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ANALYSING AND IDENTIFYING THE PLANT LEAF DISEASE USING IMAGE PROCESSING

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***Abstract*— Agriculture plays a vital role in food production, because of leaf disease there will be a reduction in yield. Here image processing is used to detect and identify the plant leaf disease, which is the major cause for economic loss as well as reduction in both quality and quantity of agricultural products by analysing the picture of that plant leaves utilizing image process algorithms. India is an Agricultural country and also is one of the primary industries developed by humans based on agricultural products. We have not seen any major technological break thoughts in the field of environment specially on disease detection of plants. The quantity in agricultural products and the quality are decreased because of plant diseases. The proposed system includes several steps to help farmers in detection of diseases, like image preprocessing, features extraction, classification using CNN algorithm.**

Keywords—Machine learning, Image processing, Detection, Identification of plant leaf diseases.

I. INTRODUCTION

The most widely used method for plant disease detection is done by experts, who just see the plant leaf and conclude the result based on prior experience. This method might have proven to be effective in some areas but still it has some downside to it. Availability of an expert is a major drawback of this method and it is an expensive and time consuming process.In India most of the population depends on agriculture and research in agriculture is aimed towards increase of productive and food quality at reduced expenditure and with increased profit.The Autonomous system for detecting the disease just by seeing the symptoms on the plant leaf makes it easier to detect the disease as well as it makes it cost efficient ,we have a samples of apple,Blueberry,Cherry,Corn,Grape,Orange,Peach,Potato,Raspberry,Soybean,Squash,Strwberry and Tomato. Here We use image processing technology to measure the affected area of the plant leaf. Some general diseases in plant leaf are bacterial, black spotted and rust, viral and red cotton leaf. Image segmentation is the process of grouping or separating images into different parts. There are many ways of performing image segmentation, ranging from the simple thresholding method to advanced color image segmentation methods. This segmentation process is based on various features found in the captured image. By the image we can detect the disease by the color information, boundaries or even in the segment of an image. Products. The majority of people depends upon agriculture but cultivation should be technically to get good yield.

II. LITRATUE SURVEY

In Machine learning, a Convolutional Neural Network (CNN) is a class of deep neural networks and this method is commonly applied to analyzing visual imagery. Based on CNN architecture and characteristics it is also known as space invariant or shift invariant.

Paper [1] discussed various classification techniques to extract the aspects of infected plant leaf and classification of diseases. In this paper ANN method is efficiently used for classifying the disease in the plants such as self-organizing feature map, SVM, back propagation algorithm. These are the methods where we can precisely identify and classify several plant diseases.

In Paper [2] they proposed the classification of grape leaf diseases and leaf identification. The grape leaf images are classified then histogram of H and color channels are generated and the pixel values are noticed to classify the healthy and diseased tissues. Here the feature extraction is done by KNN classification algorithm in order to find the leaf diseases. This method is found as more accurate and effective.

Paper [3] is based on identifying plant leaf diseases using Convolutional Neural Network. It discusses CLASHE (Contrast Limited Adaptive histogram equalization) which is used for light intensity Equalization. The inputted images undergo color transformation structural methods. On the web framework using the leaf detection algorithm it identifies the leaf disease by the help of a database.

The paper [4] discussed classification of grape leaf disease detection. In this paper they implement the system using SVM (Support vector machine) classifications and mainly

represents the image acquisition, pre-processing, segmentation GLCM feature extraction where the GLCM is Gray level co-occurrence matrix and represents the distance and angular spatial relationship over an image sub-region of specific size.

While going through most of all paper related with leaf disease detecting, Where the Convolutional Neural Network classification method and support vector machine classification techniques most used methods and these methods are accurate and intensive.

III. PROPOSED SYSTEM

A. System Architecture Design

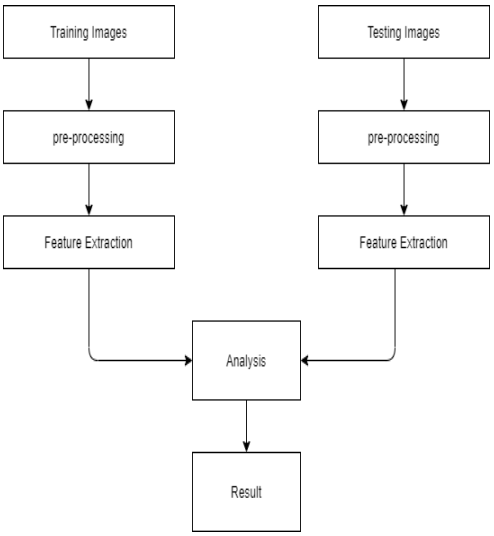

Figure 1: System Architecture

A system architecture is the applied model which characterizes a framework's structure, conduct and perspectives. An engineering depiction is a systematic description and representation of a system, laid out in a way that facilitates thinking about the framework's structures and practices. At first the raw input image from the data set is pre-processed by labelling and re-sizing and then the pre-processed images are sent for next phase through feature extraction which contains various convolution and pooling layer and then the resultis displayed.

B. Methods of Disease detection

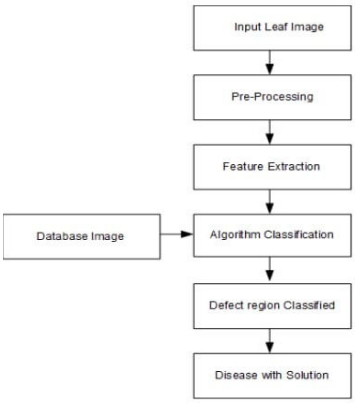

Figure 2: Detection Methods

1) Data Acquisition:

The leaf disease images have been taken from the plant village dataset. The acquired dataset consists of 20,638 images belonging to 15 classes. The dataset consists of all leaf disease that could affect the crops. Each of the downloaded images belongs to RGB color space by default and were stored in the uncompressed JPG format.

2) Data Pre-processing:

Image in the dataset were in various formats that is, in different resolution and quality. For better feature extraction and in order to gain consistency, the final images that were to be used as the dataset for deep neural network classifier were pre-processed. The procedure of images pre-processing involved identifying the image with least resolution and converting all the other images to the same resolution. Hence it was ensured that the images contained all the needed information for feature learning.

Images in the dataset will be segregated to different classes. To confirm the accuracy of classes in the dataset, the experts examined the leaf images and labelled them with appropriate disease acronym as it is very important to use images that are classified accurately for the training and validation dataset.

3) Feature Extraction

Convolutional neural network (CNN) can be used to construct a theoretical model that operates on unstructured image inputs and transforms them into corresponding output labels for the classification. They belong to the group of multi-layers neural network which can be trained for classification purpose to learn the necessary features. Compared to conventional approaches, they require less pre-processing and perform automatic extraction of features that delivers better performance. It consists of four layers: convolutional layer, activation layer, pooling layer and fully connected layer. Convolutional and pooling layers are used for feature extraction whereas the fully connected layers map the feature extraction into the final output which are used for classification. Activation layers are used for introducing non-linearity into the network. Keras which is an API for python is used in the process of implementation. The optimization

was carried out using Adam optimizer with categorial cross entropy as the loss function. Batch size of 8 has been used and the model has been trained for 20 epochs. The initial learning rate was set to 0.001.

IV. SYSTEM REQUIREMENT

- Hardware Interfaces
  - Processor: 2GHz Quad Core or more
  - RAM: 4GB or more
  - Hard Disk: 20GB
  - Input Device: Standard keyboard and Mouse.
  - Output Device: Monitor
- Software Interfaces
  - Programming Language: Python, HTML
  - Application Software: Anaconda, Django

V. TESTING

The testing varies each modules of the software, it must also be checked if they together as intended. The testing process of an integrated system is to check that it meets specified requirements. This is done using integration testing which tests multiple units or modules combined. Following table specifies the training accuracy and loss.

Epochs	Loss	Accuracy
0	1.0951	0.6538
1	0.6572	0.7720
2	0.6243	0.7692
3	0.5616	0.8462
4	0.4903	0.7885
5	0.3610	0.9038
6	0.5635	0.8462
7	0.6190	0.7981
8	0.4256	0.8558
9	0.2727	0.9135
10	0.4018	0.9038
11	0.1175	0.9519
12	0.2352	0.9231
13	0.1405	0.9423
14	0.0743	0.9712
15	0.1618	0.9423
16	0.0378	0.9904
17	0.0992	0.9519
18	0.0389	0.9808
19	0.1230	0.9712

Table 1: Training accuracy and loss

VI. RESULT ANALYSIS

- Image of the leaf is captured by using a mobile camera.
- The captured image is uploaded to the local server using an application.
- Image undergoes a training model in the server to determine the type disease.
- The determined disease is sent back as a response on the user application.
- With the disease name the proposed system also gives the solution for the diseases.
- If the plant leaf is healthy then it gives the result as heathy leaf.
- The below image shows the result part of proposed system which contains disease with solution.

Figure 3: Result and solution

VII. CONCLUSION

The proposed system was developed taking in mind the profit of the farmers and agricultural field. For effective crop production, accurate plant disease identification and classification is very important and this can be achieved by image processing technique. Using these methods, we can accurately determine and distinguish different plant diseases. Hence saving the loss and reducing the dependency on experts to a certain extent is possible. It can provide help for a person having less knowledge about the disease. The model is able to detect only a few diseases. In the future we can extend this model to detect more diseases.

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