

A Study on Deep Learning

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ABSTRACT: Deep learning is technique where a machine learns fresh features and tasks Directly from the data which is fed to it by the programmer. The data which has been fed can be of any form such as images, texts, audio and so on. Deep learning operates by the concept of neurons present in our brain. It involves the use of Artificial neural networks (ANNs) which is inspired by the concept of information processing in most of the biological systems such as a human brain. The network comprises of several layers of nodes like a human brain which is made up of neurons. Each and every node in every individual layer is connected to adjacent layers which in turn forms up a network of nodes. As the number of layers increase in the network, the network is considered as more complex. In a neural network a signal travels between many nodes and assigns respective weights to each node. A node which is heavier will exert more effect on the next layer of nodes. The final output layer compiles all the weighted inputs to produce a desirable output.

KEYWORDS: Deep learning, Neural network, Node, Neurons, Artificial Intelligence.

I.INTRODUCTION

Deep learning is a sub part of Machine learning which in turn is a sub part of Artificial Intelligence.

The Deep learning enables the machines to learn new tasks and features on its own without being explicitly programmed or instructed by the developer. In this unique technique the machine learns by experiences or the data given to it in the form of texts, audio clips or images. It functions much similar like a human brain where the neurons are involved in layers. Deep learning is much advanced and more efficient compared to the Machine learning. In Machine learning the programmer must specify a feature by which the machine is able to differentiate between to different data items and then take the next action. Whereas in Deep learning the machine learns this differentiation on its own without programmer specifying the features between two items to differentiate it. This process of differentiating of features is known as feature extraction. And it is achieved in Deep learning solely through the neural networks and with massive volumes of data to train the machine.

Deep learning systems require large volumes of data to produce accurate results, hence they require powerful hardware configurations because they have large amounts of data being processed and involves many complex mathematical calculations. Deep learning training computations may take weeks.

II.RELATED WORK

Deep learning is a part of Machine Learning which is a part of Artificial Intelligence and Deep learning was presented to the Machine Learning in 1986. Deep learning involved the use of Artificial Neural Networks (ANNs) which consists of many nodes and layers and hence it is also called as Deep Structured Learning due to the deep neural network. Deep Learning is a sub part of machine learning where Machine learning is a process by which a machine learns from examples and experiences.

“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 .”-Tom Mitchell, Carnegie Mellon University.

Deep Learning process basically has two main parts. 1) The data from which it is going to get learnt 2) The generic algorithms. The Algorithm builds the logic based on the data which has been given to it. The logic is built by the number of examples which is given in form of data. The machine can pick out the similarities and differences among the huge data given to it with the help of neural network without human intervention. This is how the machine learns new things.

III.HOW DOES DEEP LEARNING WORK?

The working process of Deep learning can be explained with the help of neural networks. Like most of the biological species our AI has neurons which are basically called as nodes and represented by circles. All neurons are interconnected, and these neurons are grouped into layers. There are three different types of layers in general, they are 1) Input Layer 2) Hidden Layer 3) Output Layer. The input layer is where the data is being introduced to the machine further the input layer passes the inputs to the hidden layers. The hidden layers can comprise many layers within it and is responsible for performing mathematical computations based on the provided inputs. Finally, the output layer returns the output data in precise terms it gives us the predictions. The real advantage or the magic of deep learning begins when the machine must decide the most accurate and the most appropriate prediction suited for that respective problem. Each connection between neurons is associated with weight. This weight corresponds to the importance of that input value. The more important a factor the heavier will be its neuron weight. Every neuron has an associated Activation Function which are hard to understand without mathematical reasoning. Finally, when the data has passed through all the layers of a neural network the data is obtained from the output layer. So now, to train the neural network is one of the hardest parts due to the requirement of large data sets and when dealing with large amounts of data it is evident that we have a large or powerful computational power to deal with vast amounts of data. This is where deep learning shows its magic and feels much better compared to machine learning. In machine learning the human intervention is necessary to manually extract the features and help the algorithm in finding vivid differences in the vast data sets.

IV.EXAMPLE SCENARIO

We explain a scenario where Deep learning is used for the movie ticket price estimation service. We need our movie ticket price estimator to predict the price using the following inputs: -

- 1) Movie Show date
- 2) Movie Show Time
- 3) Movie Language
- 4) Theatre

Our system's brain has neurons where each neuron is considered as a circle. Now these neurons are grouped into three different types layers: - 1) Input Layer 2) Hidden Layer(s) 3) Output Layer. In the input layer we have four neurons: - Movie Show date, Movie Show time, Movie Language, Theatre. When predicting the price of a movie ticket the movie show time is one of the heavier factors. Hence, the Movie Show time neuron will have more weight. For our movie ticket price estimator, we need to have the previous data of ticket prices and due to the large amount of possible Movie Show dates and times, we need a very large list of ticket prices. Now to train our AI we need to give inputs from our data set and compare its outputs with previous outputs. In the meantime, our AI is still untaught our outputs won't be accurate. Once we go through the whole data set, we can create a function that shows us how wrong the AI's outputs were from the real outputs. This function is called the Cost Function. We can change the weights between the neurons. We could randomly change it till we get a low cost function. So, we will practice a technique known as Gradient Descent. Here in this technique we change the weights in small increments after each set of data is iterated. By computing the derivative of the cost function at a particular weight we're able to see in which direction the minimum is. So, this is basically an iteration process where we iterate the data set many times until we minimize the cost function. And later the updating of weights using this is done automatically. This is the real advantage of Deep Learning. And once our price estimator is trained, we can use it predict the upcoming prices.

V.DEEP LEARNING IN DAILY LIFE

- 1) Deep learning in Text Recognition.

It is a major challenge for computers to recognize any handwritten text. This is where deep learning comes into action. Suppose a set of people are asked to write a particular text letter and it is very obvious that different people possess different types of handwritings and a human brain can recognize all of those text letters as one and the same. But for a computer to recognize a particular text which is available in so many different styles is impossible. With the help of Deep learning a machine can recognize that particular character even if it is written in different styles. This is used in translations and scan-to-type systems in real life applications.

2) Deep learning in Customer Support.

Most of the companies these days use chatbots to assist customers, and people can realize during the conversation with chatbots that how easy it is for them to explain their queries and get the resolution needed. The mechanism behind these chatbots involves the extensive use of Deep learning and its neural networks.

3) Deep learning in Automobile Industry.

In today's time all the major automobile companies are investing on self-driving cars, a self-driving car should be intelligent and smart enough to detect any objects which come in front of it or decision making like when to apply brakes, take turns and so on. All of these actions require intellect, it requires the machine to learn daily from its instances and this is only possible by Deep learning. Hence, we can say that Deep learning is the future of automobile industry in the coming days.

All the above instances of Deep learning are the sectors where it is being used widely but there are many more sectors where Deep Learning is involved like Robotics, Healthcare, Entertainment Industry, Disaster Management etc. Moreover, American computer scientist Andrew Ng has said that AI (Artificial Intelligence) is the new Electricity. As the discovery of electricity has transformed every industry in some way or the other, researchers believe that even AI capable of transforming every industry in one or the other way.

VI.CONCLUSION

At last I want to end my study paper by arriving to a conclusion that Deep learning is a part of Machine Learning where it uses the concept of neural networks which is present in the human brain and operates similar to a human brain by having neurons in multiple layers by forming an Artificial neural network and also that, Deep Learning is a technique of learning where a machine learns from its data. And with this ease of educating the machines to learn and work efficiently it is seen that, this method is a lot helpful in every industry to change and transform to something new which invites more efficiency and productivity in development and innovation.

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