Convolution Neural Network in Detection of Disease Present on Cotton Leaf

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Abstract – *India is the country in which most of the people are depended on agriculture, over 70% of the rural household depend on agriculture and cotton is one of the biggest cash crop in India. The main performance of farming is to grow healthy crops without any disease present on it. It is very difficult to usually presume the health of the cotton leaf. To overcome this problem a neural network based approach is proposed which may access the image of the leaf of the plant and detect the disease and the quality of cotton leaves using convolution neural network (CNN) approach. The main approach of the system is to detect the various disease of cotton plant by applying convolution neural network tool, which apply image and based on colours changes on the image the main portion of the affected leaf is highlighted and detect the sort of disease based on data. Convolution neural network is a type of deep neural networks and used to analyze visual images. Convolution neural network also known as shift invariant or space invariant artificial neural network. Image classification and image segmentation these application of Convolution neural network used to identify disease in cotton leaf. There are many techniques to detect disease present on cotton leaves like baye's technique, k-means technique and artificial neural network (ANN). But CNN is considered to be more effective than all of the above techniques.*

***Key Words*: Cotton, Agriculture, Cotton Leaf, Convolution Neural Network (CNN), Deep Neural Networks, Visual Images.**

1.INTRODUCTION

The main source of the disease is the leaf of cotton plant, above 80 to 90 percent of disease of cotton plant is on it's leaves. To detect the disease of cotton plant image acquisition, image pre-processing, image enhancement, image segmentation and in feature extraction some of the important features of leaves are extracted which used in further training of neural network. In back propagation the mixture of red, green, blue and hue with defected part preserved for further processing.

1) Objective of proposed system is to detect disease in cotton leaves. It is necessary to detect the disease of cotton leaf as early as possible.

2) Detection of cotton leaf disease can be done early and accurately using Convolution Neural Network.

Convolution Neural Network are most popular models used for Image data. This neural network is a computational model uses a variation of multilayer perception and contains one or more convolution layers that can be either entirely connected or pooled. Convolution neural network automatically extract the important features without any human supervision and also It has high accuracy in image recognition problems. The aim of this implementation is to develop a system which can detect disease in cotton leaf. In this system user has to upload an image of on the system after uploading image, It will detect disease in cotton leaves.

2.LITERATURE SURVEY

Irrespective of various difficulties plant disease detection is an active area of research. Different Methods have been proposed over the years. In traditional system approach for detection of cotton leaf can be achieved using machine learning algorithms. And this paper approach is based on cotton leaf disease detection using Convolution Neural Network(CNN). CNN technique is most effective to detect the disease in cotton leaf in a short time period. Another method to study diseases on the cotton leaf is executed by using image processing toolbox and also using MATLAB which helps to suggest necessary remedy for the disease present on the plant. [1]another way to recognize the leaf disease using computational effort. This approach addresses how the disease analysis is possible for the cotton leaf disease detection.[6]It's a protocol for constructional image set of natural images to be used in machine learning and image processing. [2]This paper is review of techniques for disease detection. [4]

3.PROBLEM STATEMENT

To propose a system which will accept images from remote location and identify whether the cotton leaf is affected with certain disease or not and if it is affected with disease prove solution to the farmer he will contact to the experienced person and get solution for the same but this way of detection and identification of disease is not correct it will badly affect the plant. In second case

farmer will contact to the owner of the pesticide shop. then that person will suggest some wrong treatment with respect to his experience, third case is that over a time disease will get cure automatically.

4.PROBLEM SOLUTION

The way to detect disease from cotton plant was by virtually checking it which resulted in high amount of error due to different visual perception and lighting, so to overcome all this disease, the main approach of the research is to detect different disease by applying Convolution Neural Network tool.

5.BASIC BLOCK DIAGRAM

5.1 Proposed System

• Image Acquisition :
    For this process, cotton images are taken in such a way to avoid any kind of distortion. The picture was taken under
no direct sunlight because it would affect the image.
• Image Pre-Processing :
    The image of cotton leaves are pre-processed through a series of process namely image segmentation and feature extraction. This process is done so that it can be used in the method of back propagation of neural network.
• Feature Extraction :
    The aim of this phase is to seek out and extract features which can be further determine the meaning of given sample.
• selected Features :
    By using all the steps to detect disease in cotton leaves. Firstly input image will be pre-processed and feature like colour will be extracted, with the help of these features input images are going to be compared using CNN and disease will be detected.
• Classification :
    Classifier will compare the input image with diseased leaves present in database. CNN is classifer in this system.
• Database :
    Database contain all the images of the cotton leaves that would be used for training and testing. The image database is responsible for the better efficiency of the classifier as it is decides robustness of the algorithm.
• Output :
    Training of CNN for different diseases of cotton by giving features of input test image to CNN, Which compares the feature with database images and gives proper output.
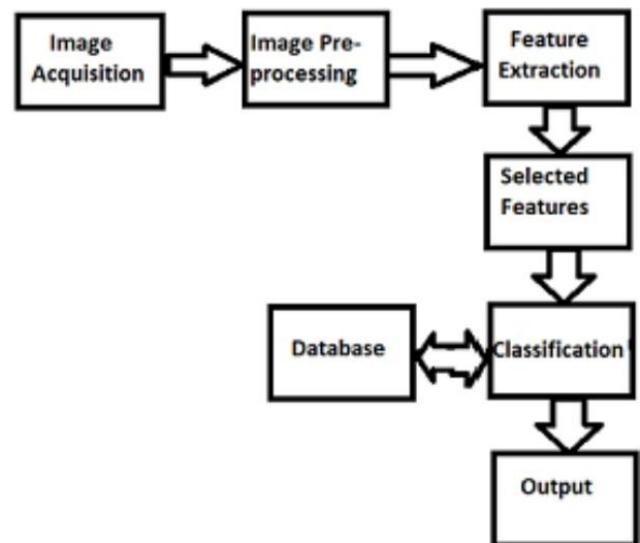

Fig. 1 Proposed System

6 IMPLEMENTATION DETAILS

6.1 Software Requirement

For this system google colab and keras version 2.4.3 is used. After that import libraries such as keras as image data
generator, Adam as optimizer, call back as model checkpoint and for Accuracy and Loss graph matplotlib is used in the system. to obtain the output give path for the database in system. Various functions used to show different version of particular image, with the help of image data generator, it creates different version of image like by rescaling, rotating, width shift, height shift and by zooming that image this is called as augumenated image shown in fig. 2 .

.   Fig. 2 Augumented Leaf

Generator will read pictures found in train data path and indefinitely generate batches of augumented image data and training data to differentiate leaves in two classes as follows :
    1)   Diseased Cotton Leaf
    2)   Fresh Cotton Leaf
    Augmentation configuration used for validation data into required format. In this system Transfer Learning is not used because it has huge parameter and while training it uses lots of time to classify input and output, for compiling Adam optimizer is used and it's learning rate is 0.0001 After compiling it gives summary of model i.e. Type of layer, Output shape and parameter and total number of trainable parameter means weight. Training model gives

loss and Accuracy and if epoch is increasing it also increases accuracy in validation and decreases loss and then plot a graph with train and test data.
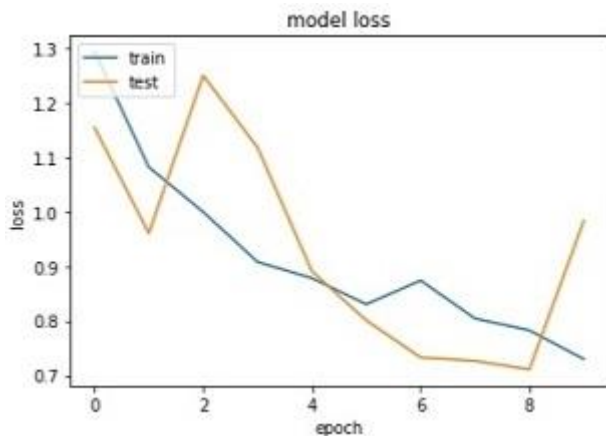
6.2 Model Loss

Fig. 3 Model Loss

Convolution Neural Network(CNN) uses a cross-entropy loss on encoded output. for a single image the cross entropy loss is given below :

$$loss = -\sum_{c=1}^{M}(y_c.\log\hat{y}_c)$$

where, M is the number of classes and yˆc is the model prediction of class due to the fact that the labels are one-hot encoded and y is a vector of ones and zeroes, yc is either 1 or 0.Therefore out of the whole sum one term will actually be added with yc = 1.
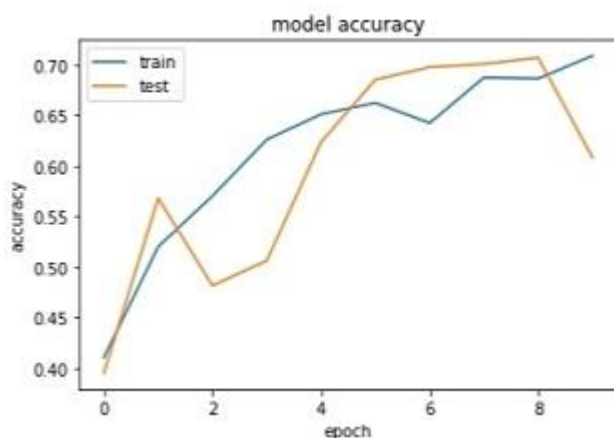
6.3 Model Accuracy

Fig. 4 Model Accuracy

Accuracy is one of the measure to evaluate classification of models.

$$Accuracy = \frac{Number\ of\ Correct\ Predictions}{Total\ Number\ of\ Predictions}$$

for binary calculation accuracy is calculated in terms of positives and negatives.

$$Accuracy = \frac{Tp + Tn}{Tp + Tn + Fp + Fn}$$

where, Tp=True Positives, Tn=True Negatives, Fp=False Positives, Fn=False Negatives.

CONCLUSION

Recognizing the disease is mainly the purpose of the proposed approach which can recognize the leaf disease with little computational effort. This approach can be used for the agriculture applications like detection and classification of disease of plant parts like leaf with suitable classifier. The analysis of the varied disease present on the cotton leaves are often effectively detected in the early stage before it will damage the whole plant

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