

# An Expert System for Plant Disease Diagnosis by using Neural Network

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**Abstract-** *The taxonomy and identification of crop infection have the foremost technical and economic importance in the Agricultural Industry. However, disease detection needs incessant observing of specialists which might be prohibitively costly in big farms region.*

*Automatic recognition of plant diseases is necessary to research themes as it may benefit in monitoring huge fields of crops and thus automatically detect the symptoms of diseases as soon as they appear on plant leaves.*

*The goal of this application is to develop a system which recognizes crop diseases. In this user have to take an image through an android phone, Image processing starts with the digitized color image of the diseased leaf. Finally by applying the SVM plant disease can be predicted.*

**Key Words:** *Plant Disease prediction, Support Vector Machine(SVM), Preprocessing, Feature Extraction, Pesticide Recommendation.*

## 1. INTRODUCTION

Agriculture is a most important and ancient occupation in India. As the financial system of India is relayed on farming production, the extreme concern of food production is essential.

Pests like the germ, fungus, and microorganisms are the origin of the disease to plants through a failure in excellence and extent of production. There is a great quantity of loss of farmer in making the crops. Hence proper care of plants is necessary for same. Research on the discovery of plant disease is gaining importance nowadays, which may prove useful in observing the large area and consequently mechanically finding the symptoms as they come out on plant[6]. This paper gives a general idea of with image processing technique to identify a variety of plant diseases. It offers more capable ways to discover infection created by fungus, microorganisms or germ on plants. simple interpretation by eyes to identify ailment is not precise. An overindulge of pesticides create destructive chronic diseases in human beings as not cleaned correctly. It also damages plants nutrient superiority. Which come out to be an enormous defeat of production to the farmer. Hence the image processing techniques can bring into play to discover and categorize diseases in agricultural applications is supportive.

It is a technique to alter an image into Digital configuration and perform numerous processes on it, so as to acquire a better image or to take out some useful information from it. The input is an image, similar to the video frame or photograph and output, might be image or features related to the particular image.

The leaf region observing is a vital tool in studying Physiological attributes associated with the plant development, photosynthetic transpiration method. Also, these are obliging factor in estimating, damage caused by leaf syndrome and pastes, to find out water and environmental stress, need of fertilization, for effective management and treatment. The uploaded pictures captured by the mobile phones are provided to the database presented. Computer vision methods are designed for finding the affected spots from the image and their categorization. The main objective of this application is to build up an image detection scheme that can perceive, crop diseases.

## 2. RELATED WORK

The literature survey is the significant step in software enlargement procedure. Before developing the tool it is necessary to determine the time factor, economy and company strength. Formerly after fulfilled by these things, subsequent steps are to determine which operating system and language be able to use for budding the tool. Once the programmers start building the tool the programmers need a lot of external support. This support can be obtained from senior programmers, from a book or from websites. Before building the system the above consideration is taken into account for developing the proposed system.

[1] This paper focuses on Windows Phone application which is able to recognize vineyard diseases from the picture of the leaves with accurateness elevated than 90%. This function can simply apply to dissimilar plant diseases and smartphone platforms. But only small training set is used for the image detection and also has the limitation of an application platform.

[2] This paper present a real-time testing system. In which results are obtained from cotton and groundnut plantations. The accuracy levels for disease identification for groundnut and cotton plantations are found to be satisfactory. To achieve better detection accuracy with different plant species we have to use efficient methodology.

[4] recognition and categorization of infection of Grape Plant with conflicting Colour Local Binary Pattern attribute and Machine Learning for automatic Decision Support System are explained in this paper. Identification of plant disease through the leaf texture analysis and pattern recognition system can be further improved by improving the training ratio.

[5] The author gives shape and vein, color, and texture features to classify a leaf. In this case, Probabilistic Neural network (PNN) was used as a classifier. This gives the tentative result that shows the technique for categorization presents an average precision of 93.75 % when it was experienced on Flavia dataset, which includes 32 kinds of plant leaves.

[6] The paper proposed a method of Fungus/ailment Analysis in Tomato Crop with the help of Image Processing Technique. In this paper, the photo of the crop leaves is taken with the help of camera and process for obtaining a gray colored and segmented image based on the character and size of the fungus. A reference is fixed for suitable acceptance and refuse crop quality depending on the growth of fungus level.

### 3. PROPOSED SYSTEM

Even though qualified agriculture engineers are responsible for the identification of plant diseases, intelligent systems can be used for their diagnosis at the beginning. An image processing method that is able to execute as a smart phone application for the detection of plant diseases.

Our aim behind providing this system architecture is that with the help of leaf image we need to identify disease and suggest pesticides to confiscate that disease. Data mining which is one of the interesting concepts can be used for the prediction of the disease and to create training data set also.

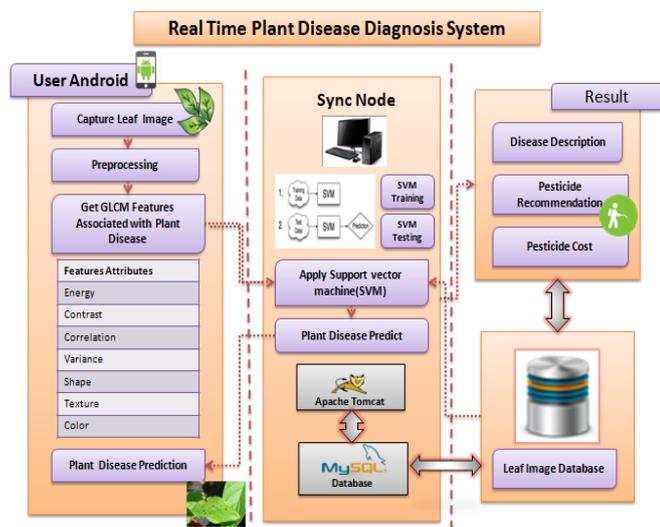


Fig-1: Diagram For Proposed system

By using android application with the good camera and sufficient ram memory is used to capture the image of the plant leaf. pre-processing can be done to remove noisy data from the image which is available in the leaf image.

After getting all the common GLCM Features related to plant disease are used for prediction of the disease. The outcome of our experimental testing in determining major model for plant disease forecasting is given.

The feature of the image is extracted that means firstly convert this image into the grayscale image then identify the pattern of points which is present on the leaf. Find out edges of the leaf this can find out using segmentation algorithm. Apply Support Vector Machine algorithm on the features extracted to formulate a forecasting of plant disease.

- Energy
- Contrast
- Correlation
- Variance
- Shape
- Texture
- Colour

The training dataset also contains the different pesticides as per the disease. There are multiple pesticides for one disease, these different pesticides have different cost then we will recommend pesticides with the cost estimation. The user should select any one pesticide from here and apply for his crop.

### 4. PROPOSED ALGORITHM

#### 1. Support vector machine

SVM is a powerful classifier that is able to distinguish two classes. SVM classifies the test image into the class with the highest distance up to the neighboring point in the training. SVM training algorithm built a form that forecasts if the test image falls into this class or another.

SVM necessitate a vast training data to decide a decision boundary and computing cost is very high although we are using single pose (frontal) detection. The SVM is a learning algorithm for classification which attempts to discover the finest distinguishing hyperplane which minimizes the error for unseen patterns.

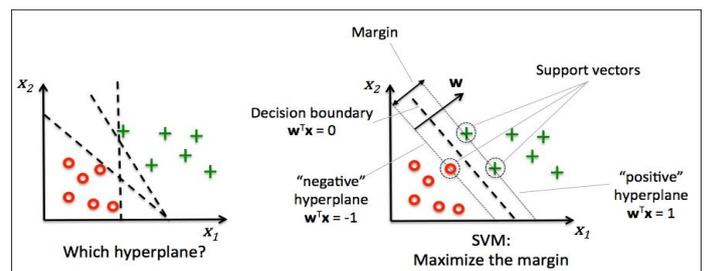


Fig -2: Distinguishing hyper plane to minimize the error

The data which cannot be distinguished the input is mapped to high-dimensional attribute space where they can be separated by a hyperplane. This projection is well performed by means of kernels.

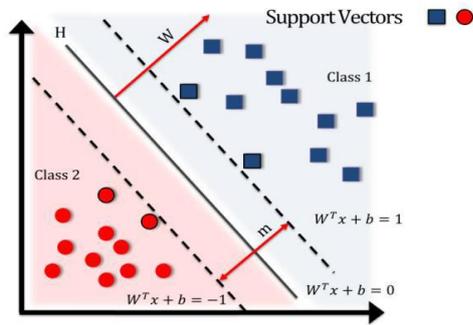


Figure3. Separating Hyper Plane By Equation

If training set of samples and the equivalent resultant values  $\{-1, 1\}$ . So SVM intends to get the best separating hyperplane specified by the equation  $WTx+b$  that make use of the distance between the two classes as shown in above figure.

### 5. IMPLEMENTATION DETAILS

The systems GUI were designed using java JSP. Core Technologies used were Java, JSP. The overall development was done in the Eclipse 3.3 Indigo and for DB we used MY SQL GUI browser. The proposed system is supported by an Android version which provides tools for Android development and debugging. The open source SDK used for hybrid mobile APP development. software programmer builds this application for mobile devices using Javascript and HTML6.

#### A. Results

By comparing with some forecasting algorithm we come to know that the Random Forest they take a long time to train. The major drawback of Random forests and linear regression is their complexity. They are greatly harder and prolonged. They also necessitate additional computational resources. The forecasting procedure with random forests is lengthy than other algorithms. Below table shows the evaluation of the three algorithms.

Table 1. Algorithm Comparison

Algorithm Comparison				
Sr.No	Algorithms	Tested On	Accuracy	% Accuracy
1	SVM Classifier	200	190	0.95
2	Random Forest	200	182	0.91
3	Linear Reprator	200	120	0.6

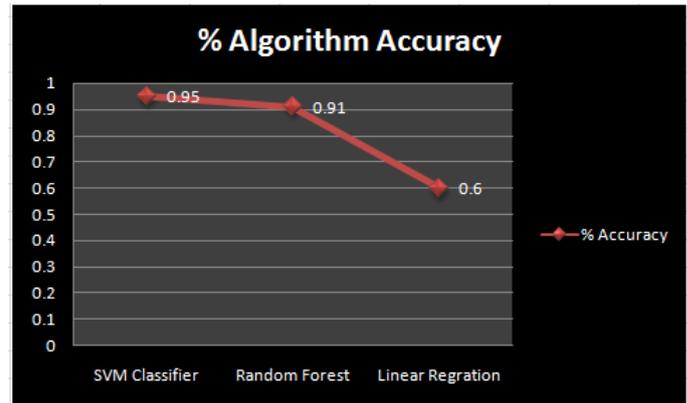


Fig - 3: Plot of Algorithm Comparison

The plot gives the clear idea of the accuracy i.e. SVM gives better accuracy in the prediction of the disease compared to other two.

### 6. CONCLUSIONS

We have developed leaf disease detection and diagnosis system with the help of image processing which is capable of diagnosing disorders. A set of features was selected to be extracted using feature extraction phase, and those features were stored in the feature database, which is designed for this purpose. The captured leaf image parameters were compared with the parameters of healthy leaf and disease was detected. According to disease pesticide control was done.

To improve the plant disease identification rate at various stages, we need to increase the training samples and extract the effective features from leaf texture.

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