International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 5 Issue: 5 641 – 645

Comprehensive Study of Deep Learning

Juhi Singh
Department of computer science, Amity University, India

***Abstract*-**Deep learning is the sub domain of machine learning with the representation learning capability to deal to learn representations of data with multiple levels of abstraction. It provide high computation rate to compose multiple processing layers. Deep learning is about the learning multiple levels of representation of data like image, speech etc. And abstraction means hide the unnecessary detail. Deep learning can identify complex structure easily applied back propagation algorithm on it to specify how a machine can change its internal parameter from the representation.

Keyword*—*Deep Learning, Neural Network, Machine learning

*****

I. INTRODUCTION

This is an era of Artificial Intelligence which uses its application to utilize the many aspects from a real world and Machine learning is one of them. Machine learning learns information which is available with in society and process them. With the help of human Machine learning automat the existing system and provide high computational ratio[1].In this paper the discussion is being on the subfield of machine learning which is used to identify the objects like speech, images and also able to select relevant search results.

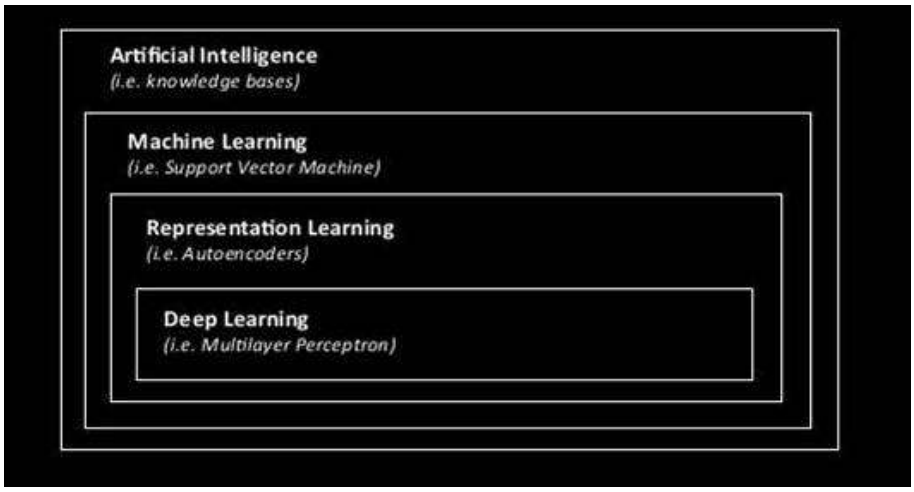

Fig 1 : the arrival concept of deep learning[2]

As shown in fig.1,[2] Deep learning is more detailed and advance to solve a problem because it usage the representation learning technique of machine learning and as for as machine learning usage the concept of artificial intelligence. So it is easy to conclude that the deep learning methods are the representation learning methods with the multiple levels starting with the raw data input into representation at higher level of abstraction, which use the simple but non-linear intrinsic structure to deal with the high-dimensional data and can be applied in many areas like in science and technology, in intelligent business system, and in governance. Without human engineering deep learning technology is capable enough to provide detailed level of abstraction on hidden layers by using general purpose of learning procedures.

II. SUPERVISED LEARNING

Supervised learning [3] is a machine learning task with the pre-define classes on labeled data under the supervision. Supervised learning algorithm consist of an input data with some weight and desired output data (answers is already being known) and training data set. Supervised learning algorithm analyzed the trained data and perform calculation to produce the desired output, if

it is desired output then signal and training data is correct and if it is not means there is some error during the process of the data , another data sequence is need to be trained. In this case bias can be used to help the activation function of training data set and probably gives more accurate result. Learning stops when the algorithm achieves an acceptable level of performance. By using supervised learning deep learning can easily extract good features can be automatically learned. There are various supervised machine learning algorithms available but few are more suitably associated with the deep learning to extract good feature from the available data sets such as:

a) *Linear Regression*: to solve regression problems.

b) *Random forest classification*: to classify regression problems.

c) *Support vector machines*: to solve classification problems.

III. BACK-PROPAGATION to TRAIN MULTILAYER ARCHITECTURES

Back propagation algorithm [6] is based on the supervised learning concept, which have ability to deal with the errors while propagating back to the multilayer feed forward network. It has one input layer with multiple instances and corresponding one output layer and has some hidden layers .While training the data set each error occurrence lead to propagate it back to correct the training data set with updated weight associated with the fixed inputs and its instances without changing the design of the existing network. Since, it is a supervised learning technique so training is required to train the network before applying on input data set. Because training is require for classification purpose. Once the network is trained for proper classification, testing is required to test the trained an input data sets. To get the desired output, all the input data sequence is being matched with the trained data set and multiplied by its weighted sum with some activation function.

As shown in fig 2(a), [3] multi-layer neural network is being represented with help of connected dots which classify the data into two classes one for red lines and another for blue lines which is linearly separable. According to the fig, there are two input units with two hidden units and one output unit.

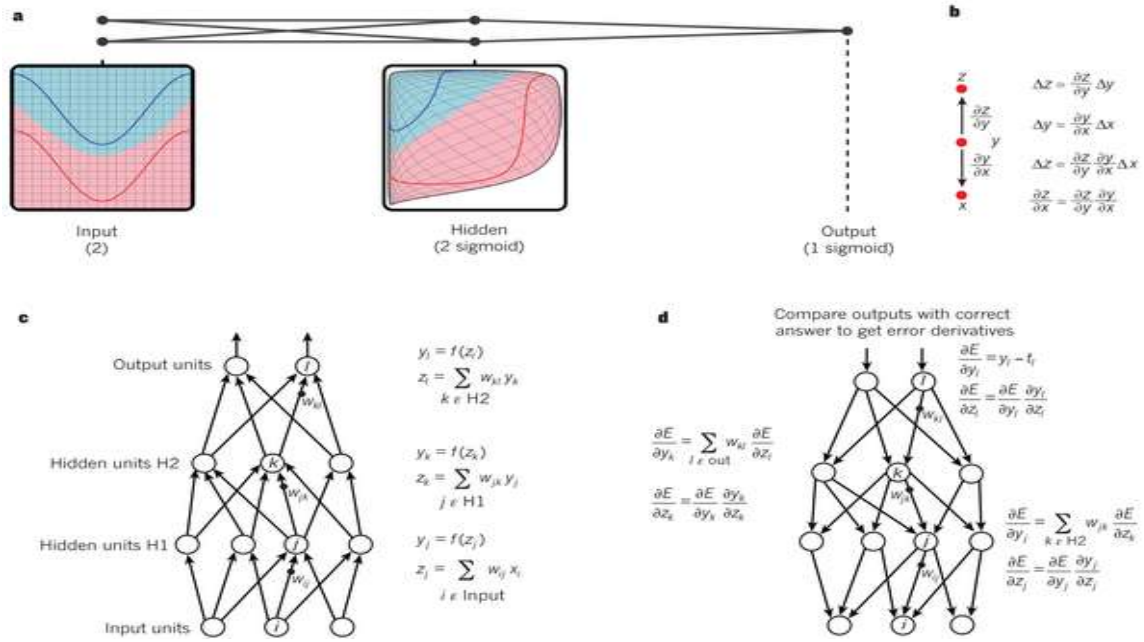

Figure 2: Multilayer neural networks and back propagation[3]

In fig 2(b), the derivatives of chain rules showed that composition of two small effects. First Δx in x gets transformed into a small change Δy in y by getting multiplied by $\partial y/\partial x$. and then Δy creates a change Δz in z similarly. In fig 2(c), it maps the computed input and output (both the input and output are fixed in size) Pass the result through a nonlinear function. In fig 2(d), the given network forwards an input and then error function is being used to calculate the error and at the end it will calculate the gradient backward.

 ISSN: 2321-8169
641 – 645

IV. CONVOLUTIONAL NEURALNETWORK

The convolutional neural network[3] is the union of similar features that are detected by processing the data of previous layers into one. Basically ConvNets is capable to extract the main four features from the natural signals that are: local connections, shared weight, pooling and the use of many layers. As shown in fig 3 the colour image composed of three 2D arrays that contain pixel intensity. The entire red colour [2] represents the connection of similar weights

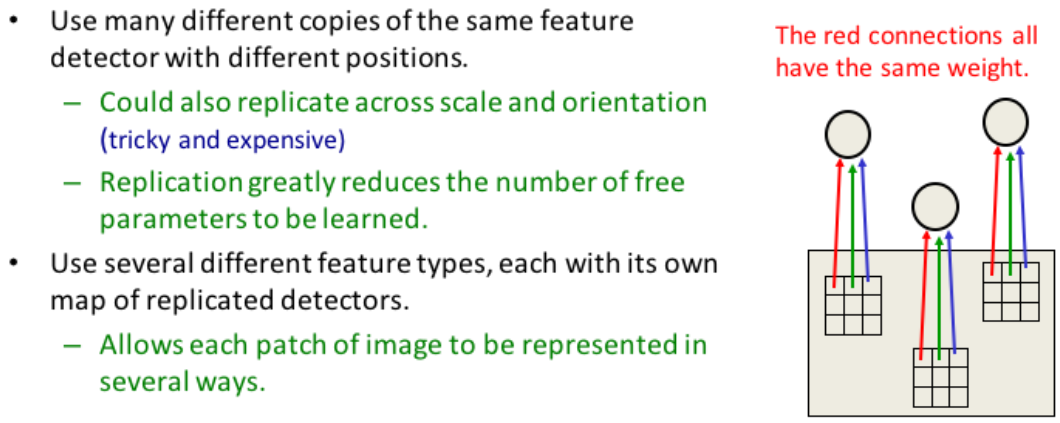

Fig 3: colour image composed of three 2D [2]

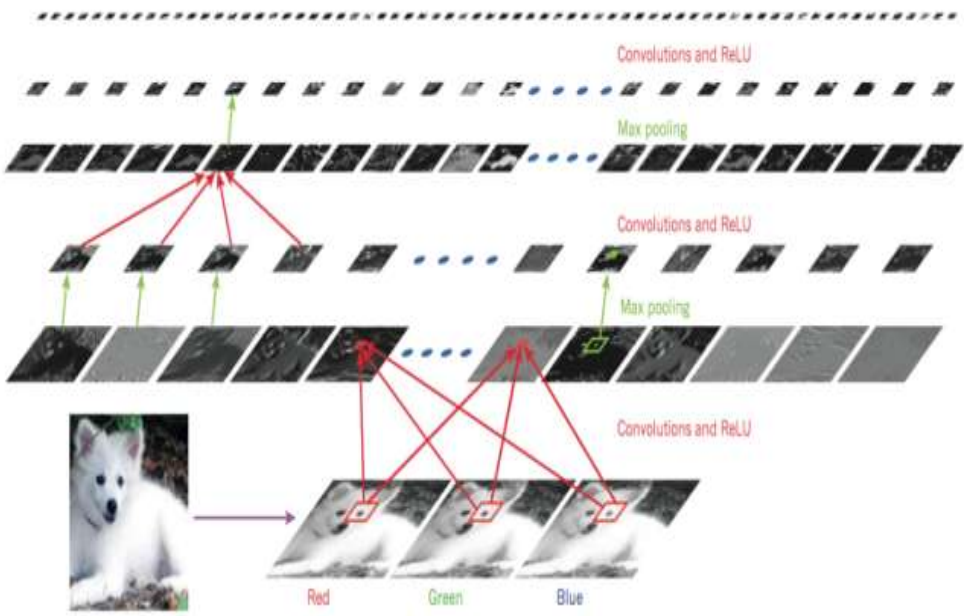

Fig 4: Image Understanding with Deep Convolutional Networks[3]

In the fig 4, [3] information flows from bottom to top and from bottom left to right. The outputs of horizontal layers of a convolutional network architecture applied to the image of a dog on the bottom from left and right side as a RGB input. And it gain output from the rectangular images.

V. DISTRIBUTED REPRESENTAION And LANGUAGE PROCESSING

While comparing the deep learning to the classical leaning algorithm, deep learning shows tremendous exponential growth, first is distributed representation and second is composed layer representation.[3] The Distributed representation of deep learning shows the new learned feature which is not shown during the training period. And the composed layer discovers the potential for next exponential advantages in deep network through deep learning. Both are these advantages represents the following point

a) Well formed representation of distributed data
b) No mutual dependency between the data
c) More than one possible combination of the same input
d) Provide an accurate classification

VI. RECURRENT NEURAL NETWORK[S

A recurrent neural networks (RNN) is a multilayer neural network which involves in unfolding the information of current layer to feed its output for the nest layer and for this RNN [3] used its internal memory. Each input element is being processed and maintained at the hidden layer (i.e. between input and output layer) and then the output of hidden layer is forwarded to output layer as a input after processing it the final output arrives, if the calculated output is different from the desired output the network use the back propagation algorithm to find out the missed value or an error. Again the same procedure will be continued with the updated weight until the desired output come.

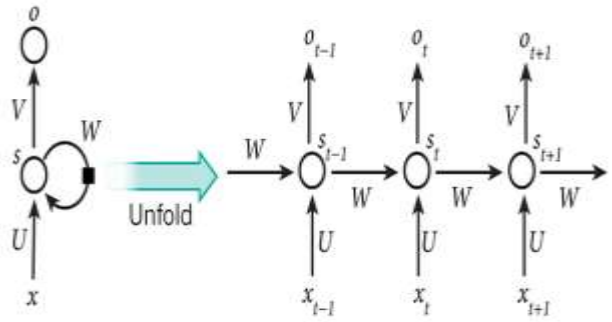

Figure 5: A RNN and the unfolding in time of the computation involved in its forward computation [3]

As shown in fig 5, a multilayer feed forward network for five words and RNN is being unfolded into a deep feed forward with sane weight at all the layers. As discussed above if there is any difference between desired and calculated output than the back propagation algorithm can be directly applied to the unfolded deep network. But during the training period of network by using back propagation algorithm can expand or shrink the network so over the time due to limited memory unit , it will vanish the network also. So to enhance that long short-term memory (LSTM) network can be used which remember inputs for long duration of time. It has a special memory cell like a gated neuron structure (as shown in fig 6) which learns when to clear the memory content.

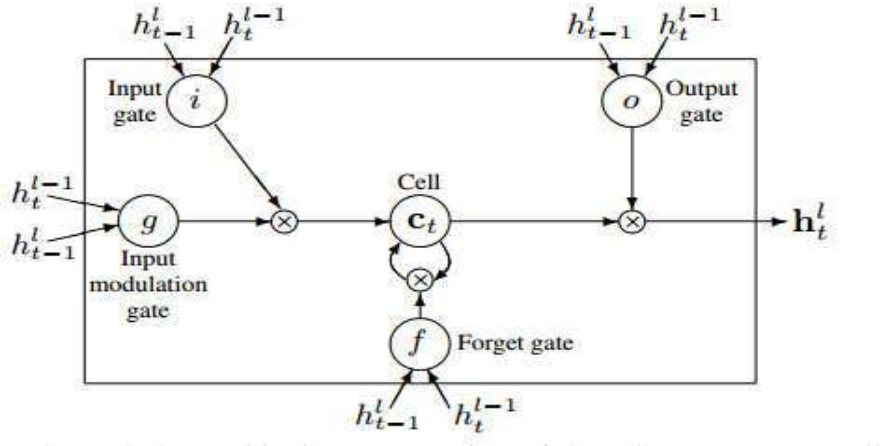

Fig 6: Gated like neuron structure[4]

LSTM [3]network is currently used for encoder and decoder at machine translation. And it is more efficient than the convention recurrent neural network.

VII. CONCLUSION

This research paper provide a comprehensive view about deep learning, it is not new learning technique anymore due its tremendous advantage of process a data for feature extraction and give comparatively more accurate and efficient value of

processed data to do so it require less engineering and more learning. Most the domain of artificial, intelligence uses the supervised deep network for its easiness. Due to its ability to deal with high volume (as shown in fig 7) of data deep learning is being used in many domains to extract data by processing them such domain are as follow:

a) Image recognition b) Speech recognition c) Natural language understanding

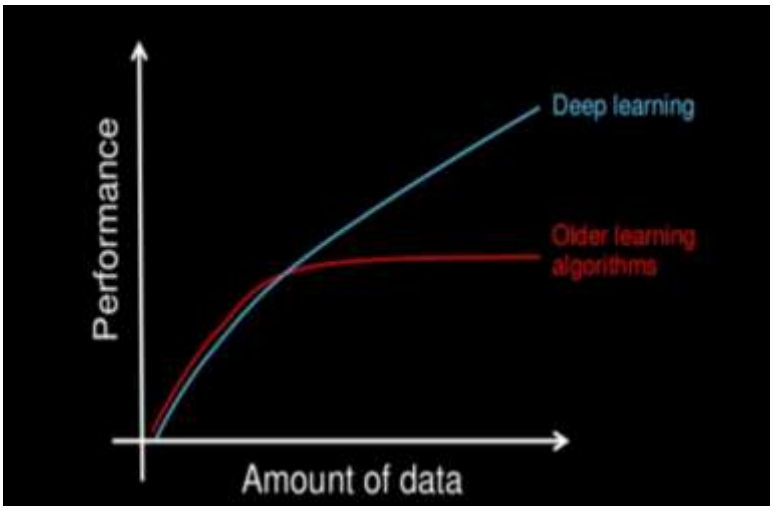

Fig 7: performance through deep learning [5]

VIII. FUTURE SCOPE of DEEP LEARNING[3]

Since, by the observation and majority of machine learning existing works are based on supervised leaning. If noticed Human and animal learning is largely unsupervised even though give accurate and desired result so in near future deep learning comes with the following future trends:

- Expect unsupervised learning to become more important
- Future progress in vision
  - Systems trained end-to-end
  - Combine ConvNets with RNNS that use reinforcement learning to decide where to look
- Natural language
  - RNNs systems will become better when they learn strategies for selectively attending to one part at a time
- Ultimate progress → systems that combine representation learning with complex reasoning

REFERENCES

[1] Kenneth Chu &Claude Poirier, "Machine Learning Documentation Initiative" United Nation Economics Commission for Europe Conference of European Statisticians, wring paper , 4 February 2015.
[2] https://www.slideshare.net/ruccome/deep-learningruoccoshort
[3] Yann LeCun, Yoshua Bengio & Geoffrey Hinton. Nature 521, 436–444 (28 May 2015)doi:10.1038/nature14539 .
[4] http://www.i-programmer.info/news/105-artificial-intelligence/7913-learning-to-be-a-computer.
[5] http://www.machinelearningmastery.com/whatisdeeplearning
[6] Saduf, Mohd Arif Wani, "Comparative Study of Back Propagation Learning Algorithms for Neural Networks", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 12, December 2013