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PLANT DISEASE IDENTIFICATION USING ML

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Abstract: Agriculture have a vital role in our day nowadays life. currently the population has increased and it additionally increased the demand for food. therefore it's necessary to extend the production of crops. For higher production of crops the plants ought to be well grown and guarded from diseases. Manual identification of disease isn't potential for giant scale farmers all the time because it is time consuming and want a lot of labours for that. Diseases are often simply detected by applying machine learning. By applying machine learning technique we are able to establish the disease that's affected to the leaf, stem, root and fruits. pictures captured using mobile camera are processed with image processing technique. The features are extracted from the disease affected half and it can be classified by machine learning technique like Convolutional Neural Network(CNN). An application that may predict the disease affected to the plant and potential precautions to avoid the disease are developed.

Index Terms **- Machine Learning, CNN, Image processing.**

I. INTRODUCTION

When crops are affected by a variety of diseases it causes economic losses in the agricultural sector. Therefore the necessary treatment can be provided if plant diseases are properly identified early. The program uses image processing and machine learning methods to identify diseases. By using a mechanical learning process we can reduce a person's effort to diagnose diseases and suggest steps to be taken to save the plant from disease. The application contains a mobile application. It is a user friendly application installed on the Android phone will help the farmer to solve the problem to find the disease. Farmer takes pictures of plant parts on a mobile phone and uploads them to the database with the help of this application. This image is processed using Image Analysis techniques and CNN classification helps diagnose the disease. After receiving precautionary measures, a message is sent to the farmer and the farmer can view the message on his request. By using this program the farmer can get the result of his / her symptoms and preventive measures can be taken.

II. REVIEW OF LITERATURE

Here we present papers based on the technology used in the diagnosis of plant diseases and the papers are organized on the basis of technology.

The purpose of this paper [1] is to introduce a new system that can be used on mobile devices. In this paper, they have proposed a portable application model based on deep CNN to identify tomato leaf diseases. To create this app, their model is inspired from the MobileNet CNN model and can detect 10 types of Tomato leaf disease. This program was trained with the help of a tomato leaf database. Mobilenet is a CNN development organization used for image classification. It takes very little computation power to work. Mobilenets are generally small, low latency and low power.

In this paper [2] the automatic detection of paddy leaf disease using the optimised fuzzy inference System (OFIS) is presented. Paddy images are converted into Red, Green and Blue band. Using the middle filter noise in the green band is deleted. The elements are then removed from the green band previously processed. Released features are provided by the OFIS system. It can therefore classify an image as a affected disease or not. This program uses OFIS in classification. About 85 images of leaves are being tested in this program. This program offers high accuracy. The OFIS provides 95% accuracy in detecting leaf diseases.

This paper [3] deals with the detection of diseases of rice crops using K-means clustering, SVM and CNN classification techniques. Self-diagnosis of a plant disease may not occur in large-scale farming. By taking pictures using camera diseases can be easily predetermined. Image processing algorithms include a combination of K-means, SVM and CNN. It helps in the separation process. The training database includes 50 images that provide more than 95 percent accuracy. With the removal of the feature the separation techniques need to be trained first. In SVM techniques each image is separated and the user selects the infected part. These parts are processed to remove the feature. With 30 images the accuracy is 90 percent. While the number of stored images increases the accuracy of the CNN algorithm also increases.

This paper [4] deals mainly with the diagnosis of plant diseases using the process of image processing. This application uses open databases. About 5000 images of diseased plant parts are used. In this program convolution techniques and a semi supervised approach are used to classify plant species and to identify disease of 4 different species. The system is trained with natural images and has a 99.32% accuracy. This proves CNN's effectiveness in diagnosing plant diseases.

This paper [5] introduces a system for the identification and classification of diseases of paddy leaves based on images of diseased plants. He takes pictures of sick plants using a camera from the agricultural sector to accurately capture the features. K-means clustering mainly separates diseased area in the leaf image. Remove the green pixels in the area with the paddy leaf disease. Sort features by color, shape and texture. With the training database and the test data obtained 93.33% and 73.33% accuracy were obtained respectively. Support Vector Machine (SVM) is used for partitioning.

This paper [6] deals with the classification of various plant diseases such as tomatoes and brinjal. Diseases are identified by its texture patterns. Grayscale is used for the purpose of extracting a feature and the GLCM matrix is used for calculating features. The ANFIS-based classification model is primarily used to diagnose diseases. ANFIS recognition provides about 90.7% accuracy. In this program the collected elements extracted from the grayscale images are transferred to the ANFIS classifier for the classification process.

III. RESEARCH METHODOLOGY

In this research, we proposed a system that can detect the disease effected parts of plants and predict the remedy. We have implemented the project as, first it classifies the part of plant in one of the 4 categories as ‘Bacteria’, ‘Virus’, ‘Sunburn’ and ‘Healthy’. Secondly, it shows the result to the user and also the remedy along with it. The picture of disease affected plant part is taken with the help of mobile camera and uploaded with the help of the application developed.

3.1System Design

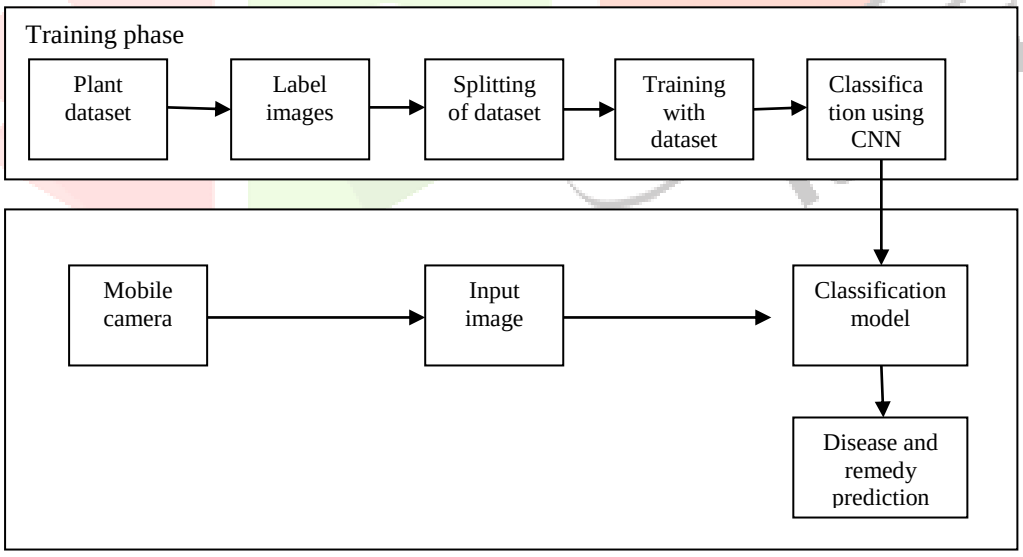

Fig 1. System Design

3.2 Convolutional Neural Network(CNN)

Convolutional Neural Networks are designed to process data using multiple layers of the same components. This type of neural network is used for applications such as image recognition or facial recognition. The main difference between CNN and any other common neural network is that CNN treats input as two-dimensional and works directly on images rather than focusing on the exclusion feature other neural networks focus on.

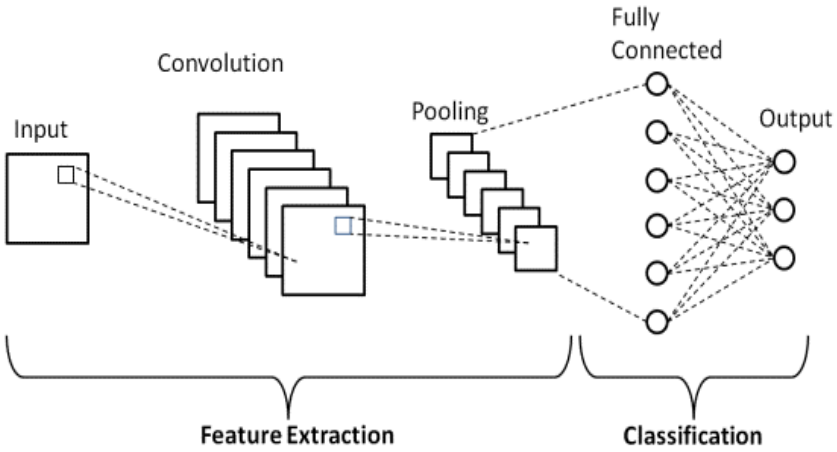

Fig 2. CNN architecture

CNN or convolutional neural networks use pooling layers, which are layers, which are placed immediately after CNN's announcement. It takes input from the user as a feature map from convolutional networks and prepares a summary feature map. Pooling layers help to create layers with neurons of previous layers. [7]

Neurons in this layer have a full connection with all the neurons in the precursor and effective layers appear in the standard FCNN. This is why it can be calculated as normal matrix replication following a bias effect. The FC layer helps to map the interaction between the input and output layers. [8]

IV. IMPLEMENTATION

4.1 Data gathering

In this research, we made our dataset by searching number of resources. We took the pictures from plant village and performed training on that dataset. This dataset includes both the pictures from plant village as well as it also consists of some images of plant parts affected with diseases downloaded from internet. The dataset consists of 6167 images of Virus, Bacteria, Sunburn and Healthy images. Out of which 4145 belongs to training data and 2022 belongs to test data.

Table 1. Plant dataset

Image	Training data	Testing data
Bacteria	1051	505
Virus	1051	482
Sunburn	1002	515
healthy	1041	520

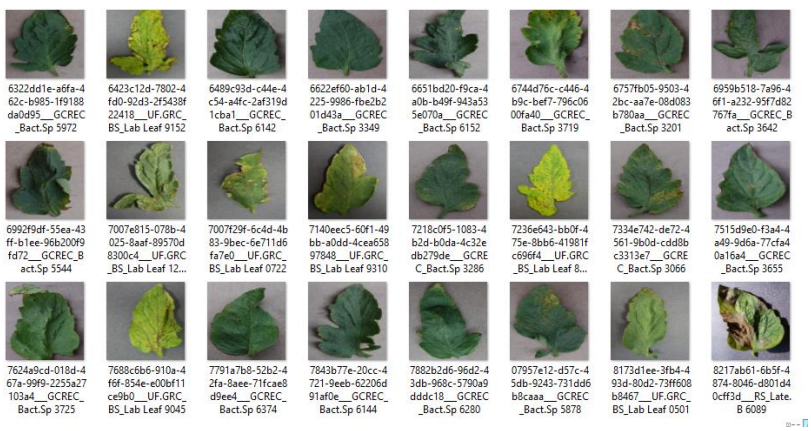

Fig 3. Plant dataset

4.2 Image Labelling

After collecting the data, the next step is to apply the label to the photos. We apply the label for images on the basis of the 4 categories. Bacteria as 'b', Virus as 'v', Sunburn as 'l' and Healthy as 'h'. The images are well cropped and arranged properly. This labelling is done for each and every image in the dataset for training purpose. And the images are saved as JPG file.

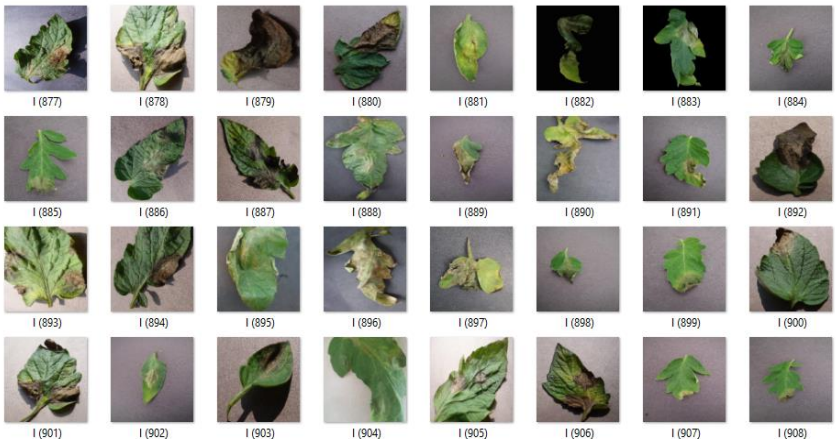

Fig 4. Labelled dataset

4.3 Training

After completing the labelling process, the next step is training the images. For this purpose, first of all split the dataset into two new folders ('train' and 'test'). We have used CNN model for training purpose. We run CNN with 4 classes along with suitable number of steps. The training process is done efficiently by using train and test images.

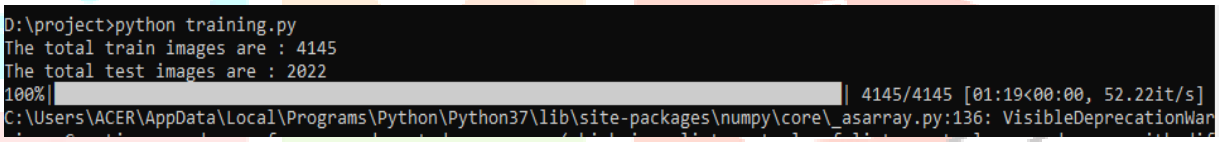

Fig 5(a). Training start

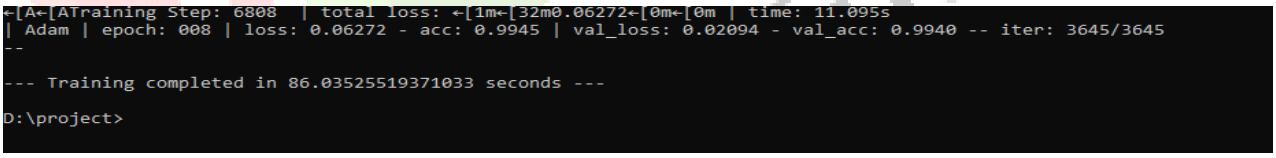

Fig 5(b). Training end

V. TESTING AND RESULT

After the training is completed, next testing process is done. The below table shows the results of the testing done by providing images to the system. The images captured is provided to the system and the classification process is done.

Table 2. Testing

No	Image	Expected class	Predicted class
1		Healthy	Healthy
2		Virus	Virus
3		Bacteria	Bacteria
4		Sunburn	Sunburn

Table 3. Result

No	Categories	Accuracy (in %)
1	Bacteria	88
2	Virus	90
3	Sunburn	85
4	Healthy	92

The table 3 shows the result of testing.

VI. CONCLUSION

This paper will help farmers who are dealing with plant diseases in their crops. An application for the identification of plant diseases and for predicting the necessary precautions for this disease will be submitted. The proposed system will work on a variety of plants. The program will be trained through an image dataset of plant-derived plant parts. Parts of plants include root, leaf, fruit and stem. This program will help to identify plant diseases early and take appropriate action without consulting a specialist. Mechanical learning technology and image processing will ensure the highest accuracy of the system.

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