



A Study Paper on Machine Learning

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Abstract: Machine learning is the field, that enables us to predict the outcomes based on past experiences. It has made many updating like one; is of storage capacity and also the processing powers of the computers. Nowadays machine learning techniques are mostly used for biometrics like fingerprint scanning, Eyes detection, etc. It will focus on what is meant by machine learning, the history of ML, then the focus is on some of the commonly used terms of ML, and then point out the types, then focus on ML process and at last differentiate types of Machine Learning in tabular format.

Keywords: Machine Learning, Supervised, Unsupervised, Reinforcement, Checkers, Linear Regression, Logistic Regression, Perceptron.

I. INTRODUCTION

A huge amount of data is generated per day; we need to find a method that analyses and processes data which we called as machine learning. ML helps us to predict risk, identify profits and grow our business.

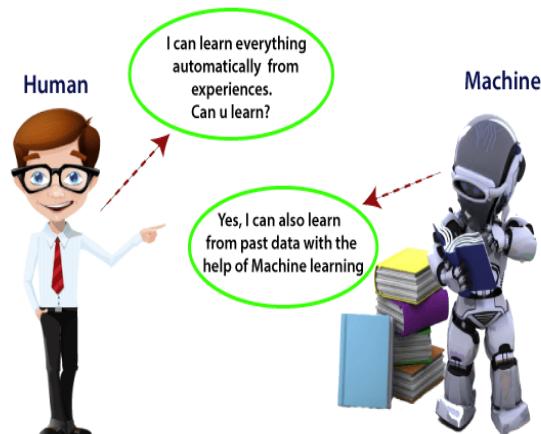


Fig 1: Sample of ML

It is the field of study that gives the computer the capability of learning without being explicitly programmed. It inputs the training data and gives the output.

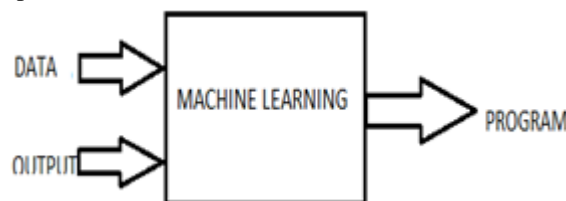


Fig 2: Short Overview of ML

Machine learning works in 3 ways:

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

Machine Learning is the subset of AI which provides machines the ability to learn automatically and improve from experience without being explicitly programmed.

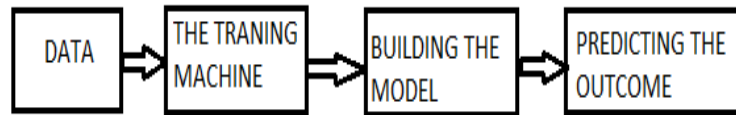


Fig 3: Working of ML

II. HISTORY OF MACHINE LEARNING

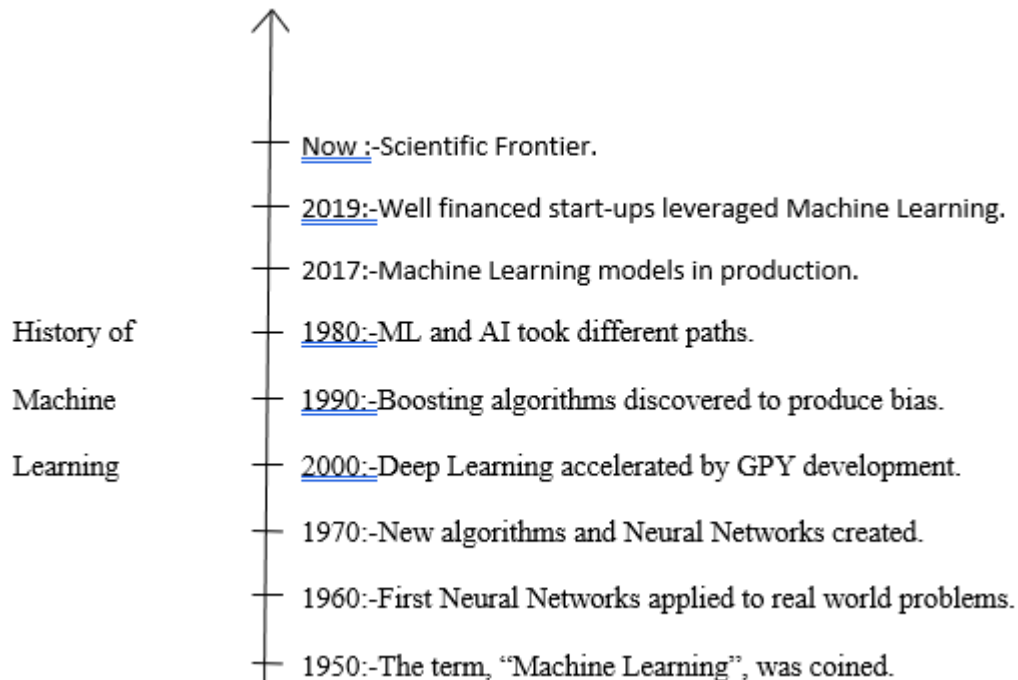


Fig.4: History of Machine Learning.

The history begins in 1950 with a mathematician and computer scientist named Alan Turing. He got a question in his mind that "Can a computer think like humans?" Based on this question he created a game "The Imitation Game"; Then in 1952, a scientist named Arthur Samuel created a game in an IBM company whose name was checkers: it was a self-learning game.

In 1958 a computer engineer named Frank Rosenblatt created one algorithm named perceptron whose work was to recognize the patterns which today came into existence which we use so-called fingerprint matching face detection, etc. In 1979, some professors of Stanford university created a robot whose name was Stanford cart. The important fact of this robot was that the robot was able to detect the obstacles and choose the direction.

III. SOME COMMONLY USED MACHINE LEARNING TERMS

- 1) ALGORITHM: A set of rules and statistical techniques used to learn patterns from data.
e.g. Linear regression
- 2) MODEL: It is the main component of ML. It will map the input with the output by using the ML algorithm and the data that we are feeding to the machine. Model is the representation of the entire ML process.
- 3) PREDICTOR VARIABLE: It is the feature of data that can be used to predict the output.
e.g. If we are trying to predict the weight of a person depending on height and age then here predictor variables are height and age, and weight on the other hand is the response or the target variable.
- 4) RESPONSE VARIABLE: It is a feature or output variable that needs to be predicted using the predictor variable. In other words, it is the output that we get after prediction.
- 5) TRAINING DATA: The data that is fed to the ML model is always split into two parts -
 - i. Training Data: It is used to build the ML model. It is usually larger than the testing data.
 - ii. Testing Data: It is used to validate and evaluate the ML model.



IV. MACHINE LEARNING PROCESS

How does Machine Learning Work?

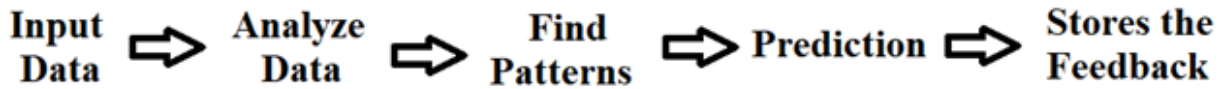


Fig. 5: Working of Machine Learning

There are different stages involved in the ML process which are as follows:

- 1) Defining the objective.
- 2) Data Gathering.
- 3) Data Preparation
- 4) Data exploration and analysis
- 5) Building a model
- 6) Model evaluation
- 7) Prediction or output

ML process with an example

- 1) Stage 1: This stage always begins with defining the objective or defining a problem that we need to solve. e.g., To predict the possibility of rain by studying the whether conditions. Now, in this stage, you must understand what exactly needs to be predicted. We need to know what kind of data is needed to solve this problem.
- 2) Stage 2: This stage is of data gathering or data collection. The data required to solve this problem is collected in this stage. e.g., In this stage we will get the data like whether condition, humidity level, temperature, pressure, etc.
- 3) Stage 3: This stage is of data preparation. The data which we have collected in stage 2 will never be in the right format. We will come across inconsistencies and anomalies in data sets. In this data cleaning is the important part which is done to get rid of inconsistencies such as missing values or redundant variables.
- 4) Stage 4: This stage is of Data exploration and analysis. It is like brainstorming of ML. this stage involves understanding the patterns and the trends of data. All the useful insights are drawn and all the correlations between the variables are understood. e.g., In this case of predicting rainfall, we know that there is a strong possibility of rain if the temperature is low; so this sort of correlation needs to be mapped in this stage.
- 5) Stage 5: This stage consists of building the ML model which always begins by splitting the data. Training data set will be used to build the ML model and the logic of the model will be based on ML algorithm. e.g., In the case of predicting the rainfall the output will be in the form of true or false. We can use a classification algorithm like logistic regression.
- 6) Stage 6: This stage is of model evaluation. And optimization. In this, the created model is tested using the testing data set. This data set checks the efficiency of the model and how accurately the model predicts the output.
- 7) Stage 7: This stage is of Prediction. The final outcome is predicted after performing parameter tuning and improving the accuracy of the model. e.g., Yes - It will rain
No - It will not rain

V. TYPES OF MACHINE LEARNING

Types of machine learning are as follows: -

1) SUPERVISED LEARNING: -

It is a technique in which we teach or train the machine using data that is labelled.

To understand supervised learning let's consider an analogy: - So as we know we all need guidance to solve a maths problem. Our teacher helps us to know what addition is and how it is done. Similarly supervised learning is a type of ML that involves a guide. The labelled data set is a teacher that will train you to understand the patterns.

2) UNSUPERVISED LEARNING: -

It involves training by using unlabelled data and allowing the model to act on that information without any guidance.



For e.g.: -A smart kid that learns without any guidance.

In this, the model is not fed with labelled data. It will identify the prominent features of the data. We are feeding unlabelled data over here and the machine has to understand the pattern and has to find trends on its own without any guidance.

The output of the unsupervised learning is usually the cluster; that, the machine has no idea about the input data it just clusters the similar item in one group.

3) REINFORCEMENT LEARNING

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

For e.g.: -Imagine if we are dropped off on an isolated island; we will panic for the first time; but as we spend time on that island we will explore the environment, food and etc.

In the same way reinforcement learning works. The agent will collect data on its own, it will perform everything on its own from data collection to model evaluation.

VI. DIFFERENCE BETWEEN SUPERVISED, UNSUPERVISED AND REINFORCEMENT LEARNING

TABLE 1: Differentiation between supervised, unsupervised, and reinforcement learning.

	Supervised learning	Unsupervised learning	Reinforcement learning
Definition	The machine learns by using the labelled data.	The machine is trained on unlabelled data without any guidance	An agent interacts with its environment by producing actions and discovers errors.
Types of problems	Regression and classification problems.	Association and clustering problems.	Reward-based problems.
Types of data	Labelled Data	Unlabelled Data	No pre-defined Data
Approach	It maps labelled input to known outputs	It understands patterns and discovers the output	It follows the trial-and-error method
Training	External supervision	No supervision	No supervision
Popular algorithm	Linear Regression, Logistic Regression, Support Vector Machine, etc	K-means, C-means, etc	Q-learning, SARSA, etc

VII. EXAMPLES AND APPLICATION AREAS OF MACHINE LEARNING

Areas in which Machine Learning is useful:

1. Image recognition,
2. Speech recognition,
3. Medical diagnosis.
4. Statistical arbitrage.
5. Predictive analytics.
6. Extraction

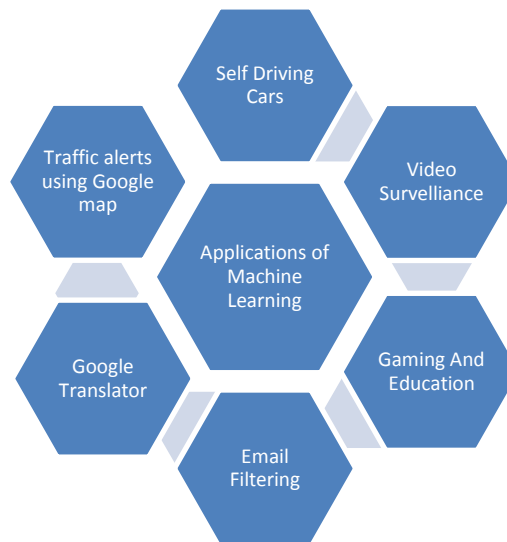


Fig 6: Applications of Machine Learning

VIII. CONCLUSION

Because of this digital age, technologies continue to make leaps and stride forward. This incredible form of Machine Learning is already being used in various industries and professions. From marketing to medicine, and web security. This technology has improved our lives in various ways. Today Machine Learning has been a hot topic everywhere and is making its way into education. This paper completely explains the basics of Machine Learning.

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REFERENCES

- [1] V. Rao and J. Sachdev, "A machine learning approach to classify news articles based on location", 2017 International Conference on Intelligent Sustainable Systems (ICISS), pp. 863-867, 2017.
- [2] J. Khairnar and M. Kinikar, "Machine learning algorithm for opinion mining and sentiment classification", International Journal of Scientific and Research Publications, vol. 3, no. 6, June 2013.
- [3] T. M. Mitchell, "Machine Learning," McGraw Hill, 1997.
- [4] E. Alpaydm, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)," MIT Press, 2004.
- [5] S. Abney, "Semi supervised Learning for Computational Linguistics", Chapman & Hall/CRC, 2008.

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