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## Plant Disease Identification Using SVM

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**ABSTRACT**--- Tomato is Indian crops for rural humans to make income. These crops are contaminated with many diseases. Our main goal is to detect the sickness that is infected by the crop and take precautions to protect the crop before it spreads over the complete crop. By doing in this way, there is less loss to the farmers and requires less pesticides and additionally viable to export which no longer have an effect on our monetary growth. At finally, we test the leaves and identify the sickness and shift those records to the farmer through message. Here, take the leaves of the tomato pick out the disease with the aid of using SVM in order to find efficient result and accuracy. To predict the illnesses in early stage and take precautions and keep the vegetation leads to extend in production and income.

**Keywords:** Diseases, SVM algorithm, vegetation.

### INTRODUCTION:-

The agriculture industry is one of the most vital sectors for contribution to the national income in many countries. Throughout the years, lot of agriculture components and processes have become robotic to ensure faster production and to ensure products are of highest quality standards. Because of the high demand in the agricultural industry, it is essential that agriculture produce is cultivated using a systematic process. Diseases and defects found in plants and crops have a large impact on production in the agriculture industry, and lead to remarkable economic losses. A loss of an estimated 33 billion dollars every year was the consequence of plant pathogens found in crops in the United States. Pathogenic species affect plants significantly, initiating diseases such as chestnut blight fungus and Huanglongbing citrus disease.

Insect infestation along with bacterial, fungal, and viral infections are other important contribution to diseases exists in plants. Changes in climate and temperature are also a few component that may contribute to the accelerate in diseases found in plants. Once a plant has been infected, symptoms develop on separate segments of the plant, basically degrading the growth of the subsequent fruit or vegetable. Apple production is a very large industry remarkably in China with over 17 million tons of produce every year. Apple infections do not only of course reduce grade and yield, but can also affect the return bloom of the resulting season. These factors have radical impact on countries that rely heavily on its agriculture sector as its main program of income. To overcome these losses and issues of plant diseases, farmers tend to see to chemical pesticides as a remedy solution. This solution may be powerful in eliminating plant diseases but has harsh drawbacks. As well as being costly, the largest use of pesticides creates dangerous levels of toxic residue levels on agriculture products. This leads to burden about wholesomeness and healthiness of products raised by the public when

pesticides are commonly used in the produce they purchase. Therefore, the use of pesticides must be controlled, and used only when needed.

This controlled or supervised method of pesticide use is called as selective pesticide spraying. For the aim to decrease losses existed in defective plants many techniques have been introduced. Manual techniques, such as hand inspection and naked eye observation are somewhat general methods used by farmers. Plant diseases are predicted and characterized by observation from experts, which can be highly expensive and time consuming too. As these methods are very tedious it is prone to sorting problems and judgmental errors from various farmers. Therefore, disease prediction systems were introduced that tackle large number of the issues faced with labor-intensive techniques

### PROBLEM STATEMENT:-

Bacterial and fungal viral infections have a serious impact on plant health and introduce diseases that affect growth of produce. In addition, the over reliance on fungicides and pesticides to remedy this issue, is not only costly, but has a considerably negative impact on the environment. So, there is a need to predict and target plant diseases at an early stage to aid farmers to take appropriate precautions to help preserve the defective plant. The purpose of this project is to discuss and compare the current plant disease detection techniques that feature visible imaging. An easy to use system to predict crop disease harshness is designed for farmers and agriculturists to find disease severity levels of plants. In addition, an robotic approach is designed and implemented for early leaf based plant health monitoring using a robotized system in real field based environments

### PROPOSED APPROACH/WORK:-

Our proposed system involves training of leaf images dataset and detection of disease from given image. To train leaf images dataset we will use SVM. It is a special technique widely used to extract unique features from no of images.



Fig 1: Human Vision



Fig 2: Computer Vision

## SVM (Algorithm)

### What is Support Vector Machine?

“Support Vector Machine” (SVM) is a supervised machine learning algorithm that can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in  $n$ -dimensional space (where  $n$  is a number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

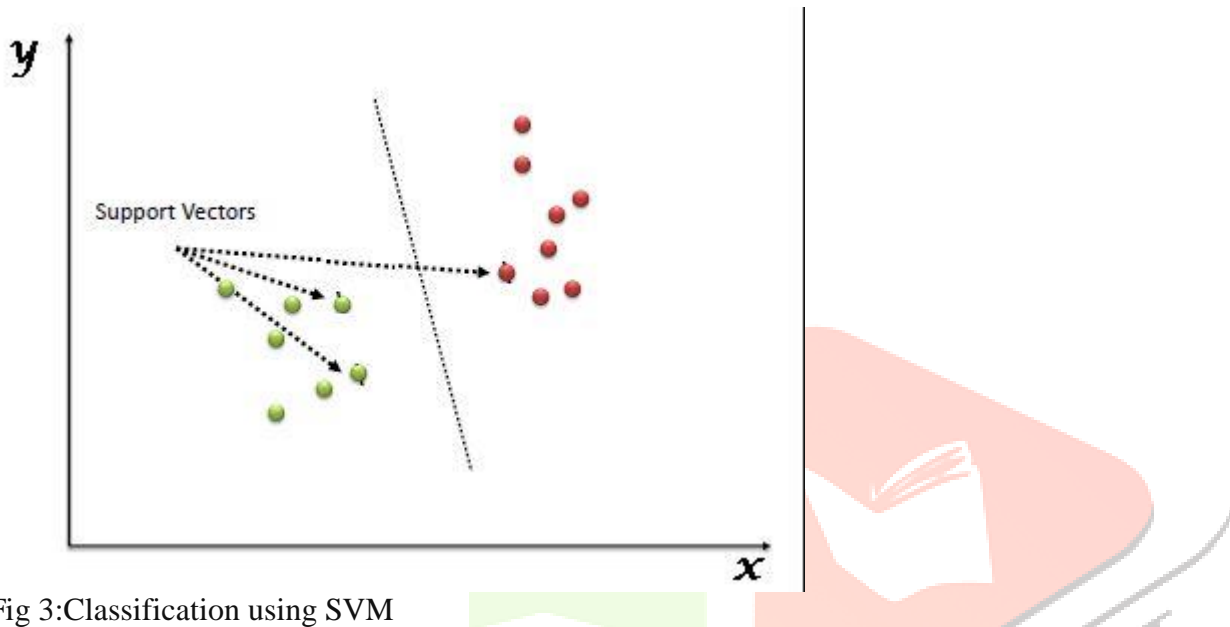


Fig 3: Classification using SVM

An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. In addition to performing linear classification, SVMs can efficiently perform a non-linear classification, implicitly mapping their inputs into high-dimensional feature spaces.

**Identify the right hyper-plane (Scenario-1):** Here, we have three hyper-planes (A, B, and C). Now, identify the right hyper-plane to classify stars and circles.

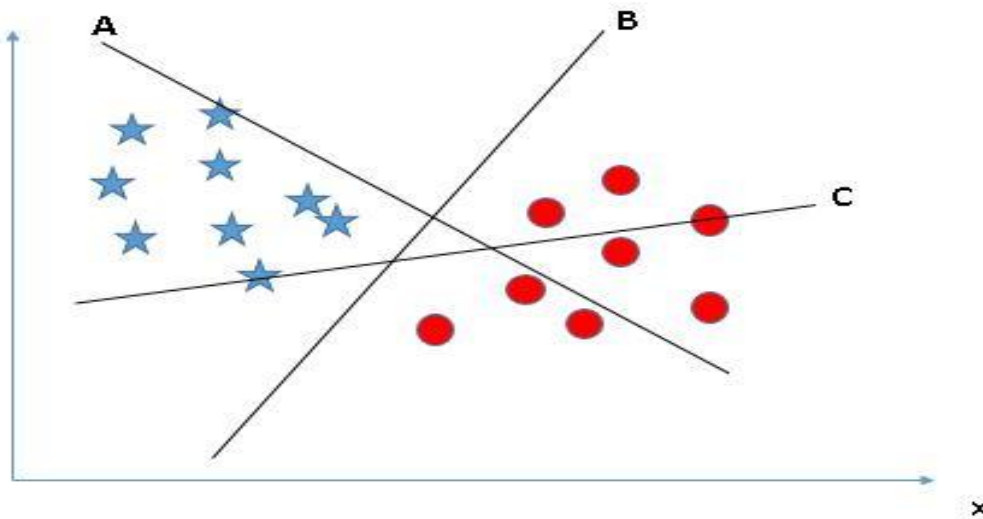


Fig 4: Classification using SVM

we need to remember a thumb rule to identify the right hyper-plane: “Select the hyper-plane which segregates the two classes better”. In this scenario, hyper-plane “B” has excellently performed this job.

**Identify the right hyper-plane (Scenario-2):** Here, we have three hyper-planes (A, B, and C) and all are segregating the classes well. Now, How can we identify the right hyper-plane?

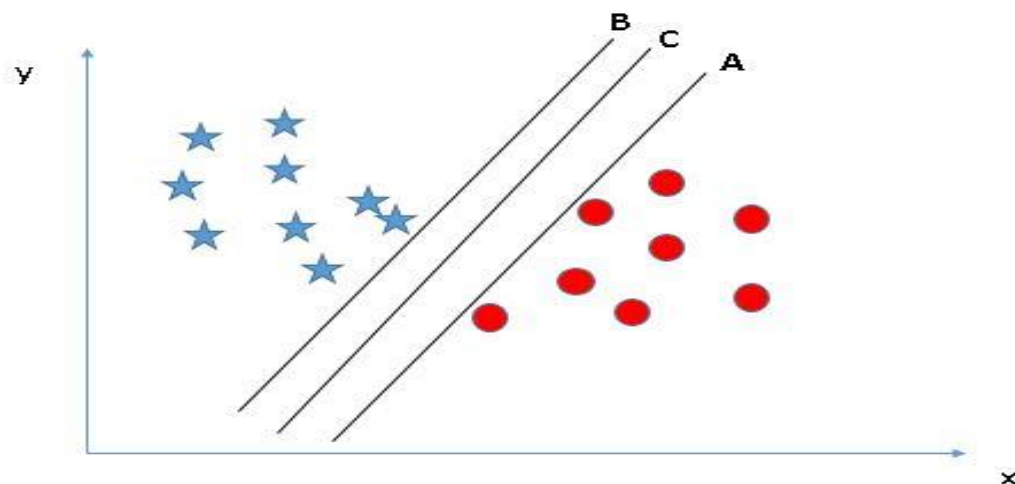


Fig 5: Classification using SVM

Here, maximizing the distances between nearest data point (either class) and hyper-plane will help us to decide the right hyper-plane. This distance is called as **Margin**. Let’s look at the below snapshot:

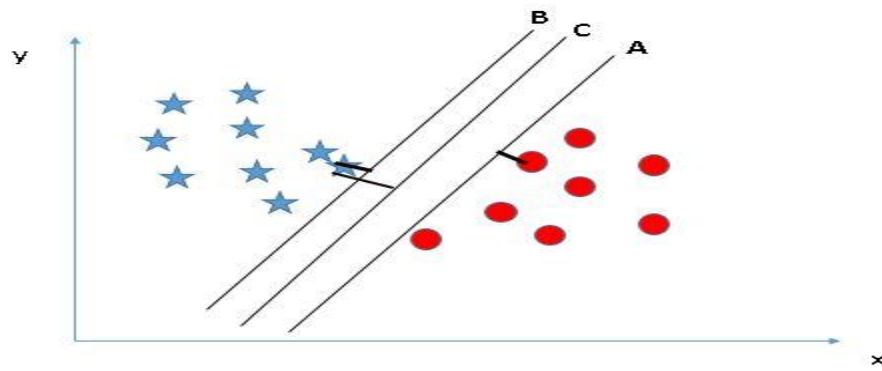


Fig 6: Classification using SVM

Above, you can see that the margin for hyper-plane C is high as compared to both A and B. Hence, we name the right hyper-plane as C. Another lightning reason for selecting the hyper-plane with higher margin is robustness. If we select a hyper-plane having low margin then there is high chance of miss-classification.

Suppose we see a strange cat that also has some features of dogs, so if we want a model that can accurately identify whether it is a cat or dog, so such a model can be created by using the SVM algorithm. We will first train our model with lots of images of cats and dogs so that it can learn about different features of cats and dogs, and then we test it with this strange creature. Consider the bellow diagram:

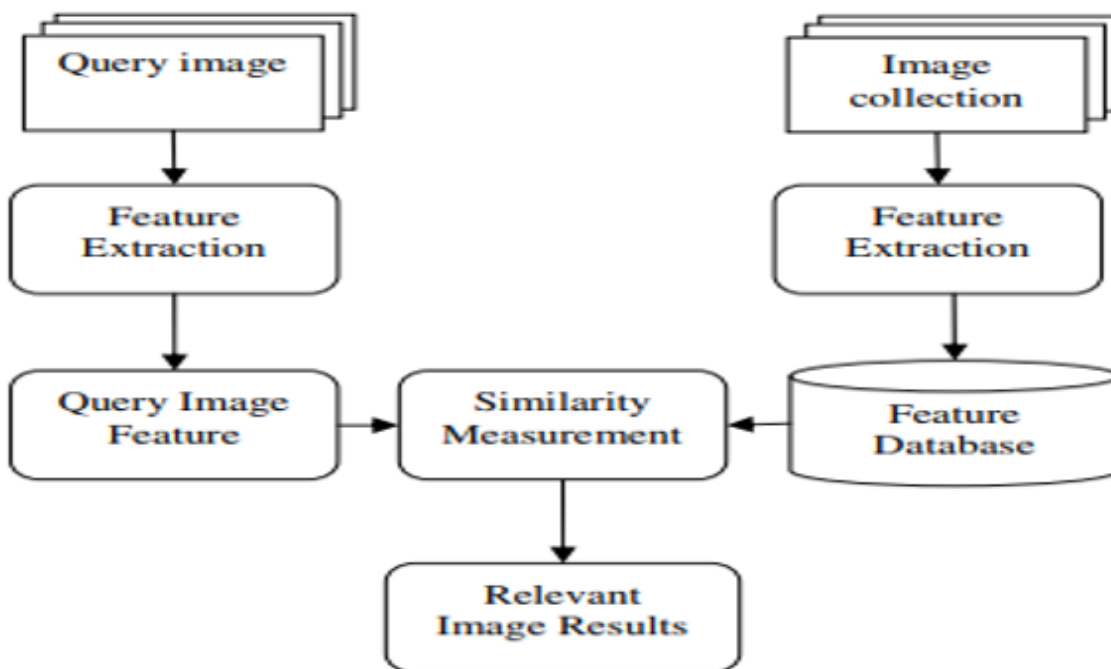


Fig4: System Architecture Diagram

Query Image: It is the infected plant image.

# METHODOLOGY

The methodology will have the following stages including Data Collection, Preprocessing, Feature extraction, Image segmentation, classification phases. The flow chart is shown below:

## i. Data Collection

In the first step, the sample snap shots are accumulated from the two datasets of tomato and maize crops, the usage of one kind digital camera with specific resolutions, which are used to educate the device the sample pictures are stored in the form of the JPG. All the pattern pictures are in RGB (Red, Green, Blue) form. The bought picture encompass the healthy pictures and also diseased photographs like Bacterial spot, Tomato Mosaic virus, Northern blight, Rust etc. Various methods of preprocessing can be applied to the photo to get better results.

## ii. Preprocessing

In the second step, we want to create the directory for each tremendous and poor snap shots if it would not exist in our picture dataset into a variable then we create a characteristic to load folders containing pictures into arrays. And additionally the picture consists of some of the unwanted noise as properly as redundancy. So, preprocessing strategies are used to eliminate the historical past noise and also to suppress the undesired distortion which is existing in the photo which occurs due to many reasons such as digital cam settings, variants in the light. To overcome these fundamental problems the input RGB photo is to be transformed into a grayscale image to provide accurate results.

## iii. Image Segmentation

Image Segmentation is a technique of partitioning an image into the range of pixels with admire to their depth levels. Assigning a label to every pixel in the image such that pixels with the identical labels will share some characteristics. Masking of the photograph and detect the part which is used to extend the sharpness of an image. The threshold is a operation performed with the pixels whose value is greater than the exact threshold value to be assigned within the fashionable value. Edge detection is a primary problem in picture processing and desktop visions. Therefore, the method label edge detection is used in image segmentation. It calculates the gradient of photograph intensities at each pixel within the image.

## iv. Feature Extraction

The procedure of extracting the relevant records from the entire photo and transfer the information into a set of elements with their labels is acknowledged as characteristic extraction. In this step, primarily based upon the elements like color, size, shape, texture features are extracted. The Histogram of oriented gradients (HOG) is a dense feature descriptor that simplifies the picture by extracting the useful records via sorting out the extraneous information and it is extensively used for picture recognition, object detection. We can forget lightening stipulations through the usage of HOG which is greater accurate.



**Northern blight.**



**Bacterial spot**

## **EXPERIMENTAL ANALYSIS & RESULTS :**

The dataset contains 200 tomato leaf pictures. From that 50 pictures are healthy tomato. Similarly, 40 leaf pictures are used for the testing part. There are sixty four input layers, sixty four hidden layers and three output layers. The keras, is a Python API which belongs to the neural network. Each batch size taken as 20 and the model has been educated for 450 epochs. The initial learning rate has been set to 0.01 and it is decreased through a component of 0.3 on plateau the place the loss stops decreasing. Early stopping has additionally been used in order to monitor the validation loss and give up the training procedure as soon as it increases.

Here the tomato crops are checked by using SVM. The result can be for tomato crop by using SVM it gives 60-70%.

## **CONCLUSION :**

This our proposed concept focuses on Leaf Disease Prediction by using Support Vector Machine. The main issue is to identify particular leaf disease just by looking at leaf manually which is not possible. But by using SVM it works very great.

In the recent years there have been important advancements in machine learning techniques. Finding more features and extracting that from query image is the very complex term but as because of SVM it becomes little bit easy and so we have thought of using SVM for more accurate result. Support Vector Machine is an important breakthrough technique, which includes a family of machine learning algorithms.

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