Prospective Of Deep Learning Approach In Different Dimensions

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Abstract: In the digital world every one wants technology to assist their day-to-day activities. The application of artificial intelligence make it possible in many fields. The buzzing word machine learning (ML) is very popular in any domain of research. The researcher's have been focusing on accurate machine learning models which can be applied to any real world problem and can be useful for society. The innovative component of ML is deep neural network (DNN) which changes our perception of information processing to a different level. The DNN is highly sophisticated multilayered conceptual model used for handling large amount of data in very less time. The Application of DNN is a large domain areas almost it covers maximum advanced fields like NLP, Computer Vision, Classification, Stock market and many more. The main attractive feature of DNN is it can handle huge amount of data for processing and supports big data. This paper focus on different DNN models and some of popular potential field of application with their advanced frame works like TensorFlow, MXNet, Neon etc.

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1.   INTRODUCTION

In the recent days machine learning methods became hot cake among researchers in different field of applications. The machine learning is such a technology that can be applicable to most of the research problems. Due to which authors are more interested to work in this field of research and published many papers by applying advanced machine learning models. The deep learning network is one of the popular network used by many researcher for value prediction , classification and many more. This deep learning originated from conventional neural networks (CNN) importantly accomplish its forerunner. This employ graph application with placement between neurons to acquire multiple layered learning forms. Most recent deep learning (DL) methods have been shown and presented convincing outcomes around various kind of implementations such as Natural Language Processing (NLP), visual data processing, voice and audio processing, and another familiar implementations [1,2]. DNN method have been giving improved outcome in the process of analysis. This method has been pioneer in global as brainstorm technology. It has distinguished ML method working on old and conventional algorithms by exploiting more human brain capabilities. This is helpful in modelling compound relation between data. The aim was on flow of algorithm emphasized on learning data representations. The learning process can be supervised, unsupervised or semi-supervised [3]. Usually the DNN process obviate attribute engineering in supervised learning applications. In unsupervised most data are not labeled and more abounding than labeled data, therefore DNN algorithms can be applied to such type of difficulty. The DBN are the example of DL frameworks which are applied to such type of unsupervised problems [4].

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DL has a outstanding development in big data attribute learning [5,6,7]. Analyzed to the formal other ML schemes such as SVM and Naive Bayes, DNN forms can yield benefit of many illustrations to pull out the upper-level characteristic. It has been observed that training was difficult for 37 classifiers and cross validating the parameters in some situations [8]. The time series data are convergence in most of real-time implementations starting from digital health records [9] and human activity recognition [10] to acoustic scene classification [11]. The CNNs have change the dimension of computer vision and tested with a job to identify a picture, the performance of model were out standing with respect to reach human level demonstration [12]. After this high sounding success of DNNs in computer vision generate new ideas in the field. People have proposed many kind of DNN schemes to solve NLP task like machine translation [13] , classification [14] and having significant effort on speech recognition.In this paper, we carry through relative survey of the various modern deep learning approaches with their potential field of application. The use rise of graphical processing units (GPUs), we show how deep architectures can be effectively learn hidden discriminating features from time series data in active manner. We have shown few environments in Python, Keras and Tensorflow to execute the deep learning techniques.

2.   PROCESS OF REVIEW

An organized analysis was conducted to collect appropriate literature from different sources, focusing on following points.
- To establish unusual direction and perception of machine learning algorithms in different domains
- To classify different types of deep learning methodologies in different domain
- To see the upcoming challenges of deep learning networks in different fields of application

By exploring the above points in detail, we will make a considerable contribution towards further applications of deep learning in the field of stock market. The articles are selected in this review process by following certain keywords and defined Rules:

R 1: Publications that are related with machine learning and deep learning using time series data.
R 2: Paper published among the year 2014 and year 2019 for recent study.
R 3: The Papers published in English Language and available in digital library.

R 4: The Papers published in referred journals having online version.

We focus on the recent developments in deep learning using time series data so articles based on traditional analytic are not considered in literature survey as shown in Table-1.

Table.1 *Selection of Articles for the review process using different level of selection*

Sl No	Review Process	Total Number of paper Selected	No of Paper Included for Review	No of Paper Excluded
1	Paper searched from different digital sources using the key work "Machine learning", "Artificial Intelligence", "Deep Learning", "Stock market".	10,125	8120	2005
2	Articles screened from the title of the paper	8120	185	7935
3	Papers analyzed after reading their abstract and keywords	185	51	134
4	Articles after reading full text of the paper.	51	29	22
5	Final selection of papers for the review process		29	

3. DEEP LEARNING MODELS

The deep learning has become very popular research topic among machine learning methods. Many deep learning methods has been developed during last few years. There are some typical model draw attention of many researchers in current days of research some are CNN, recurrent neural network (RNN) and deep belief network (DBN). Most of the deep learning models developed now a days are closely associated with these methods.

3.1 CNN

The CNN is popularly used deep learning network for learning features of large image categorization and identification [15, 16, 17]. The CNN is consisting of three layers as shown in figure-1. The convolutional label usage the convolution operation to accomplish the weight independence where sub-sampling is used to trim the magnitude. In this process picture is disintegrated into series of input for example x={x1, x2,…xn} and convolution layer is represented as follows.

$$y_i = f\left(\sum_i K_{ij} \otimes x_i + b_j\right) \tag{1}$$

Where yj denotes the output at layer jth and Kij refers as kernel to the ith value it takes in map x.
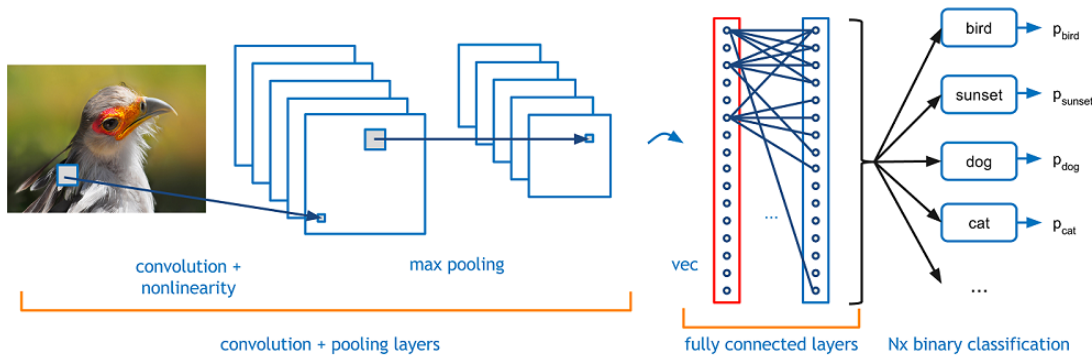

Fig. 1. *The working process of CNN based models*

The sub sampling layer design to cut down the dimension of the feature map. It can be enforced by an common pooling procedure or a max pooling procedure several fully-connected layers and a soft-max layer are typically put on the upper layer for categorization and identification. The deep convolutional neural network also enforced with prosperity in NLP and speech. [18, 19]

3.2 RNN

The RNN is suitable for different features of time series data and useful in language processing as this network works on principle of sequential learning process. This network learns from previous input data stored in internal state of network. The continuous process of RNN is shown in figure-2. the input and output of the network can be represented as following equation (2) and (3).

$$X_i = \{x_1, x_2, x_3,\ldots\ldots x_n\} \tag{2}$$

$$Y_i = \{y_1, y_2, y_3,\ldots.y_n\} \tag{3}$$

It is observed that for RNN to acquiring lengthy period physiological state for gradient disappearing with back-propagation scheme for training different factors. For

resolving current issue many schemes like LSTM came out as proposed by forbidding gradient disappearing [20]. CNN and their divergence has shown better demonstration in numerous areas like NLP, voice identification and machine translation [21,22].
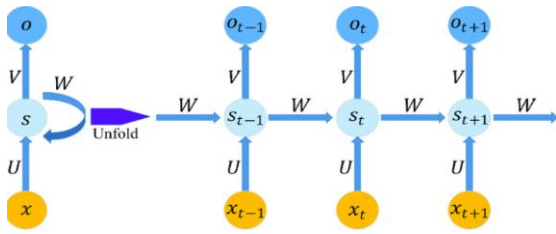

Fig. 2. The basic working structure of RNN

3.3 DBN
This DBN is regarded as first deep learning network based model to be trained successfully [23]. The network is consist of various restricted Boltzmann machines and represented in two layers visible (v) and hidden (h) level shown in figure-3. The distinctive limited Boltzmann machine usage the Gibbs distribution to process the factors. Particularly the confined Boltzmann machine generally usage dependent probability P(h|v) to compute mathematical quantity of every portion in intermediate layers after that it follows same process to find the quantity of every portion in the visual level. The procedure is a continuous process to get divergence outcome.
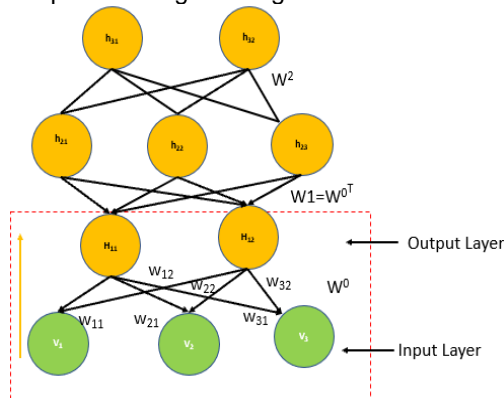

Fig. 3. The basic working structure of DBN

4. FRAMEWORKS OF DEEP LEARNING
Few well known frameworks used for design are given in the table- along with supported languages. The table shows many interface supports deep learning although use of GPU made the computation process more faster by the help of CuDNN interface [24]. The development of python given new dimension to deep learning design and very efficiently simplify the process by using frameworks like TensorFlow, MXNet and CNTK. TensorFlow is implement by Google which provide large number of build in functions for deep learning model [25]. Currently they have introduced Keras which assist TensorFlow through advanced user interface which allows developers for designing their own model without bothering internal combination due to this property and robustness it is now favourite among many. CNTK is introduced by Microsoft as high level language or brain script [26] this model helps to apply neural network.

Table 2. Overview of popular deep learning frameworks in recent days

Sl No	Framework Name	RNN & CNN	DBN	Interface support
1	DL4j [27]	Supported	Supported	Java, Scala, Python
2	Neon [28]	Supported	Supported	Python
3	MXNet [29]	Supported	Supported	Python,R , Scala, Perl many more
4	TensorFlow [25]	Supported	Supported	Python,C ++, Java & others
5	CNTK [26]	Supported	Supported	Python, C++ & BrainScript.

5. APPLICATION OF DEEP LEARNING
The recent developments of DL are many more some are like Natural language processing, Speech and audio processing, different media network synthesis, visual data processing sentiment classification, computer vision etc as shown in figure-4 [30,31]. The deep learning can be applied to many other fields these are can be treated as findings or future challenges for researchers.
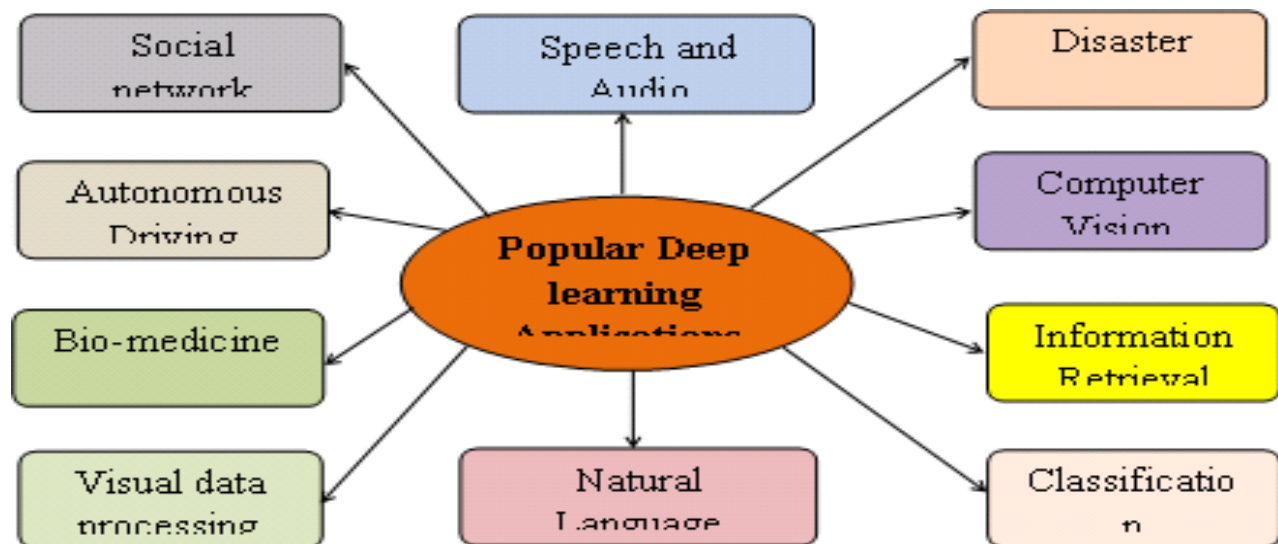
1013

Fig. 4. *The application of deep learning in different domains*

6. CONCLUSION AND FUTURE WORK

From this study we observed that the deep learning is demanding model among ML techniques by researchers. In this paper we have find out many papers from different digital sources and followed a systematic process to select papers relevant to our work as describe above. The review discussed various methods of deep learning, different kinds of frameworks used to support deep learning process and finally potential applications in different domain dimensions. The deep learning models are essential in large data computation and the support of GPU takes its to new height. In comparison to conventional ML models the deep learning can generate very high level data representation in most of the domains from large scale of raw data. So we can say due to this property this technology is successfully applied to many real time problems. We should focus on developing new methodologies to integrate deep learning models for prediction , classification and many more things can be made simple. The parameters can be tune as per requirement to get improved result with high accuracy. So we say there is vast opportunities in deep learning based applications in any field. We have also identified few potential fields of application in our paper and suggest that any researcher can work on this to implement in real world applications.

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