An Overview Of Machine Learning

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Abstract

The need to analyze and work on large collections of data continues to grow in industry, government, and sciences. Machine Learning can be considered as the upcoming face to the modern technological era. Several algorithms such as polynomial regression, random forest, apriori, and fuzzy means are designed to serve specific types of workloads. In this paper, we have discussed about what is machine learning, what is its importance and why we require various types of machine learning techniques to achieve our goals.

Keywords : *Machine, Intelligence, Learning, Supervised.*

1.Introduction

A focus is made on machines as machines cannot be understood by verbal communication it forms abstractions and concepts [1].The concept of Machine learning has been around for the past sixty to seventy years. The famous mathematician Alan Turing who discovered the "Turing Machine – A Masterpiece on its own" first started working in this domain to comprehend the level of intelligence machines can possess. Since then the field of machine learning has evolved to a great extent. As the usage of machines increased the researchers realized that the computers can perform various tasks on their own with their very own intelligence and understanding which further intrigued their interests in this particular field resulting in the rise of artificial intelligence and machine learning.

2.What is Machine Learning?

Machine learning is the genius of the modern age computer to forge human life upgradable by rendering the Machine's Neural Network without any explicit commands [2]. The ideology of automatic analytical model building using the concept of data analysis is considered as Machine Learning.
Machine learning can be considered as a sub child of artificial intelligence (AI). In other words we can say that ML is the general phenomena stating that computers can learn and predict outcomes based on the given inputs. Despite the fact that this concept has been around for a long time, the increasing dependency of humans on machines and the advancement of technologies startled the minds of researchers
giving the much awaited importance and credit to the domain of Machine Learning.

3.Why Machine Learning Is Important?

We all know that the Human race is the most evolved and intelligent known species but we also know that they are also the most arrogant one. Having the knowledge of something doesn't ensure that one can excel in that particular domain. The problem starts when we have to go through huge amount of data just to find something whose value is not even worth to invest that much time and effort. In such situations using machines/computers is a smart choice as they can perform the same amount of work in exponentially less amount of time.
Machines help us to unravel things that may get unnoticed by humans and Machine learning teaches the system to use the respective information efficiently. Based on its learning the system can work on the data that seems difficult to comprehend to a human brain.

4.How Does Machine Learning work?

It's important to understand what makes Machine Learning work and, thus, how it can be used in the future. In machine
learning, a model is built based on algorithms to make machine learn about the patterns in the data.

This process of learning about the data starts with training data or training set. This training data is poured into the model to

make the machine learn about the data and understand the insights and patterns in it. Once the model learns the data, test data or test set is poured into the model. This is the step where validation takes place and we get to know how much the model is accurate. Basically, test data is used to assess the performance of the model. The prediction or the output is compared with the actual output to assess the performance.

If the prediction is not as expected, the algorithm is re-trained many times until the desired output is found. This enables the model to continuously learn and give the most optimal answer that will slowly increase in accuracy over time.
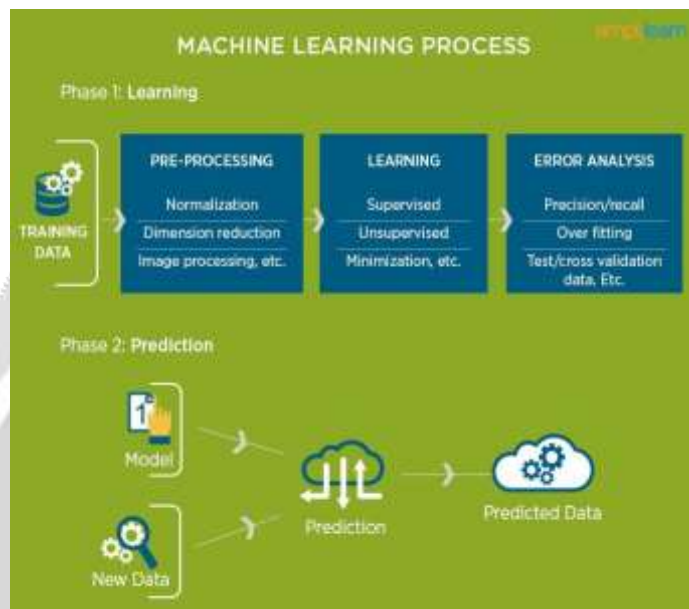

Figure 1: Machine Learning Process

5.Types of Machine Learning

- **Supervised Learning**

In supervised learning, we use labelled or known data for training of algorithm or model. The data is poured into the algorithm and is used to train the algorithm.

Once model learns the data, it is then, given an unknown data to get a response based on the known data.
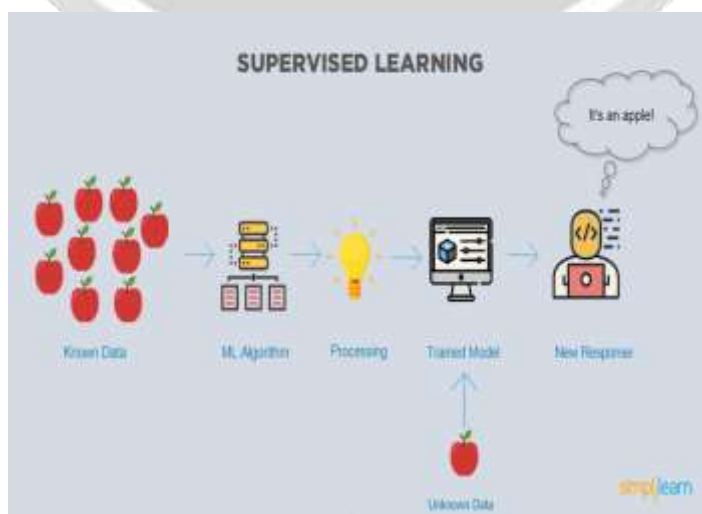

Figure 2: Supervised Learning

The top algorithms currently being used for supervised learning are:
- Polynomial regression
- Random forest
- Linear regression
- Logistic regression
- Decision trees
- K-nearest neighbors
- Naive Baye

- **Unsupervised Learning**

In unsupervised learning, unknown data – meaning that the data is not looked at before is taken as training data. This is poured into the model to train it. The model searches for the patterns and insights in the data and tries to give a desired response.
The top algorithms used for unsupervised learning are:
- Partial least squares
- Fuzzy means
- Singular value decomposition
- K-means clustering
- Apriori
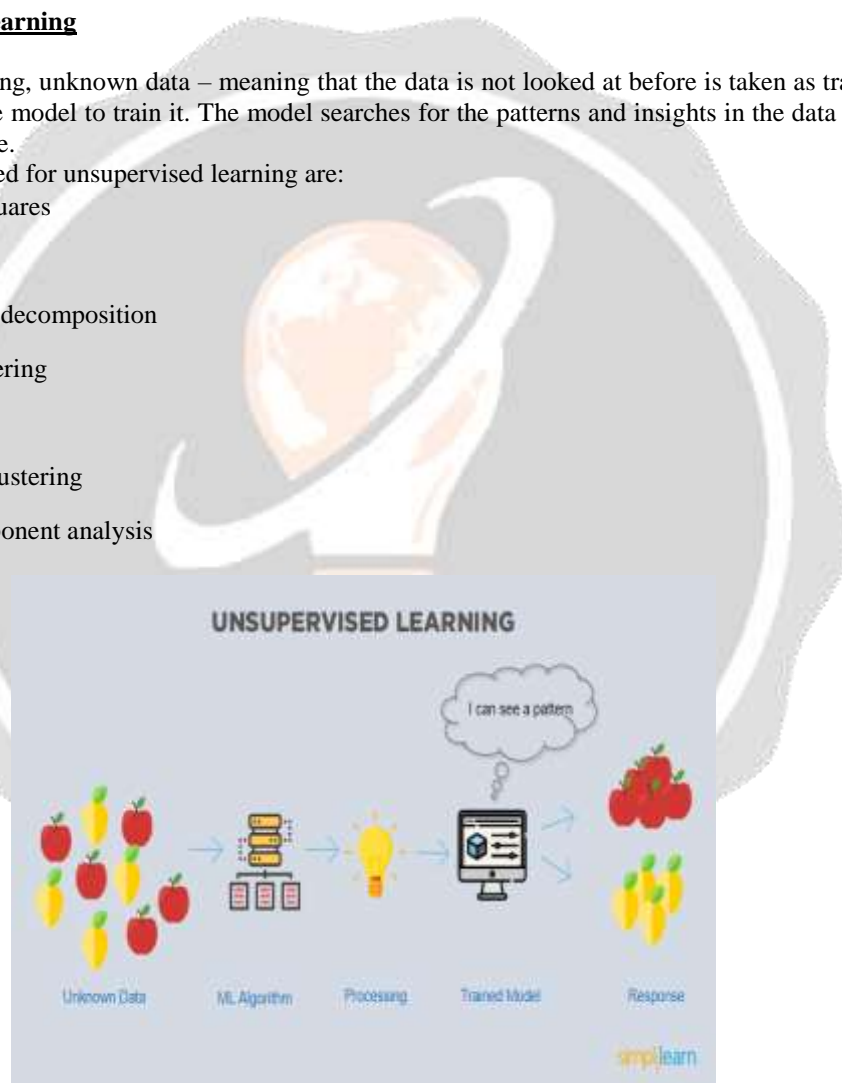- Hierarchical clustering
- Principal component analysis

Figure 3: Unsupervised Learning

- Reinforcement Learning

In this type of learning, the model learns through trial and error method. It is about reward earning in most suitable manner. It consists of three things: Agent, Environment and Action. The agent is the one who's learning, environment is
everything agent is interacting with and the action is what

agent does. The agent will try to maximize the reward in most optimized way to maximize the performance. For example, chess.
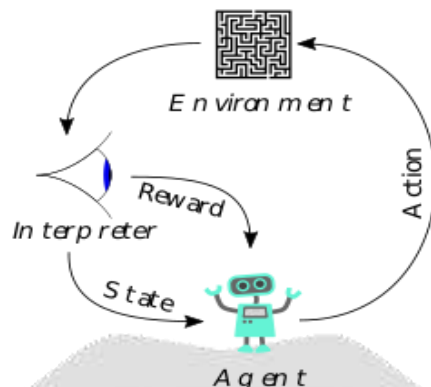

Figure 4: Reinforcement Learning

6.Data Science And Machine Learning

Data Science is a field of study in which we study the data and find the meaningful patterns and insights from the data whereas Machine Learning is building of a model which can learn from the data and can do the predictions. Machine Learning is a part of Data Science. Data science is more about extracting knowledge and machine learning is about using that knowledge. Let's understand this with an example. Assume you are working for a credit company and your boss asks you to find whether a customer is creditworthy or not. So, you collect transaction data, income statement or maybe tax statement, customer ratings etc. Now you use machine learning model to learn from the data and predict whether this customer is creditworthy or not.Finally, you prepare a nice presentation visualizing the decision tree to answer your boss' next question: As the artificial intelligence created for cyber security by using machine learning where a human brain is behind its existence to mimic the action of human to process the data [3].

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