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Early Detection of Disease in Arachis Hypogaea Leaves by using Ml Techniques

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Abstract: ***Plants are really important for the planet and for all living organisms. Plant disease, an impairment of the normal state of a plant that interrupts or modifies its vital functions. Leaf diseases are the most common diseases of most plants. One of the ultimate key factors besttow less yield is disease attack. The groundnut plant disease such as fungi, soil borne and viruses. In this paper, I have given that software determination to robotically classify and categorize groundnut leaf diseases. This method will improve production of crops. It comprises of number of steps viz. image acquisition, image pre-processing, segmentation, feature extraction and classifier using K Nearest Neighbor (KNN). To increase performance of existing algorithm the SVM classifier is replaced with KNN classification. In order to increase the speed and accuracy of the network to identify and classify the regions infected of different diseases on the groundnut leaves, classic neural networks algorithms are used. In this paper, I have categorized only 4 different diseases using KNN classifier Algorithm.***

Keywords: Image Acquisition, Image Preprocessing, Image Segmentation, Feature Extraction, Detection & Classification Of Plant Disease, KNN Classification, Neural Network, Precision Agriculture.

I. INTRODUCTION

Agricultural productivity is something on which economy highly depends. This is the one of the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected.

In India 70% of the population is depend on Agriculture, Mainly in groundnut plant disease have turned into a dilemma so it can instigate important decrease in both superiority and capacity of agricultural commodities, Digital image processing and image analysing technology adopted in practice for detection and identification of plantdisease.

Groundnut (Arachis hypogaea) is an important oilseed crop in India and is cultivated during kharif and rabi-summer. Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan and Maharashtra are major groundnut growing states contributing about 80 percent area and production in India. The average yield of rabi-summer groundnut is around 1600 kg/ha, whereas kharif-groundnut is around 1000 kg/ ha which is lower than major groundnut growing countries. This may be attributed to the rainfed nature of cultivation of this crop coupled with attack by a variety of diseases and insect pests. The role of groundnut diseases in reducing yield has been clearly demonstrated. More than 55 pathogens including viruses have been reported to affect groundnut.

Among diseases, stem rot-collar rot (Sun rot), leaf spots (early and late), Rust and bud necrosis affects the groundnut crop both in kharif andrabi-summer. Of the seed and seedling diseases, collar rot/seedling blight , stem rot/Sclerotium wilt dry wilt or dry root rot have been recognized as economically important diseases. These diseases cause severe seedling mortality resulting in patchy crop stand mostly in sandy loam soil and reduce the yields from 25-50% . Among the foliar fungal diseases , economically important are early leaf spot, late leaf spot and rust. Early leaf spot is caused by Cercospora arachidicola Hori and late leaf spot is caused by Phaeoisariopsis personata Berke & Curt both commonly called ‘tikka disease’. These diseases occur wherever the groundnut crop is grown. The magnitude of yield losses caused by these diseases is very high and ranged from 10 to 70% all over the world, but vary considerably from place to place and between seasons. Among viral diseases, groundnut bud necrosis and stem necrosis diseases are economically important. Groundnut bud necrosis disease caused by Groundnut bud necrosis tospovirus is widespread with a wide host range and is transmitted by Thrips palmi. Alternaria leaf blight had been occurring severely in summer groundnut. .More than 70 species of plant parasitic nematodes have been reported in association with groundnut disease but only a few species are known to cause economically important disease.

The existing method for plant disease detection is simply naked eye observation by experts through which identification and detection of plant diseases is done. Whereas if automatic detection technique is used it will take less efforts, less time and become more accurate.

II. LITERATURE SURVEY

Ghaiwat et al. presents survey on different classification techniques that can be used for plant leaf disease classification. For given test example, k-nearest-neighbor method is seems to be suitable as well as simplest of all algorithms for class prediction. If training data is not linearly separable then it is difficult to determine optimal parameters in SVM, which appears as one of its drawbacks [1].

Prof. Sanjay B. et al.,[2] Agricultural plant leaf disease detection using image processing (2013) describe that there are mainly four steps in developed processing scheme, out of which, first one is, for the input RGB image, a color transformation structure is created, because this RGB is used for color generation and transformed or converted image of RGB, that is, HSI is used for color descriptor. In second step, by using threshold 42 Information Processing in Agriculture 4 (2017) 41 – 4 9 value, green pixels are masked and removed. In third, by using pre-computed threshold level, removing of green pixels and masking is done for the useful segments that are extracted first in this step, while image is segmented. And in last or fourth main step the segmentation is done.

Mrunalini et al. [3] presents the technique to classify and identify the different disease through which plants are affected. In Indian Economy a Machine learning based recognition system will prove to be very useful as it saves efforts, money and time too. The approach given in this for feature set extraction is the color co-occurrence method. For automatic detection of diseases in leaves, neural networks are used.

The approach proposed can significantly support an accurate detection of leaf, and seems to be important approach, in case of steam, and root diseases, putting fewer efforts in computation.

S. Arivazhagan et al.,[4] Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture features (2013) disease identification process include some steps out of which four main steps are as follows: first, for the input RGB image, a color transformation structure is taken, and then using a specific threshold value, the green pixels are masked and removed, which is further followed by segmentation process, and for getting useful segments the texture statistics are computed. At last, classifier is used for the features that are extracted to classify the disease. The robustness of the proposed algorithm is proved by using experimental results of about 500 plant leaves in a database.

Harshadkumar B Prajapati, Jitsh Shah, Vipul Dabhi [5] Detection and classification of rice plant diseases (2017) In this proposal, Identification of diseases from the images of a plant is one of the interesting research areas in the agriculture field, for which machine learning concepts of computer field can be applied. This article presents a prototype system for detection and classification of rice diseases based on the images of infected rice plants. This prototype system is developed after detailed experimental analysis of various techniques used in image processing operations. We consider three rice plant diseases namely Bacterial leaf blight, Brown spot, and Leaf smut. We capture images of infected rice plants using a digital camera from a rice field. We empirically evaluate four techniques of background removal and three techniques of segmentation.

Limitation of existing work:

1) The implementation still lacks in accuracy of result in some cases. More optimization is needed.
2) They have used simple image processing classifier algorithm.
3) For plant disease detection is simply naked eye observation by experts through which identification and detection of plant diseases is done.

III. PROPOSED METHODOLOGY

The advantages of proposed algorithm are as follows:

1) The detection accuracy is enhanced with proposed algorithm.
2) Proposed method is fully automatic while existing methods require user input to select the best segmentation of input image.
3) It also provides environment friendly recoverymeasures of the identified disease.

The flowchart is shown in figure 1 indicating steps in plant disease detection. Digital camera or similar devices are use to take images of leafs of different types, and then those are used to identify the affected area in leafs. Then different types of image processing techniques are applied on them, to process those images, to get different and useful features needed for the purpose of analyzing later.

A. Image Acquisition

Image acquisition is the very first step that requires capturing an image with the help of a digital camera. Image acquisition is the creation of a digitally encoded representation of the visual characteristics of an object, such as a physical scene or the interior structure of an object.

B. Image Preprocessing

Preprocessing of input image to improve the quality of image and to remove the undesired distortion from the image.
Here we are using image scaling. Image scaling is used to convert the original image into thumbnails because the pixel size of original image is large and it require more time for the overall process hence after converting the image into thumbnails the pixel size will get decreases and it will require less time. Clipping of the leaf image is performed to get the interested image region and then image smoothing is done using the smoothing filter. To increase the contrast Image enhancement is also done.

C. Image Segmentation

Mostly green colored pixels, in this step, are masked. In this, we computed a threshold value that is used for these pixels. Then in the following way mostly green pixels are masked: if pixel intensity of the green component is less than the pre- computed threshold value, then zero value is assigned to the red, green and blue components of the this pixel.

D. Feature Extraction

Feature Extraction is an important part in the disease detection. For feature extraction the method used is color cooccurrence method. It is the methodology in which both the texture and color of an image are considered. Features called as texture features.
There are three major mathematical processes in the color co-occurrence method. First, conversion of the RGB images of leaves is converted into HSV because RGB is for color generation and color descriptor. The next step is plane separation. Next performed the color features. Then using KNN algorithm detection of leaf disease is done.

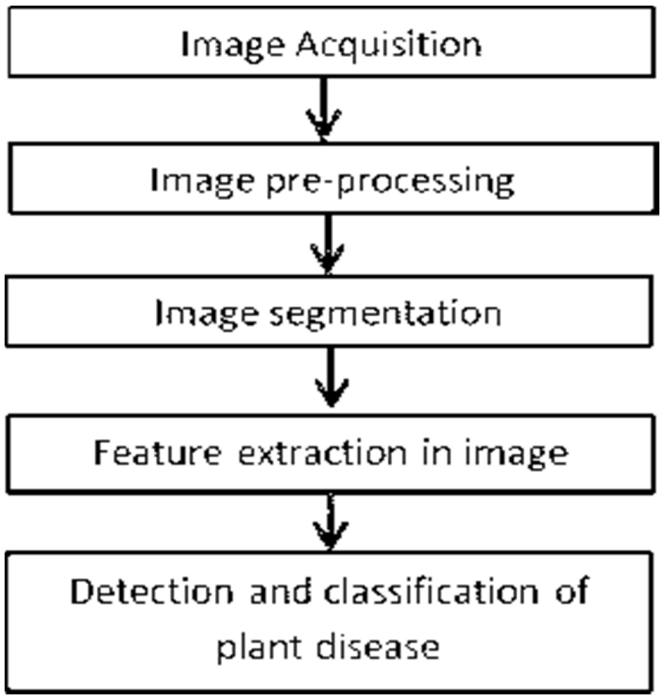

Fig 1- Flowchart

1) *KNN Algorithm:* The KNN flow is shown in figure 2. The k-Nearest Neighbors (KNN) family of classification algorithms and regression algorithms is often referred to as memory-based learning or instance-based learning. Sometimes, it is also called lazy learning. These terms correspond to the main concept of KNN. The concept is to replace model creation by memorizing the training data set and then use this data to make predictions. The KNN algorithm uses a majority voting mechanism. It collects data from a training data set, and uses this data later to make predictions for new records. For each new record, the k-closest records of the training data set are determined. Based on the value of the target attribute of the closest records, a prediction is made for the new record. The KNN algorithm expands this process by using a specified number $k \geq 1$ of the closest training instances instead of using only one instance. Typical values range from 1 to several dozens. The output depends on whether you use the KNN algorithm for classification or regression.

a) In KNN classification, the predicted class label is determined by the voting for the nearest neighbors, that is, the majority class label in the set of the selected k instances is returned.
b) In KNN regression, the average value of the target function values of the nearest neighbors is returned as the predicted value.
c) By using a specified number k≥1, you can control the trade off between overfitting prevention and resolution. Overfitting prevention might be important for noisy data. Resolution might be important to get different predictions for similar instances.

KNN is still the better choice for applications where predictions are not requested frequently but where accuracy is important.

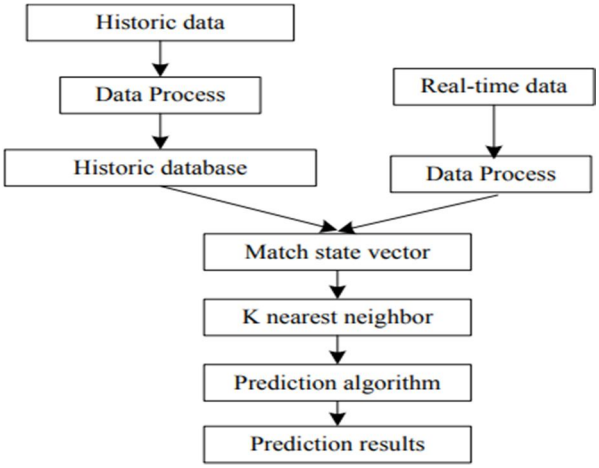

Fig 2- KNN Flow

E. Detection and Classification Of Plant Disease

The final stage is the detection of the diseases and with the help of disease classify the plants with the disease matches with the given dataset. For the disease detection and classification, we are implementing the deep learning algorithm. Deep learning algorithm is used to classify the specified image into appropriate disease hence it will be easy to detect the disease and find out the remedy over the disease. Deep learning algorithm is the part where we are finding out the relevancy count of the pixels by comparing the images with the data set. According to the relevancy count we will find out the matched disease.

1) Deep Learning Algorithm

a) Upload image and read it into pix [][]
b) Initialize Pix [][] with image pixels.
c) for i=0 to pix [][]. Len
i) match pix [][] attributes with dataset pixels' attributes
ii) store matching result in db
d) end for
e) Calculate weights for every pixel.
f) Calculate z for matching diseases z=sum (w)
g) Take average of z=avg (z)
h) Filter diseases having z value less than avg (z)
i) Transfer the output of 1st layer to 2nd layer
j) Take average of z=avg (z)
k) Filter diseases having z value less than avg (z)
l) Transfer the output of 1st layer to 3nd layer
m) Output of 3rd layer will be delivered to user.

2) Advantages

a) Efficient and user friendly system.
b) Improved accuracy with the help of Deep learning algorithm.
c) Increased layers of deep learning algorithm to get most accurate and appropriate result.
d) Our system is very fast as compared to other because segmentation makes the processing time less.

IV. RESULTS AND DISCUSSION

The test inputs are shown in Figure 3, 4, 5, 6. The test results of an input image shows the detection of disease in a success manner. The training and the testing sets for each type of leaf along with their detection is occurred. From the results it can be seen that the detection accuracy is enhanced by NN with proposed algorithm compared to other approaches. The performance of the system enables to achieve the accurate output within the assumedtiming.


Fig 3- Blight


Fig 4- Leaf spot


Fig 5- Sun Rot


Fig 6- Necrosis

A. Simulation Results

The result at each stage till the detection is predicted with the usage of MATLAB and the assigned coding.

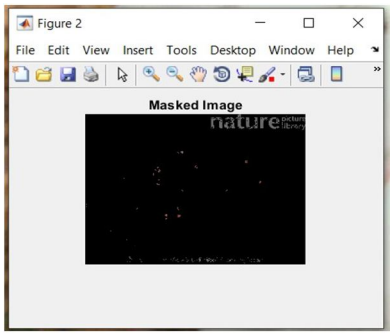

Fig 7- Masked Image

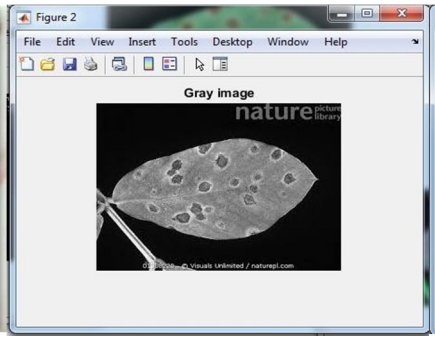

Fig 8- Gray Image

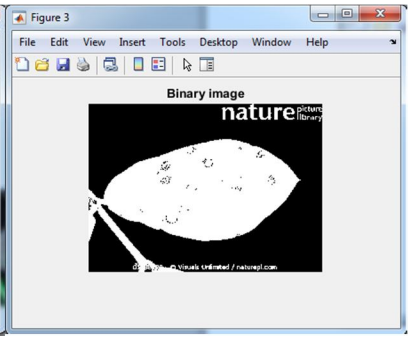

Fig 9- Binary Masked Image

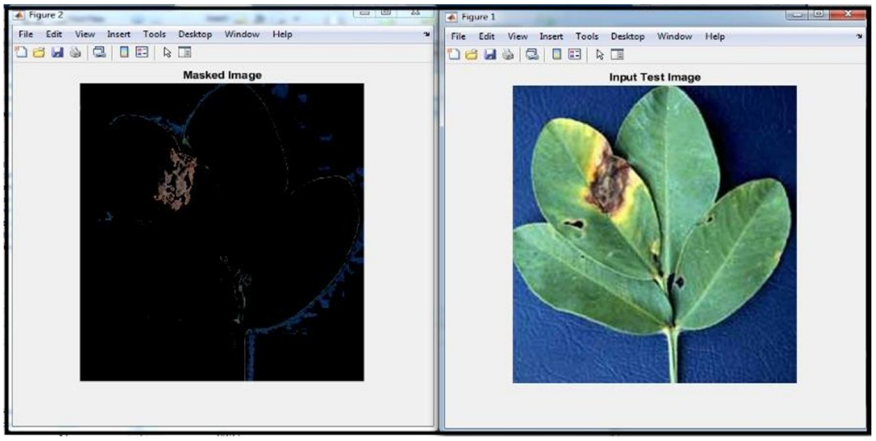

Fig 10- HSV Segmentation

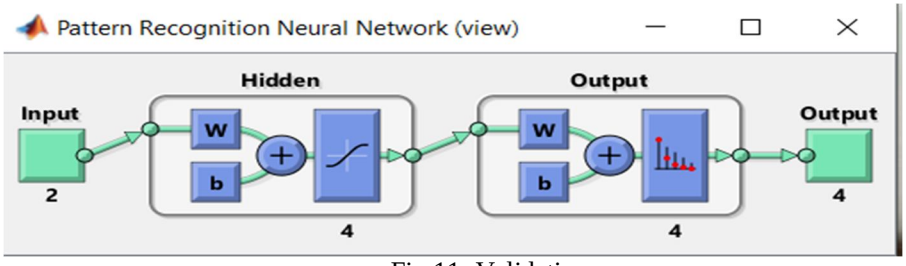

Fig 11- Validation

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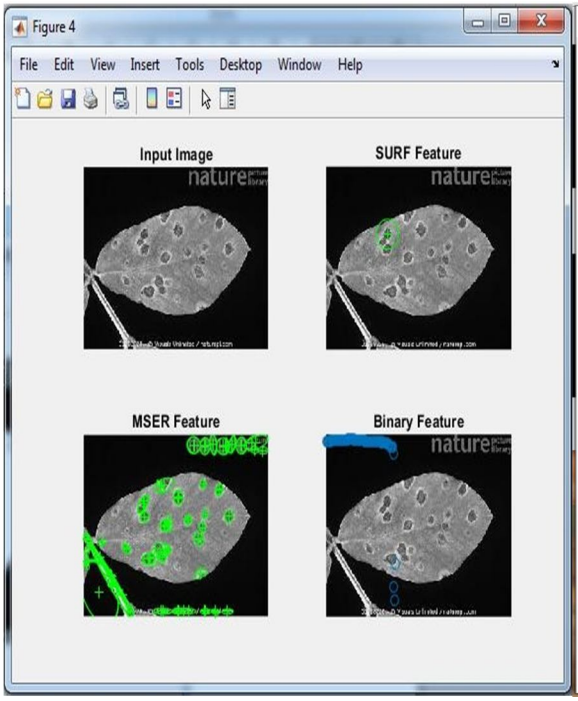

Fig 11- Feature Extraction

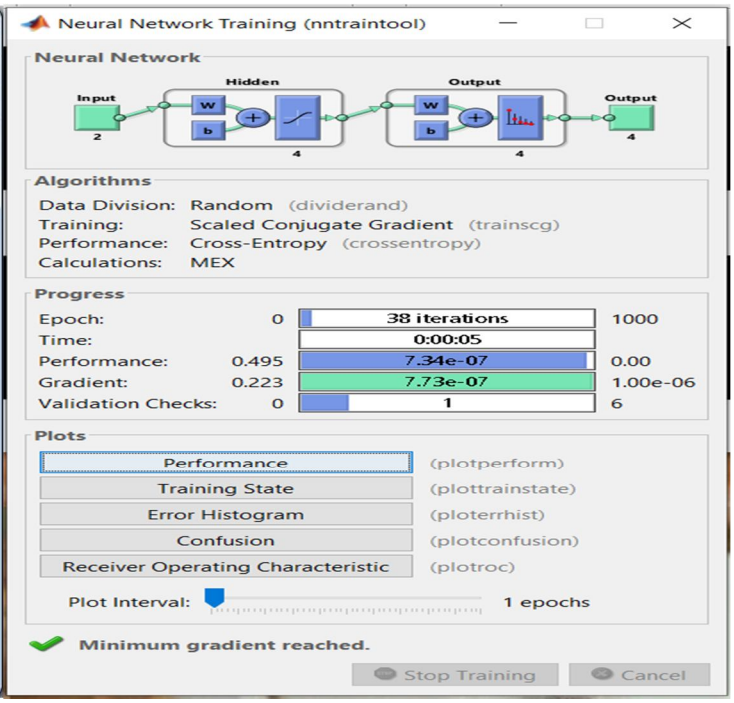

Fig 12- Neural Network Training

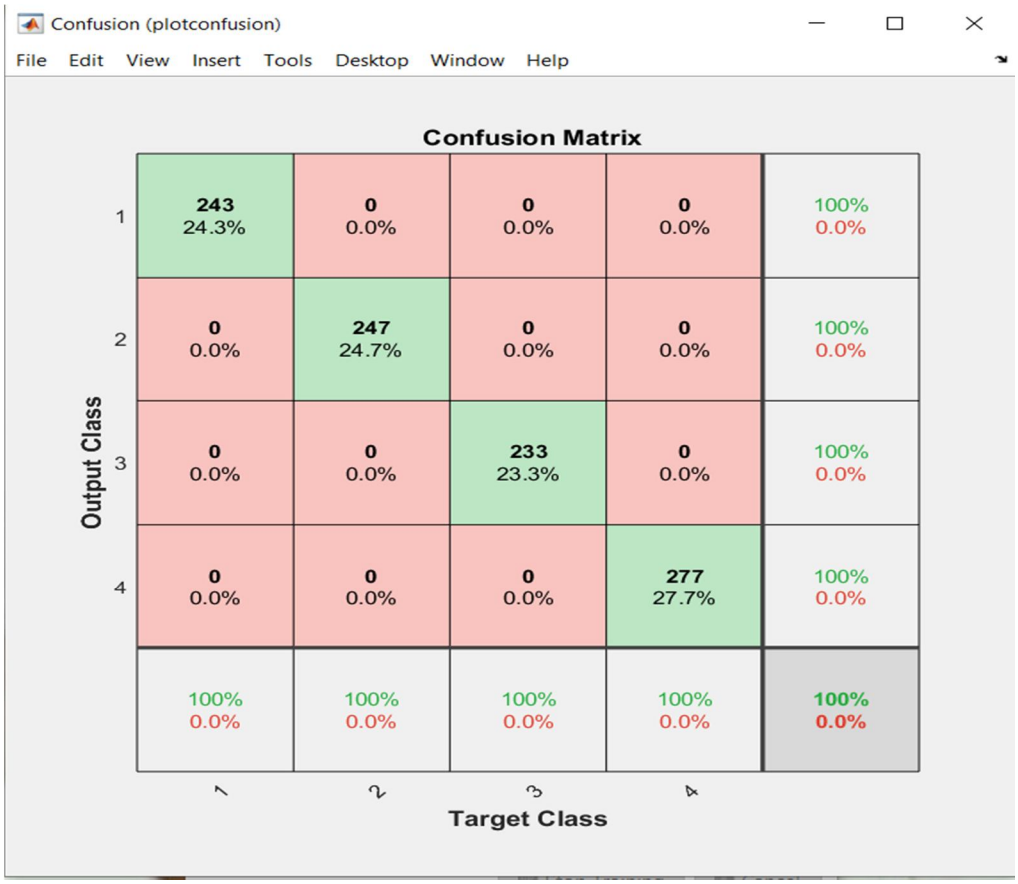

Fig 13- Confusion Matrix

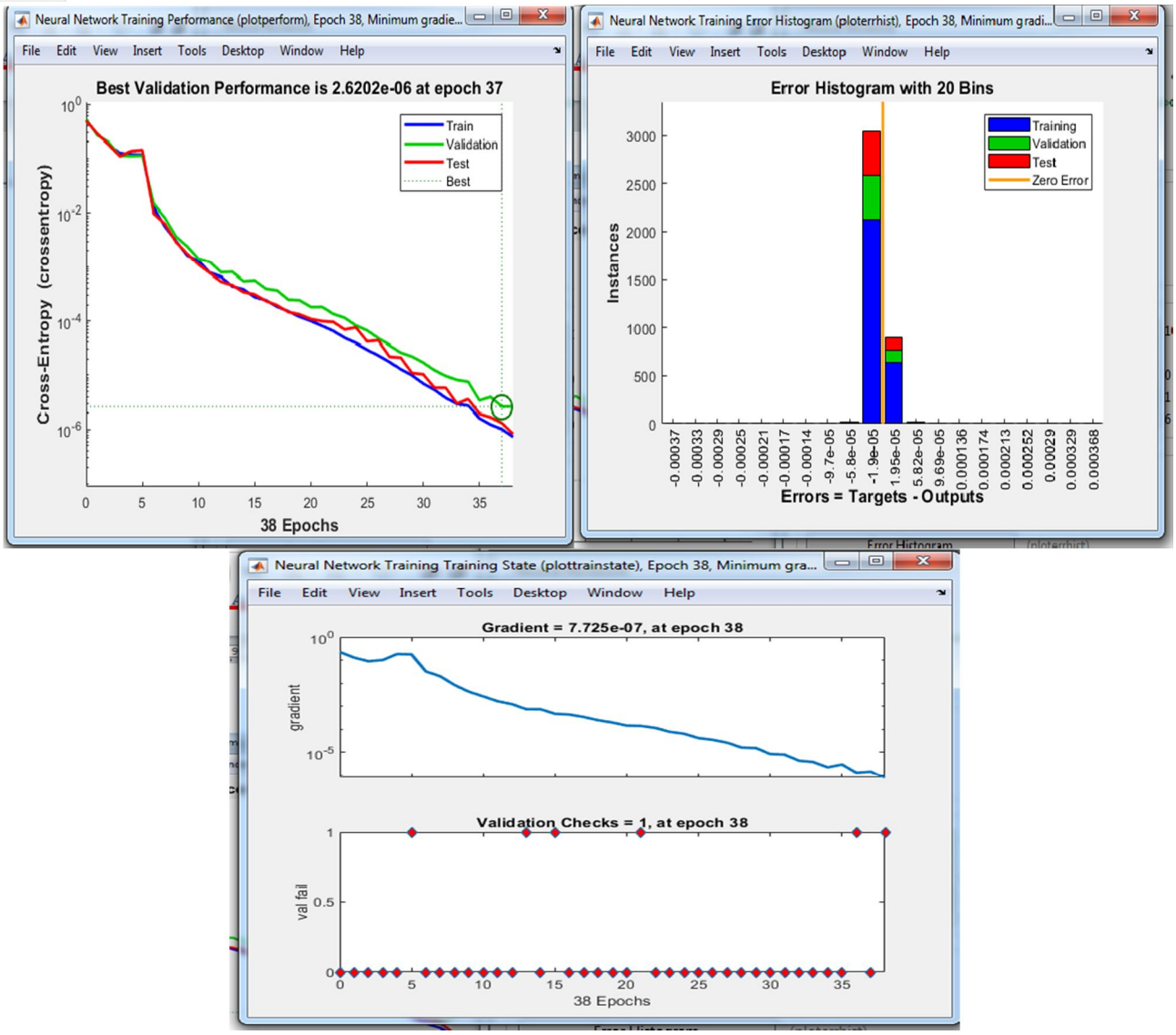

Fig 14- Performance Evaluation

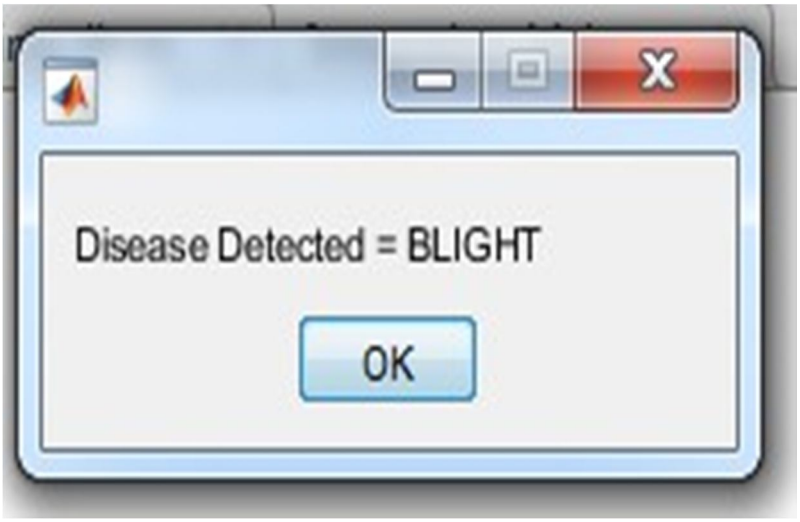

Fig 15- Predicted Disease

V. CONCLUSION

Automated disease diagnosing scheme for plants to sustain their health and growth. A real time, efficient and low cost disease monitoring system is proposed for classification among infected and healthy groundnut leaves. This paper present a different disease classification techniques used for plant leaf disease detection and an algorithm used for automatic detection as well as classification of plant leaf disease. Use of Deep learning concepts for real time images of Groundnut leaves having higher economic values in all countries like India.

Monitoring and preventing the plant to nourish environment and enhance their economic value. Designing and implementing the framework using Internet of Things in Precision Agriculture.

VI. ACKNOWLEDGMENT

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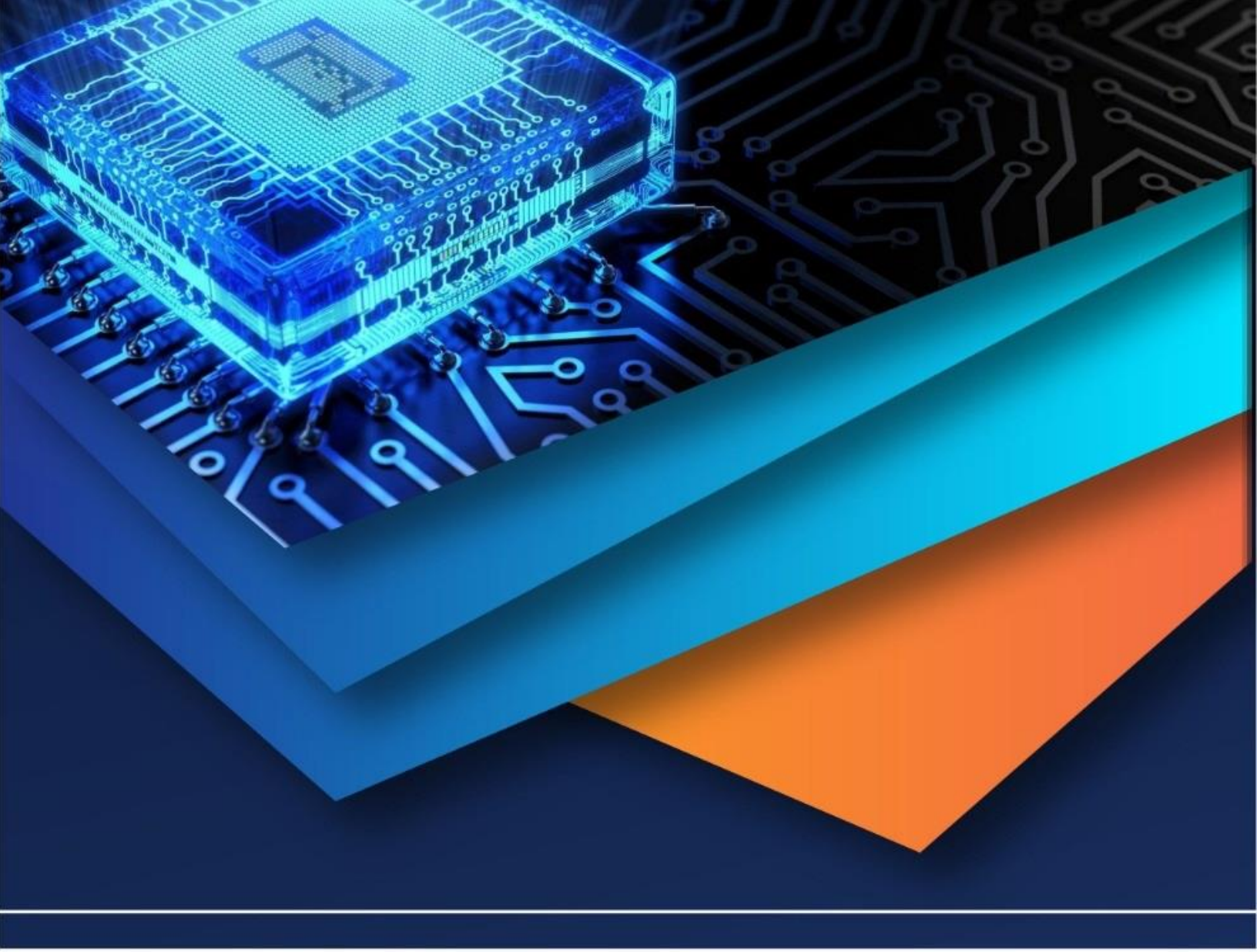

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