

Unit - 03

" Machine Learning "

Machine learning is a subfield of AI....
Because of this, machine learning facilitates computers in building models from sample data in order to automate any technology used today has benefitted from M/L.

Why machine learning is so important :

- Increase in Data Generation.
- Improve Decision making.
- Uncover patterns & trends in data.
- Solve Complex problems.

Terminologies used in machine learning.

Algorithm. → A ML is a set of rules & statistical techniques used to learn patterns from the data & draw significant information from it. it is the logic behind a ML model.

Ex Linear Regression algorithm.

Model : A model is the main component of ML
A model is trained by using a ML algorithm.

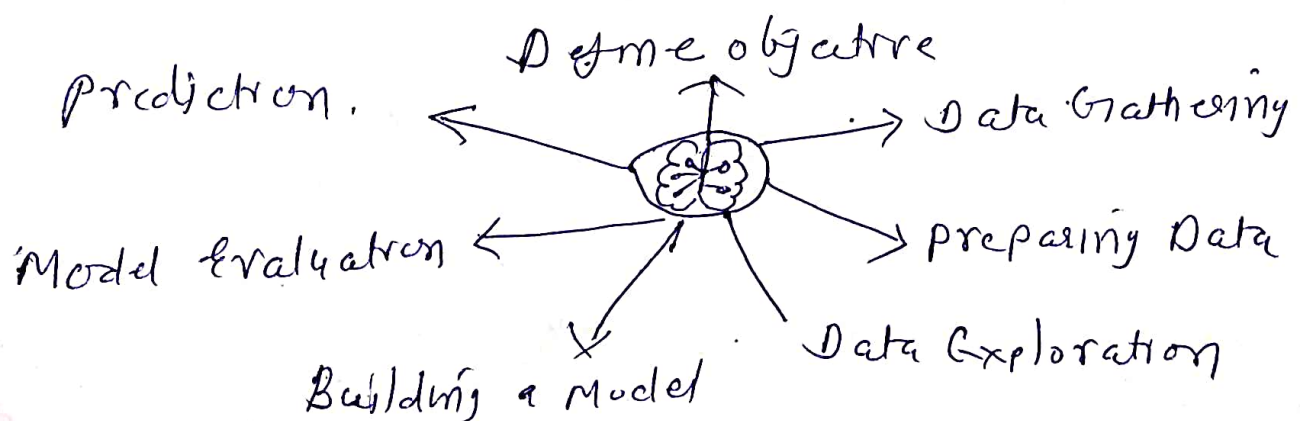
predictive Variable — It is a feature(s) of the data that can be used to predict the output

Response Variable : \rightarrow It is the features or the output variable that needs to be predicted by using the predictor variables(s)

Training data \rightarrow The m/L model is built using the training data. The training data helps the model to identify key trends & patterns essential to predict the output.

Testing Data : \rightarrow After the model is trained, it must be tested to evaluate how accurately it can predict an outcome. This is done by the testing data set.

M/L process \rightarrow The m/L process involves building a predictive model that can be used to find a solution for a problem statement. To understand the m/L process let's assume that you have been given a problem that needs to be solved by using m.



The Below Steps. — are followed in a m/L process.

Step-01 \rightarrow Define the objective of the problem statement.

Step 02 → Data Gathering.

Step 03 → Data preparation.

Step 04 → Exploratory Data Analysis

Step 05 → Building a machine Learning Model.

Step 06 → Model Evaluation & optimization.

Step 07 → predictions.

Types of Machine Learning.

A ML approach uses three way in which a machine can learn:

- 01) Supervised Learning
- 02) Unsupervised Learning
- 03) Reinforcement Learning.

Supervised Learning is a technique in which we teach to train the machine using data which is well labeled.

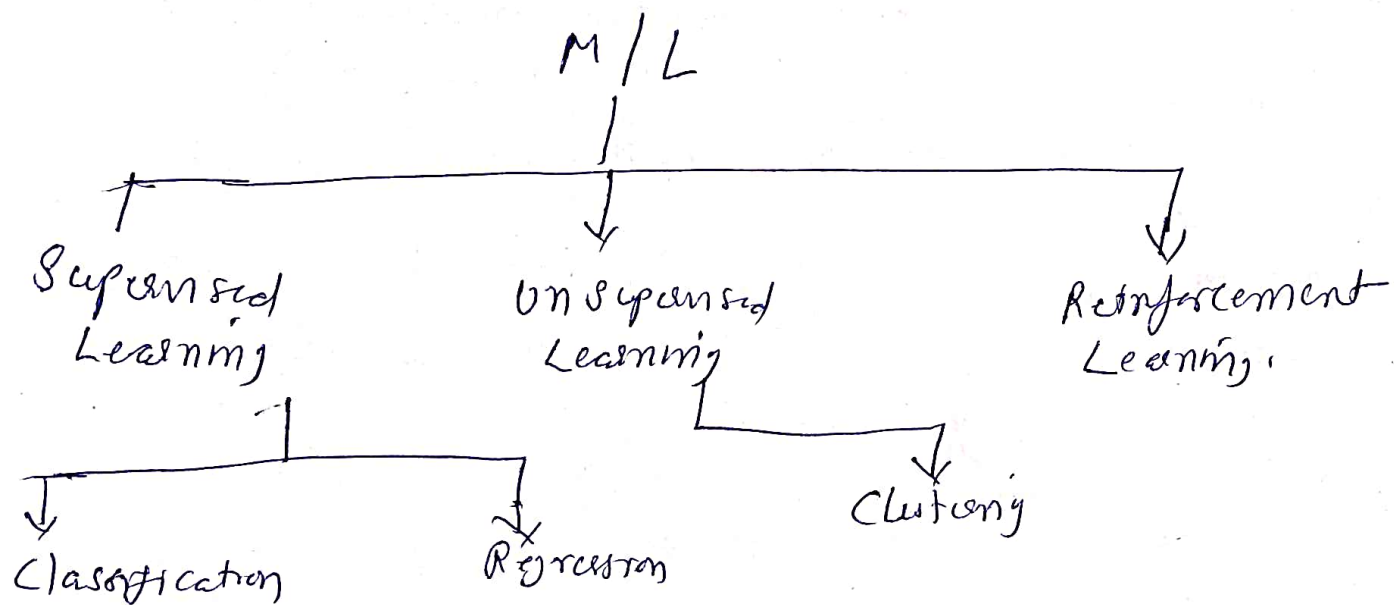
The Unsupervised Learning : → is different from Supervised learning techniques as its name suggests, there is no need for supervision. It means, in unsupervised machine learning, the machine is trained from the unlabeled dataset, & the machine predicts the output without any supervision.

In unsupervised learning, the models are trained with the data that is neither classified nor labelled, & the model acts on that data without any supervision.

Reinforcement Learning : →

Reinforcement Learning is a part of Machine Learning where an agent is put in an environment & he learns to behave in this environment by performing certain actions & observing the rewards which it gets from those actions.

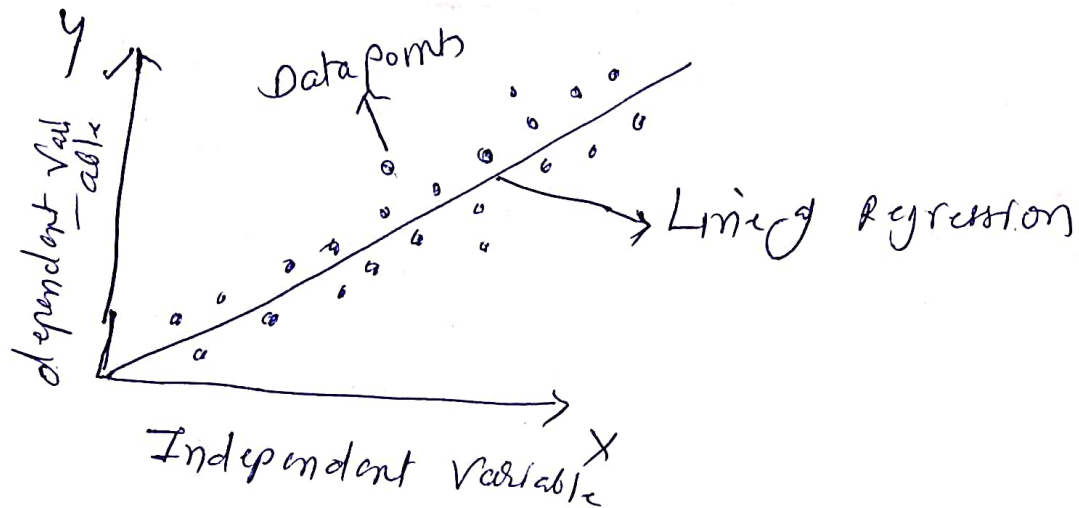
Ex Self driving cars, AlphaGo etc.



Linear Regression → It is the one of the easiest & most popular machine Learning algorithm. It is a statistical method that is used for predictive analysis. Linear regression makes prediction for continuous/real or numeric variables such as Sales, Salary, age, product price etc.

Linear Regression algorithm shows a linear relationship between a dependent (y) & one or more independent (x) variables.

The L.R model provides a sloped straight line representing the relationship between the variables. Consider the below image:



Equation of Line $y = a_0 + a_1x + \epsilon$
Here.

y = Dependent variable (Target Variable)

x = Independent Variable (predictor variable)

a_0 = Intercept of the line.

a_1 = Linear Regression Coefficient.

ϵ = Random error.

The values of x & y variables are training datasets for L.R model representation.

Types of L.R →

- Simple L.R
- M.L.R.

L.R Line →

- positive L. Relationship
- Negative Linear Relationship

Logistic Regression in M/L →

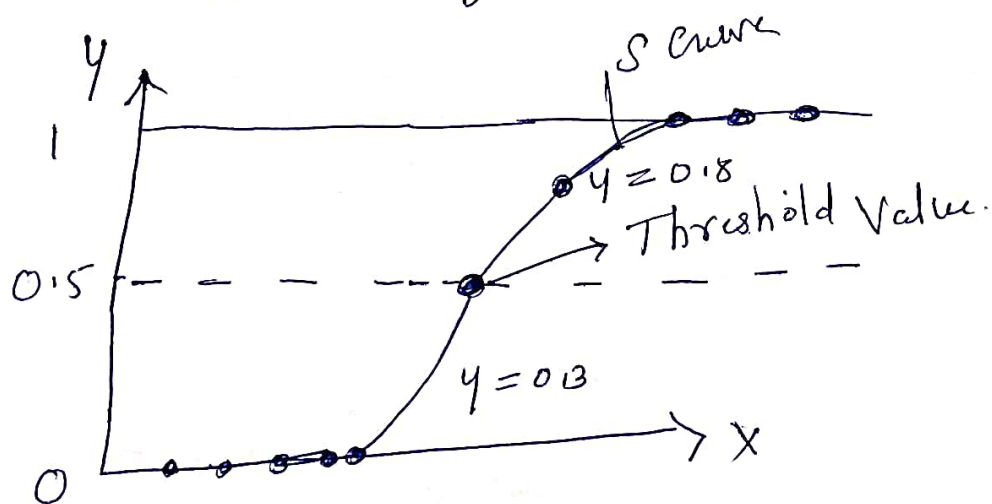
Logistic Regression comes under the Supervised Learning technique.

It is used for predicting the categorical dependent variable using a given set of independent variables. The outcome must be in a discrete value i.e. 0, 1.

It gives a probabilistic value which lies between 0 & 1.

Logistic Regression is used for solving the classification problems. It can be used to classify the observation using different types of data & can easily determine the most effective variables used for the classification.

The below diagram shows the logistic function.



Note :- Logistic Regression Equation can be obtained from linear Regression Equation.

Logistic Regression uses the concept of predictive modeling as regression. Therefore, it is called logistic regression, but it is used to classify samples. Therefore it falls under the classification algorithm.

Logistic Regression Equation ? \rightarrow

The mathematical steps to get logistic regression equations are given below -

- We know the equation of the straight line can be written as

$$y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n.$$

In logistic regression y can lie between 0,1 so for this let's divide above equation by $(1-y)$:

$$\boxed{\frac{y}{1-y} ; 0 \text{ for } y=0 \text{ \& \infty for } y=1}$$

But we need range between $-\infty$ to $+\infty$, then take logarithm of the equation it will become:

$$\log \left[\frac{y}{1-y} \right] = b_0 + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

This is final equation of logistic regression.