

## **Machine Learning is an opportunity for Deep Learning: A Concept**

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**Abstract:** Machine learning is a subset of artificial intelligence and deep learning is a subset of machine learning. This research paper is a conceptual paper will focus on machine learning or its basic principle, is required to understand deep learning. Deep learning is a specific type of machine learning. Machine learning, the data are fed into machine and machine learn automatically and improve itself with the experience. If data are in large amount of having complexity then machine learning returns inaccurate prediction in such case it requires more updates of weighted data by using step function to improve results by using multiple analysis. This is nothing but deep learning.

**Keywords :** Machine learning ,deep learning, artificial intelligence, artificial neurons.

**Introduction:**

Machine learning is sub-field within artificial intelligence (AI) that is focused on how machines provide ability to learn automatically and improve from experience, means it focuses on the development of algorithms or programs that can access data use it and learn themselves.

The process starts with observation of data, visualization, experience to find out pattern from data and takes the decision from these to predict the future.

Machine learning is the process of self learning of a computer system to make perfect predictions when data inputted based on the pattern or algorithm without being explicitly programmed.

Deep learning is a subset of machine learning. It technically is machine learning and functions in a similar way (hence why the terms are sometimes loosely interchanged), but its capabilities are different.

As deep learning is a subset of machine learning where artificial neural networks algorithms encouraged by the human brain, learn from large amounts of data. Similarly as human learn from experience, in the deep learning task are executed repeatedly and each time it improve the outcome using algorithm. Refer to 'deep learning' because the neural networks have various

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(deep) layers that enable learning. It is similar that we want to solve a problem that require thought and more thought to understand a problem deeply to solve the problem, is a problem deep learning can learn to solve.

Basic machine learning models perform progressively better at whatever their function is, but they still some guidance. If a Machine Learning algorithm returns an inaccurate prediction, then it needs to step in and make adjustments. But with a deep learning model, the algorithms can determine on their own if a prediction is accurate or not.

This research will focus on how machine learning has opportunity for the deep learning. The algorithms are affected by properties in the data that is types of data and characteristics of data. Focusing on different types of data, which type of data are often hard to analyse with conventional Machine Learning methods. For this the data is first manually craft into a new dataset with new features. A new sub-field of machine learning that can handle data which are hard to analyse with conventional ML methods (complex data). This sub-field is called Deep learning (DL) and an introduction to this field and the models contained within.



## Machine Learning

When we shopped online and we are checking for a product we noticed that it recommends similar product what we are looking or we noticed that the person bought particular product also bought this, that is combination of products. How they did recommend these products? This is machine learning.

Machine learning is a subset of Artificial Intelligence which emphasis on machine learning from their experience (based on some rules, trends, pattern etc) and predictions are based on these experiences. It allows the machine (computer) to make decision based on the data to carrying out certain tasks without explicit programming. These program or algorithm are developed in such a way that they learn and improve results continue when new data inputted. This is simplistic even

though it is confusing so let understand what is learning – we want to learn a new subject not only to memories as it is but try to learn with complete understanding, now we feed our brain (machine) with a quality data in an appropriate amount (different books, notes, video lecture etc). These inputs and output trained our brain that different approaches, concepts, logics have to solve different kinds of problems. Each time we are practicing test and evaluating performance by comparing answers. Gradually we continuously improving performance and gaining more confidence. Similarly in machine learning, models are building with the help of input and output data given and trained the model. After this only input data is feed to model which gives out put based on learning and now output is compared with the actual output (which is not fed during training). Researchers working with these models put their efforts to improving algorithm, methods, techniques to model for better performance.



Then the model(machine) would be able to use learned knowledge to give results for new example(data) similar to those offered during training not exactly same, these automatically finding conclusions or results are support to human for decision making.

The definition of machine learning is

*“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*

Supervised Learning:

Supervised learning algorithms are one where learning is guided by a teacher. The data set act as a teacher and it is responsible to train the model or machine. Once it trained, it starts making prediction or decision when new input data are fed.

In this, models are trained using labels as an input where a desired output is known. In this learning algorithm it receives a set of input with desired output is known respectively, and algorithm learn by comparing actual output to correct output and finds errors and modify accordingly.

Unsupervised Learning:

The model or machine learns with the help of observations and data structure found in data. Data set are fed to model, it automatically identify patterns, trends and relationship among the data and classify to create cluster in it. But there is problem; it cannot label to the cluster. It cannot identify group like apple or mango but it can separate all apples from mangoes.

In this data are used has no historical labels. The system is not feed with correct answer. The algorithm or system must identify what is being shown. The objective is that to identify the data and some pattern, trends, structure within. This type of model/system will work well with transactional data.

### Semi Supervised Learning

As the name suggest, this approach is mix of Supervised and unsupervised Learning. This approached uses both labeled and unlabeled data. The model is trained by using of small amount of labeled data and large amount of unlabeled data. In this approach model is partially trained by the labeled data and then this model used unlabelled data to label data. This process is blending of both supervised learning and unsupervised learning.

### Reinforcement Learning

This is a traditional approach of data analytics. In this model or algorithm is develop by using trial and error and determine which action is result is more appropriate (reward). In functionality of reinforcement learning there are major three components: the agent, the environment, and the action. In this the agent is interact with the environment and find out the best results. The result is decide whether agent is rewarded or panelized based on answer is correct or wrong. Based on this it again train the system till ready to predict.

### Deep learning

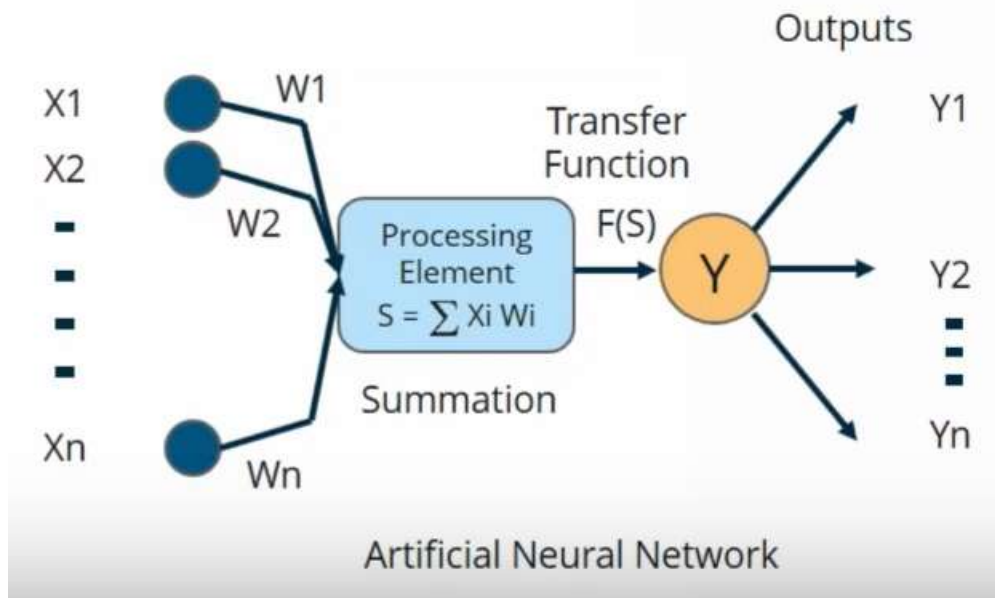
Deep learning is a subset of machine learning, and machine learning is a subset of AI, which is an umbrella term for any computer program that does something smart. In other words, all machine learning is AI, but not all AI is machine learning, and all deep learning is machine learning, but not all machine learning is deep learning. Deep learning is one of the ways of executing machine learning.

Deep learning is a machine learning techniques that learn features and tasks directly from data, data can be images, text or sound. Deep learning is often referred to n to n learning. Let example, we have sets of images and we want to recognize which category of objects each belongs to car, truck or boat. We start with labels of the images on training data, the label corresponding to the desired output of the tasks. This deep learning algorithm needs these labels as tell the algorithm about the specific features and objects in the image. The deep learning algorithm then learns how to classify input images into desired categories. We use term n to n learning because the task is learning directly from data. Another example is a robot learning how to control the movement of arm to pickup specific object. In this case, the task is being learned how to pickup object as given input image. Many of these techniques used in deep learning today have around decades, for example deep learning have been recognize as hand written postal cards in the mail services since the 1990s. the use of deep learning has searched over the last five years primarily due to three factors first, deep learning methods are now more accurate than people in classifying images second, GPU enable us now trained deep network in less time. Finally large amount of label data required for deep learning has become accessible over the last few years.

Most deep learning methods used neural network architecture this is why often deep learning models refer to as deep neural networks. One popular type of deep neural network is known as convolutional neural network or CNN is especially well working with image data. The term deep usually refers to the number of hidden layers in the neural network; well traditional neural network only contains two or three hidden layers; the recent deep layers as many as hundred and fifty layers. So now that you understood that deep learning models are capable to focus on weight features by themselves, requiring little guidance from the program. These models also partially solved the dimensionality problem hence we know that it has been evolved by machine learning and machine learning is nothing but a subset of AI and the idea behind AI is to imitate the human behaviors. The same idea for the deep learning is well build learning algorithm that mimic brains.

Deep learning is implemented through neural network and idea behind motivation is nothing but neurons. Neurons are brain cells. In neuron dendrites which provide inputs to human if there are multiple dendrites. There are nucleus in cell of neuron which perform some function is travel through axon and receive to axon terminal and hence those neurons will fire this out to the next neurons. the studies tell us that the next neuron or the two neurons never connected to each other there is gap between them.

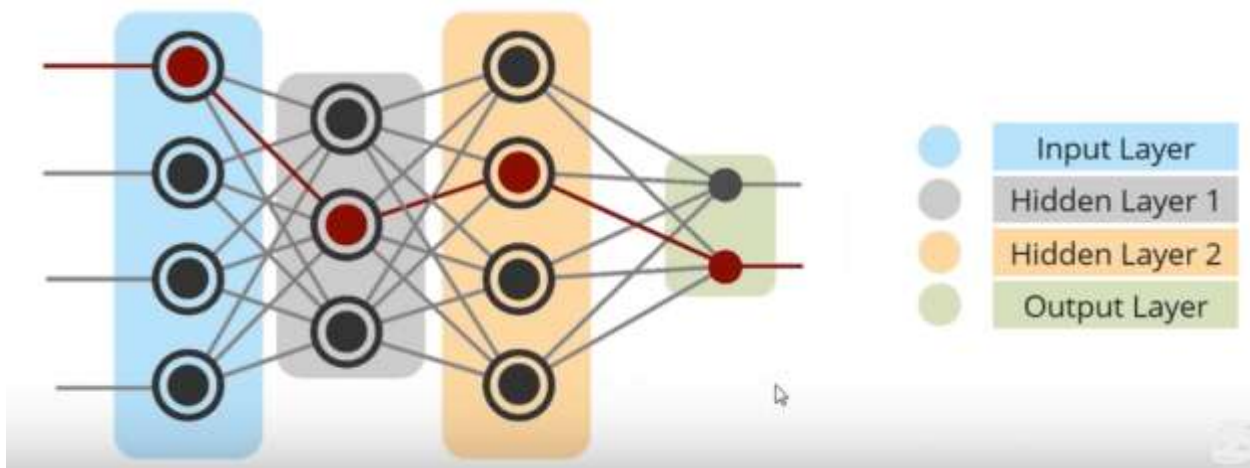
Artificial neurons, there are similarly multiple inputs now these inputs will be provided to the processing element like a cell body and over here a process element what happen summation of your inputs and weights. These inputs will be multiply by the weight let input X1 is multiply by



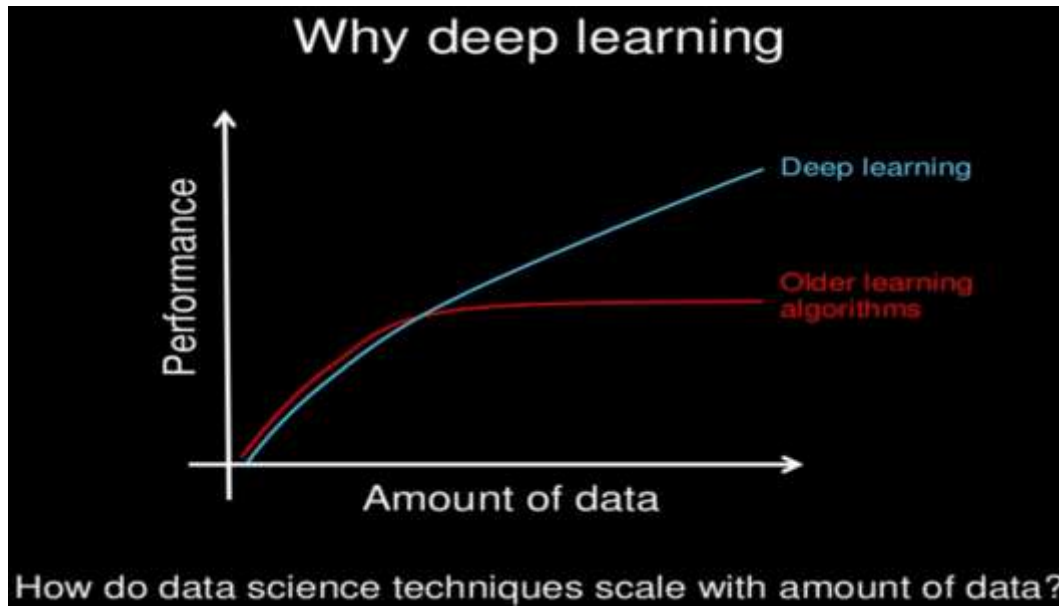
$W_1$  will go to the processing element similarly  $X_2$  multiply by  $W_2$  will go to processing element and same with other inputs and summation will happen and generate a function of  $S$   $[F(S)]$  after that the concept of activation function. Activation function is nothing but in order to provide a threshold. So if output is bug that threshold there is only neuron will fire otherwise it don't fire you can take this as step function or as an activation function. This is our artificial neuron. In

network if the multiple neurons which are connected to each other form an artificial neuron network and this activation function can be a sigmoid function or an step function that will be as our requirement. We can use sigmoid function as an activation function and that will depend on requirement once that it exceed the threshold it will fired after that what will happen it will check the output now if this and is not desired and put the actual output and we know the real output so we compare both of them and will find the difference between the actual output and the desired output on the basis of that difference we again going to update our weight and this process will keep updates until we get desired output equal to actual output now this process of updating weight is nothing but your back propagation method this is neural network in a nutshell.

Deep learning is implanted by the deep network and deep networks are nothing but neural network with multiple hidden layers what are hidden layers we have inputs layer after that some process happened and it will go to the next node to the hidden layer node this is nothing but hidden layer every node is interconnected after that one more hidden layer where some function will happen and each hidden layer is interconnected with each other at last the output layer and this output layer again to check output if it is as per desired output or not, if it is not then output again going to update the weight so this is deep network there may be hundreds of hidden layer but if we take about machine learning that will not the case we were not able to process the multiple hidden layer in the machine learning because in deep learning we have multiple hidden layer at once.



In deep learning how much data is required to train the algorithm is a big question, and there is no straight forward answer for it but if you want more accurate result you require more data. More data gives training much higher as compared to machine learning. Deep algorithm has two sides, one before solving the problem its requirement is to learn about domain. The algorithm needs a huge inputs / hyper-parameters to learn about domain. It is difficult to identify the parameter whose values are needed to fix before training.



In machine learning and deep learning, there are many different algorithms or models are used. Which categorized in supervised learning and unsupervised learning. In unsupervised learning, different algorithm such as clustering, k-means, Gaussian Models used to understand meaningful structure of data. Supervised learning used to involve an associated output label with each instance of data. Regression model approximate real output values. Classification estimate output as discrete-valued.

Convolution Neural Network outputs 'cat' in a dog vs. cat problem, nobody give impression to know why it happen. Means, when you are modeling data for an electronic health record or bank loan dataset with a machine learning technique, it is much easier to understand the reasoning for the model's prediction.

Conclusion:

Machine learning use the algorithms and techniques for the kinds of predictions and discovers previously unknown patterns and knowledge, machine learning with the help of different algorithms, models or techniques reproduces known trends, patterns, predictions—and further it will automatically implemented on data for decision-making, and actions.

Deep learning, on the other hand, uses complex data where machine cannot compute by using advanced computing power and artificial neural networks. Now this can be applied on large amounts of data to learn and training model. In summary we can say that machine learning have an opportunity for deep learning.

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