REVIEW ON DEEP LEARNING AND MACHINE LEARNING

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ABSTRACT

Nowadays, machines are so advance that they are taking place of human. And machine are able to do such a great task in few minutes, all because of data with the help of that machine are getting trained. We have huge amount of data everywhere. But not all the data are meaningful. We need to analysis the data and extract the meaningful data and used that data to build strong algorithm. We can achieve that with the help of data mining and machine learning. Nowadays machine learning is helping in every field with the great intelligence. Machine learning and deep learning is the integral part of Artificial intelligence, in this paper we will focus on some important part of machine learning and types of machine learning like supervised learning, unsupervised learning, reinforcement learning. We will also analyse from 1952(machine learning word first introduced by Frank Rosenblatt) to 2021 how much machine are advanced, and what they can do further in future.

Keywords:

Machine learning, Artificial intelligence, Unsupervised learning, Regression.

INTRODUCTION

The term Machine learning were first coined in 1952 by Frank Rosenblastt.it was just a computer program which could learn from action taken in past and occurred result. Mitchell gave a standard mathematical and relational definition that "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 (Pandey, 2020). Machine

learning nowadays a buzzword in the world around the people. Machine learning is now beyond the normal people expectation. The goal of machine learning is basically to extract data from warehouse, in warehouse data stored in unstructured from, machine learning model extract useful data from WH and understand the structure of data and bullied the models that can be understood by human and utilized.

Although in computer science machine learning concept is bit differ from traditional approaches. In traditional computing, algorithm used explicitly programed instructions to solve any problem or complex calculation. Here we can take an example to explain it in better way. FACIAL RECOGNITION in phones could be the best example here to explain how ML actually work, first it take sample input of face and stored in memory and when someone try to unlock the phone if face of user matched with past stored face structure then only it will unlock. Otherwise give authentication error. Here one question comes in mind what are the different way machine learns

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning

We will explain one by one with a proper example here.

Supervised learning

When we train a machine learning model with a labelled input and predefined output. Output can be numeric value or any string labels. Supervised learning is quite similar with human learning. Human also learn from past experience and here also teacher provide a good example to student to memorize the things, and later student itself drive the common rule to

remind that. Supervised learning models also help us to solve real world problem, example are Spam email filtering, and fraud detection is some of the best example of supervised learning. Supervised learning also classified in two types

Classification: classification algorithm are trained based on categorical output such as yes-no, Male-Female, True-false, etc.

Regression: Regression also comes in supervised learning, this is special case when output are not discrete it is continuous. Used for the prediction of continuous type, such as Weather forecasting, market trends

Unsupervised Learning

We have learnt supervised learning where model are trained using labelled data under the supervision. Now let's discuss the unsupervised learning. As the name suggest models are not supervised not trained. In real world, there will be many cases where we do not have labelled data, and models are needed to find the hidden pattern from the given dataset. Unsupervised learning is very similar in real world where human learn new things.

Types of unsupervised learning:

Clustering: Clustering means simply is grouping such data and objects together which have some similarities and objects which have no similarities grouped together. Cluster data analysed and find commonality among the data. Group that formed are formed after clustering has similarities.

Association: Association comes under unsupervised learning so they also not have labelled data so this rule is used to find relationship between objects and variable in large data like data warehouse. Association rules are used to suggest product to customer. If customer have buy product 'A' item probably buy product 'B' also.

Reinforcement Learning

Reinforcement learning is the kind of research of mapping from different kinds of conditions to actions to accelerate a reinforcement signal. The learner is not recognized which action to perform, as in most applications of machine learning, but rather must discover which actions allow the most powerful reward by trying them. There are some most interesting and challenging problems, actions may influence not only the instants reward, but also the forward situations, and through that all consequent rewards. These two points—trial-and-error search and postponed rewards are the most important characteristic features of reinforcement learning.

2.2 MACHINE LEARNING APPLICATIONS

Machine learning aims to build or develop computer algorithms that help to improve the overall experience, it enables computers to aid people in the analysis of complex and large data sets.

Now, we will understand the machine learning application in genetics as well as genomics with some key point -

In the field of machine learning contain development as well as the application of computer algorithm which helps to improve the experience.

There are three types of machine learning methods available to us that are supervised, semi-supervised, and unsupervised methods. The supervised methods are trained by the examples with labels like 'gene' and 'not gene' and then these predicted labels used for other examples, and on the other hand, unsupervised methods use the pattern in the datasets instead of using labels. Semi-supervised methods are the combination of both approaches.

All the different machine learning methods are usually required for some applications that depend upon the interest in interpreting the output or just simply bothered with predictive power. Now, Generative models that assume probabilistic distribution instead of input data, are usually best for interpretability and if we look at the discriminative models that seek on models labels only, are the best for predictive power.

Preceding information can be added to the model to train the model in a more efficient way if and only if it has a limited amount of data, which allows limiting the complexity of the model or limiting the incorporated data which is not used by models directly. Preceding information can be assimilated explicitly in probabilistic models or also implicitly by the choice of the features.

Using an appropriate performance measure usually strongly depends upon the application tasks, whereas Machine learning methods give the most effective performance if they optimized for an appropriate performance measure.

The Network estimation methods are the most convenient when most data contain complex dependencies from all examples. These methods are great to work effectively when they take into account the confounding effects in the indirect relationships.

ML Applications

- Finance
  - Asset allocation
  - Algo trading
- Fraud detection
- Cybersecurity
- eCommerce
- Search
- Manufacturing
- Medicine
- Law
- Business Analytics
- Ad serving
- Recommendation engines
- Smart homes

- Robotics
  - Industry
  - Consumer
  - Space
  - Military
- UAV (cars, drones etc.)
- Scientific discovery
- Mathematical theorems
- Route Planning
- Virtual Assistants
- Personalisation
- Compose music
- Write stories

The value of machine learning is increasing day by day and has been acknowledged by several companies across all the industries that deal with an immense amount of data. From the data and performed different kinds of algorithms to the data made companies work in an efficient manner to control the price and also get potential to fight with their competitors.

There are some popular machine learning algorithms/methods that are in use today and widely accepted by large businesses. Supervised learning, semi-supervised and unsupervised machine learning methods are one of them. Apart from these three, there is one more very important method available which is new to the competition but its highly getting accepted these days that is Reinforcement learning, this method mainly focused on the fields like Navigation, Robotics, and Gaming. There are three primary components in reinforcement learning algorithms/methods that are the agent, the actions, and the environment.

## 2.3 OVERVIEW OF DEEP LEARNING

Deep learning is a subfield of machine learning that basically an algorithm inspired by the structure and this function is called Artificial Neural Networks. To understand it better we need to understand the relationship or difference between the three terms are Deep learning, machine learning, and artificial intelligence.

As you saw in the above diagram, Deep learning is a subset of machine learning which already a subset of Artificial intelligence. Now, we need to understand artificial intelligence to understand all the other terms.

Artificial intelligence is a broad mandate thing to build machines that can think themself or can think intelligently. Machine learning is a part of artificial intelligence or it just a way of achieving AI by using a different algorithm to train the machines with the help of data. Now

comes the Deep learning part, here we use deep learning to achieve machine learning using specific algorithms called Neural networks.

Deep learning is just a type of different kinds of algorithms that seems to work great for predictions. By focused closely we found (for most cases) Deep learning and Neural Nets are effectively synonyms of each other.
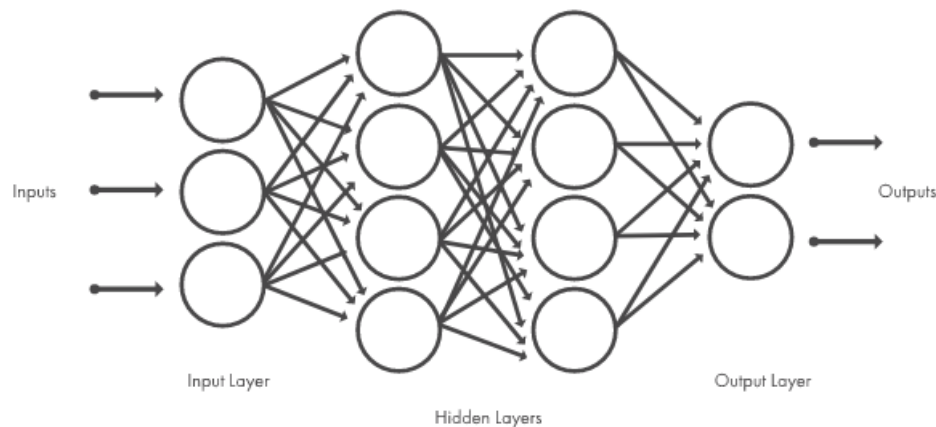
Most deep learning methods are based on neural network architecture, and this is the reason why always deep learning models refer to neural networks. Deep learning models mostly focused on a large amount of labelled data and the neural network architecture learn that how to features directly from data without even performing manual feature extraction.

The most popular type of Neural nets is the CNN that is a Convolutional neural network. It convolves learned most features with the help of input data itself and uses in 2D convolutional layers, this whole idea making the architecture well suited for 2D data processing, such as images. CNN drops the need for manual feature extractions, by this, it would be easier to perform some task and there is no need to identify features that are used to classify images. CNN works directly extracting features from images. There is no relevant feature to train first, it is learned while the network trains on a set of images. This automated process of extraction makes the deep learning model to be more accurate.
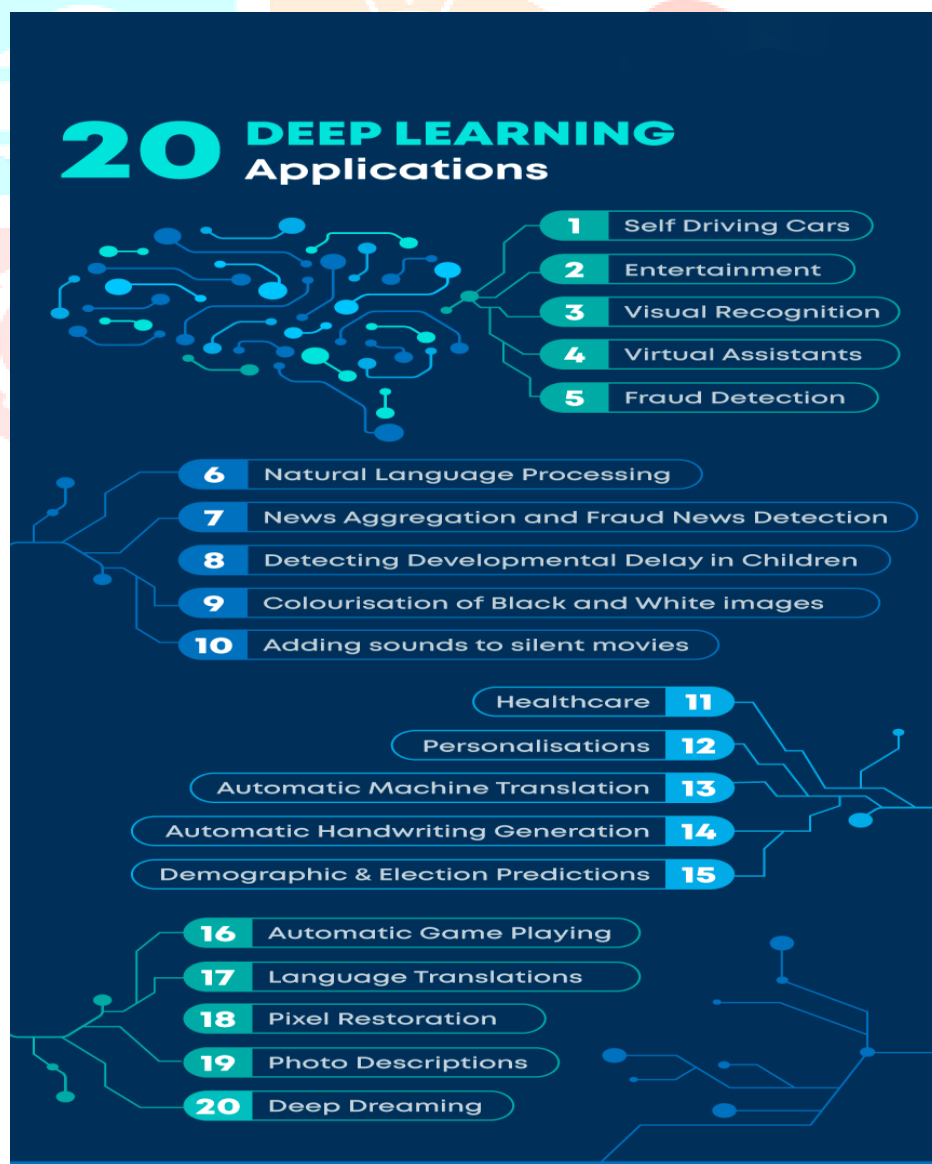
2.4 DEEP LEARNING APPLICATIONS

As we discuss Deep Learning algorithms that extract a meaningful abstract action of the raw data through the uses of a hierarchical order of multi-level learning approach, wherein a higher level of learning there are more abstractions and complex representations are learned based on the least abstract concepts and representations in the lowest level of the learning hierarchy. While Deep Learning can be worked to learn from labelled data if the given data available in large amounts, it is primarily an attraction for learning from big amounts of unlabelled or unsupervised data which makes it attractive for obtaining meaningful representations as well as patterns from Big Data.

In today's era, Deep learning is delivering state-of-the-art results across many difficult problem domains. A fact, but also hyperbole. There is a lot of Achievement in the field of artificial intelligence, machine learning, and deep learning at this moment. There is also an amazing opportunity to get on the very ground floor of some really powerful technology.

If I talk about a few years ago, we would've never thought of deep learning applications to develop self-driving cars and virtual assistants like Google, Siri, and Alexa Assistant. But today, these inventions are part of our everyday life. Deep Learning continues to overwhelm us with its endless opportunities such as fraud detection and pixel restoration.

Ever think of a world with no car accidents or a world where every surgery will be successful without causing the loss of any human life because of surgical errors. Like these, thousands of advantages would be possible. Deep Learning applications may seem confusing to a normal human being, but those with the opportunity of knowing the machine learning world understand the cut that deep learning is making globally by researching and resolving human problems in every domain out there. Here are some of the Deep learning applications –

INFERENCE

From the above research, we can infer the common application field and some differences. Few applications use both machine learning and deep learning like natural language processing, computer vision, prediction etc. CRM can be considered as the newer areas of deep learning. Customer relationship management system helps you to centralize the collected data from the user.

Data dependency is the main reason why newer areas of applications need deep learning. It takes place when we have to work on huge amount of data. The ability to learn high-level features from data gives it a plus point over machine learning.

CONCLUSION

This review paper covers the deep study of machine learning and deep learning. A complete study of how machine and deep learning came into light and how it evolved over the few years. There are wide variety of frameworks present today to develop any application and still we have new areas to explore the deep learning.

Through this we came to know that there are many applications of machine learning and deep learning like computer vision, Natural language processing, Prediction etc. We have lots of examples where machine learning is implemented like Google assistance, Apple's Siri. Self-driving cars are latest example of implementation of machine and deep learning and we still have to explore newer areas of deep learning.

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