Agriculture Leaf Disease Detection Using Machine Learning

Rahul Khane[1], Vinit Patil[1], Jayesh Shinde[1], Siddhesh Khanvilkar[2].
1-Students of Pillai HOCL College of Engineering & Technology.
2- Professor of Pillai HOCL College of Engineering & Technology.

Abstract ---- The detection of diseases at earlier stage is important in agriculture for an efficient crop yield. The bacterial spot, late blight, septoria leaf spot and yellow curved leaf diseases affect the crop quality of agriculture plants. Due to automatic methods for classification of leaf diseases it helps in taking action after detecting the symptoms of leaf diseases. This paper presents a Convolutional Neural Network (CNN) model based method for leaf disease detection and classification. The dataset contains 500 or more images of leaves with four symptoms of diseases. We have trained a CNN Model for automatic feature extraction and classification. In our model, based on RGB components the filters are applied to three channels .Color information is used for plant leaf disease researches.

Index Terms--- Convolutional Neural Network, Feature Extraction, Classification, Pooling, Flattening,

1. INTRODUCTION

Pests and Diseases ends up in the destruction of crops or a part of the plant leading to decreased food production. Polymerase chain reaction, gas chromatography, thermography can be used for disease identification. These techniques are not cost effective and are high time consuming. Our objective is to distinguish the illness introduced in a plant by watching its morphology by picture handling and Machine Learning. Random forest, Artificial neural network, Support vector machine (SVM), Fuzzy logic, K-means method, Convolutional neural networks can be used for detection .This system is able to distinguish between healthy and unhealthy leaves. It enables you to identify diseased plants so that your entire production does not go to waste .To extract the features from images we are using Image processing and Machine Learning algorithms. It Minimizes losses by detecting diseased plants at early stage and also Increase efficiency by monitoring plants on daily basis.

1.1 Literature Review:

Plant Disease detection detects illness spread in various kinds of plants. Plant Disease detection helps in searching for unhealthy leaves by watching morphology of plants using Image processing. Keeping the minimal user interaction needed for the system to work[2]. This application will scan and detect disease within short amount of time thus making it real time.

2. EXISTING SYSTEM

Existing System makes use of Random Forest in identifying between healthy and unhealthy leaf from the data sets created. Random forests is learning method for classification, regression and other tasks that operate by constructing a forest of the decision trees during the training time. It uses various phases of implementation namely dataset creation, feature extraction, training the classifier and classification.

The created datasets of unhealthy and healthy leaves are collectively trained under Random Forest to classify the diseased and healthy images.

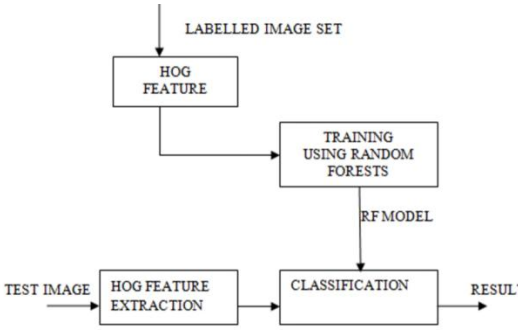

fig 1. Architecture Of Random Forest Method

The existing system supports small datasets and limited to only one plant. Random forest algorithm doesn't take image as a input, Image has to be preprocessed first using Image processing.

All of these drawbacks can be resolved using CNN algorithm which provides more flexibility and Reliability.

3. PROPOSED SYSTEM

We make use of Smartphone's Camera in order to take picture of Plant Leaves. As per following fig.2 This images are send to the Server. Server has an application which will run Convolutional Neural Networks Algorithm in order to classify the healthy leaves and disease leaves. It will process the image and create a diagnosis report regarding the detected disease. The report will be sent back to the user of Mobile .

3.1 SYSTEM ARCHITECTURE

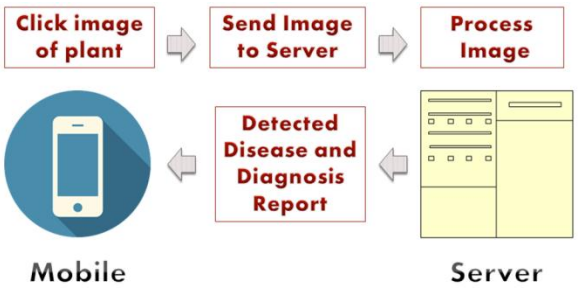

Fig.2 System Architecture

3.2 WORKFLOW OF THE SYSTEM

We make use of **Convolutional Neural Networks** Algorithm for automatic feature extraction and classification[7]. CNNs have wide applications in image and video recognition, recommended systems and natural language processing. CNNs are made up of neurons with learnable weights and biases. Each and every single neuron receives several inputs, takes a weighted sum over them, pass it through an activation function and responds with an output. Each layer uses the output of the preceding layer as input. The learning can be unsupervised, supervised or semi-supervised. CNN does not have to divide the feature extraction and the classification because the model automatically extracts the features while training the model. It is used in many research areas such as image processing, image restoration, speech recognition, natural language processing and bioinformatics.

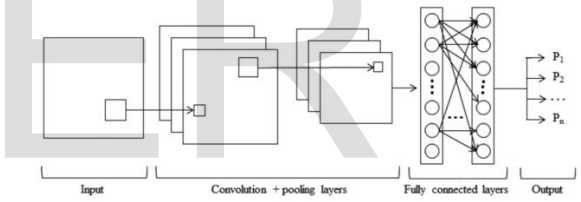

Fig.3 Steps of CNN

Steps for CNN Algorithm are as follows :

Convolution : for preparing the matrix of pixels from Image and applying filters on matrix.

Pooling : Create Feature Map based on Max Pooling (General size of filter is 2 X 2 matrix)

Flattening : Feature Map is converted into Input form that have to be supplied to Artificial Neural Networks

Ann : Input is processed through number of Hidden layers of Neurons to produce output.

4. SYSTEM DESIGN

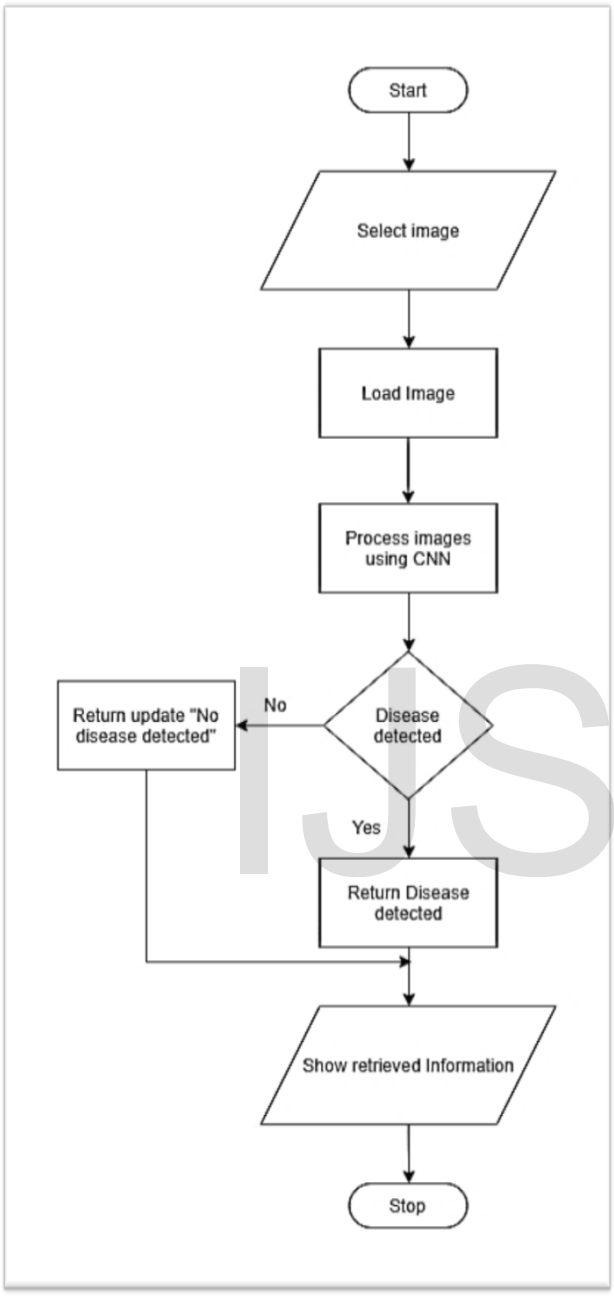

Fig.4 Flowchart of system.

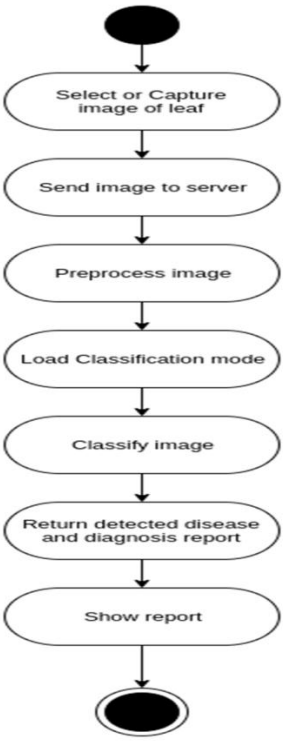

Fig.5 Activity Diagram Of System

5. Result

We have conducted a set of experiments on different healthy and diseased leaf image databases and have performed classification. Different diseasesed leaves look similar to each other due to which sometimes it may give incorrect classification.We have conducted this experiment on potato leaf. The output of this is shown below in fig.6.

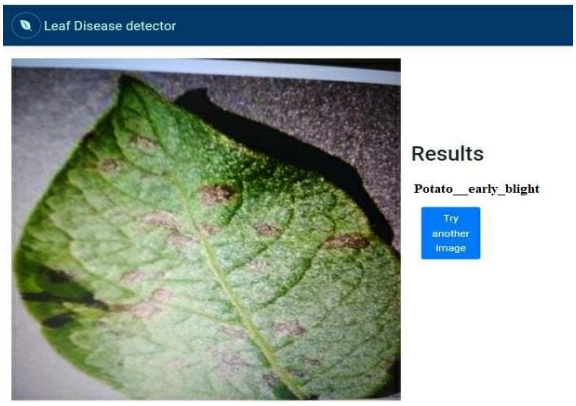

Fig.6 Result of Leaf Disease Detector

6. CONCLUSION

In this paper, Different leaf diseases detection and classification method is presented based on Convolutional Neural Network. The dataset consist of 500 or more leaves images. Three different input matrices have been obtained for R, G and B channels to start convolution for every image in the dataset. Each input image matrix has been convoluted. Using this system we can detect the plant disease in early stage by which we can get more healthy yield and more profit. We have explained the architecture and working of existing system for plant disease detection. We have also proposed new system which will provide more efficiency. The accuracy of the proposed System depends on Number of hidden layers of Neurons. In the current implemented system the small dataset is used. In future large amount of dataset can be used to increase the accuracy and efficiency. We can also improve the system for real time data capture and processing of image to give results as quickly as possible.

7. REFERENCES

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