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Machine Learning v/s Deep Learning

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ABSTRACT - This is research paper on a brief comparison and summary about the machine learning and deep learning. This comparison on these two learning techniques was done as there was lot of confusion about these two learning techniques. Nowadays these techniques are used widely in IT industry to make some projects or to solve problems or to maintain large amount of data. This paper includes the comparison of two techniques and will also tell about the future aspects of the learning techniques.

Keywords: ML, DL, AI, Neural Networks, Supervised & Unsupervised learning, Algorithms.

INTRODUCTION

As the technology is getting advanced day by day, now we are trying to make a machine to work like a human so that we don't have to make any effort to solve any problem or to do any heavy stuff. To make a machine work like a human, the machine need to learn how to do work, for this machine learning technique is used and deep learning is used to help a machine to solve a real-time problem. They both have algorithms which work on these issues.

With the rapid growth of this IT sector, this industry needs speed, accuracy to meet their targets. With these learning algorithms industry can meet their requirements and these new techniques will provide industry a different way to solve problems.

LITERATURE

Arthur Samuel who is an American pioneer in the field of computer graphics with artificial intelligence. He managed to bring this term 'machine learning' out in the market in 1959.But at that time this technique was very new to study and explore. So later on in 1990's machine learning re-organized and made a separate field in industry. Now this is new way to solve problems and make machines work for humans. [9]

Rina Dechter who is a professor in Computer Science introduced the term 'Deep Learning' in 1989 as a sub part of machine learning. And then later on in 2000 this term was again introduced by Igor Aizenberg to Artificial Neural Networks. Deep Learning plays an important role in understanding the real problems. [10]

MACHINE LEARNING

As the name suggests, it's a new way through which we made machines learn how to do work, like make decisions, solve problems, solve real-time problems. Actually we see machine learning works as helping hand to artificial intelligence. It is way to apply artificial intelligence through machine learning algorithms to make an extra-ordinary machine for us. Machine learning has many algorithms and they are divided into categories. [1]

Machine has three categories for these algorithms:

- Supervised Machine Learning: This learning make results as predictions on the basis of matching pattern of the data which we provide for solving the problem. We use Supervised Machine Learning when we have sorted data to use. This type of learning technique is best match for it.
- Unsupervised Machine Learning: This learning make results as predictions on the basis of pattern of the provided data, usually this type of learning is used when we have uns-sorted data to solve a problem. Unsupervised Machine Learning make use of that and make it like clusters and then sorts the data as per the demand.
- Reinforcement Machine Learning: This learning is used when we are done with deciding which type of learning should be used to solve a problem (Supervised/Unsupervised). After this decision this learning makes sure that algorithm has better strategy to deal with the problem. [3]

Here's a list of some common machine learning algorithms which are used widely:

1. Linear Regression
2. Logistic Regression
3. Decision Tree
4. SVM
5. Naïve Bayes
6. kNN
7. K-Means
8. Random Forest
9. Dimensionality Reduction Algorithms
10. Gradient Boosting Algorithms

DEEP LEARNING

As the name suggests, this is the whole new way of focusing on how do our brain and a human nervous system works. This Deep Learning is closely observing the neural system of a human being. This helps it to understand the neural system and communication better. Through this we can get to know how a normal human brain thinks and we can use it to map a new algorithm for it so that we can solve a problem through a machine just as it has been solved by a human brain. Actually deep learning is persuaded from the biological process of nervous system to think better and solve better in a whole new way. It also focuses on how a brain recognize, process on the basis of an image. [2]

Deep Learning can also be seen as neural networks which has multi-layer architectures and very huge parameters on which it works.

Deep Learning is also defined as working of neural network which has further four categories:

- Unsupervised Pre-trained Network: This pre-training learning technique is used to extract features which make easy to use in supervised learning to train data.
- Convolutional Neural Network (CNN): CNN is special architecture of artificial neural networks (ANN) which works with the assistance of visual cortex.
- Recurrent Neural Network: This network is also a class of ANN in which extracts a sequence from a directed graph which is made by connecting each node to one another. This really helps in speech recognition.
- Recursive Neural Network: RNN is just a name for deep neural network which is made by using or applying weights recursively.[4]

Some methods through which Deep Learning is implemented:

1. Back Propagation
2. Batch Normalization
3. Dropout
4. Learning Rate Decay
5. Gradient Descent
6. Max Pooling
7. Long & Short Term Memory
8. Skip-gram
9. Transfer Learning
10. Continuous Bag of Words.

COMPARISON ON WORKING OF ML & DL

Machine Learning (ML) is basically used to implement Artificial Intelligence. Machine Learning works efficiently when we have some moderate amount of sorted data which we train and get the desired results according to the problem we need to solve.

Machine Learning working does not depend on the type of system or hardware we are using, it works efficiently on every system. Machine Learning takes less time to train data and get ready for analyzing results. It works by converting the complexity of data to a lower level so that analysis of results get more efficiency and produce more accurate result. It starts by

matching pattern by doing so it breaks a problem into sub-problems as it is easy to get an output from a short problem then at the end it cumulate the results to get the final result as in other words we can say it uses divide-n-conquer technique to analyze the data and get results from it. [7]

This is how Machine Learning works for us.

Deep Learning (DL) is also used to implement techniques of Artificial Intelligence by neural networks. The basic principle is neural network on which deep learning works. As Deep Learning takes more time to train data but produces more enhanced and accurate output/results as compared to deep learning. It works by making clusters of similar data to have some result and then it cumulate the outputs from the all the clusters and provide as a better enhanced result. Deep Learning needs advanced machines to run efficiently and it gives more accurate result when we use large amount of data for analyzing the results through deep learning.

Image Recognition, Speech Recognition, Computer Vision and Bio-Informatics are some of the things in which we use Deep Learning for implementing it correctly. It can also used to analyze the medical image. Deep Learning has a large number of parameters on which it works and get us desired results.

Working with neural networks deep learning has some network architectures which are used in it such as Artificial neural network (ANN), Deep neural network (DNN), Convolutional neural network (CNN). This ANN and DNN algorithms are designed to understand and to imitate the working of brain. It just caricatures the working brain so that it helps in solving real-time problems in a more enhanced way. [5]

This is how deep Learning works for us.

FUTURE ASPECTS

As Machine Learning and Deep Learning as Data Scientist are in trend in the market so every company is demanding a data scientist to hold their company at the market level. As Machine Learning and Deep Learning has proven themselves for solving problems in an amazing way so they have their future. And there are many more researchers all over the world trying to explore these two learning techniques to their very core. [6,8]

These Learning techniques will be used in future for analyzing the problem correctly and getting the result accordingly. As these techniques will give a bright future to Artificial Intelligence as well as neuroscience.

CONCLUSION

We have studied working of Machine Learning and Deep Learning and also studied the difference how the two leaning techniques work. So as we conclude we get to know that both of them are equally important in implementing Artificial Intelligence. So Deep Learning is a sub-set of Machine Learning which is further a sub-set of Artificial Intelligence. This comparison provides us a clear view of Machine Learning and Deep Learning.

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