International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 07 | July 2021 www.irjet.net p-ISSN: 2395-0072

PLANT DISEASE DETECTION USING LEAF IMAGES

Sahana Uday Naik[1], Sudhakara B [2], Rashmi K[3]

[1]Student of Department of Computer science, Srinivas Institute of Technology Mangalore, Karnataka
[2]Faculty of Department of Computer science, Srinivas Institute of Technology Mangalore, Karnataka
[3]Student of Department of Computer science, Srinivas Institute of Technology Mangalore, Karnataka

---

Abstract - *Plants play a significant role in survival of all organisms on earth. because of this have fact, it's vital to confirm that the measures are taken to detect and mitigate disease in plants disease are major problem within the agricultural sector. Accurate and rapid detection of disease and pests in plants can help to develop an early treatment technique while greatly reducing economic losses. Now a day's disease detection has received increasing attention in monitoring large field of crops.*

Automation in disease detection and diagnosis is one in all the challenging research areas that gained significant attention within the agricultural sector. Traditional disease detection methods depend on extracting handcrafted features from the acquired images to spot the kind of disease. Also, the performance of those works solely depends on the character of the handcrafted features selected. this may be addressed by learning the features automatically with the assistance of Convolutional Neural Network (CNN).

Key Words: Convolutional Neural Network, Plant Village dataset, Convolution and pooling layers, Image Pre-processing, Feature Extraction

1.INTRODUCTION

Agriculture has become far more than simply a way to feed ever growing population. India is well-known for agriculture. during this situation the yield of the crops must be high and of fine quality which results in an honest amount of income in agriculture. Diseases in crops may affect both qualities furthermore as quantity of the crops. Crop diseases are mainly of three types namely bacterial, fungal and spots. Plant diseases effect the humans directly or indirectly by health or also economically. Traditional methods were wont to detect the diseases which led to the utilization of enormous number of pesticides harming the soil and also the character. We try to analyze the disease using machine learning concepts so it helps the farmers to detect the diseases faster and increase the crop yield. agriculture and it contributes a majority to the economy.

The proposed method is predicated on the employment of Convolutional Neural Network (CNN) with the desirable goal of accurate and fast classification of diseases. Convolutional Neural Networks are very successful in various computer vision tasks, like object detection and recognition, classification, and biometry. The convolution layers of a CNN may be seen as matching filters that are derived directly from the information. CNNs thus produces a hierarchy of visual representations that are optimized for a particular task. As a results of CNN training, a model is obtained, a group of weights and biases which then responds to the particular task it absolutely was designed for. one among the main strengths of CNNs is their capacity of generalization i.e., the power to process data never observed before.

1.1 PROBLEM STATEMENT

The task here is to automatically detect and classify the diseases from leaf images acquired from database. The symptoms of plant discases are conspicuous in several parts of a plant like leaves, stems etc. Manual detection of plant diseases using leaf images may be a tedious job. Hence, it's required to develop computational methods which is able to make the method of disease detection and classification using leaf images automatic.

1.2 OBJECTIVE

The objective of Plant disease detection using leaf images is to design an incremental model to detect the plant diseases ignoring external features like environment, noise and background. This focuses on identifying various diseases in plants and to ease the job of farmers or to educate the farmers about the disease detected. An approach of classification using Convolutional Neural Network that has very good working efficiency produces the accurate results. The system helps to improve the performance. Maintaining the project is easy and manageable.

2. LITERATURE SURVEY

Detection of Plant Leaf Diseases using CNN[1]: The proposed method is used for predicting leaf diseases. This paper explains about the experimental analysis of their methodology. Samples of 38 images are collected that are comprised of different plant diseases like tomato, grapes, apple and healthy leaves. Different number of images is collected for each disease that is classified into database images and input images. The primary attributes of the image are based upon the shape and texture-oriented features. In this method when a new input image is given, then the module extracts the leaf features. Then it goes through the CNN model. It then compares the features with

the already trained dataset. Then it goes through dense CNN and leaf features are extracted separately. Then the module will predict whether the plant is affected by any disease or not. It shows the output from one of the 38 classes which was predetermined and trained. The dataset is pre-processed such as image reshaping, resizing and conversion to an array form. The trained dataset is used to train the model (CNN) so it can identify the test image and the diseases it has. In this paper various CNN layers have been discussed that are Dense, Dropout, Activation, Flattern, Convolution2D and MaxPoolin2D. When the model is trained successfully, the software can identify the disease if the plant species is contained in the dataset. After successful training and pre-processing, comparison of the test image and trained model takes place then the disease will be predicted.

Plant Disease Detection and Classification Using Deep Neural Networks[2]: This paper presents a deep learning approach to detect and classify plant disease by examining the leaf of the given plant. Here, the classification is performed in multiple stage to eliminate possibilities at every stage., hence providing better accuracy during prediction. A YOLOV3 object detector is used to extract a leaf from input image. The extracted leaf is analysed through a series of ResNetl8 models. These models were trained using transfer learning. One layer identifies the type of leaf and following layer checks for the possible disease that occur in the plant. There has been a lot of research around classifying the disease in plant using image processing. The research includes use various Machine learning and Deep learning to finish the task. Machine learning includes image segmentation. support vector machine, using shape feature and K-Nearest Neighbors (KNN), K-means and Artificial Neural Network (ANN) and Probabilistic Neural Network (PNN). Deep Learning based plant discase classification models includes the use of variety of CNN model such as Alex Net, GoogleNet, modified GoogleNet, LeNet and deconvolution Network. The dataset used in this is called as Plant Village Dataset was obtained from SP Mohanty's Git-Hub repository. The dataset consists of raw images and other useful data.

Plant Disease Detection Using Machine Learning. [3]:Crop diseases are a noteworthy risk to sustenance security, however their quick distinguishing proof stays troublesome in numerous parts of the world because of the nonattendance of the important foundation. Emergence of accurate techniques in the field of leaf-based image classification has shown impressive results. This paper makes use of Random Forest in identifying between healthy and diseased leaf from the data sets created. Our proposed paper includes various phases of implementation namely dataset creation, feature extraction. training the classifier and classification. The created datasets of diseased and healthy leaves are collectively trained under Random Forest to classify the diseased and healthy images. For extracting features of an image, we use Histogram of an Oriented Gradient (HOG). Overall, using machine learning to train the large data sets available publicly gives us a clear way to detect the disease present in plants in a colossal scale.

Classification and Detection Technique Using Plant Leaf Disease[4]: Here pre-process is done before feature extraction. RGB images are converted into white and then converted into grey level image to extract the image of vein from each leaf. Then basic morphological functions are applied on the image. Then the image is converted into binary image. After that if binary pixel value is 0 its converted to corresponding RGB image value. Finally, by using pearson correlation and dominating features set and Naive Bayesian classifier disease is detected. Detection of unhealthy plants leaves include some steps are RGB acquisition. Converting input image from RGB to HSI format. Masking and removing the green pixels. Components using Ostu's method. Computing the texture features using color occurance methodology and finally classifying the disease using Genetic Algorithm.

3. SYSTEM DESIGN

The purpose of the look phase is to plan an answer of the matter specified by the need document. the planning of a system is maybe the foremost critical factor affecting the standard of the software, and includes a major impact on the later phases, particularly testing and maintenance. The output of this phase is that the design document. the planning activity is usually divided into two separate phases they're system design and detailed design.

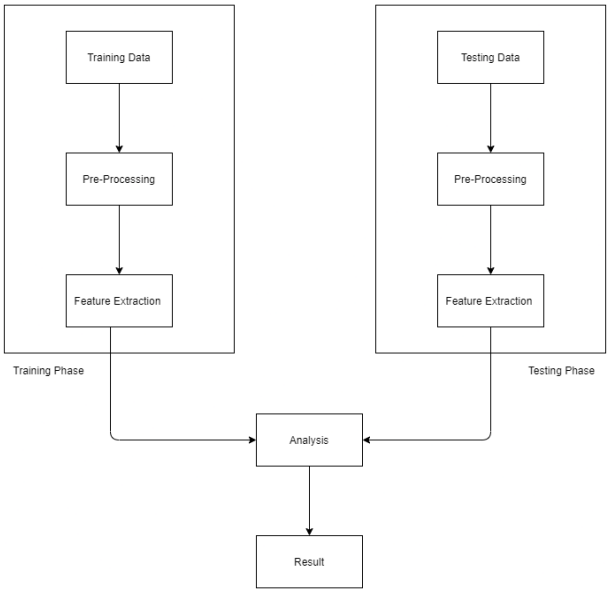

Figure- 3.1: System architecture diagram

Figure 3.1 shows the system architecture of Plant Disease Detection using Leaf Images. The training data and the testing data is pre-processed and the feature extraction of

the training phase and testing phase is analyzed which then produces the result.

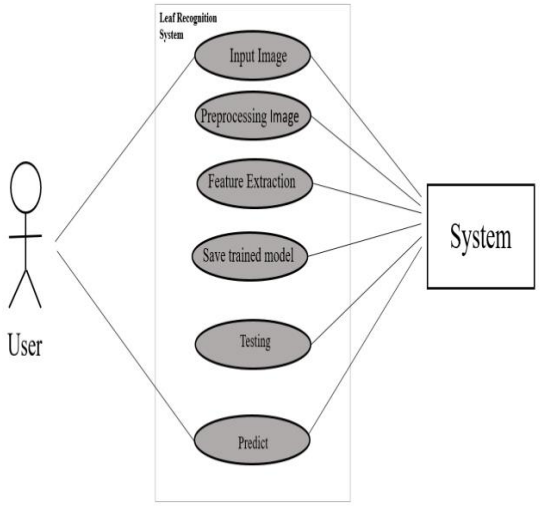

Figure- 3.2: Use case diagram

In Figure 3.2 The user selects the image and gets the result displayed to him. The system receives the input image and preprocesses the image, then extracts the features, saves the trained model, does the testing then predicts and displays the result.

4. SYSTEM IMPLEMENTATION

System Implementation is that the stage where the theoretical design is converted into a working system, the new system is additionally totally new, replacing an existing manual, or automated system or it should be a major modification to an existing system. The system is implemented using Visual Studio Code and data set.

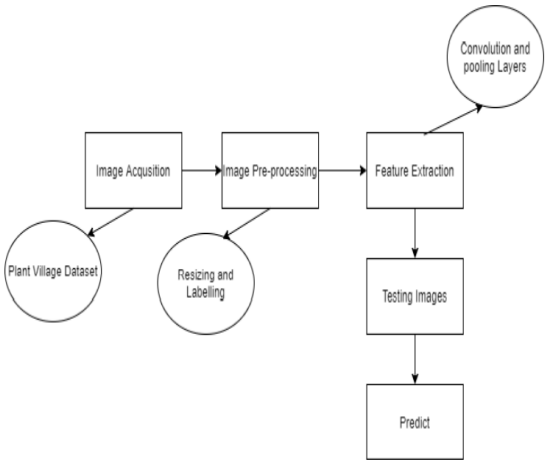

Figure- 4.1: Data Flow diagram

Figure 4.1 shows the data flow diagram for Plant Disease Detection using Leaf Images. The image is acquired and is saved in the Plant Village Dataset. The image pre-processing takes place, then its resized and labelled, and the feature extraction takes place. After feature extraction, the convolution and pooling layers, and the testing of images is done. After testing of images, the prediction is done, and the prediction result is displayed as output.

Pseudocode for training images

Labelled images of leaves
for Every image in training image in dataset do
I ← image
Preprocessing
$I_{resized}$ ← Image Resizing(I)
$I_{feature\ extraction}$ ← feature extraction($I_{resized}$)
Pass this instance to the pre-trained model
Get the output
Calculate the loss
Update weights based on loss for n number of epochs
end for
Save the model trained

Pseudocode for testing images

Labelled images of Leaves
Input image I
Preprocessing
$I_{resized}$ ← Image Resizing(I)
$I_{feature\ extraction}$ ← feature extraction($I_{resized}$)
The testing image will be classified based on the trained model
The output will be displayed

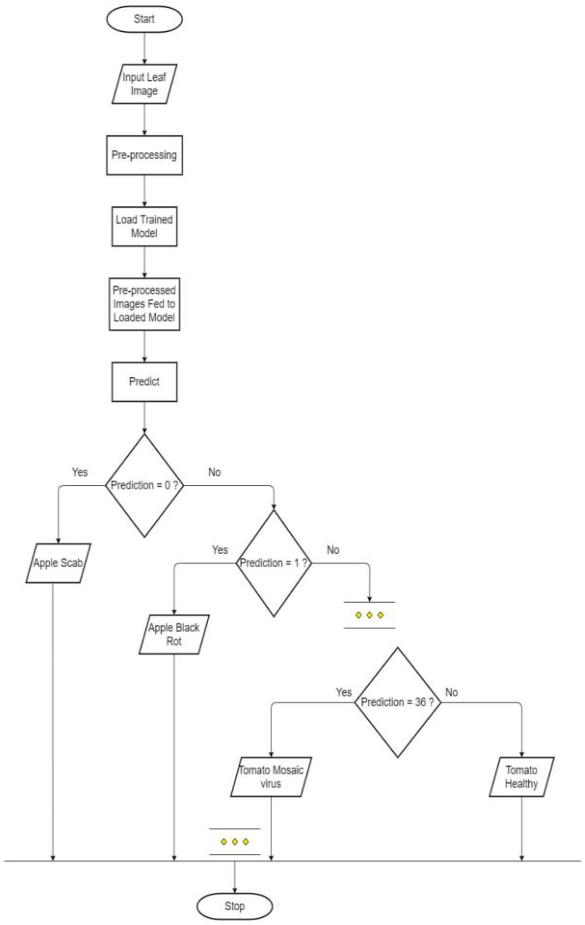

Figure- 4.2: Flow Chart diagram

A system flowchart symbolically shows how data flows throughout a system and how event controlling decisions are made. Initially the leaf image is input, and the pre-processing of the input image takes place followed by segmentation. Later the images are classified according to their extracted feature. Finally, the name of the plant disease is detected. The steps involved is shown in the figure 4.2

5. RESULT

The output of non-real time is given below:

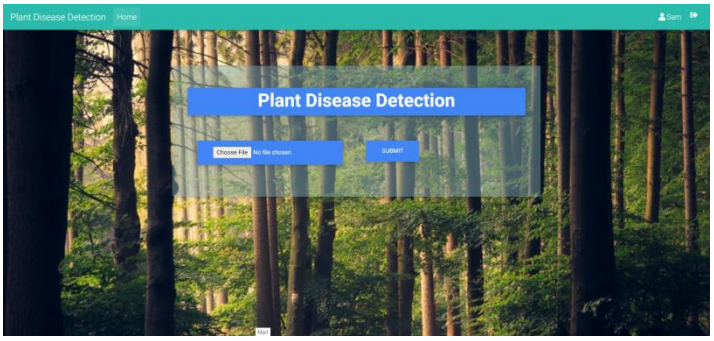

Fig 5.1: shows the Home Page of the Plant Disease Detection system. This page appears once the user login is completed. User can choose file and submit it. It also has logout option.

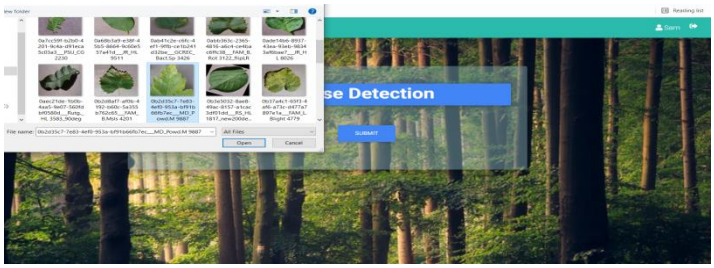

Fig 5.2: shows the collection of different leaf images of the Plant Disease Detection system. Images are in the form of .jpg extensions. The user will select a particular image for detection. The selected image will be displayed in the homepage and can be used for predicting the result.

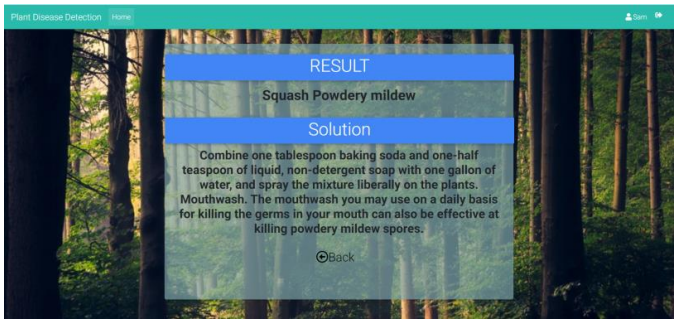

Fig 5.3: shows the result and solution of the selected image. It detects the disease and corresponding solution for the disease detected is displayed that can be taken as cure.

6. CONCLUSION

In conclusion it can be said that The Plant Disease Detection has increasingly important role in shaping the future of farming. Protecting crops in farm is not an easy task it depends on thorough knowledge of the crop being grown and possible pests. The application developed addresses the problem of manual detection of non-real time plant diseases. The project demonstrates CNN method to recognize the plant diseases in non-real. The experiment demonstrates that the CNN obtained 97% accuracy in non-real time. Using the leaf images and the CNN is used to detect the plant disease and remedies.

As a future work the system can be upgraded to a real time video entry system that allows unattended plant care. Studies shows that managing plant diseases can help increase yields. Create an android/iOS app instead of website which will be more convenient to user.

REFERENCES

[1]Ghaiwat Savita N, Arora Parul. Detection and classification ofplant leaf diseases using image processing techniques: areview. Int J Recent Adv Eng Technol 2014;2(3):2347–812. ISSN(Online)

[2]Dhaygude Sanjay B, Kumbhar Nitin P. Agricultural plant leafdisease detection using image processing. Int J Adv Res ElectrElectron Instrum Eng 2013;2(1).

[3]Rathod Arti N, Tanawal Bhavesh, Shah Vatsal. Imageprocessing techniques for detection of leaf disease. Int J AdvRes Comput Sci Softw Eng 2013;3(11).

[4]Bhanu B, Lee S, Ming J. Adaptive image segmentation using agenetic algorithm. IEEE Trans Syst Man Cybern Dec1995;25:1543–67.

[5]Bhanu B, Peng J. Adaptive integrated image segmentation andobject recognition. IEEE Trans Syst Man Cybern Part C2000;30:427–41.

[6]Vijayaraghavan Venkatesh, Garg Akhil, Wong Chee How, TailKang, Bhalerao Yogesh. Predicting the mechanicalcharacteristics of hydrogen functionalized graphene sheetsusing artificial neural network approach. J Nanostruct Chem2013;3:83

.[7]Garg Akhil, Garg Ankit, Tai K. A multi-gene geneticprogramming model for estimating stress-dependent soilwater retention curves. Comput Geosci 2014:1–12.

[8]Garg Akhil, Garg Ankit, Tai K, Sreedeep S. An integrated SRM-multi-gene genetic programming approach for prediction of factor of safety of 3D soil nailed slopes.Eng Appl Artif Intell201430:30-40.