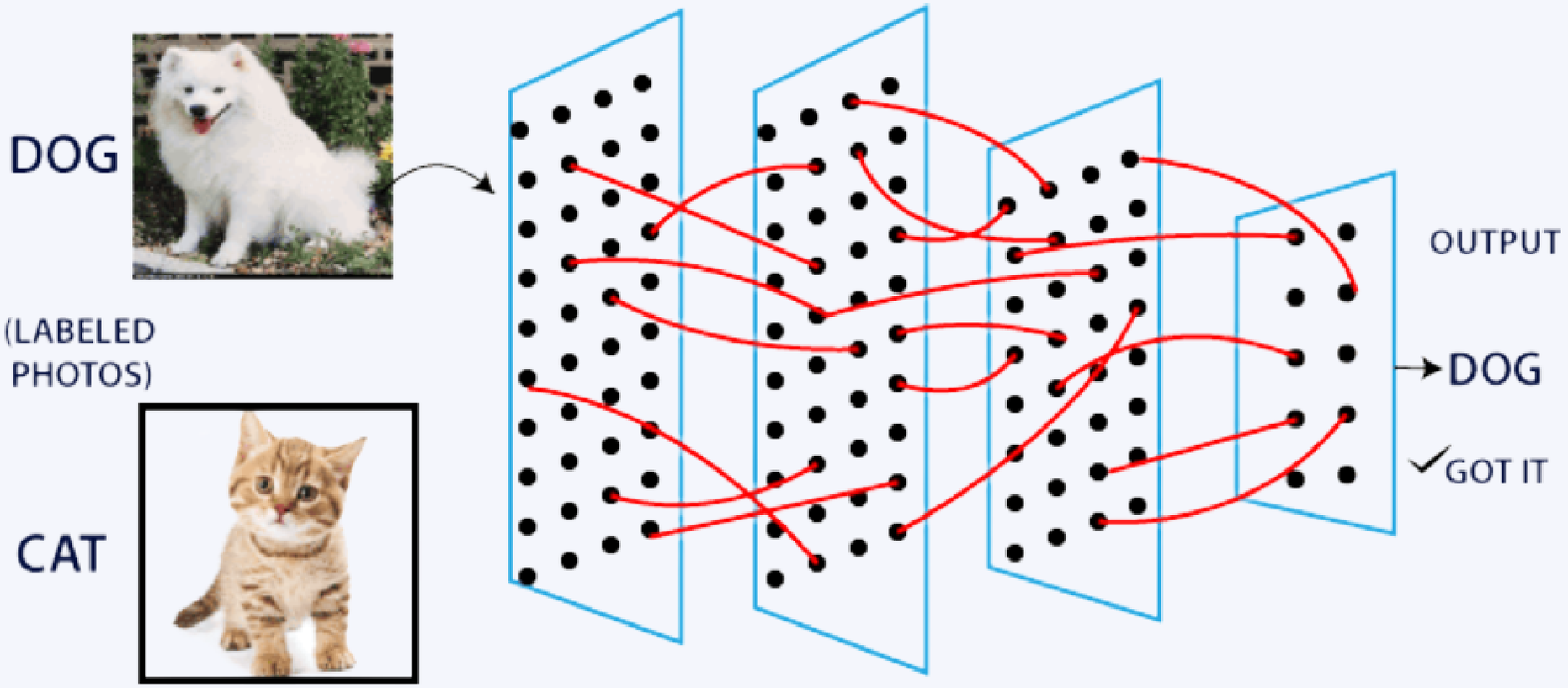
What is a neural network ?

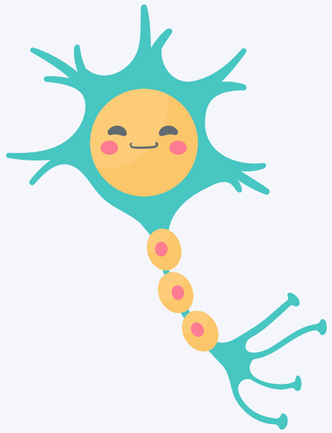
- A neural network is a type of machine learning algorithm inspired by the function of the human brain.
- It is composed of layers of interconnected "neurons," which process and transmit information.



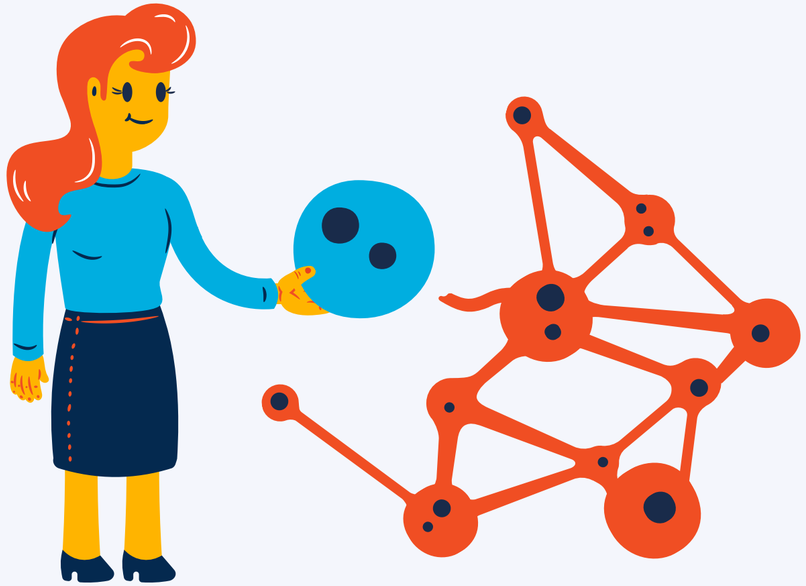
An example of a neural network



What is a neuron ?

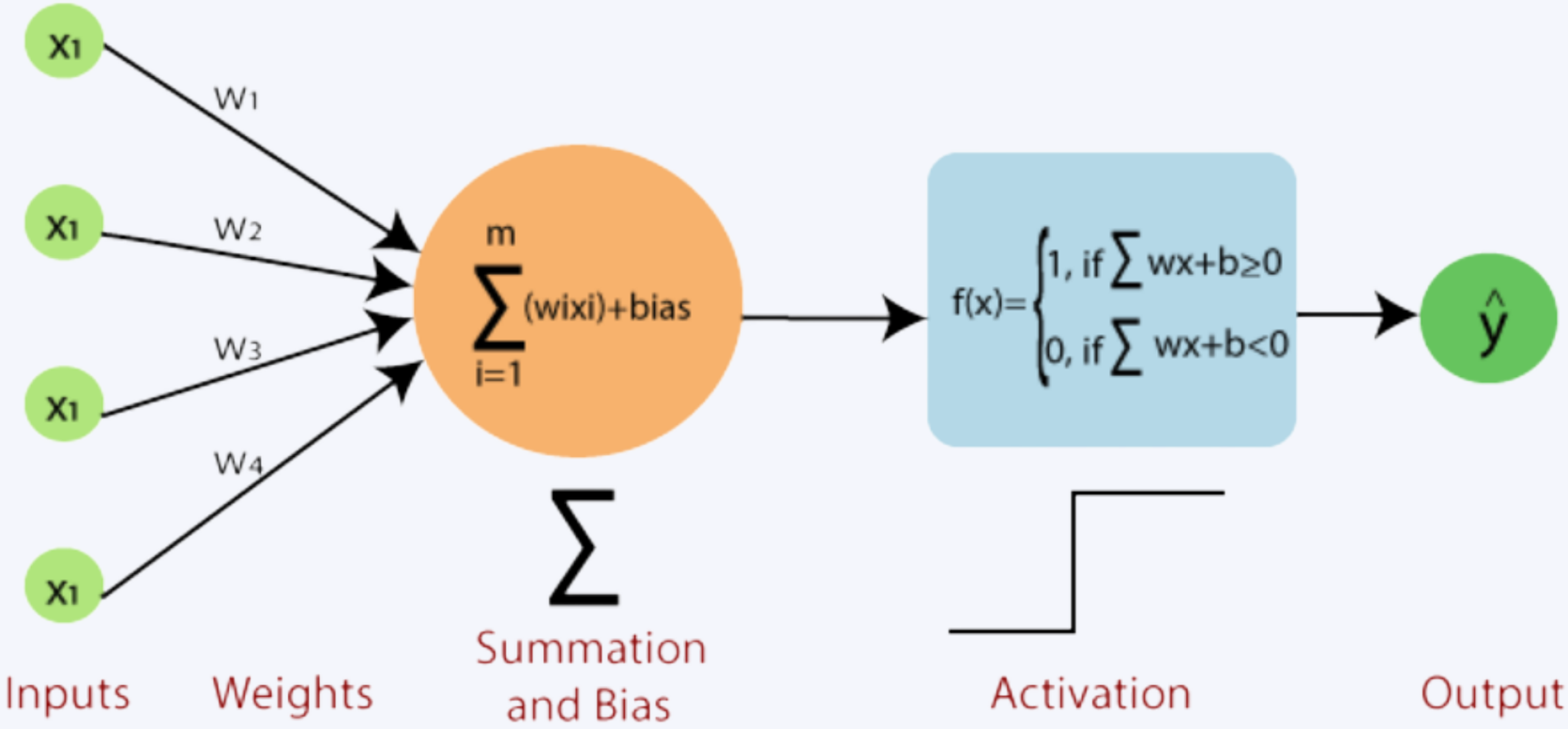


- **A neuron is a basic unit of a neural network. It receives input from other neurons or from external sources, processes that input using an activation function, and produces an output.**



The perceptron model

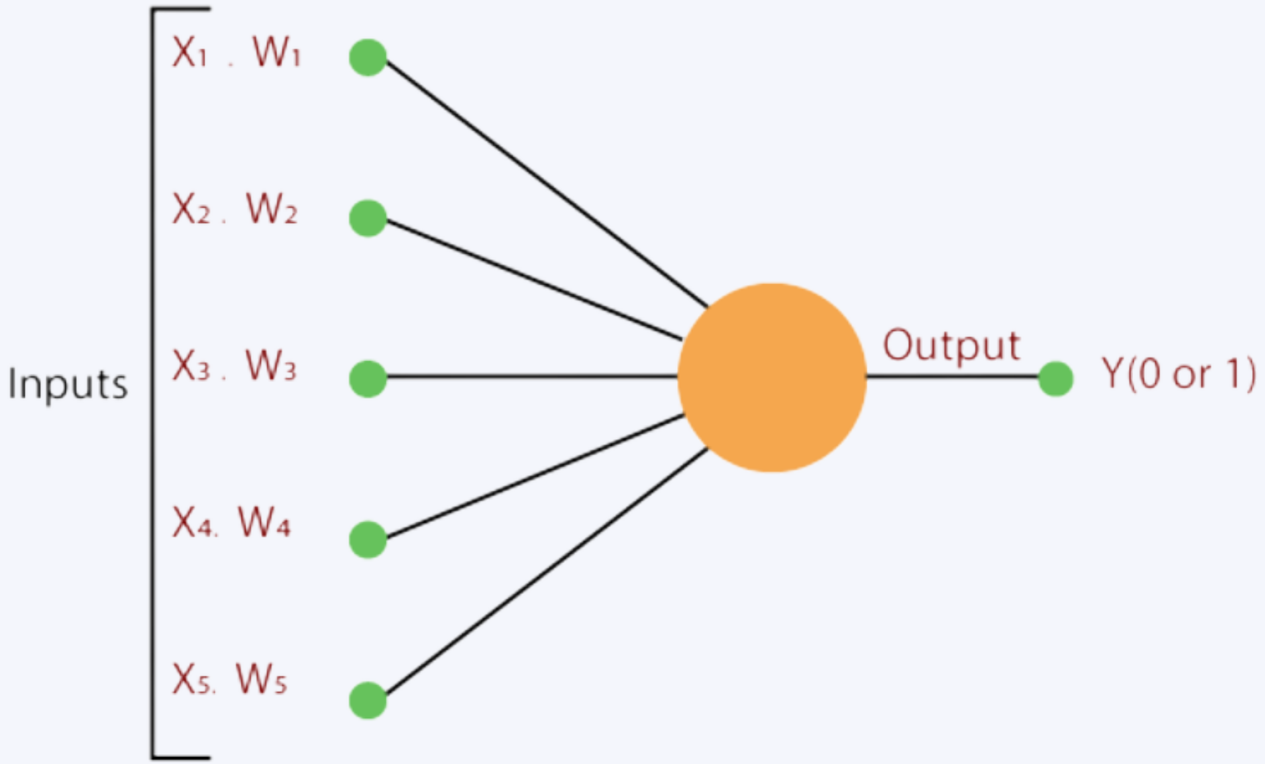
- A perceptron is a type of single-layer neural network.
- The perceptron receives input, processes it using an activation function, and produces an output that is either a 0 or a 1.



How does it work ?

Step 1 :

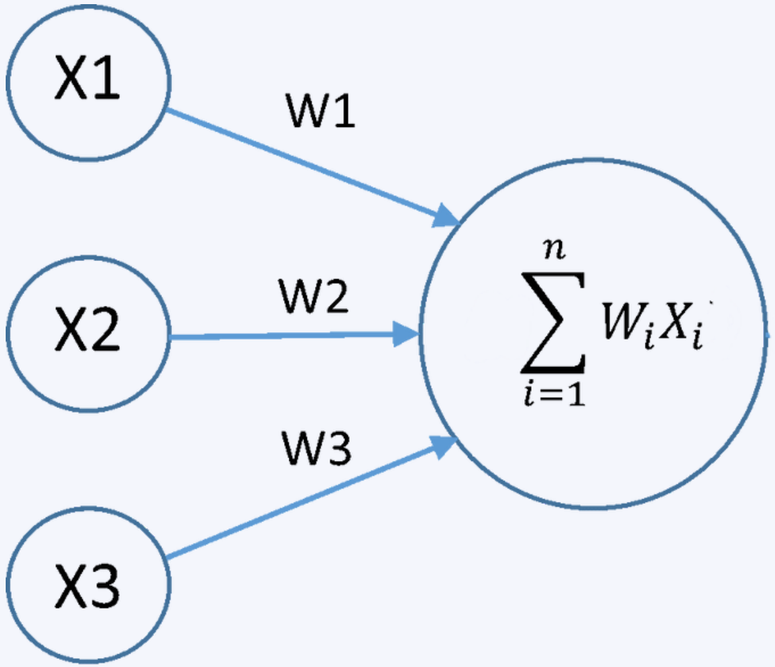
In the first step, all the inputs x are multiplied with their weights w.

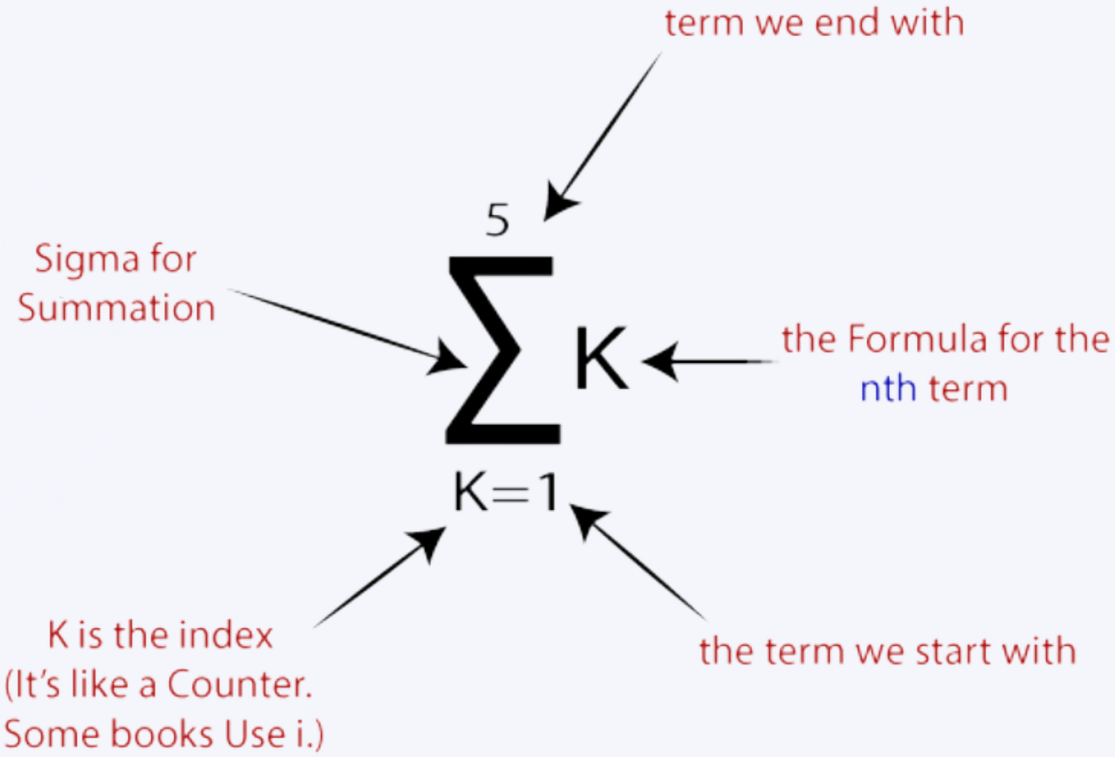


How does it work ?

Step 2 :

In this step, we add up all the values , we call the Weighted sum.

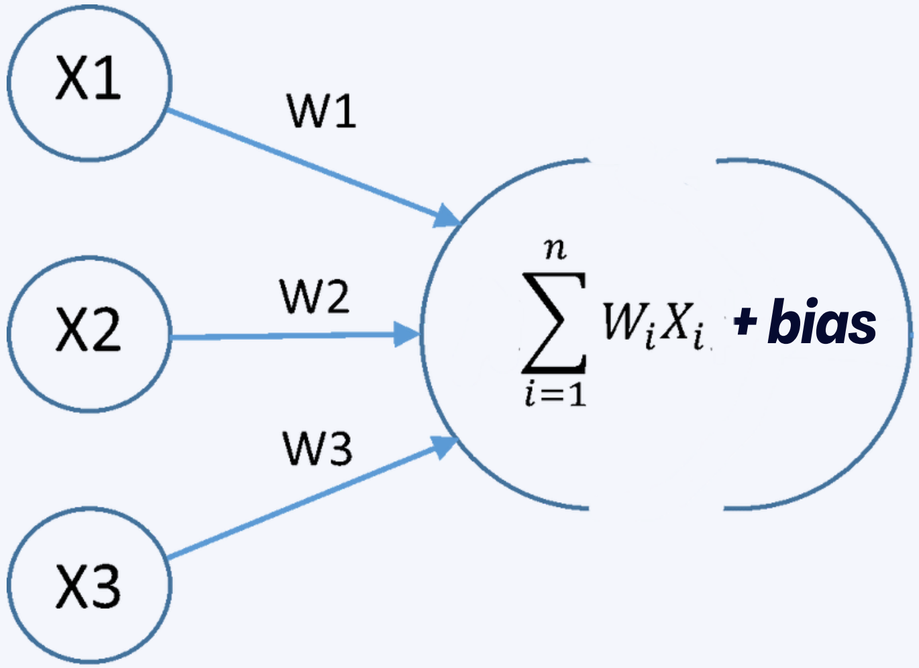




How does it work ?

Step 3 :

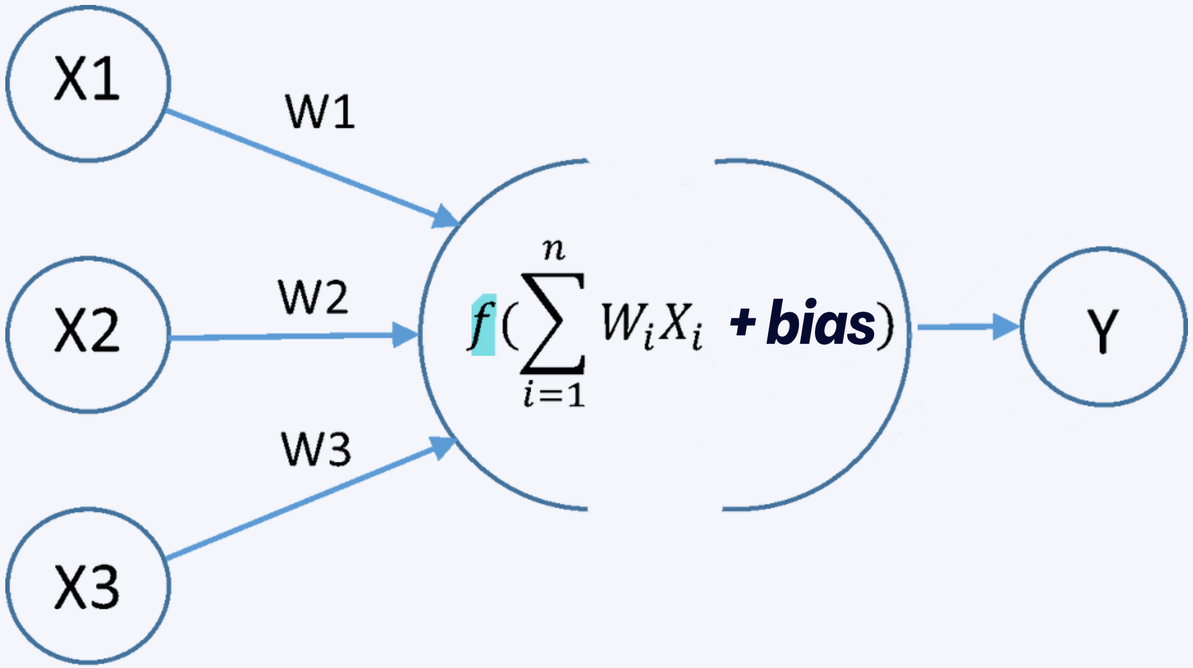
In this step, we add up the bias to the Weighted sum.



How does it work ?

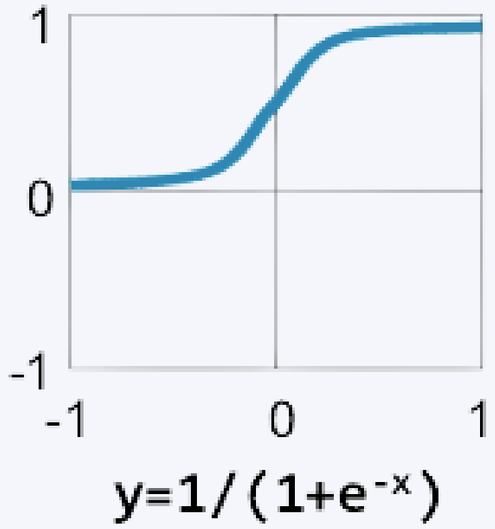
Step 4:

- In our last step, apply an activation fuction on the weighted sum .
- Activation functions are an essential component of neural networks, as they introduce non-linearity into the network, allowing it to learn and model more complex relationships in the data.



Types of activation functions

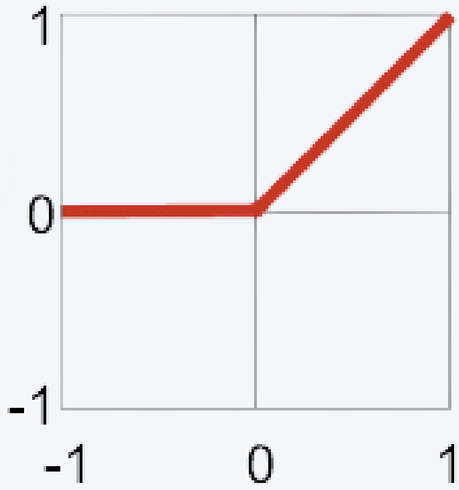
Sigmoid



$y=1/(1+e^{-x})$

Sigmoid function

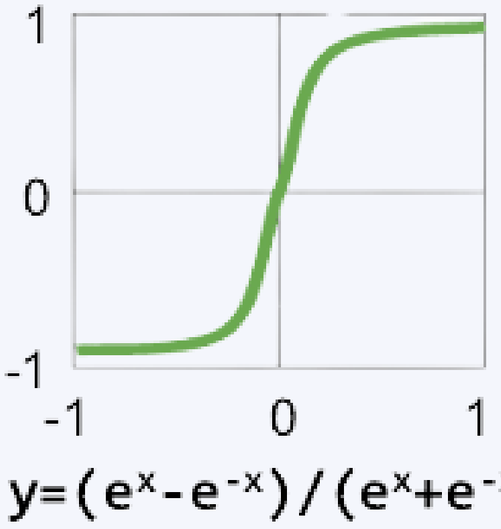
Rectified Linear Unit
(ReLU)



$y=max(0,x)$

Relu function

Hyperbolic Tangent

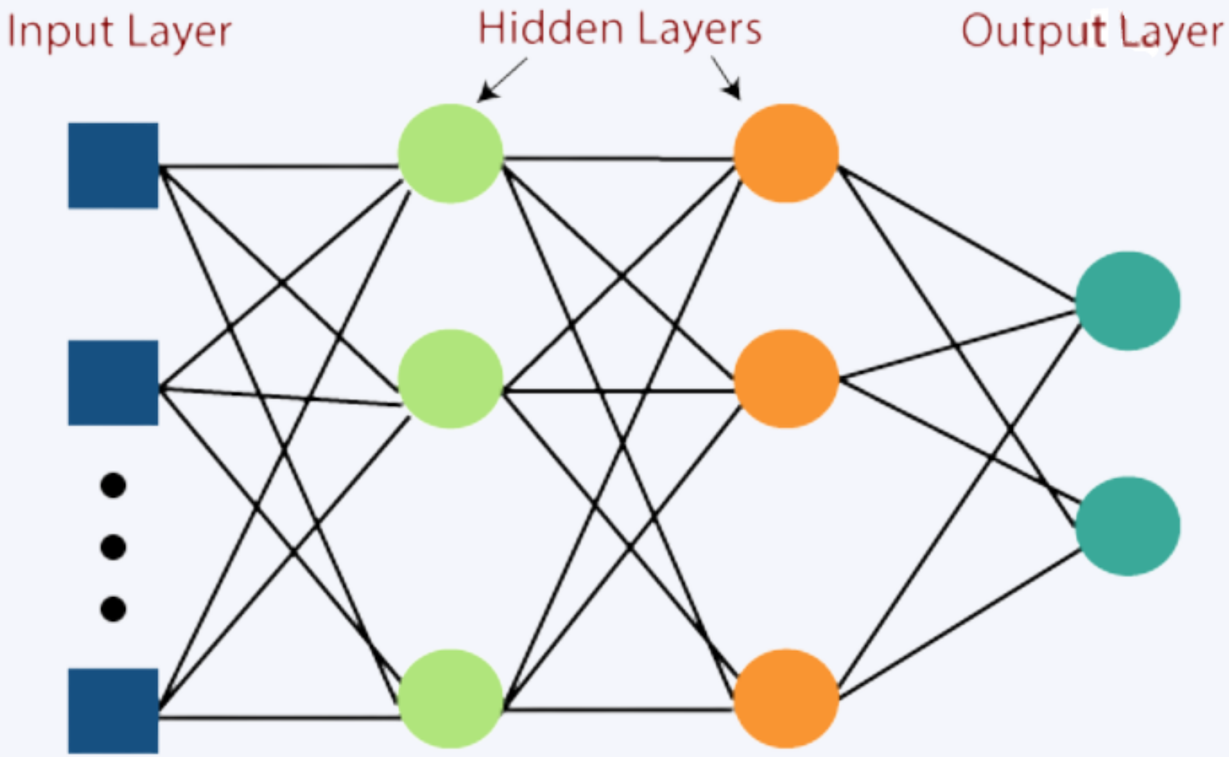


$y=(e^{x}-e^{-x})/(e^{x}+e^{-x})$

Tanh function

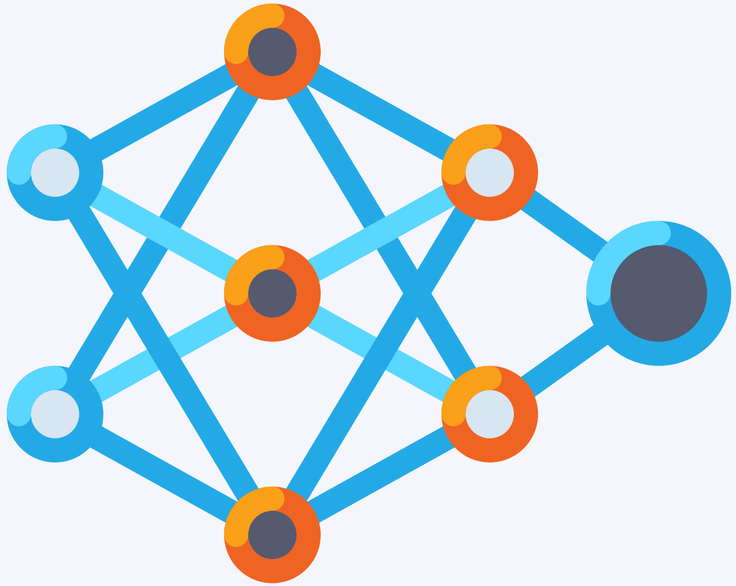
Multi-layer perceptron (MLP)

- A multi-layer perceptron (MLP) is formed from multiple layers of the perceptron.
- A multi-layer perceptron (MLP) is a feed forward artificial neural network that generates a set of outputs from a set of inputs.
- MLP networks are used for supervised learning format.



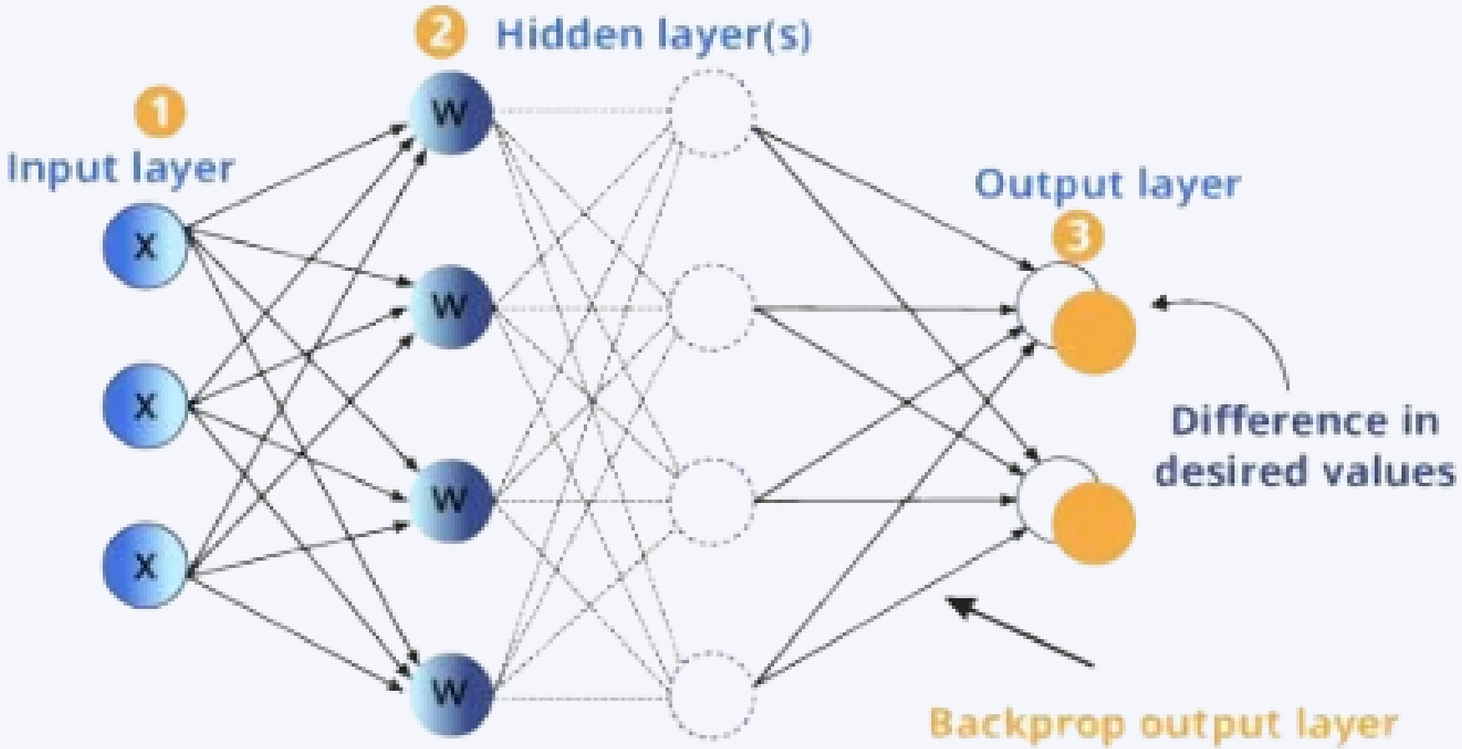
What is a forward propagation?

- Forward propagation refers to the process of passing inputs through a neural network and producing an output. It involves multiplying the input by the weights and adding the bias, and then applying an activation function. This process is repeated for each layer in the network until the final output is produced.



What is a Backpropagation?

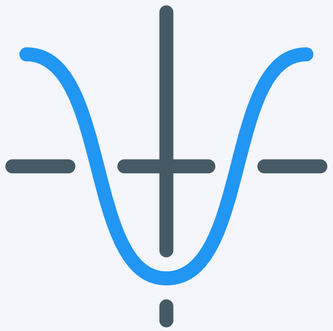
Backpropagation is the process of adjusting the weights and biases in the network in order to minimize the error between the predicted output and the true output.



Optimizers

In order to adjust the weights and bias during the backpropagation step we need to use an optimization algorithm. optimization algorithms are used to find the best set of parameters for a model that minimize the error between the predicted output and the true output.

Gradient descent



Stochastic gradient descent

Adam

Thank You