

Machine Learning

What Is Machine Learning ?

Machine Learning is a concept which allows the machine to learn from examples and experience, and that too without being explicitly programmed. So instead of you writing the code, what you do is you feed data to the generic algorithm, and the algorithm/ machine builds the logic based on the given data.

What is Machine Learning?

Have you ever shopped online? So while checking for a product, did you noticed when it recommends for a product similar to what you are looking for? or did you noticed “the person bought this product also bought this” combination of products. How are they doing this recommendation? This is machine learning.



Did you ever get a call from any bank or finance company asking you to take a loan or an insurance policy? What do you think, do they call everyone? No, they call only a few selected customers who they think will purchase their product. How do they select? This is target marketing and can be applied using Clustering. This is machine learning.



In 1959, Arthur Samuel, an American pioneer in the field of computer gaming, machine learning, and artificial intelligence has defined machine learning as a “Field of study that gives computers the ability to learn without being explicitly programmed.”

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.

How does Machine Learning Work?

Machine Learning algorithm is trained using a training data set to create a model. When new input data is introduced to the ML algorithm, it makes a prediction on the basis of the model.

The prediction is evaluated for accuracy and if the accuracy is acceptable, the Machine Learning algorithm is deployed. If the accuracy is not acceptable, the Machine Learning algorithm is trained again and again with an augmented training data set.

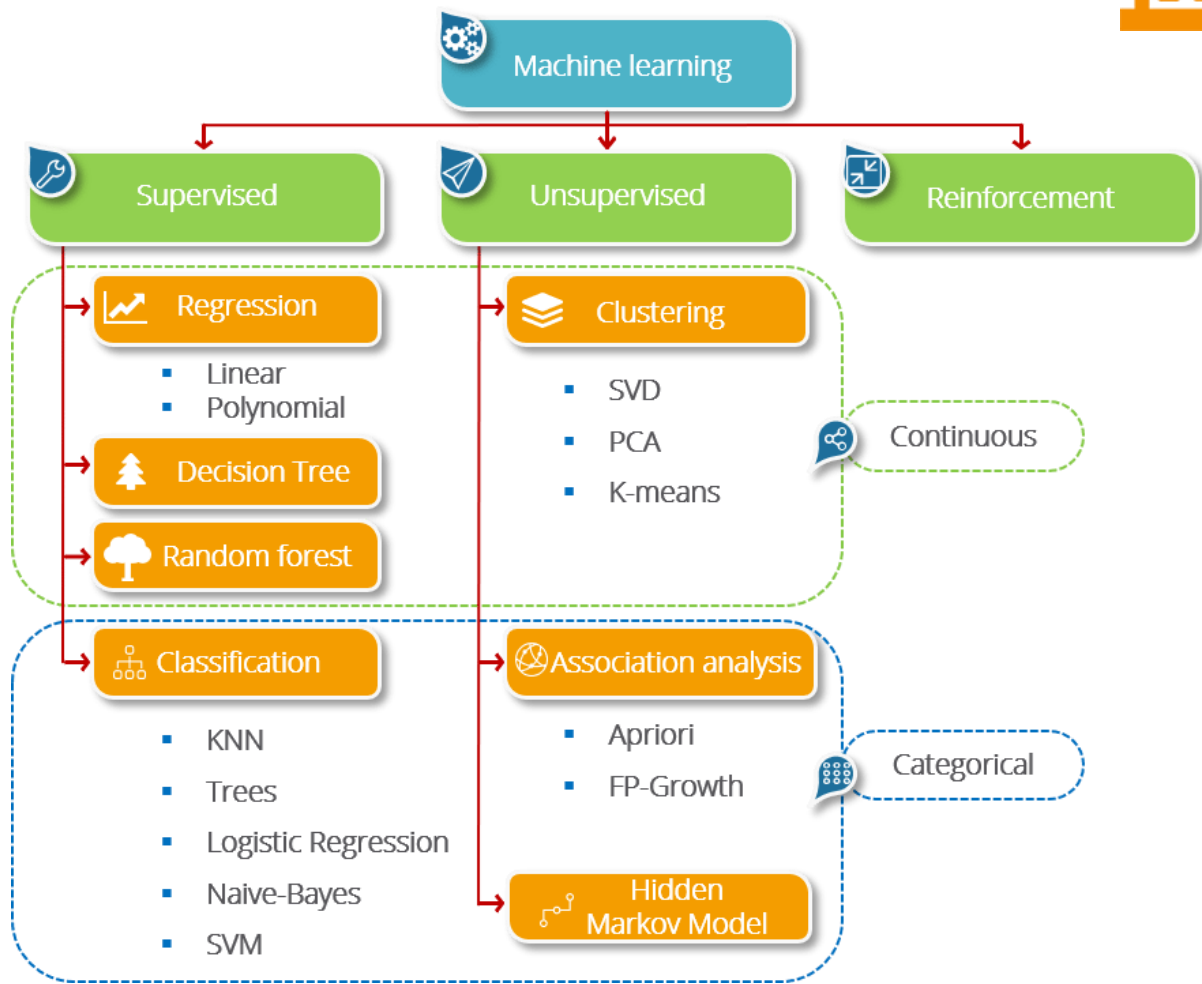
Types of Machine Learning

Machine learning is sub-categorized to three types:

Supervised Learning – Train Me!

Unsupervised Learning – I am self sufficient in learning

Reinforcement Learning – My life My rules! (Hit & Trial)



What is Supervised Learning ?

Supervised Learning is the one, where you can consider the learning is guided by a teacher. We have a dataset which acts as a teacher and its role is to train the model or the machine. Once the model gets trained it can start making prediction or decision when new data is given to it.

Supervised learning, is a type of system in which both input and desired output data are provided.

Supervised learning is a type of machine learning that enables the model to predict future outcomes after they are trained based on past data.

To train the model, first, a set of inputs and outputs are fed to it. Say for example, you want your model to be able to recognize a car from given data.

Training is done by providing a set of inputs and outputs that help the system understand what the essential features are, that define a car.

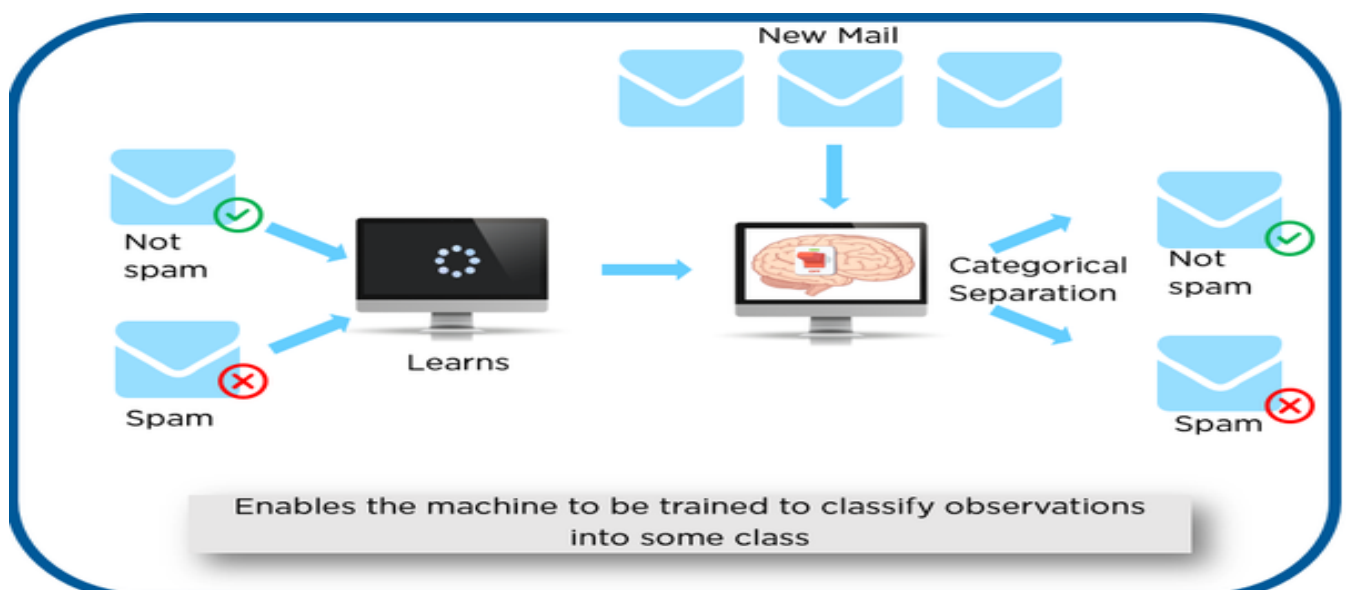
These features may include a bonnet, a headlight, a steering wheel and so on.



Now, when the new data is fed to the model, the model is in a position to recognize a car.

OVERVIEW OF SUPERVISED LEARNING

Supervised machine learning is also used to detect which emails can be marked as spam and not spam. An email spam filter will be fed with thousands, possibly millions of emails. Each of these emails will already have a label - 'spam' or 'not spam'. The supervised machine learning algorithm will then figure out which type of emails are being marked as spam. Next time an email is about to hit your inbox, the spam filter will use statistical analysis to figure out how likely it is that the email is spam. If the probability is high, it will label it as spam and the email won't hit your inbox.



What is Unsupervised Learning ?

Unsupervised learning is where you only have input data (X) and no corresponding output variables.

Suppose we have images of apples, bananas and mangoes to the model, so what it does, based on some patterns and relationships it creates clusters and divides the dataset into clusters. It will separate all the apples from mangoes.

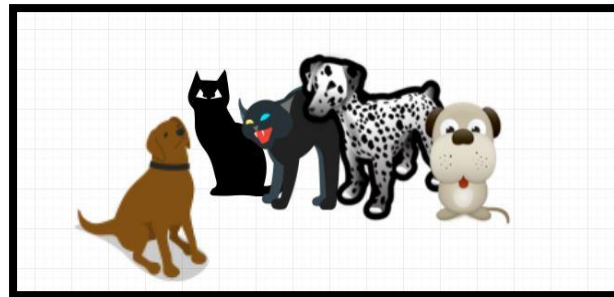
Now if a new data is fed to the model, it adds it to one of the created clusters.

Here the task of machine is to group unsorted information according to similarities, patterns and differences without any prior training of data.

Unlike supervised learning, no teacher is provided that means no training will be given to the machine.

Therefore machine is restricted to find the hidden structure in unlabeled data by our-self.

For instance, suppose it is given an image having both dogs and cats.



Thus machine has no any idea about the features of dogs and cat so we can't categorize it in dogs and cats. But it can categorize them according to their similarities, patterns and differences.

Unsupervised learning classified into two categories of algorithms:

- **Clustering:** A clustering problem is where you want to discover the inherent groupings in the data, such as grouping customers by purchasing behavior.
- **Association:** An association rule learning problem is where you want to discover rules that describe large portions of your data, such as people that buy X also tend to buy Y.

What is Reinforcement Learning ?

Reinforcement learning, in the context of artificial intelligence, is a type of dynamic programming that trains algorithms using a system of reward and punishment.

A reinforcement learning algorithm, or agent, learns by interacting with its environment. The agent receives rewards by performing correctly and penalties for performing incorrectly. The agent learns without intervention from a human by maximizing its reward and minimizing its penalty.

Example :

Game playing: Let's consider a board game like Go or Chess. In order to determine the best move, the players need to think about various factors. The number of possibilities is so large that it is not possible to perform a brute-force search. If we were to build a machine to play such a game using traditional techniques, we need to specify a large number of rules to cover all these possibilities. Reinforcement learning completely bypasses this problem. We do not need to manually specify any rules. The learning agent simply learns by actually playing the game.

Supervised Learning– Regression

In data analytics we come across the term “Regression” very frequently. Before we continue to focus on our topic i.e. “Linear Regression” lets first know what we mean by Regression. Regression is a statistical way to establish a relationship between a dependent variable and a set of independent variable(s).

Linear regression is a **linear model**, e.g. a model that assumes a linear relationship between the input variables (x) and the single output variable (y). More specifically, that y can be calculated from a linear combination of the input variables (x).

Let’s consider a use case where we have collected students’ average test grade scores and their respective average number of study hours.