Journal of Artificial Intelligence, Machine Learning and Neural Network
Vol: 03, No. 01, Jan-June 2023
ISSN: 2799-1172, DOI: 10.55529/jaimlnn.31.39.46

Research Paper

Machine learning in modern world

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Article Info

Article History:
Received: 20 October 2022
Revised: 01 January 2023
Accepted: 07 January 2023
Published: 23 February 2023

Keywords:
Machine Learning
Artificial Intelligence
Technology
Deep Learning
Models

ABSTRACT

Today the world is totally dependent on technology. Machine learning is one of the game changing technologies which is used in our day to day life. Every day in machine learning technology there are developed a variety of new products and applications using various machine learning algorithms. Mainly of three types of algorithm. A few applications of machine learning are Product recommendations, Speech recognition etc. The machine learning outcome of the product is perfectly excellent and more accurate. Machine learning is otherwise a subset of Artificial intelligence, it implements several tasks left out any changes. There are many more trending technologies depending on machine learning, in machine learning the process is more effective and quick and faster than human work efficiency. These trends are done by using huge amounts of biological data, medical data, algorithms and numerical models available today. It is also becoming very useful in the upcoming future generation.

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1. INTRODUCTION

Machine learning was discovered by Arthur Samuel in 1959. Machine learning is a subdivide of artificial intelligence but this is possible quicker and more efficiently with the concept of machine learning. Machine learning is the ability of machines to intimate smart human attitudes. This Machine learning is implemented by the main factor known algorithm, the algorithm which is used in machine learning is known as machine learning algorithms. Machine learning algorithms are allowed to identify the design in data and learn from them, it makes its own forecast.

Now the world is getting into the term of automation. Earlier all of the activities are done by humans, then the activities are developed as it can be done quickly with the help of technologies (ie machines). Later it becomes very useful to humans to complete their work faster and more accurately. Later it becomes mandatory to complete the work for humans. Now the activities become fully automated so that the human work is not required, the output gained is very accurate and higher efficiency than to human involved output. Now this automation technology is fully designed and computed by artificial intelligence and machine learning technology [1].

1.1 Machine Learning Algorithms

The main purpose of machine learning is to give some permission to customers to provide computer algorithms with a very big amount of data and have the computer analyses and make the data-driven recommendations and decisions based on the input. Here machine learning in used in various applications

The machine learning concept can be implemented with the machine learning algorithms. There are various machine learning algorithms. The applications use respective machine learning algorithms so that the required output is obtained with exact results.

Mainly there are three machine learning algorithms

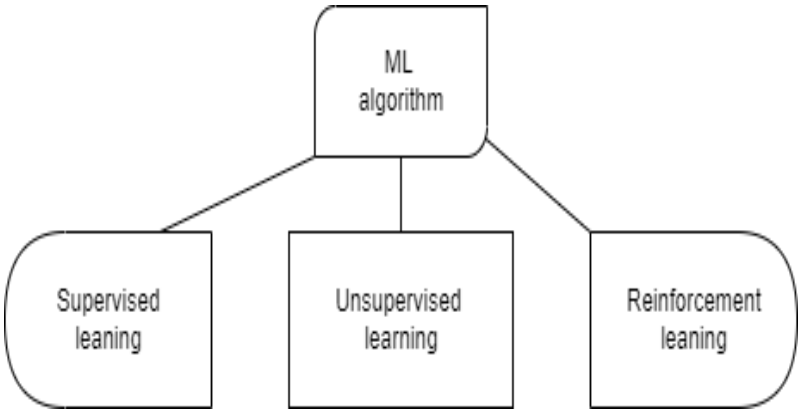

Figure 1. Types of Machine Learning Algorithms

1.2 Supervised Learning

Supervised learning is one type of machine learning that labels the datasets to train the data.The data set is to be labelled during the process of training,so that the output is identified on time of testing. The data set that to be inserted should be labelled properly for the more accurate outcome. The labelling process is to be done manually by the humans. This algorithm works by establishing the relationship between the given parameter data with the predicted trained data set. Supervised learning there are some algorithms. There are mainly two types of machine learning problems that can be solutioned by supervised machine learning algorithms

- Regression
- Classification

1.3 Linear Regression

This is the most used and simple algorithm for the analysis of prediction. Here the algorithm relates the relationship among the dependent and independent variable and shows how the dependent variable changes with respect to the independent variable with the help of a line called the regression line. This algorithm best fits the regression line between the dependent and independent variable

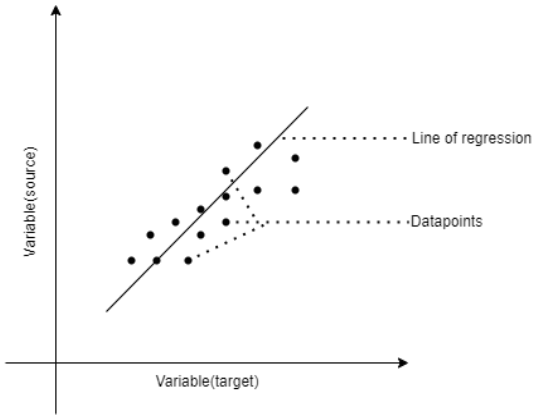

Figure 2. Linear Regression Line

$b=y_0 + y*a + y$
b=independent
a=dependent
y_0=intercept

1.4 Decision Tree

The regression and classification can be done using the decision tree machine learning algorithm. This technique is matched to a tree-structure where the node of the tree indicates the dataset, branches of the tree indicate the rules and each and every leaf node/child node represent the outcome.
In this tree technique there are mainly two nodes:

- Decision node
- Leaf node

The decision node used to make the decision and this node may have multiple branches but the leaf node does not have further branches as it represents the outcome.

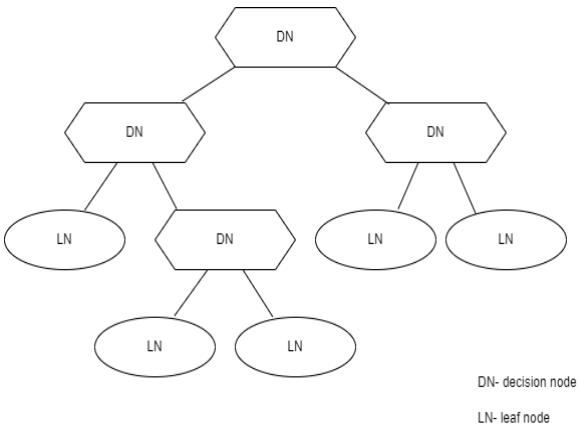

Figure 3. Decision Tree Structure (Decision Nodes & Leaf Nodes)

1.5 Random Forest

Random forest machine learning is one of the supervised machine learning algorithms. It is also one of the most used supervised machine learning algorithms. Random forest machine learning algorithms can be used for both regression and classification problems in machine learning. In the random forest machine learning algorithm the concept of ensemble learning is used [2].

This is predicating the final output as the same as the decision tree. The regression tree machine learning algorithm is dependent on a single decision tree where a random forest machine learning algorithm gives the final prediction on comparing with each of the decision tree.

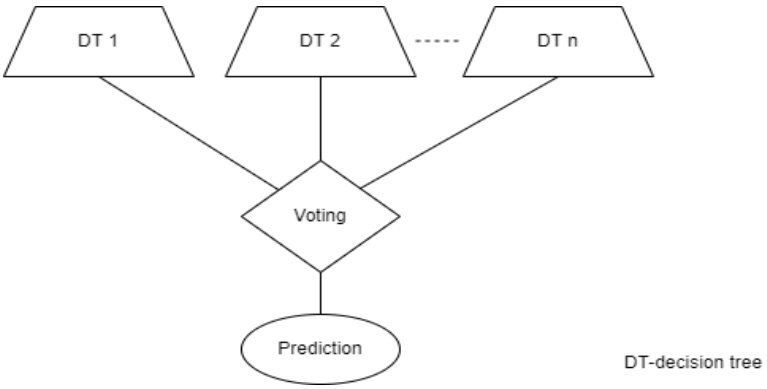

Figure 4. Random Forest Voting & Prediction

Here each decision tree gives a prediction, form these predictions the random forest machine learning algorithm gives the most voted prediction as final prediction

1.6 Support Vector Machines

Support vector machine algorithm is a supervised learning algorithm which is used in the area of classification. The classification problems are taken with a support vector machine as it has the capability of solving it with more accuracy compared to all of the others.

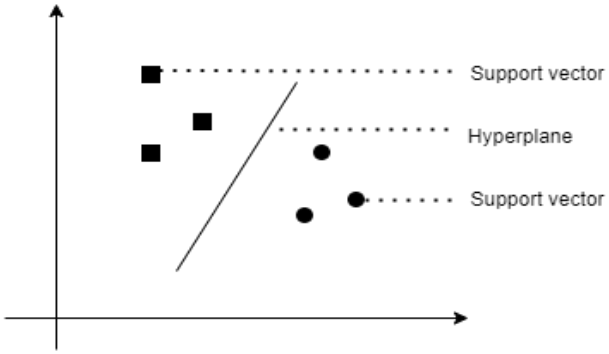

Figure 5. Support Vector Machine (Hyperplane / Decision Boundary)

The support vector machine algorithm classifies the data set into different classes and creates a decision boundary or hyperplane. Support vectors are the data point that helps the support vector machine algorithm to obtain the hyperplane.

The supervised machine learning algorithm is use in the applications like

- Bioinformatics
- Speech recognition
- Spam detection
- Text recognition
- Face detection
- Signature recognition
- Stock market

1.7 Unsupervised Learning

Unsupervised learning uses machine learning algorithms to survey and collect unlabeled data sets. The models are trained without the labelled set of data. The model itself identifies the hidden patterns and trains itself. It is similar to the human brain. This is the way to uplift the current machine learning methodology of drug discovery to a high level, where it self gets trained with its appropriate hidden data, so that the high variety of outcome is expected without any manual feeding of labelled data on time of

training the model. The input data need not to be categorised, after feeding the algorithm divides the input data objects and segregates them under similar objects. Here the relation between the data set and parameters input is abstracted.

There are mainly two types of machine learning problems that can be solutioned by supervised machine learning algorithms:

1. Clustering
2. Association

1.8 Clustering

Cluster analysis is a machine learning approach, which groups the nameless dataset.it is unsupervised method hence no supervision is provided in algorithm and deals with nameless dataset. After using this technique each cluster approach the with cluster-id. Machine learning system is used id to process large dataset complex. It consists of two types

- Hard cluster
- Soft cluster

1.9 Association

It is an unsupervised learning method used for finding relationships between variables in a large database. It is most applied by market basket analysis, web mining, etc. Here it is compared with a large collection of actions and the respective association is found. In this meathon apriori algorithm, eclat algorithm, F-P growth algorithm are majorly used.

1.10 K-Means Algorithm

K-means algorithm is an unsupervised algorithm which deals with clusters. The K-means algorithm clarifies the unlabeled data sets into clusters that makes no need for training. The letter K in the K-means algorithm indicated the number of defined clusters. Here each of the clusters is deepened with the centroid as it is a centroid based algorithm. This algorithm is used to reduce the sum of distance in between the data points and its corresponding clusters. In this algorithm the number of algorithms found by the use of the elbow method. The concept of 'Within cluster sum of squares' is used to provide complete variation among clusters [3].

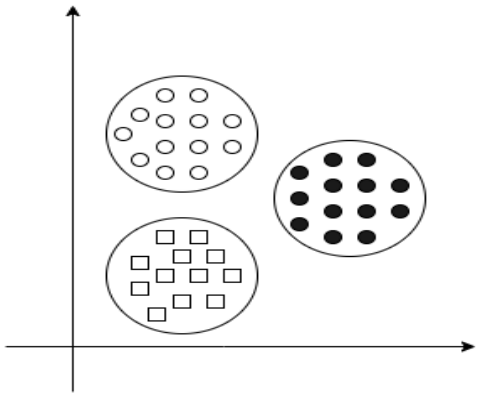

Figure 6. Clustering in Unsupervised Learning

This algorithm works as follow

1. Initially number of clusters are decided
2. Random points or centroid are been found
3. The data point is taken closer to its nearest centroid
4. The variance is been calculated and centroid is paced for each cluster
5. This is carried until that all of the data points are get closer to a centroid
6. Here the final result is obtained

1.11 K-Nearest Neighbour Algorithm

K-Nearest neighbour algorithm is one of simplesry algorithms based on supervised learning technique.it stores all ready for use data and categorise a new data point based on likeness.it used for regression in addition to grouping otherwise than mainly used for grouping problems.it is non-parametric algorithm, which means does not make any entering on elementary data.it does not learn from the training set instantly it stores dataset and time grouping, it training the point just stores dataset and when it gets new data, then group the data into family is much similar to new data.

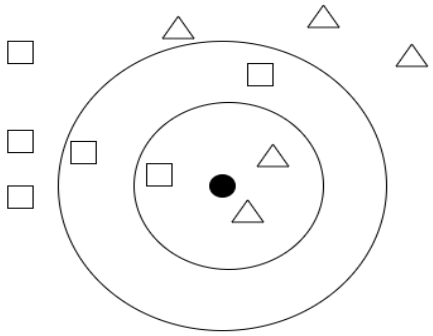

Figure 7. K-Nearest Neighbour (KNN) Classification

This algorithm works as follow

1. Number of neighbours are found
2. The euclidean distance all of the neigher was found
3. The nearest neighbour is taken as per the euclidean distance
4. Then the number of data point in each category are calculated
5. New data points are assigned to the category that ha maximum number of neighbours
6. Here the final result is obtained

The unsupervised machine learning algorithm is use in the applications like

- Fraud detection
- Malware detection
- Error in data entry by human
- Labelling unlabelled data sets
- Similarity detection
- Product segmentation
- Customer segmentation
- Recommendation system

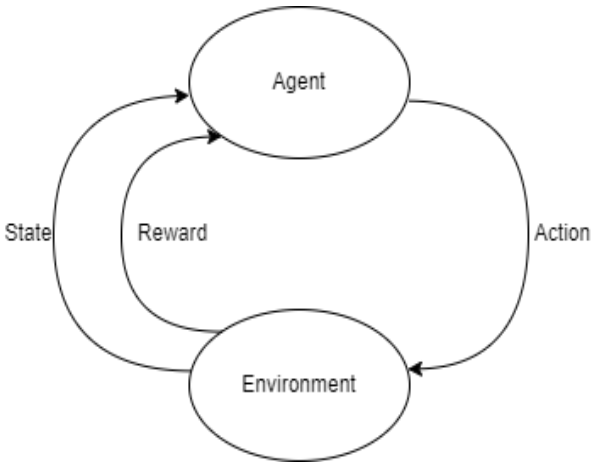

Figure 8. Reinforcement Learning Agent and Environment Interaction

1.12 Reinforcement Learning

Reinforcement learning is related to taking appropriate action to maximise reward in particular situations.in this learning the computer itself interacted with environment and trains its own.it is completely based on trial and action. The model trends to learn by its own experience as it doesn't have a labelled data set. Here the next operation to be done depends on the experience. This is self-developed by gathering positive experience .most this algorithm is used in area of sequential way of decision making.

The decision making is done more accurately by using the Bellman equation. This equation helps to obtain value for the decision point associated with the concept of dynamic programming

$$X(z) = \max [A(z,a) + \gamma P(z`)]$$

X(z)= value calculated at a particular point.
A(z,a) = Reward at a particular states by performing an action.
γ = Discount factor P(z`) = The value at the previous state.

Here the model always takes the optimal solution so we take the maximum of all complete values available. The main advantage of the reinforcement algorithm is the model experiences the environment without the help of human intervention. Using a reinforcement algorithm in the case of having large enough data is worth less that other machine learning algorithms can handle the data more impressively efficiently and as it depends upon its own experience so the large amount of time is taken. In the future the process of full automation is possible with the use of this reinforcement learning machine learning algorithm, then human less discovery can be done, as it prevents human form biological side-effects. Reinforcement learning intervals with the environment and learns for it. As per feedback the reinforcement learning algorithm is classified into two types

1.13 Positive reinforcement

The tendency is increased by occurrence of positive behaviour.

1.14 Negative reinforcement

The tendency is increased by avoiding the occurrence of negative behaviour.

The reinforcement learning is used in applications like

- Automation car
- Industrial automation
- Natural language processing
- Health care
- Recommendations
- Gaming
- Advertizing
- Robotics

Acknowledgments

The authors have no specific acknowledgments to make for this research.

Funding Information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Archana V	✓	✓	✓	✓		✓		✓	✓	✓	✓			

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration

Va : **Va**lidation
Fo : **Fo**rmal analysis
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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How to Cite: Archana V. (2023). Machine learning in modern world. Journal of Artificial Intelligence, Machine Learning and Neural Network (JAIMLNN), 3(1), 35–42. https://doi.org/10.55529/jaimlnn.31.39.46

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