

# Plant Leaf Disease Detection Using Image Processing

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**ABSTRACT:** India is a country that depends on agriculture for round 70% of the population. It is therefore maximum crucial to pick out the plant sicknesses. Preventing losses within the yield and quantity of agricultural products relies upon on proper plant disease detection and prevention. Identifying plant diseases involves the use of photos to predict plant diseases. Disease detection and fitness tracking of plant may be very challengeable for sustainable agriculture. Identification of plant disease could be very difficult whilst working manually. Gathering both understanding and analytical paintings together with useless processing time is vital. The proposed paintings is for the detection of plant diseases primarily based on image processing. Detection of ailment consists of methods consisting of acquisition of pics, pre-processing of pics, segmentation of pix, and extraction of capabilities. This paper uses Convolutional neural community to discover the strategies used to identify plant sicknesses. This paper also addressed several strategies of segmentation and extraction of capabilities used with greater accuracy in the identification of plant disease.

**KEYWORDS:** Image acquisition, Image Segmentation, Feature Extraction, Convolutional Neural Network.

## I. INTRODUCTION

The current research for the prognosis of plant disorder is totally based totally on professional observation through which plant ailment identity and detection is performed. Large group of specialists is wanted for non-stop tracking, which fees very excessive when farms are large. For better accuracy and high reliability, the want for plant ailment detection is based on machine learning. On the basis of gadget gaining knowledge of and photograph processing, we can broaden plant ailment detection and prediction era. We will work on the confined length of the photo dataset of the plant leaf. We use Convolutional neural community to reap excessive detection accuracy.

The proposed method is used to classify and identify the various diseases that infect flora. A reputation machine is totally based on gadget gaining knowledge of have to show to be very useful in improving the Indian economy's financial situations. The photograph processing methods are the approach given in this for extraction of the leaf characteristic. Convolutional neural networks are to be used for automatic detection of diseases in leaves. The proposed technique may be impactful and effective for leaf detection, and it seems to be an critical technique. This gadget acquires various pix of plant leaves for extraction of features. The evaluation phase, pre-processing unit is used to take away noise, to transform gray scale the usage of Gaussian clear out, to transform binary images. Use the OTSU method accompanied by way of extraction of the function. Convolutional Neural Network (CNN) might be utilized in our device for future recognition in which we've got the input unit of plant leaf photographs education information set. Next we've got a hidden unit that acts in this schooling dataset to assess the results teach model of the output unit. This complete CNN works by contemplating the factors, specifically the matrix feature of plant leaf images, for designing a teach version for recognition of plant disease. When managing real-time plant sickness detection, we will face obstacles so that it will now not produce correct consequences. In the future, to clear up this constraint, we have to work with real-time statistics collection.

## II. LITERATURE SURVEY

Sabah Bashir et. al [1] Offers illness detection in *Malus domestica* via the usage of using an effective approach which incorporates K-recommend clustering, texture and colour assessment. To sorting and detection certainly one of a kind agriculture, it used that the feel and shade capabilities the ones usually determined in regular and infected regions. In upcoming days, for type purpose given classifiers furthermore can be used, like K-manner clustering, Bayes classifier and most vital element classifier.

Smita Naikwadi et. al [2] states that histogram matching is used to apprehend the plant illness. In plants, disease founds on leaf therefore the histogram matching is executed on the bottom of aspect detection method and colour function. Layers separation method is used for the training purpose which involves the training of these samples which differentiates the layers of RGB sample into red, green, and blue layers. The facet detection approach is used to

drawing edges of the layered pix. Spatial Gray-level Dependence Matrices are used for growing the shade co prevalence texture evaluation method.

Sanjay B. Patil et. al [3] affords the Triangle threshold and commonplace threshold approach. These techniques are implemented to lesion region area and corporation the leaf area. In final step, class of sickness is performed through way of calculating the quotient feature of leaf place and lesion location. According to the research completed, the given technique can be very rapid and correct for calculating leaf sickness severity and leaf place calculation is accomplished by the use of threshold segmentation.

Anand H. Kulkarni et al. [4] gives a method for early and appropriately plant sicknesses detection, using artificial neural network (ANN). The various image processing techniques is also utilized in it. As the proposed technique is depending on ANN classifier for category and Gabor clear out for function extraction, it receives higher consequences with a identity price of as much as 91%. An ANN primarily based definitely classifier classifies great plant illnesses and implemented the fusion of textures, colour and features to stumble on the ones plant illnesses.

S. Arivazhagan et. al [5] states that ailment identification mechanism entails some procedures out of which 4 essential strategies are as follows: first, for the input RGB plant leaf image, a shade transformation form is taken, after which the usage of a particular threshold value, the green pixels are grouped and eliminated, that is further followed via manner of segmentation system, and for extracting useful segments the feel statistics are calculated. At closing, classifier is used for the functions which might be evaluated to differentiate the ailment. The proposed set of rules suggests its performance with an accuracy of ninety four% in a fulfilment kind and detection of the detected ailments. The robustness of the proposed set of guidelines is concluded thru using experimental results of about 500 plant leaves in a database.

Savita N. Ghaiwat et al. [6] presented Survey on distinct kind methods is getting used for plant leaf ailment type. For given test example, okay-nearest-neighbor method is appears to be applicable in addition to simplest of all algorithms for sophistication prediction. If education facts is not linearly separable then it's miles challengeable to have a have a look at advanced parameters in SVM, that's one in all its drawbacks.

Prof. Sanjay B. Dhaygude et. al [7] states That there are four steps in invented processing scheme, out of which, first one is, for the input RGB photo, a colour transformation form is created, due to the reality this RGB is used for shade generation and transformed or transformed picture of RGB, this is, HSI is used for color descriptor. In step second, threshold price is used to masked and removed the inexperienced pixels. In zero.33 section, through the usage of pre-calculated threshold degree, casting off of green pixels and defensive is completed for the useful segments which may be evaluated first on this technique, even as picture is segmented. And in last or fourth critical step the segmentation is completed.

Mrunalini R. Badnakhe et. al [8] states that the approach to categorise and locate the more than one sicknesses thru which vegetation are infected. In Indian Economy the Machine mastering reliable recognition system will shows to be very useful as it saves efforts, time and money too. The color Co-incidence approach is used in this implementation for function set extraction. For automatic identification of sicknesses in plant leaves, neural networks are used. The method used can substantially guide an accurate detection of leaf, and seems to be crucial method, in case of steam, and root illnesses, placing minimal efforts in calculations.

### III. SYSTEM DESIGN

We are going to overcome existing trouble of much less yield and exceptional lack of vegetation due to more than one disease. The system learning answer is applied to correct detection of plant leaf diseases. In modern-day paintings achieved we are going to work on photo processing strategies with the benefits of Convolutional neural network characteristic of accuracy in photo class and recognition. We are the use of plant leaf dataset for schooling purpose to create train version with the intention to similarly use to classify plant sicknesses appropriately.

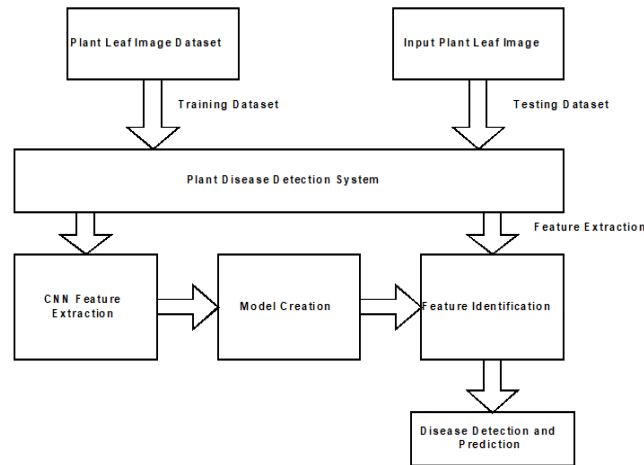


Fig. System Architecture

We are going to develop following modules:

**1. Plant leaf image acquisition**

Open-CV (Open Source Computer Vision) is a bundle of programming functions used for dynamic picture processing with computer vision. In our implementation we're going to use open compute imaginative and prescient for taking plant leaf images for further processing. After getting plant leaf images processing carried out on it for eliminating noise from it.

**2. Image processing**

After getting plant leaf picture it will send for picture processing module. In photograph processing photograph receives transformed in gray format with the aid of putting off noise in it using Gaussian filter out. After grey conversion is of image thresholding by using setting RGB colour values to 0 and is keeping handiest black and white [0 and 1] values. Gray to binary conversion is performed with the aid of the use of OTSU's approach. After getting black formatted photograph hand shape get extracted from photo. The genuine form of hand will get by drawing side using canny part detection technique. After processing unit extract disease infected location from input image.

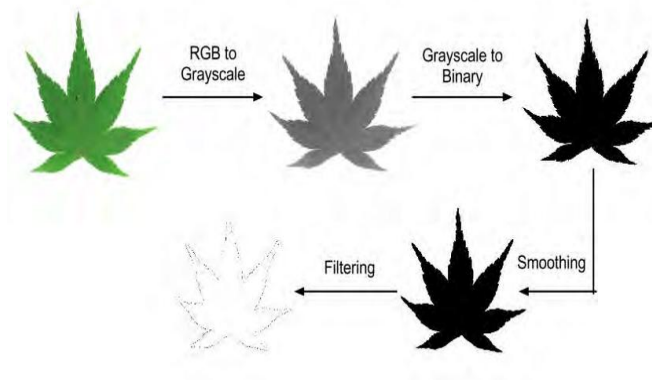


Fig. Processed plant leaf image

**3. Feature extraction**

After getting specific form of plant sickness infected vicinity capabilities get extracted from it by the use of pixels weight calculations. The photograph pixels get drafted in matrix with the aid of the usage of weight gradient capabilities simplest on drawn place of sicknesses. Feature extraction achieved on all plant photograph dataset for training version introduction and drafting. The teach version introduction accomplished through the use of deep learning (CNN) algorithm.

**4. Feature mapping & model generation**

The plant leaf image dataset goes via image processing and subsequent phases of characteristic extraction. After getting photograph capabilities those statistical features get mapped on system document which is nothing however educated version. The runtime testing photograph receives matched with pre skilled version and respective effects will be generated. After final results technology those effects is nothing but our preference plant ailment detection and prediction results.

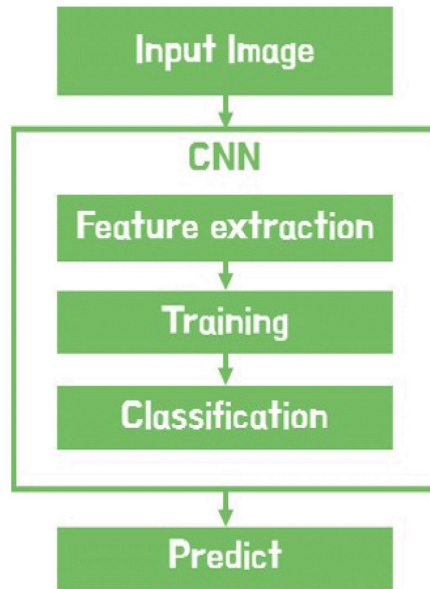


Fig. CNN model generation

**IV. EXISTING SYSTEM APPROACH**

There are exceptional tactics for plant sickness detection is being used before. The plant leaf pictures from dataset are used for similarly processing. Digital image processing is a subject that analyses picture processing methods. Mathematically, the picture is a method of mild intensity on two-dimensional discipline. The photograph to be processed with the aid of a device or pc, a picture ought to be supplied statistically with numerical values. A digital image may be said through a two-dimensional matrix  $f(m, n)$  along with M columns and N rows. The shade picture processing [RGB], there are distinct fashions are like hue and saturation, amount (HSV) framework. This framework is used with an object with a particular colour may be recognized and to decrease the undesirable depth of light from the opposite facet. Further Tests on pictures were completed the use of six types of colours, i.e. brown, yellow, inexperienced, blue, and black and white.

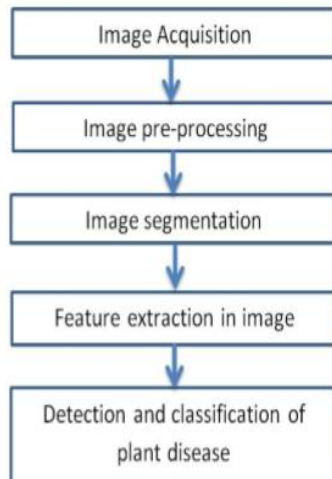


Fig. Existing Approach

#### A) Image Acquisition

The snap shots of the plant leaf are getting through the gadget dataset of plant leaf photographs. This photo is in RGB (Red, Green And Blue) form. Color transformation structure for the RGB leaf picture is created, and then, a device-independent colour area transformation for the colour transformation structure is applied.

#### B) Image Pre-processing

To take away noise in image or different object removal, specific pre-processing techniques is taken into consideration. Image clipping i.e. cropping of the leaf photograph is to get the interested photograph vicinity. Image smoothing is finished the use of the smoothing filter. Image enhancement is executed for growing the assessment.

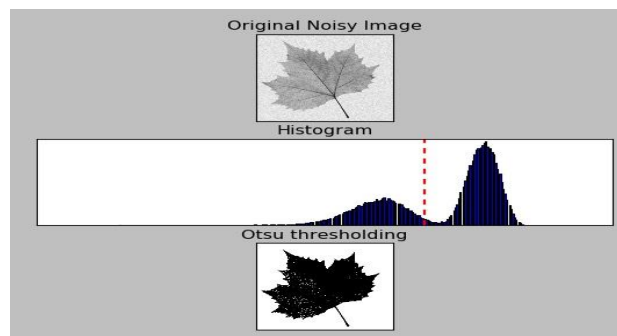


Fig. Binary formatted plant image

#### C) Image Segmentation

Segmentation method will partition of image into various part of same capabilities or having a few similarity. The segmentation can be used to accomplished using various strategies like otsu' technique, okay-technique clustering, changing RGB image into HIS version and so on.

### V. RESULTS AND DISCUSSION

In plant leaf disease detection and stage prediction system we have been implemented highly trained model that can accurately recognize diseases. In this system we used Gaussian blur for gray scale conversion, Otsu's method for binary conversion of images after that we used convex hull for edge detection.

#### A. Gray scale conversion

In gray scale conversion colour image is converted into a gray form using Gaussian blur. Colour image containing noise and unwanted background which is removed or blurred by using this method.



Fig.3 Gray Image

#### B. Binary conversion

Gray scale image is given to input for Otsu's method for binary conversion. In Binary form of images converted in 0 and 1 form means black and white.

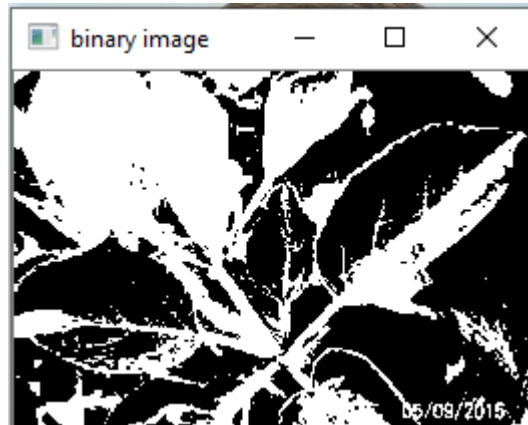


Fig.4 Binary Image

**C. Edge Detection**

In Edge detection binary image get dimensions by counters using convex hull algorithm. In which eccentricity finding drawing edges around white portion of binary image.

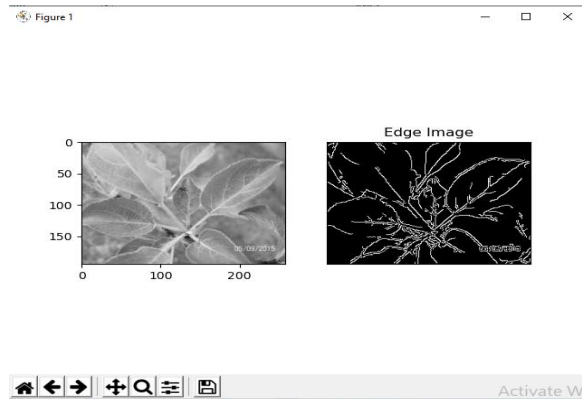


Fig.5 Edge Detection Image

**D. Training Model**

In our system we are using tensor flow for extracting feature's of training dataset. In which 12000 image samples are trained by using training model. Finally plot files generated as an output of our trained model.

**E. Testing Model**

In final phase of data testing in which leaf disease and normal leaf images were matched by our training model with higher percent of accuracy.

After matching all type of disease images respective results of stage and detection display on console and stored in text file as well.

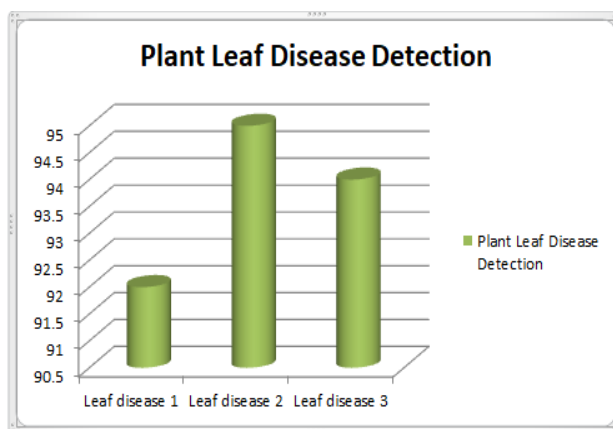
TABLE I

In our experimental setup, In table 1 describe our system modules and respective generated output.

Disease Type	Accuracy	Time Taken(sec)
Leaf Disease 1	87	609
Leaf Disease 2	85	740
Leaf Disease 3	89	910

Table 1 Plant leaf disease stage evaluation criteria

#### F. Comparative Study Graph



Graph 1: Average Accuracy Rate

#### G. Accuracy Rate of System

All plant leaf image samples were trained by our trained model using deep neural network. Thus we have archived high accuracy near about 98%.

### VI. CONCLUSION

We are invented the plant disease detection and prediction based on deep neural network and machine gaining knowledge of methods. It could be very essential for the hit cultivation of crop and this may be achieved using image processing. This paper goes to invent the numerous strategies to segment the ailment part of the plant. This paper additionally mentioned a few Feature extraction and type strategies to extract the features of inflamed leaf and the classification of plant diseases.

### FUTURE WORK

Our future research will be extended for further improvement in crop disease recognition accuracy and work for real time disease recognition.

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