Deep Learning

**What is a Neural Network?**

* It is a series of algorithms recognizing patterns in the data similar to the brain to process any new information
* It consists of a network of nodes called neurons which process and send data forward

**What is Deep Learning?**

* It is trained by deciding the goal for the model and then fine-tuning the parameters to best predict the model
* It consists of a set of neurons placed in layers

**Basic Neural Network:**

* Types:
  + Single-Layer Perceptron: It consists of an input layer and an output layer with no other layers in between
  + Multi- Layered Perceptron: It consists of hidden layers between the input and output layers.
* Working:
  + Each neuron receives data either from raw inputs or previous neurons.
  + The data is passed through some calculations based on parameters and then passed onto the next neuron
  + The passing is called synapse
* Layers:
  + Input layer: this takes the input from raw data
  + Hidden layer: here patterns are found in the data
  + Output layer: here the learned information is presented in desired manner
* Terms:
  + Neuron/node: As mentioned before they receive, process and output data
  + Weights: each neuron has a pathway with weights assigned which show the importance of that data, further allowing us to fine tune which point we need to focus on
  + Bias: its job is similar to weights to give importance or reduce the same for data, just a different method to do so
  + Activation function: it helps add non linearity to the data allowing one to identify more complex relations and convert the data into required formats.

**Activation Functions**

* Threshold Function: it only gets activated if the sum of the inputs, after being multiplied by their weights and altered by biases, is greater than a threshold value. If activated it outputs a single value else 0
* Sigmoid function: It provides a smooth curve of values from 0 to 1 based on the input however its gradient is varying. Its optimal for problems where probability is required and allows one to use techniques like gradient decent since it is a continuous
* ReLu: it outputs 0 for negative values and the input itself for positive values
* Hyperbolic tangent function: it is similar to sigmoid function but based on tanh(). Hence it outputs values from -1 to 1.