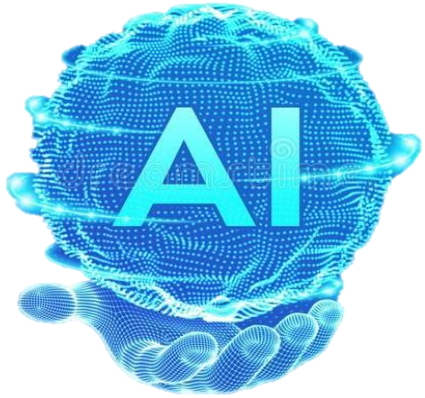
AI is a technique of getting machines to work and behave like humans.



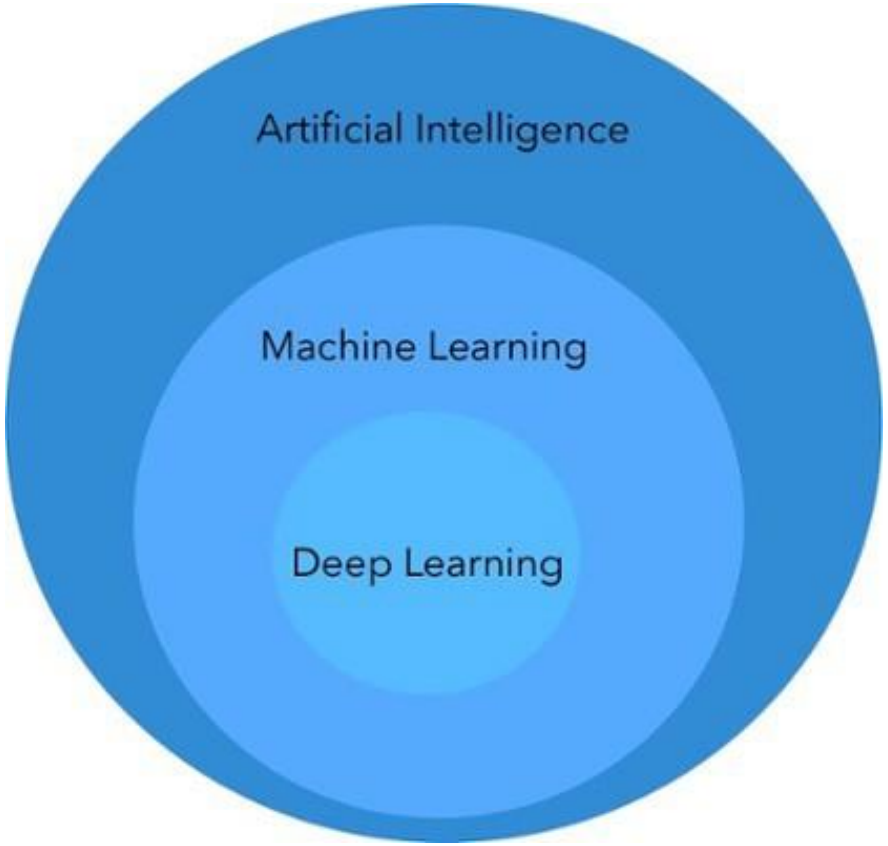
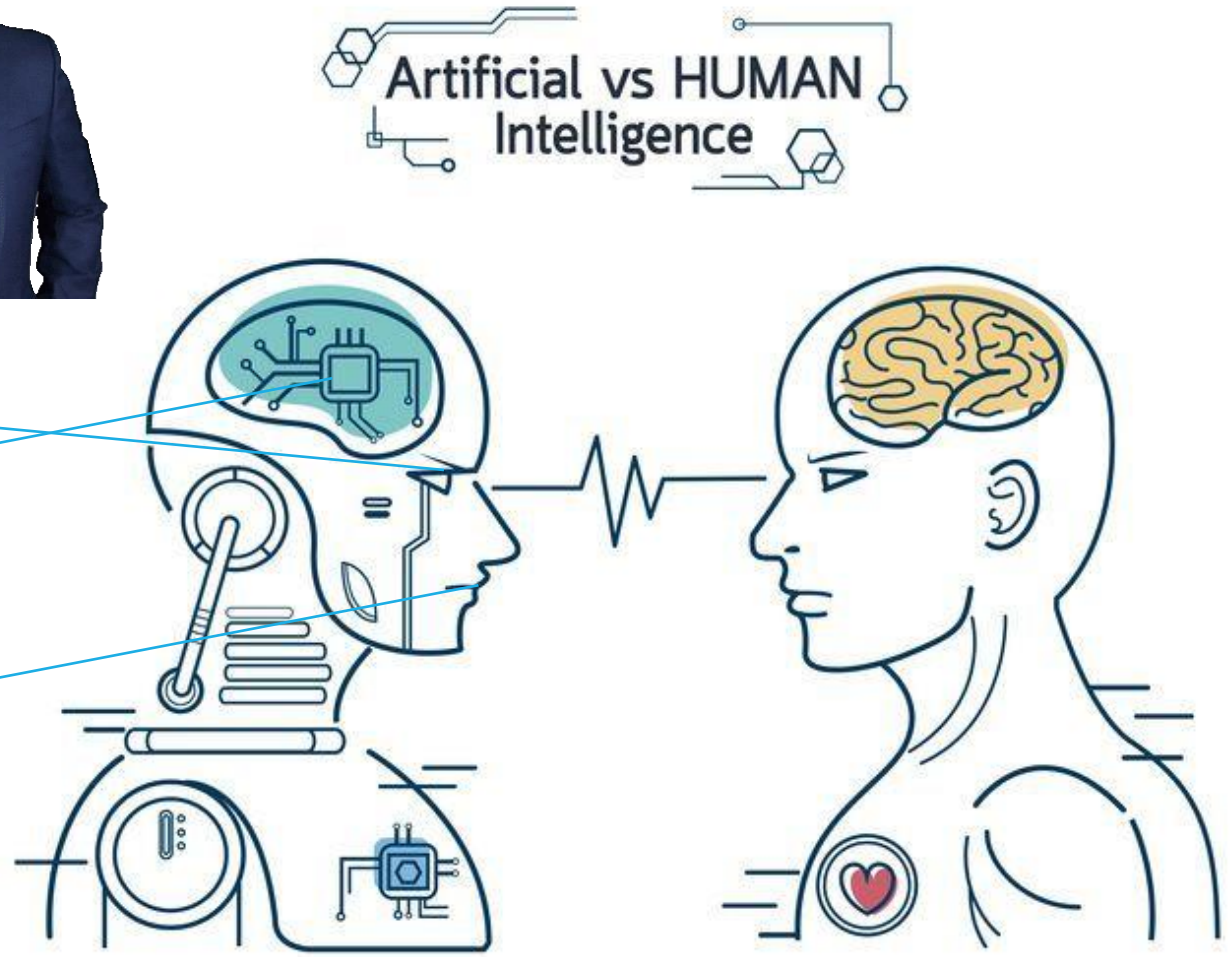


Image Processing

Computer Vision

Neural Network

Natural Language Processing



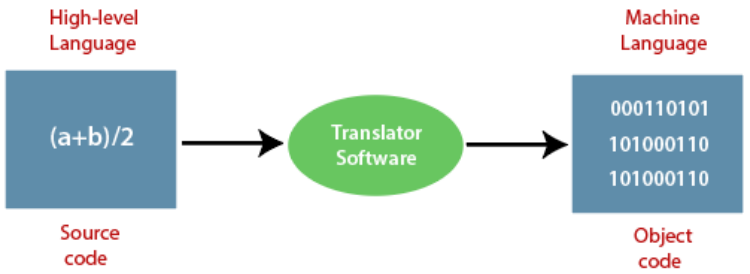
Machine Learning

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.

Machine learning and AI are built on mathematical principles like Calculus, Linear Algebra, Probability, Statistics, and Optimization

Static Programming

Compiler



Java

```
int a=9;
int b =4;
int c;
c = a/b  2.25
println(c)  2
```

take input

translator

t.V

t.V & I.v

Result

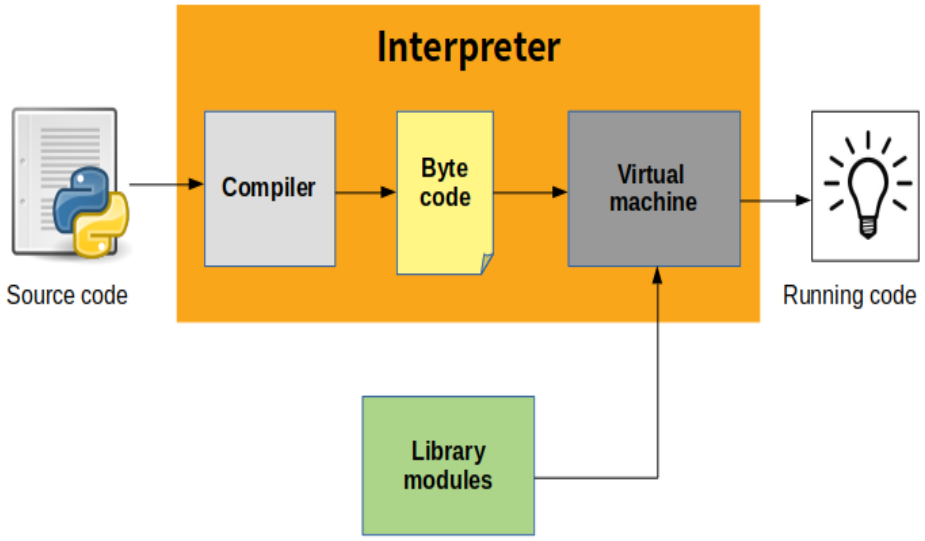
Dynamic Programming

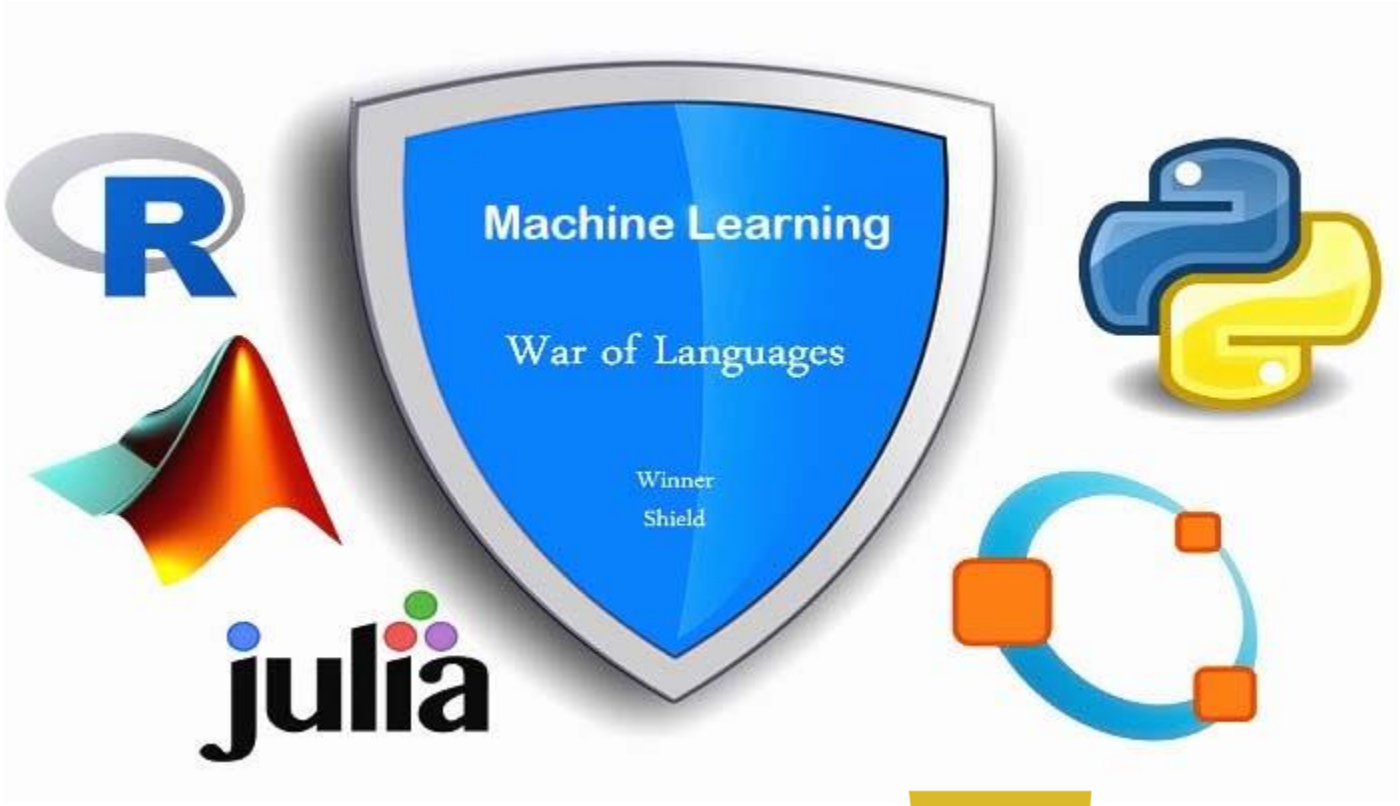
Interpreter

Take input

Translator

Result



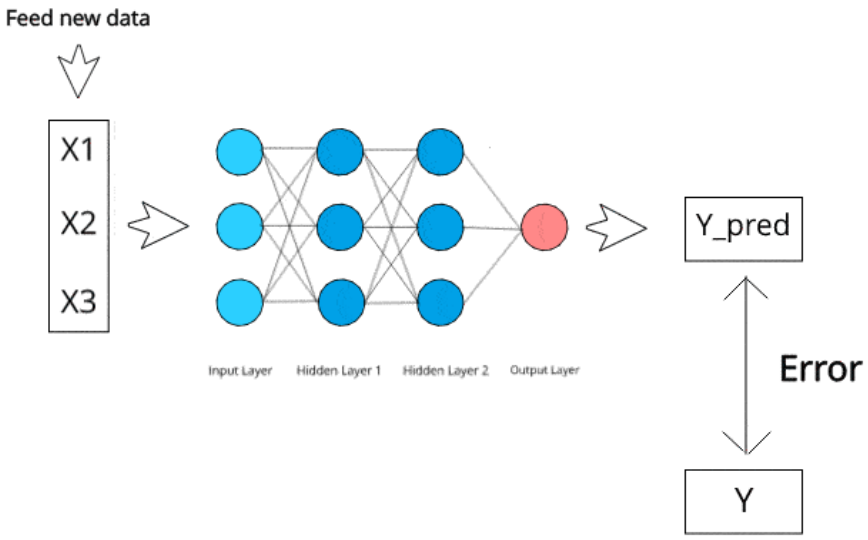

Machine Learning
War of Languages
Winner
Shield
julia
sas

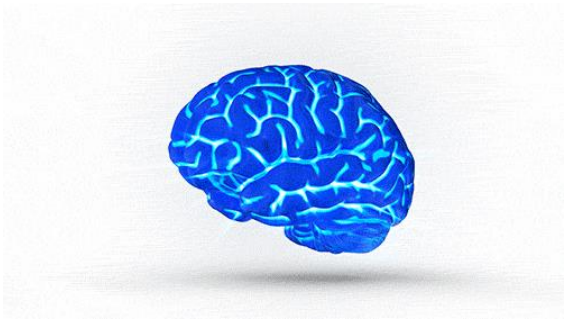
16 Famous Companies that uses PYTHON

Quora
Spotify
NASA
YouTube
Google
edX
YAHOO!
Dropbox
yelp
reddit
DISQUS
IBM
Pinterest
Instagram
Eventbrite
UBER

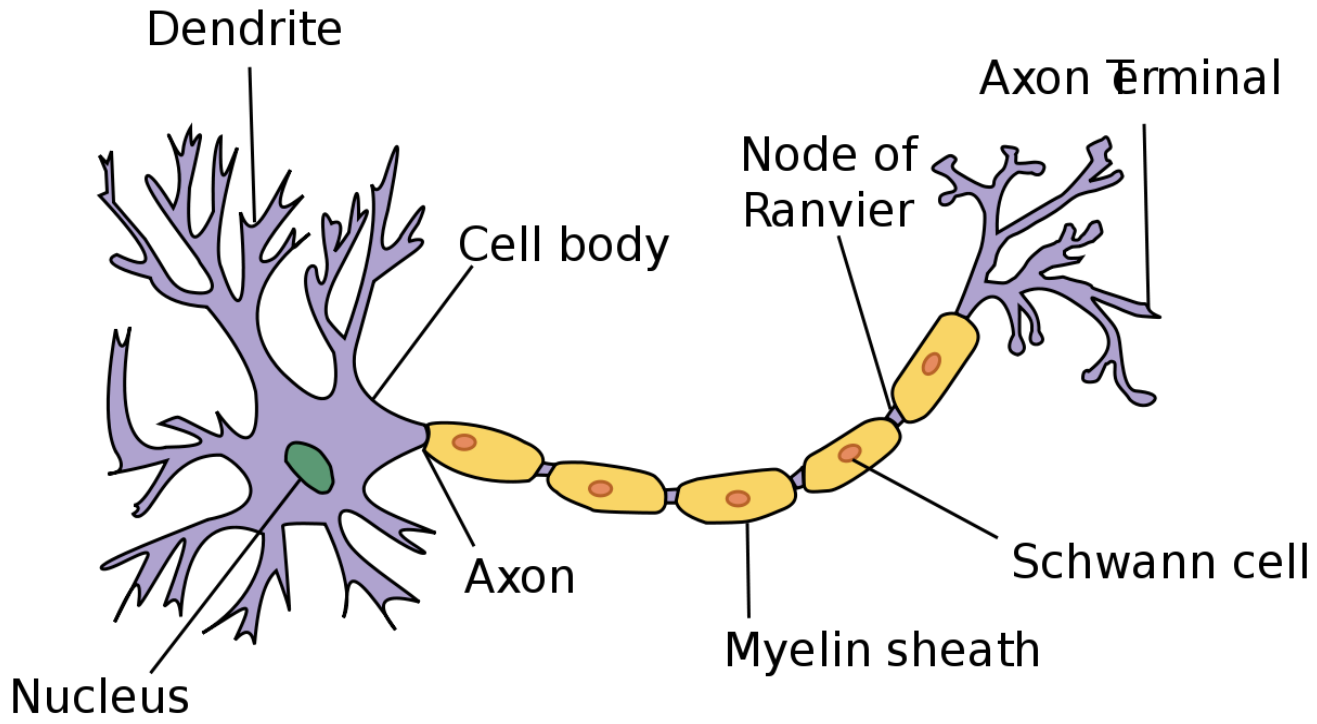
Neural Network

A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates

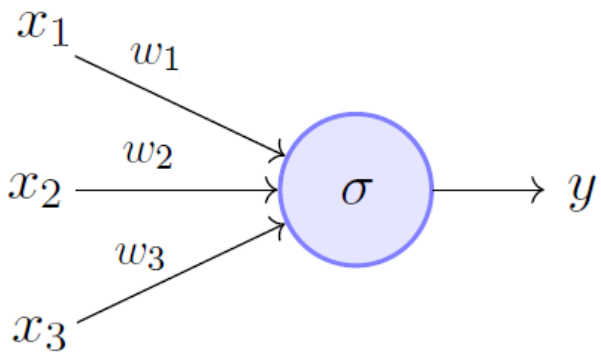




Neuron Structure



100 B neurons



Artificial Neuron

Dendrites: Receives signal from other neurons

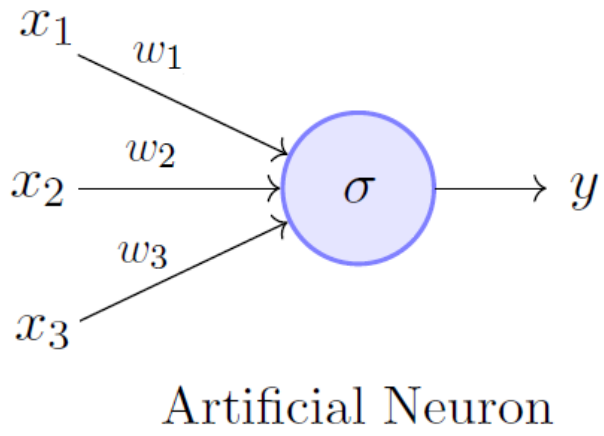
Cell body: Sum of all the inputs

Nucleus: signal transmitted to the next neuron from axon terminal

Axon: Used to transmit the signals to other cells.

Artificial Neural Network

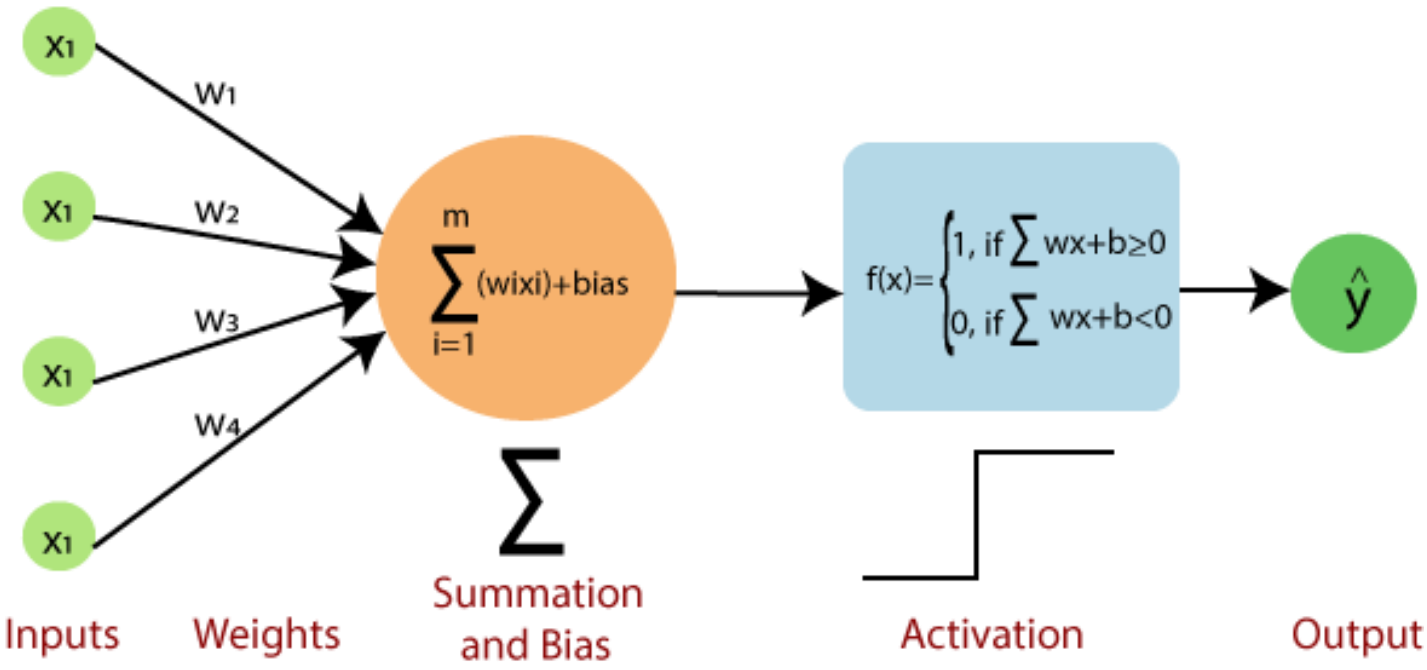
Perceptron’s were developed in the 1950s and 1960s by the scientist Frank Rosenblatt



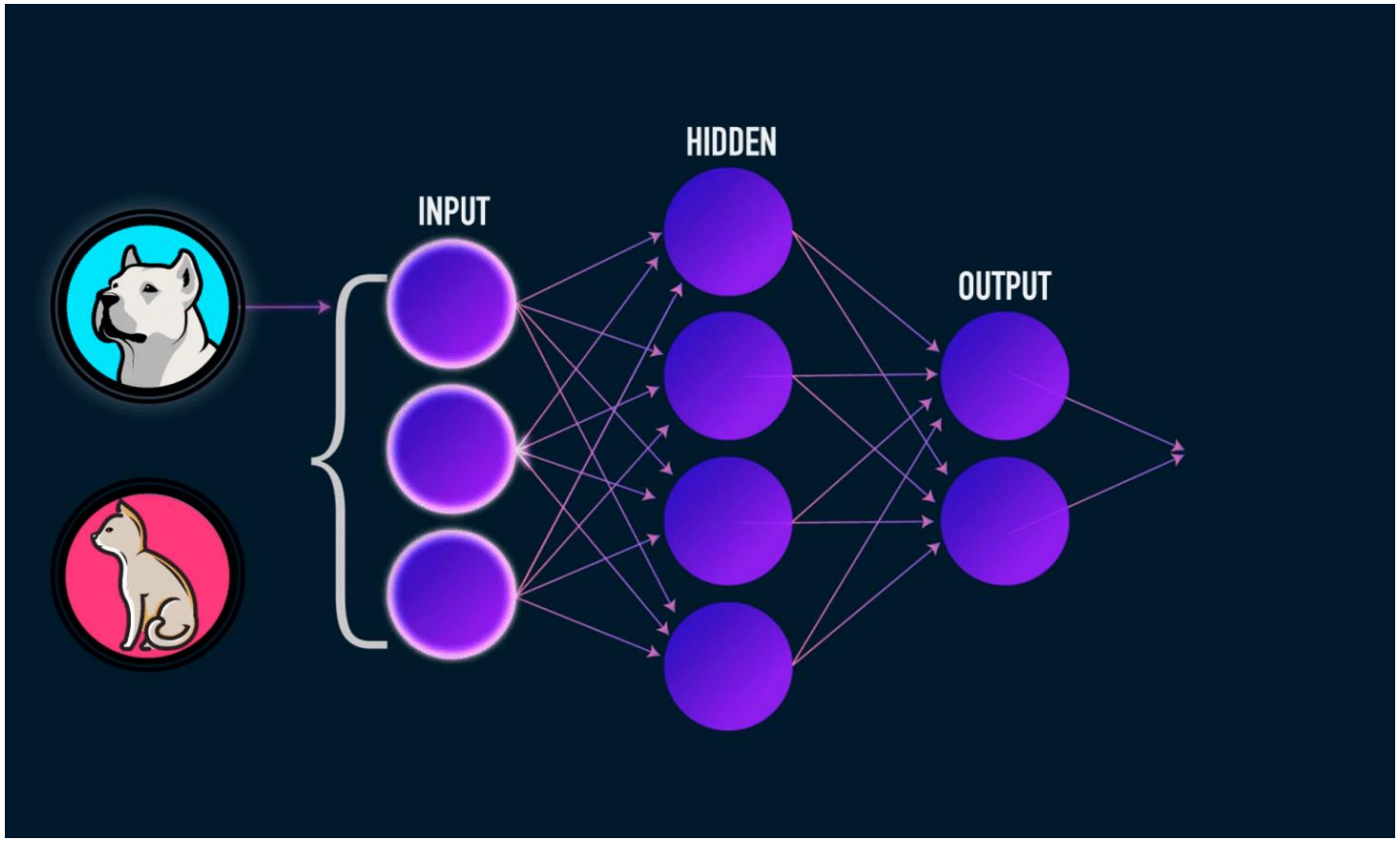
Artificial Neuron

Artificial Neuron is called as Perceptron

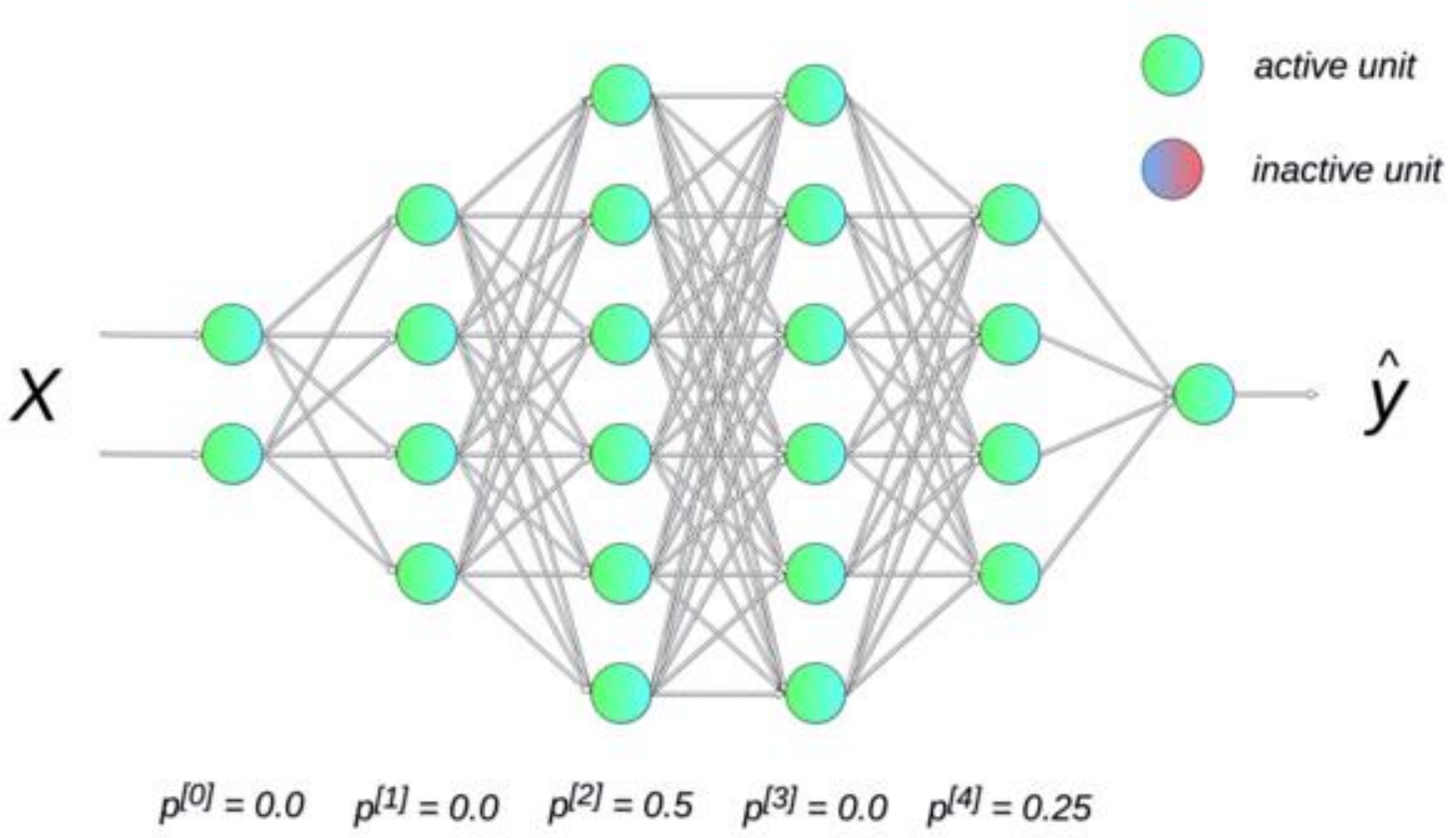
Single Layer perceptron



How does Neural Network works



Multilayer perceptron



Backpropagation

Practical Implementation

Index	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMember	EstimatedSalary	Exited
0	1	15634602	Hargrave	619	France	Female	42	2	0	1	1	1	101349	1
1	2	15647311	Hill	608	Spain	Female	41	1	83807.9	1	0	1	112543	0
2	3	15619304	Onio	502	France	Female	42	8	159661	3	1	0	113932	1
3	4	15701354	Boni	699	France	Female	39	1	0	2	0	0	93826.6	0
4	5	15737888	Mitchell	850	Spain	Female	43	2	125511	1	1	1	79084.1	0
5	6	15574012	Chu	645	Spain	Male	44	8	113756	2	1	0	149757	1
6	7	15592531	Bartlett	822	France	Male	50	7	0	2	1	1	10062.8	0
7	8	15656148	Obinna	376	Germany	Female	29	4	115047	4	1	0	119347	1
8	9	15792365	He	501	France	Male	44	4	142051	2	0	1	74940.5	0
9	10	15592389	H?	684	France	Male	27	2	134604	1	1	1	71725.7	0
10	11	15767821	Bearce	528	France	Male	31	6	102017	2	0	0	80181.1	0
11	12	15737173	Andrews	497	Spain	Male	24	3	0	2	1	0	76390	0
12	13	15632264	Kay	476	France	Female	34	10	0	2	1	0	26261	0
13	14	15691483	Chin	549	France	Female	25	5	0	2	0	0	190858	0
14	15	15600882	Scott	635	Spain	Female	35	7	0	2	1	1	65951.6	0
15	16	15643966	Goforth	616	Germany	Male	45	3	143129	2	0	1	64327.3	0
16	17	15737452	Romeo	653	Germany	Male	58	1	132603	1	1	0	5097.67	1
17	18	15788218	Henderson	549	Spain	Female	24	9	0	2	1	1	14406.4	0

Label Encoder

	Temperature	Color	Target	Temp_label_encoded
0	Hot	Red	1	1
1	Cold	Yellow	1	0
2	Very Hot	Blue	1	2
3	Warm	Blue	0	3
4	Hot	Red	1	1
5	Warm	Yellow	0	3
6	Warm	Red	1	3
7	Hot	Yellow	0	1
8	Hot	Yellow	1	1
9	Cold	Yellow	1	0

Feature Scaling

$$z = \frac{x - \mu}{\sigma}$$

μ = Mean

σ = Standard Deviation

Keras & Tensorflow

Keras is an open-source neural-network library written in Python

Keras is the recommended library

It’s a high level api which, runs above Tensorflow, Theono, CNTK

Keras always needs a backend framework

Easy to use and fast development

TensorFlow is a open source library for numerical computation that makes machine learning faster and easier.

Written in Python & C++

Machine Learning application like Neural Network

Gives keras as a framwork

Both the high and low api

No support for windows

Only support for python language

TensorFlow is a open source library for numerical computation that makes machine learning faster and easier.

Written in Python & C++

Machine Learning application like Neural Network

Gives keras as a framwork

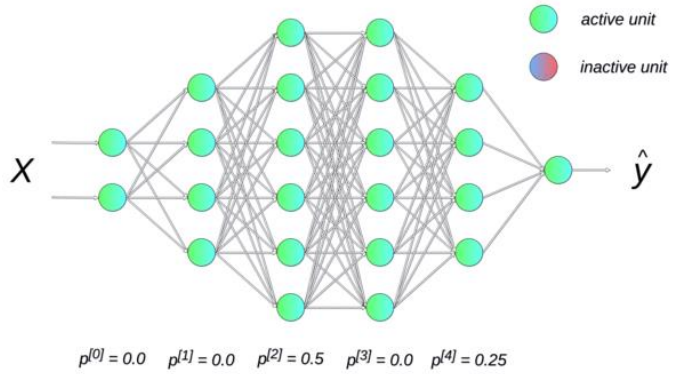
Both the high and low api

No support for windows

Only support for python language

Activation Function

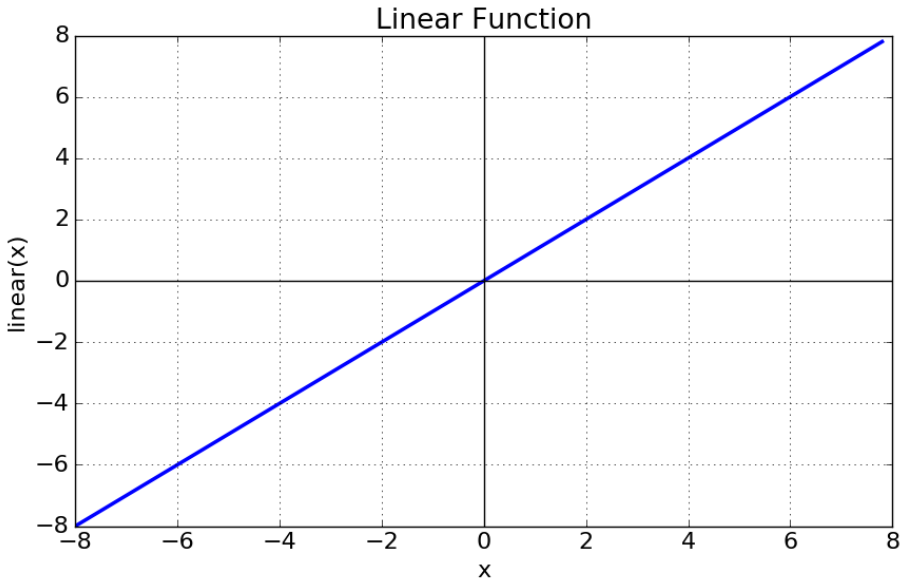
Activation function will decide whether the neuron should be activated or not.



Linear Activation Function

Non-Linear Activation Function

Linear Activation Function

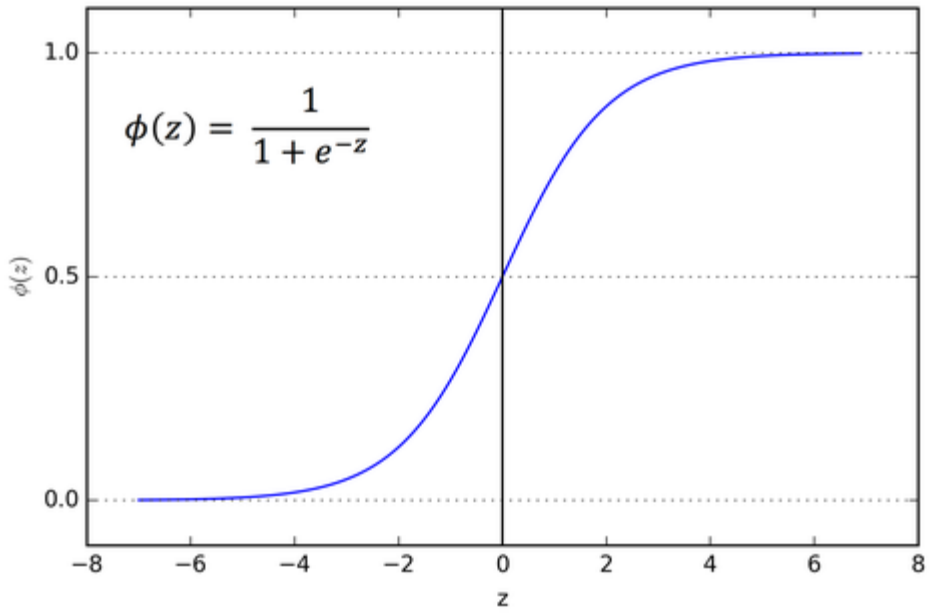


Equation : f(x) = x
Range : (-infinity to infinity)

It doesn’t help with the complexity or various parameters of usual data that is fed to the neural networks.

Non-Linear Activation Function

1. Sigmoid or Logistic Activation Function



Range: 0-1

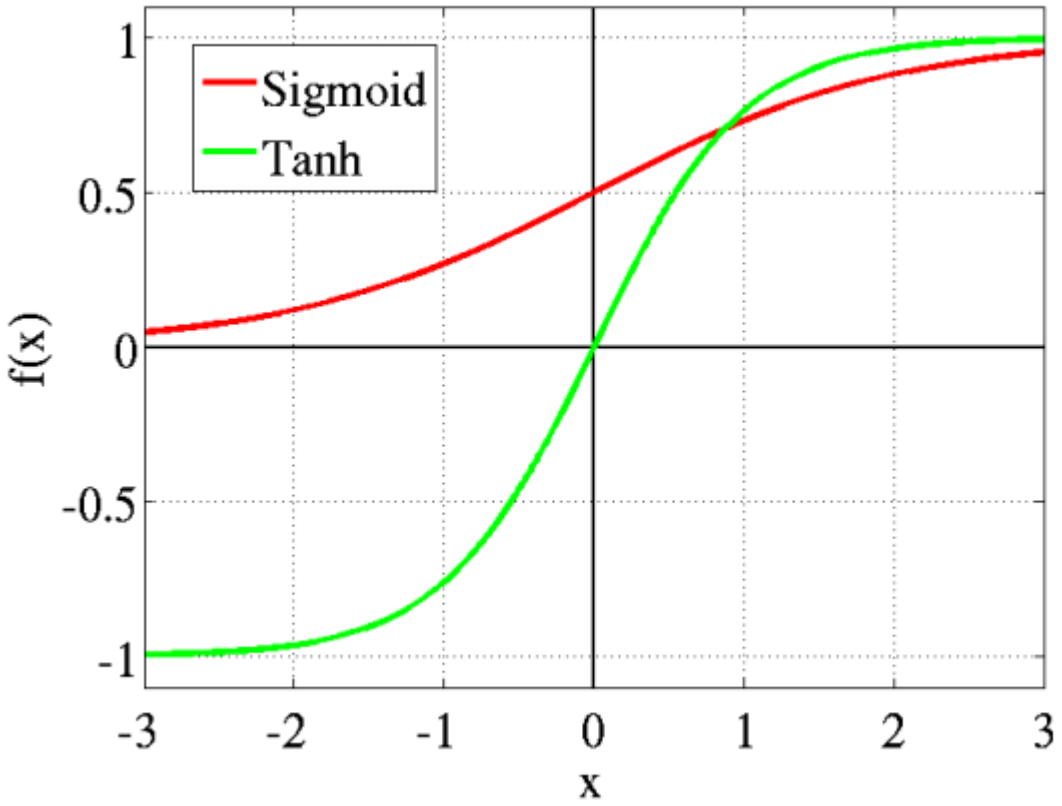
Since probability of anything exists only between the range of **0 and 1,** sigmoid is the right choice.

2. Softmax Activation Function

Multiclassification in softmax regression model

Binary classification in logistic regression model

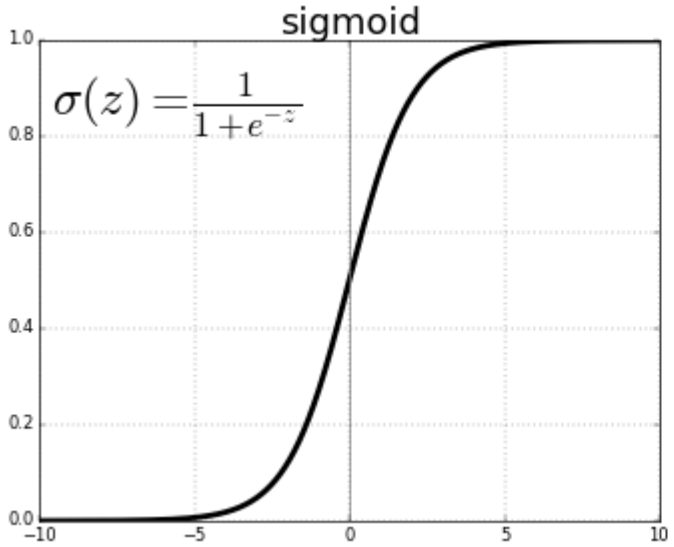
3. Tanh or hyperbolic tangent Activation Function

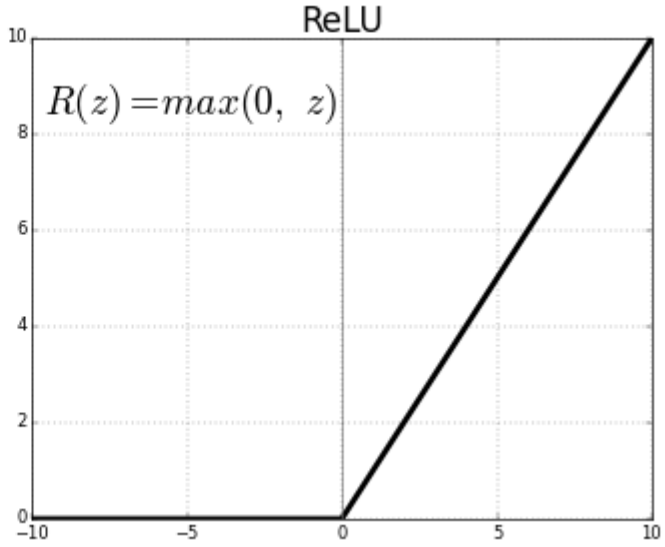


The range of the tanh function is from (-1 to 1).

4. ReLU (Rectified Linear Unit) Activation Function

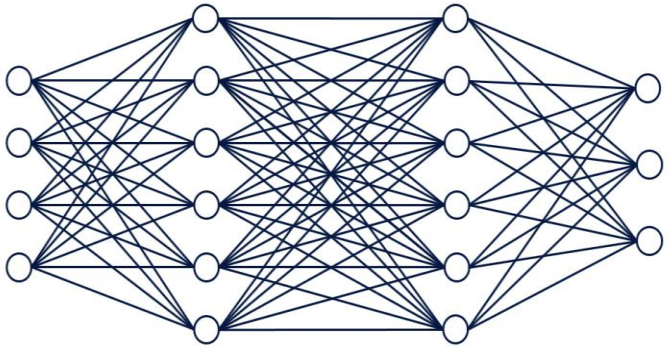
The ReLU is the most used activation function.



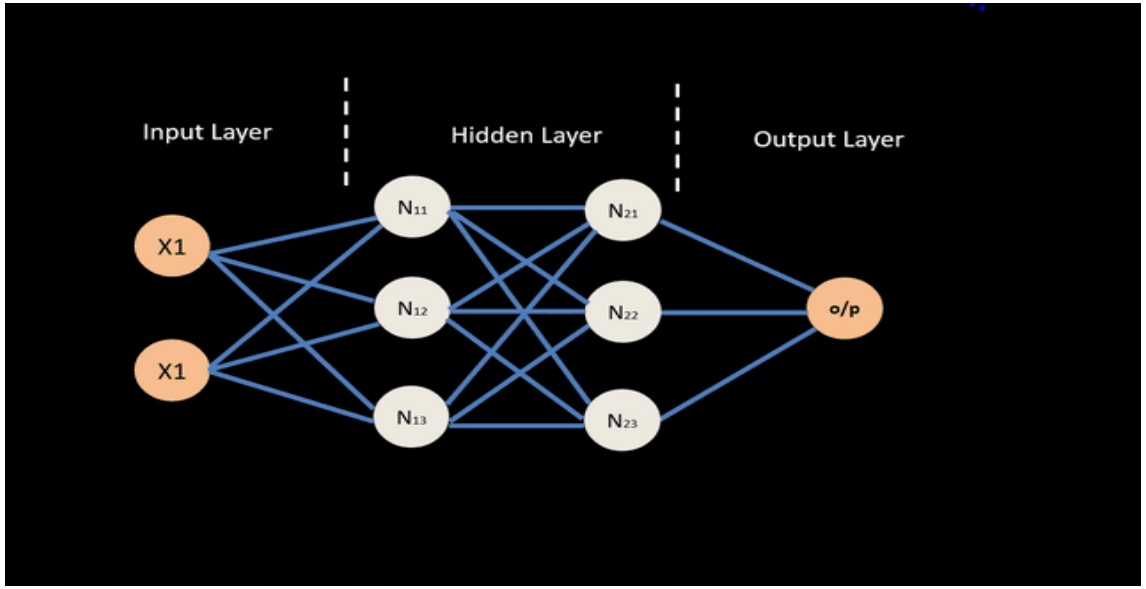


f(z) is zero when z is less than zero and f(z) is equal to z when z is above or equal to zero.
Range: [0 to infinity)

Backpropagation

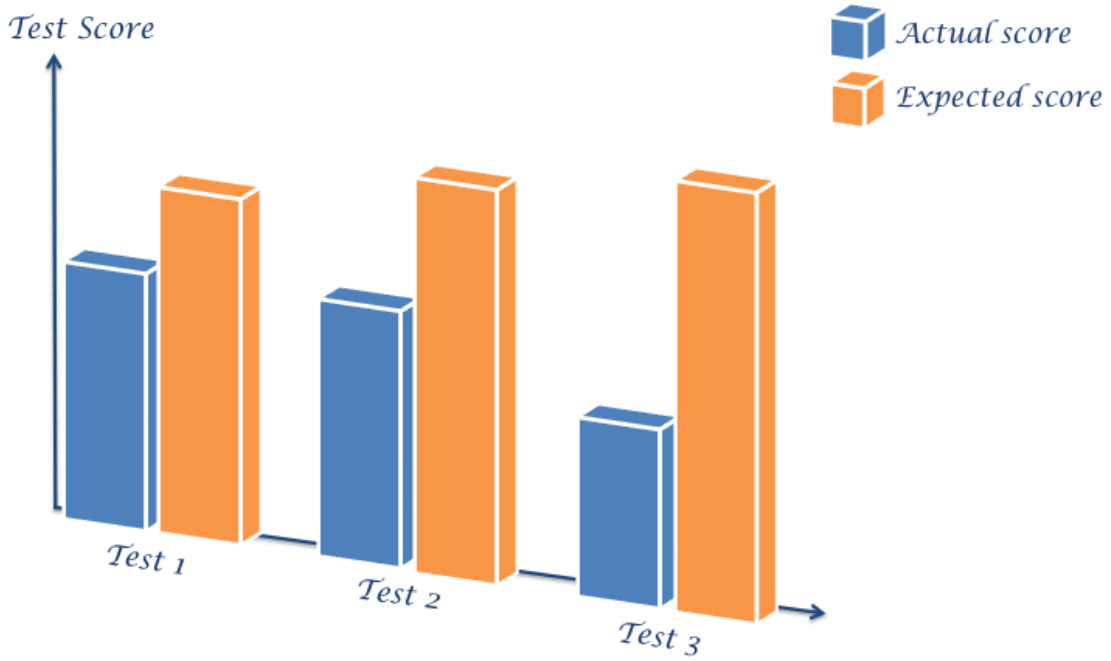


Training neural network

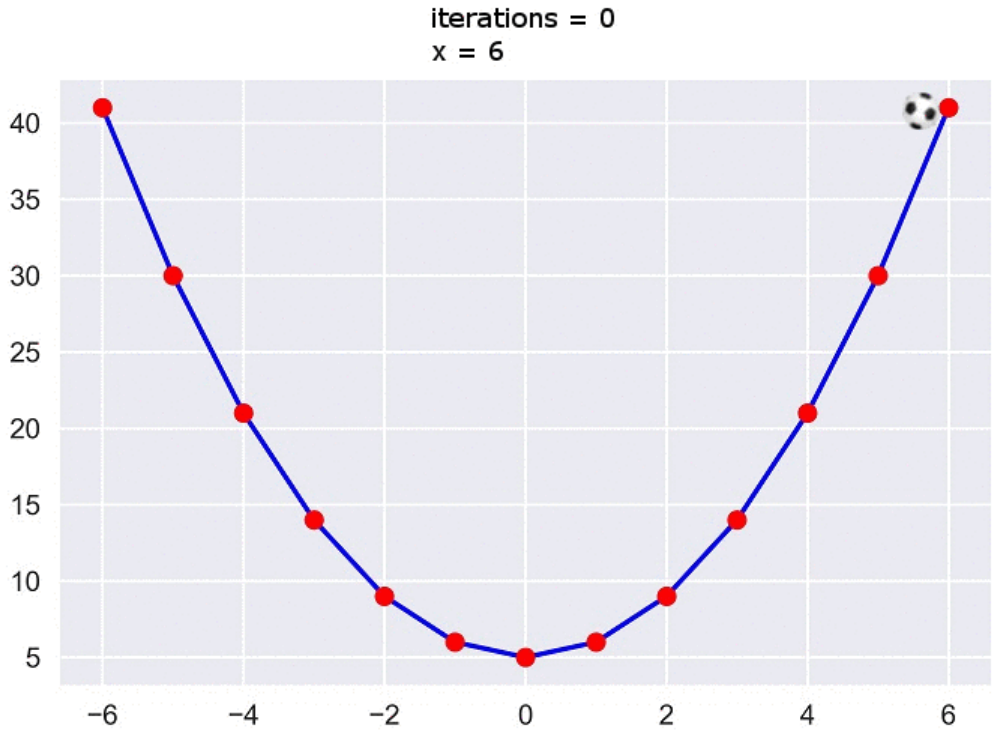


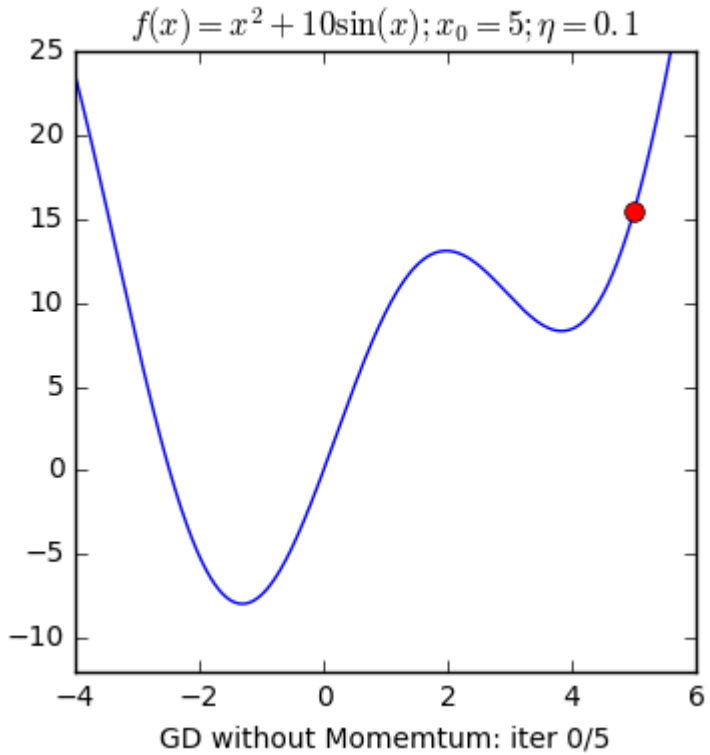
The method calculates the gradient of the error function with respect to the neural network's weights.

Cost Function



Gradient Descent





Epoch and batch size

Epoch

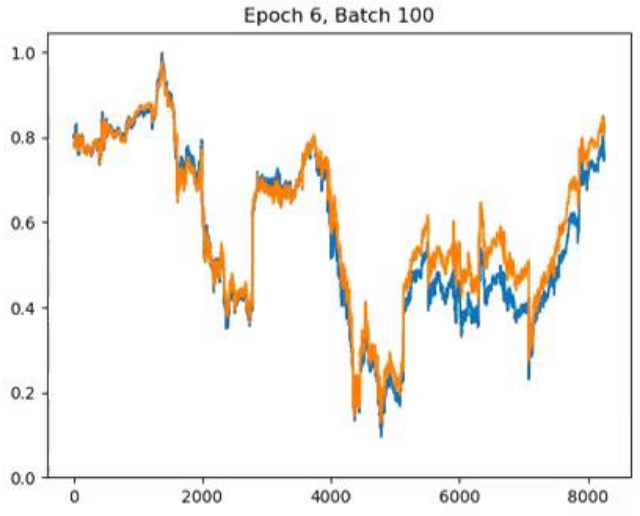
- An Epoch represents one iteration over the entire dataset

Batch Size

- Batch size: We can't pass the entire dataset into the neural network at once. So, we divide the dataset into number of batches.

Iteration

- If we have 10000 of rows as data and a batch size of 200, then one epoch should contain 10000/200 = 50



Confusion Matrix

n=165	**Predicted: NO**	**Predicted: YES**	
Actual: NO	TN = 50	FP = 10	60
Actual: YES	FN = 5	TP = 100	105
	55	110	

$$\textbf{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

Process of Machine Learning for creating Project

Data

Schema

Sampling over Time

Volume

Model

Algorithms

More Training

Experiments

Code

Business Needs

Bug Fixes

Configuration