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A review on Machine Learning: Application and Algorithms

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Abstract: *The field of machine learning is introduced at a conceptual level. The main goal of machine learning is how computers automatically learn without any human invention or assistance so that they can adjust their action accordingly. We are discussing mainly three types of algorithms in machine learning and also discussed ML's features and applications in detail. Supervised ML, In this typeof algorithm, the machine applies what it has learned in its past to new data, in which they use labeled examples, so that they predict future events. Unsupervised ML studies how systems can infer a function, so that they can describe a hidden structure from unlabeled data. Reinforcement ML, is a type of learning method, which interacts with its environment, produces action, as well as discovers errors and rewards.*

Keywords: *Machine Learning, Applications, Algorithms, Features.*

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I. Introduction

Artificial intelligence is providing the field of machine learning. Machine learning was released by Arthur Samuel in the year of 1959. Machine learning is a type of learning, in which the machines Learns over selves. It is a machine that has the ability to think and make decisions. Machine learning is a type of application that provides systems with the ability to learn automatically and improve over selves if needed. We can generate a program that has been made to integrate the input and output of the same program. The main goal of machine learning is how computers automatically learn without any human invention or assistance so that they can adjust their action accordingly. According to need for machine learning is increasing to day by day. In the main reason is that are too complex for person to implement directly. A concise review of what ML includes can be found in. De Mantras' and Armengol (1998) also presented a historical survey of logic and 25 instances-based learning classifiers.[1]

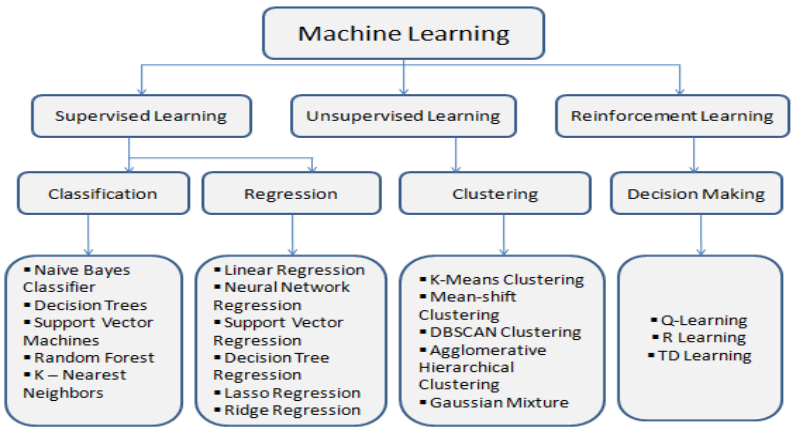

Figure 1 Machine Learning

- Supervised machine learning algorithm
- Unsupervised machine learning algorithm
- Reinforcement machine learning algorithm

1.1 Supervised Machine Learning Algorithm:-In this type of algorithm, the machine applies what it has learned in its past to new data , in which they use labeled examples, so that they predict future events. To analyzing a known training dataset, this learning algorithm produces a kind of inferred function which can easily make predictions regarding the output values [2]. This system can provide them targets for new inputs to give them sufficient training, and it compares the resulting output with the correct, intended output and finds errors, so that they can modify the model accordingly...

1.1.1 Types of Supervised Machine Learning Algorithm:-
Supervised machine learning algorithms are divided into two groups "Regression and Classification". The main goal of both these method is that the relationship in structure determine correct output data and both have the goal of finding the value of dependent variable from the attribute variable[3].
Regression: - It is a technique use to find out the relationship between independent and dependent. Also regression is used as a method of predictive modeling in machine learning. If there is a relationship between the input or output variables, then regression algorithm is used in it. Further regression is divided into sub parts:-

- Linear regression:-Linear regression is the supervised Machine Learning model in which the model finds the best fit linear line between the independent and dependent variable.

- Non -Linear regression:- Non -Linear regression is a statistical technique that help describes nonlinear relationship in experimental data
- Polynomial regression:- This regression algorithm that model the relationship between a dependent and independent variable as nth degree polynomial. [4]

- Regression trees:- this regressing tree is basically a decision tree that is used for the task of regression which can be used to predicate continuous valued outputs instead of discrete outputs.

Classification:-when inputs are divided into two or more classes and the learner produces a model that assigns unseen Inputs to one or more classes. It is usually set about in a supervised way.
In classification, some mathematical techniques are used:-

- **Decision Tree:** provided an overview of work in decision trees and a sample of their usefulness to newcomers as well as practitioners in the field of machine learning. Decision trees are Rees that classify instances by sorting them based on feature values.[5]In decision tree there is two nodes parent node and child node it is also known asdecision node and leaf node. The parent node has branches and child nodes are the result of the parent nodes.

- **Linear programming**: -Decision trees can be translated into a set of rules by creating a separate rule for each path from the root to a leaf in the tree . However, rules can also be directly induced from training data using a variety of rule-based algorithms. A large number of learned rules is usually a sign that the learning algorithm is attempting to "remember" the training set, instead ofdiscovering the assumptions that govern it.[6]

- **Neural Networks: -** Perceptions can only classify linearly separable sets of instances. If a straight line or plane can be drawn to separate the input instances into their correct categories, input instances are linearly separable and the preceptor will find the solution. Provided an overview of existing work in Artificial Neural Networks (ANNs)

1.1.2 Applications of Supervised Machine Learning
There are many applications of supervised machine learning, these applications are as follows:-

1. Online machine learning.
2. Speech recognition
3. Spam detection
4. Object-recognition for vision

1.1.3 Features of supervised machine learning:-
Supervised learning used a training set to each models to yield the desired outputs. This training dataset includes inputs and correct output, which allow the model to learn over time.

1.2 Unsupervised Machine Learning:-Unsupervised machine learning algorithm are used when the information is to be trained and not classified alone or labeled. Machine cannot identify the difference between features of humans and animals. But it can identify the similarities, structure and differences. This system does not describe any right output, but it explores the data.[7]

1.2.1Types of unsupervised machine learning

Clustering is a task of unsupervised machine learning. It involves automatically discovering natural grouping in data with two or more variable quantities. Group cannot be known in advance, expect for its classification, which make it's a typically unsupervised task. Always remember machine learning come into picture only when problem cannot be solving with typical approaches.

- **Partitioning clustering**: -Partitioning clustering are clustering methods used to classify observations, within a dataset, into multiple groups based on their similarity.

- **Density-based clustering**:- density based clustering refer to unsupervised learning methods that identify distinctive groups /clusters in the data, based on the idea that a cluster in a data space is a contiguous region of high point density, separated from other such cluster by contiguous regions of low point density.

- **Distribution model-based clustering**: - Model based clustering is a statistical approach to data clustering. The observed data is considered to have been created from a finite combination of component models.

- **Hierarchical clustering**: -Hierarchical clustering is another unsupervised machine learning algorithm, which is used to group the unlabeled datasets into a cluster and it is also known as hierarchical cluster analysis. The Hierarchical clustering technique has two approaches: - Bottom- up approach, top-down approach.

- **Fuzzy clustering**: - this algorithm works by assigning membership to each data point corresponding to each cluster center on the basic of distance between the cluster center and the data point.[8]

Association: -Association is a technique that describes how objects are associated with each other. Association is a very well know method of finding relationship between variables in large databases.[9]

1.2.2 Applications of Unsupervised Machine Learning:-

1. Products segmentation
2. Customer segmentation
3. Similarity detection
4. Recommendation system
5. Labeling unlabelled datasets

1.2.3 Features of Unsupervised machine learning:-

There are following features of Unsupervised Machine learning *i.e.*

- Knowledge Discovery
- Wrapping
- Filtering
- Course of dimensionality

***1.*3Reinforcement Machine Learning Algorithm**:-It is a type of learning method, which interacts with its environment, produces action, as well as discovers errors and rewards. This method allows machines and software agents to automatically determine any ideal behavior, which is within a specific context and so that it can maximize their performance.

1.3.1Types of reinforcement machine learning

- **Decision Making:-**It is a process that helps us for make decisions and provides a way to solve our problems step by step. It is process of identifying a decision, gathering information and assigning alternative decision. Reinforcement ML is a providing further some steps of decision making.[10]

- **Q- Learning:-**Q-Learning is a model-free reinforcement learning algorithm to learn the value of an action in particular states. It does not require a model of the environment, and it can handle problems with transitions.
- **Q- Table:-** Q-table is a value based learning algorithm in reinforcement learning.

1.3.2Applications of Reinforcement Machine Learning:-

1. Business strategy planning
2. Machine learning and data processing
3. Robotic for industrial automation
4. Motion planning
5. Dynamic path
6. Controller optimization
7. Provide custom instruction and materials according to the requirement
8. Aircraft control

9. Healthcare

1.3.3Features of Reinforcement Machine Learning:-

This technique is used to achieve such results which are very difficult to achieve.
It provides accurate results.

2. Features of Machine Learning:-

- In fact, it has made the life of man a lot easier.
- Today machine learning is constantly being used to improve tasks in every field.
- For this, machines are being made more the effective and efficient.
- The use of machine learning is not limited to any one field, but today this technology of AI is being benefited in almost every field.
- Finance: - AI and machine learning are also being used in the finance sector, to provide a better and faster service to the customer, such as enhancing the security of transaction and preventing fraud activity, etc...
- Health: -Machine learning is making a big change in health sector, such as machine learning and diagnosis of patients, improving radiotherapy facilities, as well as promoting health facilities at a much lower cost.[11]

3. Applications of machine learning:-

3.1 Image Recognition:-Image recognition is one of the most common applications of machine learning. Image recognition is a technology that is used to identifier places, people, building, objects and other variables in digital images.

3.2 Email Spam and Malware Filtering:-Whenever we receive a new email, it is automatically filters whether it is important email, normal, and spam. We always receive an important mail in our inbox and spam emails in our spam box, and the technology behind this is Machine learning. Some following filters in gmail:-

- Content Filter
- Header filter
- General blacklists
- filter Rules-based filters
- Permission filters.

3.3 Speech Recognition: -This is such technology in which you do not need a keypad or keyboard because this technology recognizes your voice and responds to you accordingly. It is also known as "**speech to text**". At present the speech recognition are widely used in machine learning algorithm. [12]

3.4 Traffic Prediction: -Machine learning allows you to create predictive models that consider large masses from different sources. Traffic prediction is the task of forecasting real time traffic information, such as traffic flow average traffic speed.[13]

3.5 Medical Diagnosis: - This medical diagnosis is used for diseases diagnosis. AI techniques extend from machine learning to deep learning are used in healthcare for risk identification, medical imaging & medicine diagnosis.[14]

3.6 Automatic Language Translation: - Machine translation is a challenging task to convert one language into another language translation. The Neural Machine Learning feature provides by GNMT (Google Neural Machine Translation) that helps to translate the text into our friendly language and it's known as automatic translation.

3.7 Self Driving Car: -An autonomous car is a vehicle that uses a combination of sensors, cameras, radar and artificial intelligence to travel between destinations without a human operator[15]

3.8 Online Fraud Detection: - Machine learning is making our transaction safe and secure by detection fraud transaction. Through machine learning fraud detection allows you to run automated transaction processing on an example dataset or your own dataset.[16]

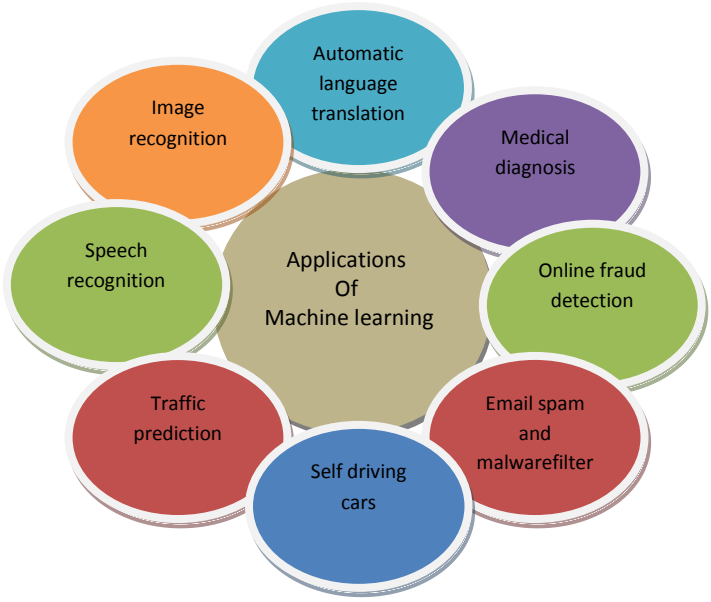

Figure 2 Application of Machine Learning

4. PRESENT SCOPE OF MACHINE LEARNING

- Healthcare
- Education
- Finance
- Agriculture
- Covid-19

4.1 Healthcare: Machine learning helps the development of hospitalization by expanding patient crisis and improving health results. In healthcare machine learning helps in finding diseases and diagnosing.[17]

4.2 Education: Machine learning is a transfer education and essentially changeable training, study, and research. Educationists are using Machine learning to help to struggle with scholars previous and take the deal to better success and detention. Researchers are growing research with Machine learning to free new analysis.[18]

4.3 Finance: In finance, machine learning is used to catch blackmail, automatize commerce enterprises, and arrange financial helping convocation to shareholders. Machine learning is evaluating lots of document sets within a little time to better the results without clear programmed.[19]

4.4 Agriculture: - The scopes of Machine Learning are students can take career paths in this field, such as a job as an agriculture engineer at agro-based industries, farm shop managers, agriculture researcher, food supervisors, and agriculture inspectors. In fact, the development in technology, research, and innovation has multiplied the scope of agriculture in a big way.[20]

4.5 Covid-19: Machine learning is used to disease based on x-ray copies. For instance, chest copies of patients can be used to find whether a patient is altered with covid-19.

5. FUTURE SCOPE OF MACHINE LEARNING

Machine learning is a type of application that provides system with the ability to learn automatically and improve over serves if needed.Lavanyatekumalla the founder of aifonilabs and spring board mentor is says that "Machine learning is the process of automatically getting insights from data that can drive business value “Let us look and discuss about some of the top use cases evolving today, which will come to extend the future scope of machine learning: -

1. Safer Healthcare.
2. Optimizing operations.
3. Fraud Prevention.
4. Mass Personalization.

Conclusion:

Machine learning is both supervised and unsupervised. If you have fewer data points with clearly identified training data, choose supervised learning. Unsupervised learning would normally perform and get better results for large data sets. If you have a huge data collection that is readily available, you might want to

think about applying deep learning techniques. You also learned about reinforcement learning and deep reinforcement learning. Now that you are more knowledgeable about neural networks, their applications, and their shortcomings. This study surveys a wide range of machine learning algorithms. Nowadays, everyone employs machine learning, whether consciously or unconsciously. From changing pictures on social networking sites to getting product suggestions when shopping online virtually all of the well-known.

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