







Essence of Deep Learning Techniques in Evolving Agriculture Technology Society

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Abstract. In recent times, many modern techniques have arrived, one most popular Deep learning. This highly use in image processing and data analysis. With the up-coming time, it has even bigger scope and potential use in future. As currently even it has a part of various and spread fields. Here by study-document an evectional study of 36 research documents of application for deep learning. this paper has analyzed the specific issues which arises in production of food in agriculture sector. this paper has gone through, framework and models, nature, pre-processing-of-the-data used, and allover performance got as per metrics use in specific case of study. Further this paper goes through comparative study of deep learning with similar present and famous methods, performed for classification or regression in our work. The results this paper get shows that by using deep learning this paper can receive high amount of accuracy and performance, frequently use in image processing methods.

Keywords: Deep Learning, LSTM, ANN, Tensor flow.

1 Introduction

The importance to tackle the issues in field of production of agricultural goods as in term of production, productivity, food-security environmental-impact, and sustainability discussed in Smart farming [1]. As the concern, world population is growing on regularly, soon there will be need of bigger food sources discussed in FAO, 2009) providing the high supply with also maintain the soil fertility and protection and conservation of natural resource by supply with sustainable development in agriculture procedures [2].

For taking in concern the challenges face as complexity, having multi-variants and un-productiveness of ecosystems in agricultural which require a better understanding and observation, measurement and continuous analyzing various physical phenomena and aspects [3]. This request implementation of huge amount of data of agriculture and use

it in upcoming technologies, for the both large scale observation of ecosystem and small-scale farm management is required to develop, design manage policies, situation and awareness of locals [4].

Huge setups for observation using remote sensing technology as in by airplanes, satellites and devices like drones, which will give aerial view of the fields [5]. When it is practically applied, it will give various advantages like getting more familiar to field, no harm to field, crops and productivity and gather the data of geographical features over a large area [6].

A massive amount of collected organized data is obtained by using the remote sensing by images [7]. But here, these images contribute to building up challenges [8][9]. There for analysis of image becomes more important for field of research in domain of agriculture and here is use of smart techniques for analyzing the data and there classification, detection of anatomy stricture and similarly numerous applications in field of agriculture [10].

There are 2 steps for bibliographic analysis in this study: (a) related work's collection (b) review of work and analysis in detail. At step one, a search based on keywords is done from the list of journal articles and research papers from the database of IEEE and Google Scholar. Deep learning exhibits use of classical Machine Learning by summation of increased in complexity and depth inside to the training-model and even reforming, vast verity of functions is applied on the data for its hierarchical representation, by using various data abstraction levels (Schmidhuber, 2015, LeCun and Bengio, 1995). One of the biggest benefits of Deep Learning is feature learning. This means the extraction of features from raw data, with additional function of composing the features of low level from the high level (LeCun et al., 2015). The next section describes popular deep learning model in the area of agriculture.

2 Deep Learning Models

Deep learning algorithms have been very useful in the field of agriculture. Deep learning exhibits use of classical Machine Learning by summation of increased in complexity and depth inside to the training-model and even reforming, vast verity of functions is applied on the data for its hierarchical representation, by using various data abstraction levels. Some popular machine learning and deep learning models discussed in this section as:

2.1 Artificial Neural Network

Artificial-neural-networks (ANNs) also known as neural nets or simply neural networks (NNs) are computing technique inspired by neural network preset in brains of animals.

This approach works on collection artificial neurons commonly called as nodes and can forward signals forward the signal to the next neuron. The neuron gets a signal, processes it then forward it to its connected neurons. The number of signals at a connection is of integer value and the output is generally in form of some non-linear function for some given input. This connection between two nodes are called as edges. Each neuron and edge is associated with a weight define as per process of learning. Increment or decrement in the weight effects in the strength of signal between nodes. Weight is directly provisional to the strength of signal. Nodes may also have a threshold value of strength such that if strength crosses the threshold value then only it will be carry forward.

In a neural network, neurons are combined into layers. As per work, layers perform different transformations on input. In general, ANN layers are as following:

1. **Input-Layers:** in the first layer, the input is feed. Total numbers of nodes are equivalent to total number of features in this layer. Example: if input is an image, then the number of total features is the number of total pixels present in image.
2. **Hidden Layer:** As the name says, it does not show directly to user, remains hidden. From the input layer, input is feed to this layer. As per the task to be performed, each layer can have different number of nodes. Output of each layer is taken and performed matrix multiplication with the output-matrix from the matrix of last layer additionally, power of weight and bias is also learned in continuation with activation function, by which function becomes non-linear.
3. **Output Layer:** Outcome of this is feeds to logical and static iterative function, such as SoftMax and sigmoid that transform outcome of all classes into a score in terms of probability respectively.

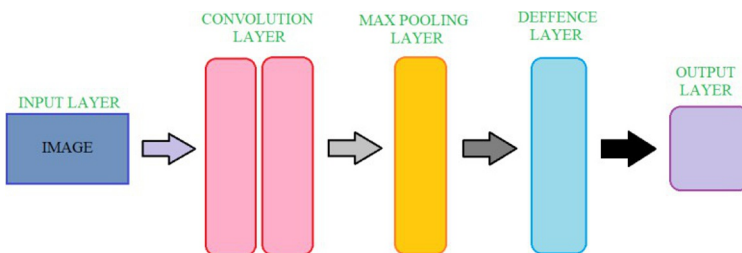
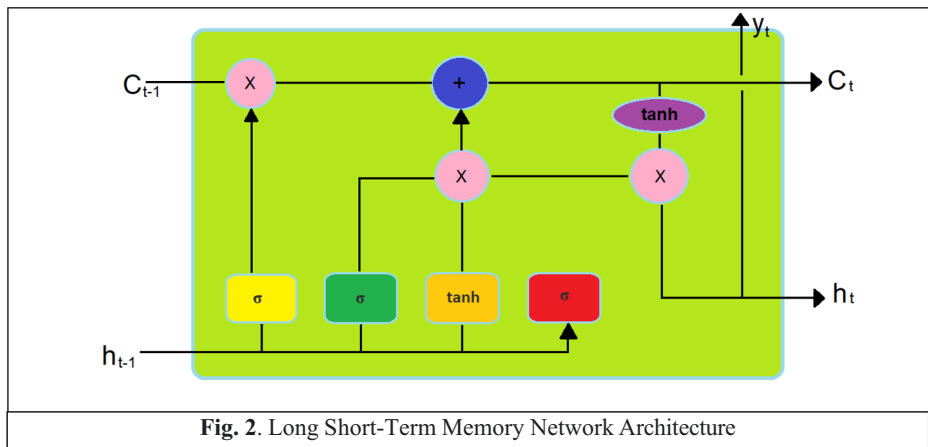


Figure1. CNN architecture Layer Orchestration Representation

2.2 Long Short-Term Memory Network (LSTM)

The LSTM is an example of RNN (recurrent-neural-network) technique. Therefore, it is also a recurrent-neural-network (RNN). In the recurrent-neural-network (RNN) technique, the outcome of previous layer is taken as input for the present-one. Hochreiter & Schmidhuber in 1997 design the Long-Short-Term-Memory. The issue of long-term dependencies present in RNN was tackle here, as if word stored in the long-term-memory by RNN is insufficient in predicting that but after recent information is able to provide more accurate predictions. With increase in gap length, RNN is not able to give efficient performance. By default, LSTM can remember the data for a long duration of time. Uses of LSTM are classifying, predicting and processing on the depending of data of time-and-series.

As Long-Short-Term-Memory-Network (LSTM) is a kind of RNN (Recurrent Neural Network), therefore it is designed at particular for handling the data in a sequential manner, data like series of time, speed and text. Long Short-Term Memory Networks have ability to learn dependencies of long term in sequential data. This makes Long Short-Term Memory (LSTM) good choice for jobs like time series forecasting, speech recognition and language translation.



2.3 Tensor Flow

Tensor-Flow is a freely available machine learning model. It can use to cover a large volume of tasks, but it mainly focuses to interface and training of deep learning base neural networks. Brain team developed Google Tensor-Flow model for using it for research and production in internal google. In starting phase, it was first release in 2015 under Apache Licence2.0. Then later on in 2019, Google release Tensor Flow 2.0[10]. Which is an updated version of previous model. Tensor-Flow is highly flexible, there

for it is compatible with multiple languages like C++, JAVA, JAVA Script and Python. Which make it all over useable in wide range of fields.

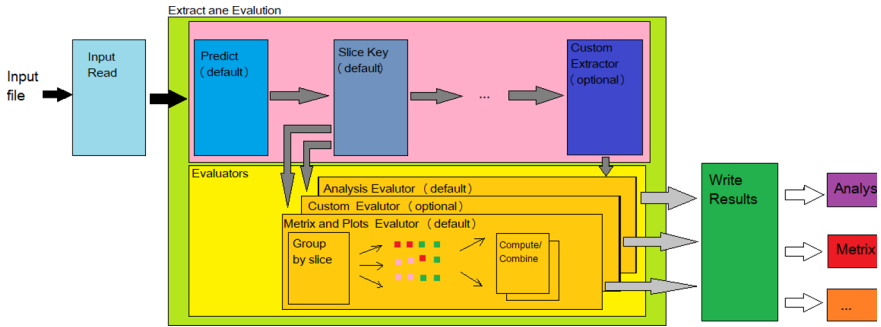


Fig. 3. Architecture of Tensor flow model

3 Comparative Analysis

The study this paper made has proved that Deep Learning gives a greater performance in the major work. While comparing the working of Deep Learning with similar approaches for the similar experiments, Deep learning comes out to be have grater performance. In our work of relative study, 27 out of 36 cases (75%), performed, valid and compared comes out to be Deep Learning approach got one side win. As in 25% cases, Deep Learning not comes to be the best technique for our task. So, the other techniques also have their own value as per the case and scenario. There for, this paper need to see the working first and then this paper can decide the best option. this paper can also go to have an automated design for selecting the best approach for a particular case

Table 1. Comparative analysis table

	Tensor flow	LSTM	CNN
Data	Tabular format	Sequential data	Images
Reconnect Connections	Not-Present	Present	Not-Present
Sharing Of Parameter	Not-Present	Present	Present
Spiral-Relationship	Not-Present	Not-Present	Not-Present
Vanishing-And-Exploding Gradient	Present	Present	Present

4 Conclusion

Here, this paper has made a study of various survey of researches base deep learning approaches in domain of agriculture. this paper inspect 36 research papers of this domain, inspect the sub-domain and issue, the approach of the employed model, the data source use, augmentation of data for the adopted technique, pre-processing of data and the complete performance made, ca see in performance metrics in each paper. this paper made a comparative study Deep Learning with similar approaches.

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