A study on Essential of Machine Learning to society and Its types

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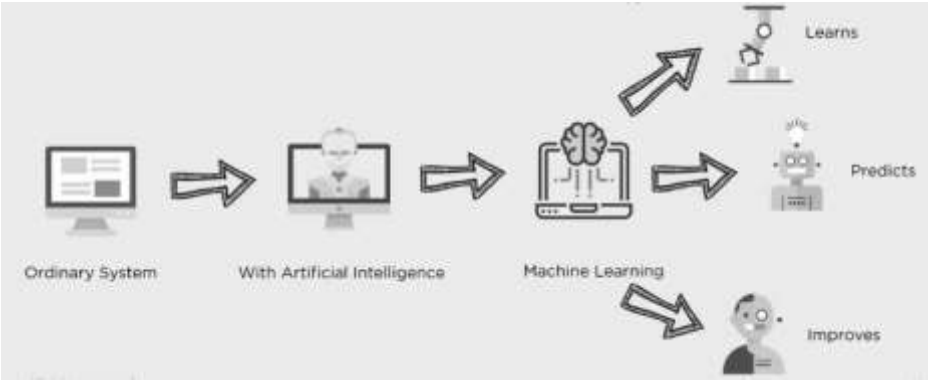
Abstract : Machine learning is a subset of Artificial Intelligence. Machine learning is estimates the future tasks based on the previous experiences. Machine learning system builds the learning model that learns from experiences of the past to enhance the performance of Intelligence tasks. Machine learning is used in a variety of computational tasks include email spam filtering, recognition of intruders in networks, ranking of web pages, recognizing friend's photo on facebook etc., In this paper, a brief review of machine learning and various solutions of real world problems using machine learning algorithms in different approaches.

IndexTerms **– Machine Learning, Learning algorithms.**

I. INTRODUCTION

Machine learning is the science of making computers learn and act like humans by feeding data and information without being explicitly programmed.



Machine learning is a field of study that gives computers the ability to learn without being explicitly programmed(Arthur Samuel, 1959).

A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T as measured by P, improves with experience E of a Machine is called Machine Leaning(Tom Mitchell, 1998).

Machine learning is a technology that allows computers to learn directly from examples and experience in the form of data. Traditional approaches to programming rely on hardcoded rules, which set out how to solve a problem, step-by-step. In contrast, machine learning systems are set a task, and given a large amount of data to use as examples of how this task can be achieved or from which to detect patterns.

The system then learns how best to achieve the desired output. It can be thought of as narrow AI: machine learning supports intelligent systems, which are able to learn a particular function, given a specific set of data to learn from. In some specific areas or tasks, machine learning is already able to achieve a higher level of performance than people. For other tasks, human performance remains much better than that of machine learning systems. For example, recent advances in image recognition have made these systems more accurate than ever before. In one image labeling challenge, the accuracy of machine learning has increased from 72% in 2010, to 96% in 2015, surpassing human accuracy at this task. However, human-level performance at visual recognition in more general terms remains considerably higher than these systems can achieve.

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.

II. FEATURES OF MACHINE LEARNING:

- It uses the data to detect patterns in a dataset and adjust program actions accordingly.
- It focuses on the development of computer programs that can teach themselves grow and change when exposed to new data.
- It enables computers to find hidden insights using iterative algorithms without being explicitly programmed.
- It is method of data analysis that automates analytical model building.

III. NEED OF MACHINE LEARNING TO SOCIETY:

To give you a better understanding of how important Machine Learning is, let's list down a couple of Machine Learning Applications:

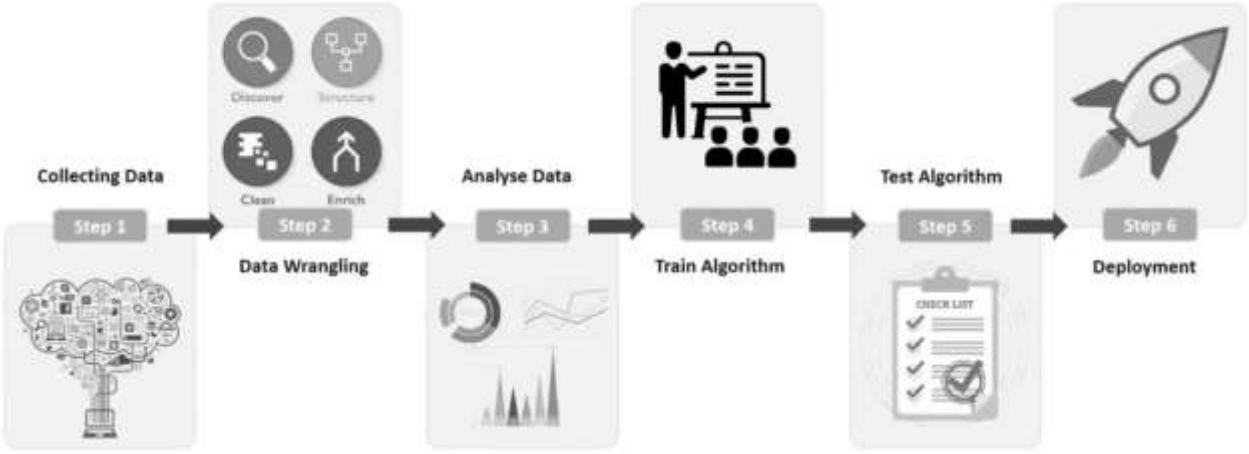
Netflix's Recommendation Engine: The core of Netflix is its infamous recommendation engine. Over 75% of what you watch is recommended by Netflix and these recommendations are made by implementing Machine Learning.

Facebook's Auto-tagging feature: The logic behind Facebook's DeepMind face verification system is Machine Learning and Neural Networks. DeepMind studies the facial features in an image to tag your friends and family.

Amazon's Alexa: The infamous Alexa, which is based on Natural Language Processing and Machine Learning is an advanced level Virtual Assistant that does more than just play songs on your playlist. It can book you an Uber, connect with the other IoT devices at home, track your health, etc.

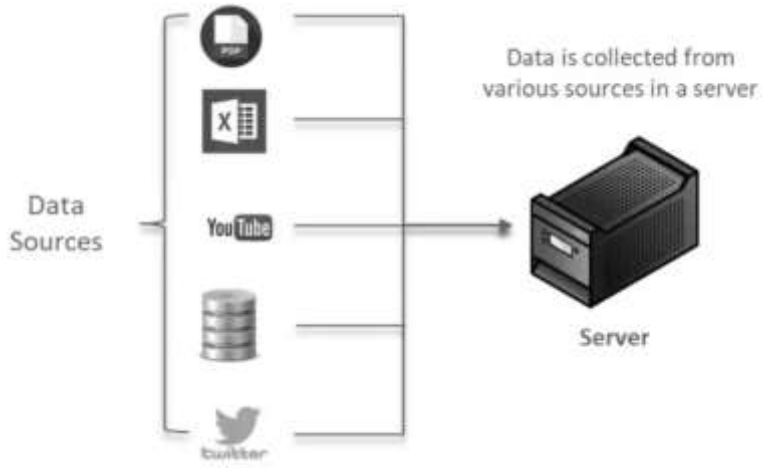
Google's Spam Filter: Gmail makes use of Machine Learning to filter out spam messages. It uses Machine Learning algorithms and Natural Language Processing to analyze emails in real-time and classify them as either spam or non-spam.

IV. LIFE CYCLE OF MACHINE LEARNING:



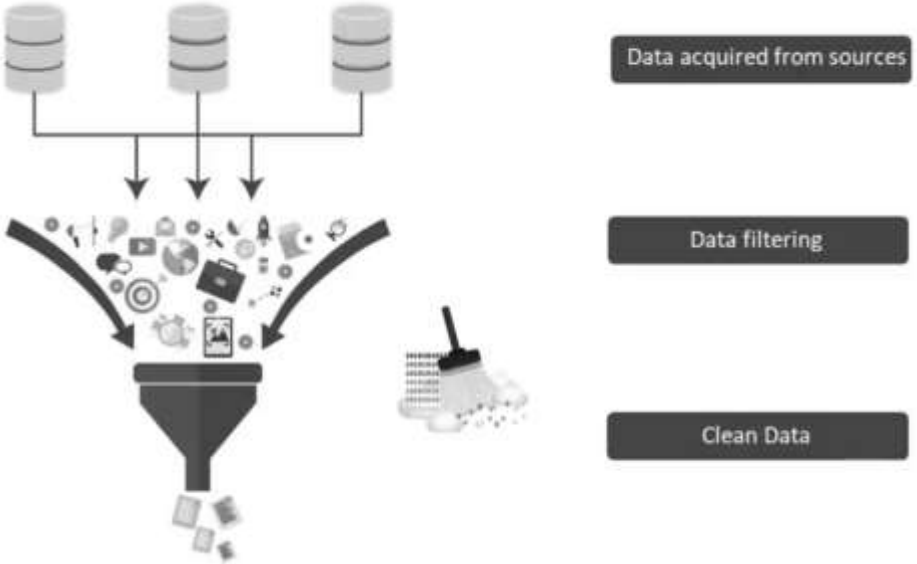
Collecting data:

Data has been collected from various sources and this stage collect the relevant information from the various sources.



Data Wrangling:

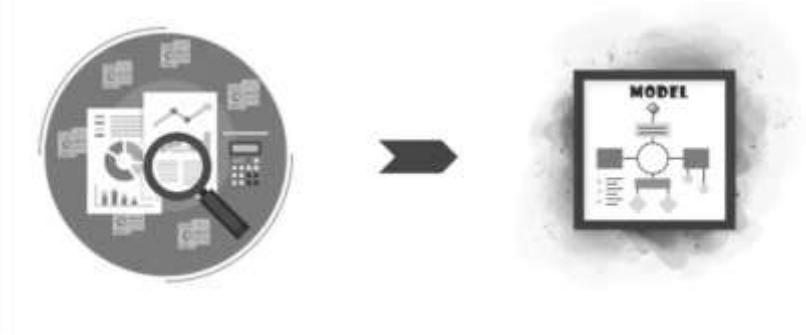
Data wrangling is a process of cleaning and converting raw data into a format. This is very important stage in machine learning life cycle.



Analyze Data:

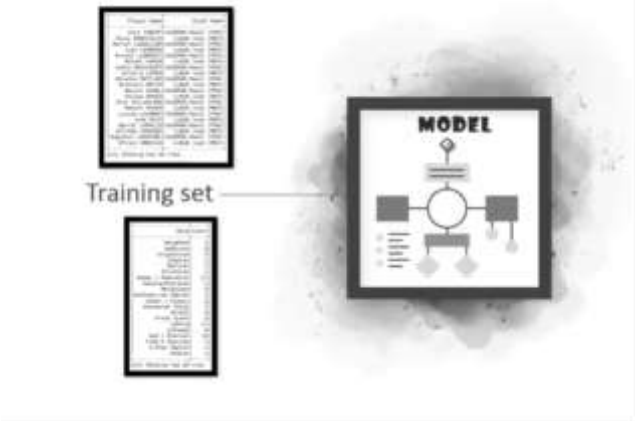
In this step create the data model form acquired data using the machine learning algorithms. It involves Selection of analytical techniques, Building models and Review the result.

The goal of this step is to build a machine learning model to analyze the data using various analytical techniques and review the outcome of the problem. It starts with the determination of the type of the problems, where we select the machine learning techniques such as Classification, Regression, Cluster analysis; Association, etc. then build the model using prepared data, and evaluate the model.



Train the algorithm:

In this step, train our model to improve its performance for better result of the specified problem. Here we use the datasets to train the model using various machine learning algorithms. Training a model is required to understand the various patterns, rules, and, features.



Test Algorithm:

Once we build our machine learning model has been trained on a given dataset, and then we test the model. In this step, we check for the accuracy of our model by providing a test dataset to it.

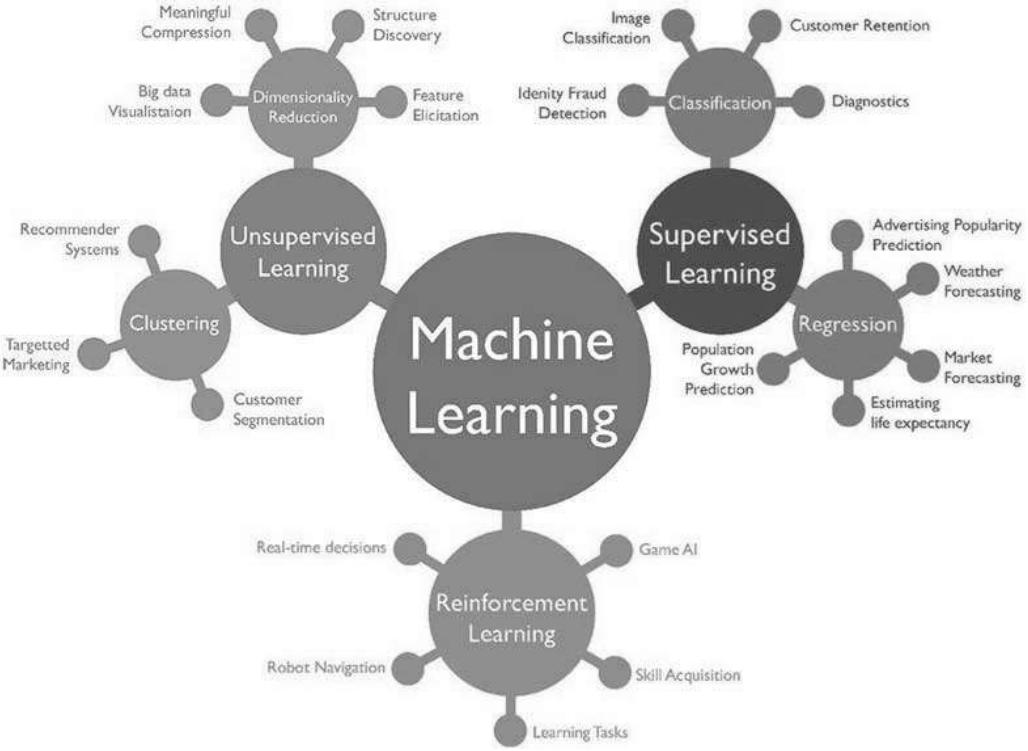
Testing the model determines the percentage accuracy of the model as per the requirement of project or problem.

Operation and optimization:

We will check whether it is improving its performance using available data or not. Optimize the speed and performance of the model at the real world.

V. BRANCHES OF MACHINE LEARNING:

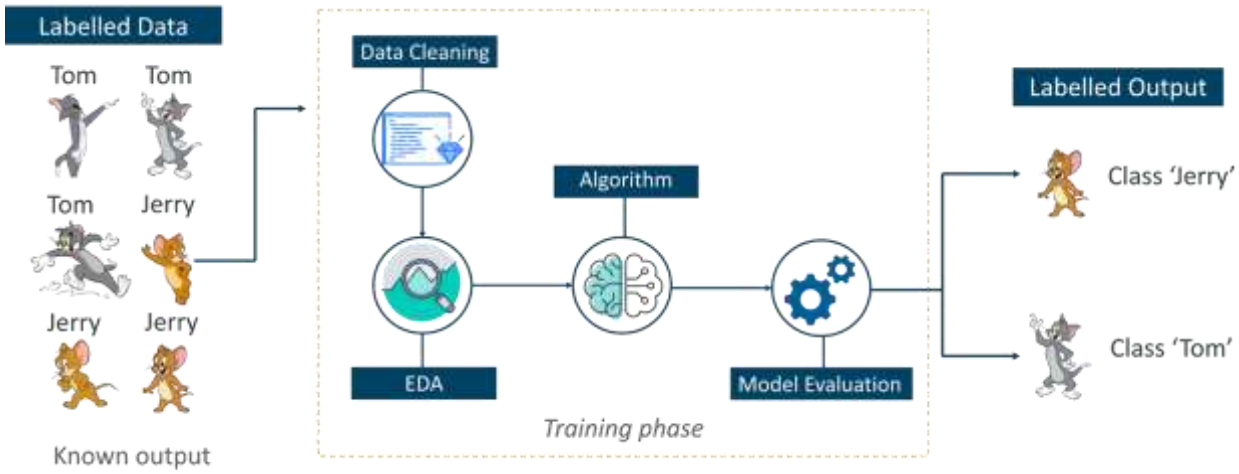
1) Supervised Learning
2) Unsupervised Learning
3) Reinforcement Leraning



5.1 Supervised Learning:

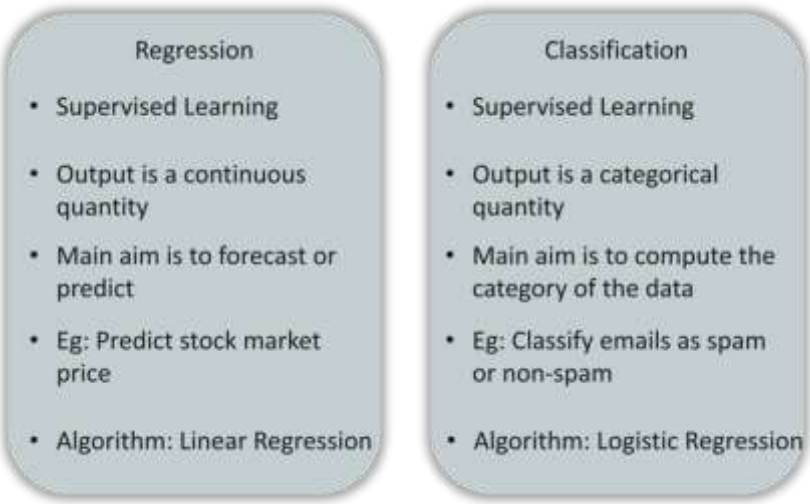
Supervised learning is a technique in which we train the machine using data which is well labeled. Supervised learning is trained using labeled data. Supervised learning provides dataset consisting of both features and labels. The task of supervised learning is to construct an estimator which is able to predict the label of an object given the set of features.

The learning algorithm receives a set of features as inputs along with the corresponding correct outputs, and the algorithm learns by comparing its actual output with correct outputs to find errors. It then modifies the model accordingly. This model is not needed as long as the inputs are available, but if some of the input values are missing, it is not possible to infer anything about the outputs.



Consider the above figure. Here we are labeled the images of Tom and Jerry and the main aim of the machine to identify and classify the images into two groups (Tom images and Jerry images). The training data set that is fed to the model is labeled, as in, we are telling the machine, 'this is how Tom looks and this is Jerry'. By doing so you're training the machine by using labeled data. In Supervised Learning, there is a well-defined training phase done with the help of labeled data.

The Supervised Machine Learning algorithm can be broadly classified into Regression and Classification Algorithms.



Regression:

Regression is a supervised learning technique which helps in finding the correlation between variables and enables us to predict the continuous output variable based on the one or more predictor variables. It is mainly used for prediction, forecasting, time series modeling, and determining the causal-effect relationship between variables.

Regression analysis is a statistical method to model the relationship between a dependent (target) and independent (predictor) variables with one or more independent variables. More specifically, Regression analysis helps us to understand how the value of the dependent variable is changing corresponding to an independent variable when other independent variables are held fixed. It predicts continuous/real values such as temperature, age, salary, price, etc. For example, if you want to predict the speed of a car in given distance.

Some examples of regression can be as:

- Prediction of rain using temperature and other factors
- Determining Market trends
- Prediction of road accidents due to rash driving.

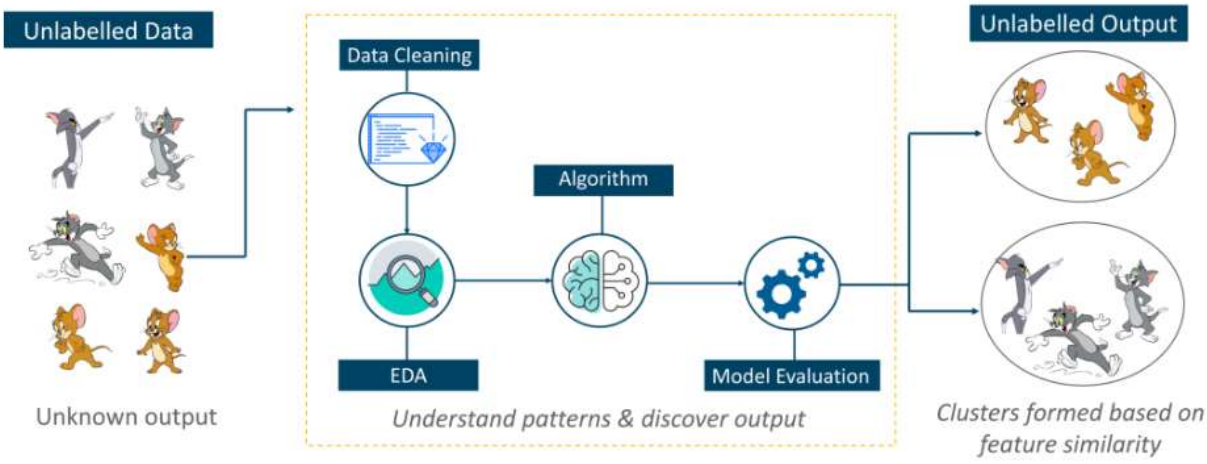
Classification:

The Classification algorithm is a Supervised Learning technique that is used to identify the category of new observations on the basis of training data. In Classification, a program learns from the given dataset or observations and then classifies new observation into a number of classes or groups.

In this type, the output is a categorical value. Classifying emails into two classes, spam and non-spam is a classification problem that can be solved by using Supervised Learning classification algorithms such as Naive Bayes, Logistic Regression, Support Vector Machines, K Nearest Neighbor, etc.

5.2 Unsupervised Learning:

Unsupervised learning involves training by using unlabeled data and allowing the model to act on that information without guidance. Unsupervised learning is learning without labels. Unsupervised learning used data that has no historical labels and the goal is to explore the data and find similarities between the objects.



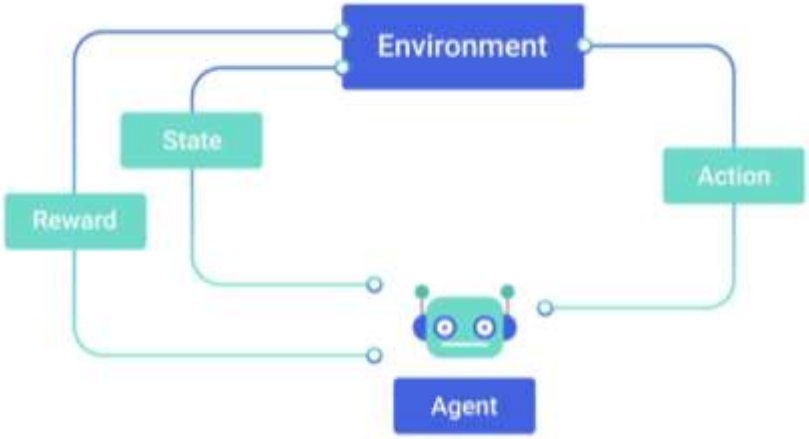
In this type of Machine Learning, the model is not stored with labeled data, as in the model has no idea or hint that 'this image is Tom and this is Jerry', it determines patterns and the differences between Tom and Jerry on its own by taking in bulk of data.

For example, it identifies features of Tom such as pointy ears, bigger size, etc, to understand that this image is of type 1. Similarly, it finds such features in Jerry and knows that this image is of type 2. Therefore, it classifies the images into two different classes without knowing who Tom is or Jerry is.

5.3 Reinforcement learning:

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

Reinforcement learning focuses on learning from experience, and lies between unsupervised and supervised learning. In a typical reinforcement learning setting, an agent interacts with its environment, and is given a reward function that it tries to optimize.



Learning technique which interacts with a dynamic environment in which it must perform a certain goal without a teacher explicitly telling it whether it has come close to its goal. With reinforcement learning, the algorithm discovers through trial and error which actions yield the greatest rewards. So in the chess playing, reinforcement learning learns to play a game by playing against an opponent which performs trial and error actions to win.

Reinforcement Learning is mainly used in advanced Machine Learning areas such as self-driving cars, AplhaGo, etc.

VI. FUTURE WORK

In the research areas, Machine Learning is steadily moving away from abstractions and engaging more in business problem solving with support from Artificial Intelligence and Deep Learning. The Artificial Intelligence and Machine Learning Cloud will increasingly feed on IoT (Internet of Things) data as sensors and smart apps take over every facet of our daily lives.

VII. CONCLUSION

This paper we discussed need of machine learning techniques for future. Machine learning model is given which describes the overview of machine learning process. Also describes the various machine learning algorithm based on types of machine learning styles. Examples of machine learning applications and need of tools are provided.

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