

## A study on Machine Learning Algorithms and Application

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**Abstract:** In the past few years, there has been a significant development in Machine Learning that can be used in various industries and research areas. Machine learning is a limb of Artificial Intelligence where its concepts introduce the core idea of teaching a computer to learn the concepts using data without being explicitly programmed. This paper focuses on elucidation of the concept and progression of Machine Learning, Machine Learning algorithms and its application in various research areas. It is fairly expected that this development of Machine Learning will grow considerably in coming years.

**Keywords:** Machine Learning, Artificial Intelligence, Algorithms

### I. INTRODUCTION

Learning is the key hallmark of human intelligence and the basic means to gain knowledge. Machine learning is the fundamental manner to make the computer intelligent that is the best approach used in order to predict something via devising some models and algorithms. R.shankhas said: "if a computer cannot learn, it will not be called intellectual." so machine learning is the suitable method to train the computer.

### II. MACHINE LEARNING

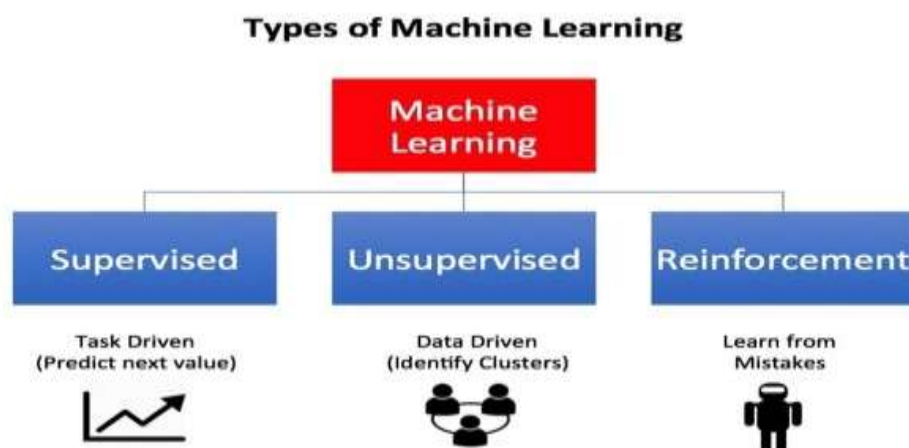
Machine learning is an area under discussion that study how to use computers to simulate human learning activities, and to study self-improvement methods of computers that to obtain new knowledge and new skills, identify existing knowledge, and continuously improve the performance and achievement.

Many people now interact with Machine Learning-driven systems on a daily basis. Compared with human learning, machine learning learns faster, the accumulation of knowledge is more facilitate the results of learning spread easier. So, any progress of human in the field of Machine Learning, will enhance the capability of computers, thus have an impact on human society. Machine Learning lives at the intersection of computer science, statistics, and data science. It uses elements of each of these fields to process data in a way that can detect and learn from patterns, predict future activity, or make decisions.

### III. TYPES OF MACHINE LEARNING

There are three key branches of machine learning:

1. Supervised Learning.
2. Unsupervised Learning.
3. Reinforcement learning



### 3.1 Supervised Learning

Supervised learning causes a function that maps inputs to preferred outputs. For example, in a classification problem, the learner approximates a function mapping a vector into classes by looking at input-output examples of the function for robot manipulators [7].

### 3.2 Unsupervised Learning

Input data or training data is not labeled. A classifier is designed by deducing existing patterns or cluster in the training datasets.

### 3.3 Reinforcement learning

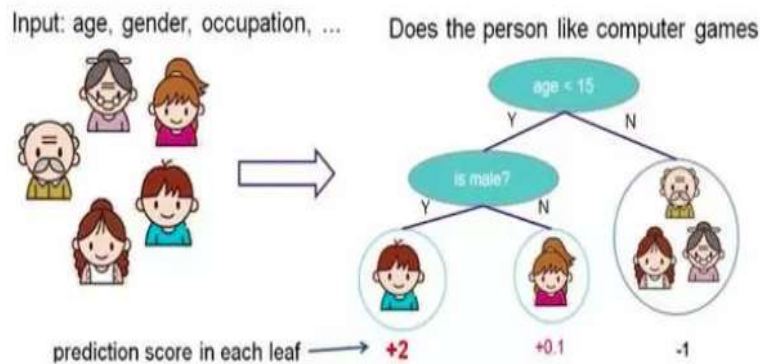
Reinforcement learning learns how to act given an observation of the world. Every action has some impact in the environment, and the environment provides feedback in the form of rewards that guides the learning algorithm [7][8].

## IV. MACHINE LEARNING ALGORITHMS

The commonly used machine learning algorithms that can be applied to almost any data problems and applications are

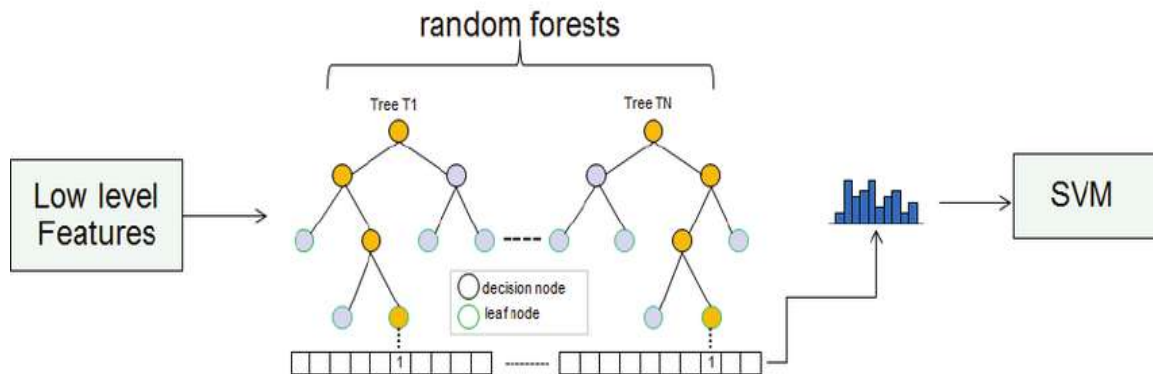
- Decision tree

Classify a set of data into different groups using certain attributes, execute a test at each node, through branch judgment, further split the data into two distinct groups, so on and so forth. Tests are done based on existing data, and when new data are being added, it can be classified to the corresponding group based on some features.



- Random forest

Random Forest is a supervised learning algorithm which is a flexible, simple to use that produces, even without hyper-parameter tuning, a great result most of the time. It is also one of the most used algorithms, because of its simplicity and the verity that it can be used for both classification and regression tasks.

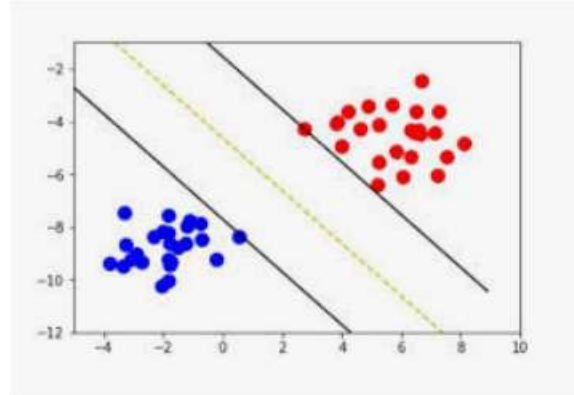


- Logistic regression

When the probability of the predicting target is larger than 0, and less than or equal to 1, it cannot be fulfilled by simple linear model. Because when domain of definition is not within certain level, the range would exceed the specific interval.

- Support vector machine

It is a method mainly used for classification. SVM works on the principle of margin calculation. It basically, draw margins between the classes. The margins are drawn in such a fashion that the distance between the margin and the classes is maximum and hence, minimizing the classification error.



- Naive Bayes

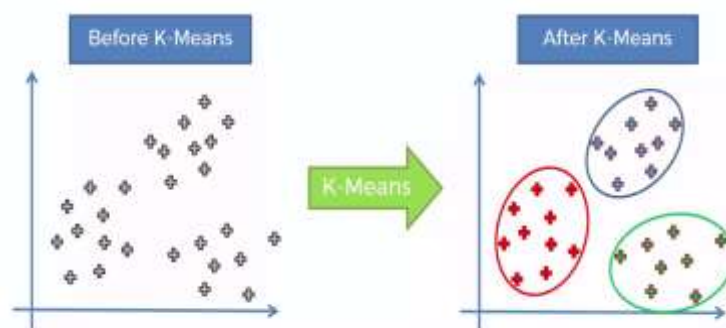
Naïve Bayes mainly targets the text classification industry. It is generally used for clustering and classification purpose [9]. The fundamental architecture of Naïve Bayes depends on the conditional probability. It creates trees based on their probability of occurrence. These trees are also known as Bayesian Network

- K-Nearest Neighbor

In K-Nearest Neighbor (or KNN), the training data which is well-labeled is feed into the learner. The test data is introduced to the learner where it is compared both the data. 'k' most correlated data is taken from training set. The majority of k is taken which serves as the new class for the test data [10].

- K-means

Clustering or grouping is a type of unsupervised learning technique that when initiates, creates groups automatically. The items which possesses similar characteristics are put in the same cluster. This algorithm is called K-means because it creates k distinct clusters. The mean of the values in a particular cluster is the center of that cluster [1].



- Adaboost

Adaboost is one measure of boosting. Boosting is to gather up the classifiers that didn't have satisfied results, and generate a classifier that may have better effect. Boosting creates a collection of weak learners and convert them to one strong learner. A weak learner is a classifier which is barely correlated with true classification. On the other hand, a strong learner is a type of classifier which is strongly correlated with true classification [4].

- **Neural network**

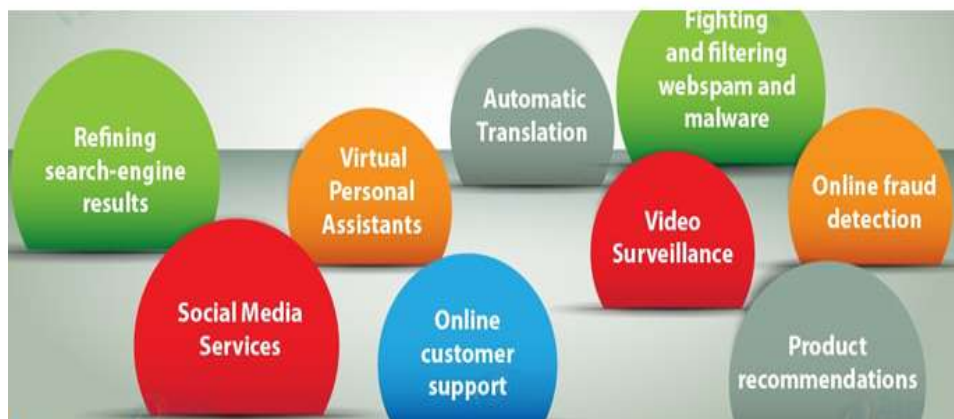
The neural network (or artificial neural network or ANN) is derived from the biological concept of neurons. A neuron is a cell like structure in a brain. To understand neural network, one must understand how a neuron works. A neuron has mainly four parts likewise an artificial neural network behaves the same way. It works on three layers. The input layer takes input. The hidden layer processes the input. Finally, the output layer sends the calculated output [5]. There are basically three types of artificial neural network namely supervised, unsupervised and reinforcement [6].

- **Markov**

Markov Chain consists of states and transitions. Markov chains are a fairly common, and relatively simple, way to statistically model random processes. They have been used in many different domains, ranging from text generation to financial modeling. Markov Chains are conceptually quite intuitive, and are very accessible in that they can be implemented without the use of any advanced statistical or mathematical concepts. They are a great way to start learning about probabilistic modeling and data science techniques[2].

## **V. APPLICATION OF MACHINE LEARNING**

One clear precursor of advancement in ML is its important real-life applications, some of which are briefly described here. It is to be noted that until 1985 there was no significant commercial applications of ML algorithms. Machine learning played great role in recent years as significant development happened in various fields using it. ML lets machines make decision from enormous data. Companies such as Google, Amazon, Accenture, Toyota, Hitachi, Tesla, Johnson & Johnson have embraced machine learning at massive scale and improved their products & services. Start-up companies also developed innovative applications using machine learning. Amazon launched machine learning platform in 2015 and showed more helpful reviews to customers, Google used the ML to translate text in 27 languages. Tesla adopted ML in Auto pilot technology [20].



Application of Machine Learning

### **A. SPEECH RECOGNITION**

All existing speech recognition systems available in the market use machine learning approaches to train the system for better accuracy. In practice, most of such systems implement learning in two distinct phases: pre-shipping speaker independent training and post-shipping speaker-dependent training.

### **B. COMPUTER VISION.**

Majority of recent revelation systems, e.g., facial recognition software's, systems capable of automatic classification microscopic images of cells, employ machine learning approaches for better accuracy. For example, the US Post Office uses a computer vision system with a handwriting analyser thus trained to sort letters with handwritten addresses automatically with an accuracy level as high as 85%.

### **C. BIO-SURVEILLANCE**

Several government initiatives to track probable outbreaks of diseases uses ML algorithms. Consider the RODS project in western Pennsylvania. This project collects admissions reports to emergency rooms in the hospitals there, and the ML software system is trained using the profiles of admitted patients in order to detect aberrant symptoms, their patterns and areal distribution. Research is ongoing to incorporate some additional data in the system, like over-the counter medicines' purchase history to provide more training data. Complexity

of this kind of complex and dynamic data sets can be handled efficiently using automated learning methods only.

#### D. ROBOT OR AUTOMATION CONTROL

ML methods are basically worn in robot and automated systems. For example, consider the use of ML to obtain control tactics for stable flight and aerobatics of helicopter. The self driving cars developed by Google uses ML to train from collected terrain data.

#### E. EMPIRICAL SCIENCE EXPERIMENTS

A outsized grouping data demanding science disciplines use ML methods in several of it researches. For example, ML is being implemented in genetics, to identify unusual celestial objects in astronomy, and in Neuroscience and psychological analysis. The other small scale yet important application of ML involves spam filtering, fraud detection, topic identification and predictive analytics (e.g., weather forecast, stock market prediction, market survey etc.

#### F. HEALTH CARE

Machine learning is a high-speed increasing trend in the health care industry. The technology can also help medical experts analyze data to identify risks that may lead to improved diagnoses and treatment. IBM research group "The Machine Learning for Healthcare and Life Sciences" is developing and applying machine learning and data mining tools to an array of different challenging problems from medical genomic investigation, through scheming clinical decision support systems, to analyze real world evidence for personalized medicine.

### VI. CONCLUSION

This article surveys about Machine Learning concepts, Algorithms and its application. Today each and every person is using machine learning deliberately or inadvertently. It should be used in different application areas and is useful in different domains based on its advantages. This article gives an foreword to most of the popular Machine Learning algorithms.

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