CROP DISEASE DETECTION / PREVENTION

India is an Agricultural country. Most of India's economy come from Agriculture production.Though country is accelerating in various fields but majority of our population are still farmers who are facing various problems related to crop cultivation, they face high loss due to improper guidance of how the crop are affected due to many factors which leads to destruction of crops.Therefore in field of agriculture early crop disease detection becomes highly essential. One way to make sure this is by manually supervising each and every crop which is not feasible nor economical, here comes Artificial intelligence which plays an important role to solve this problem by identifying the disease of leaf.

Existing Solutions/Models

In 2011 Fungi-caused disease was detected using image processing technique it used simple threshold and Triangle thresholding methods to segment the leaf area and lesion region area.

In 2012 Detection of disease in Malus Domestica was done using methods like K-means clustering color and text analysis. Another report from same year used diverse image processing techniques and artificial neural network (ANN).

In 2013 various types of disease such as Bacterial , Fungal, Viral were detected using image both Image processing techniques and advanced computing techniques.

In 2016 Using Deep Learning for Image-Based Plant Disease Detection the technique used was CNN(Convolutional Neural Network) which achieved impressive results with two CNN algorithms namely AlexNet and GoogleNet. Here they experiment the model on three different datasets namely colored images, gray-scaled images and segmented leaf images and evaluated the model using the metric like mean precision, mean recall, mean F1 score, along with the overall accuracy.

In 2017, Plant Disease Classification Using Image Segmentation and SVM Techniques
made use of K means clustering and otsu techniques for segmenting the affected area from the image , then this image along with features is provided to SVM classifier to correctly classify the disease in the plant.

INFERENCES

The existing systems have mainly incorporated image processing techniques and neural networks. Image processing is used for measuring affected area of disease and to determine the difference in the color of the affected area. Neural network seems to be very useful because of their outstanding ability to meaning from complex data. It is used to extract patterns and detect the trends followed by the data which cannot be done by computer techniques. It mainly provides a mapping from the image of the diseased plant (input) to the crop-disease pair (output).

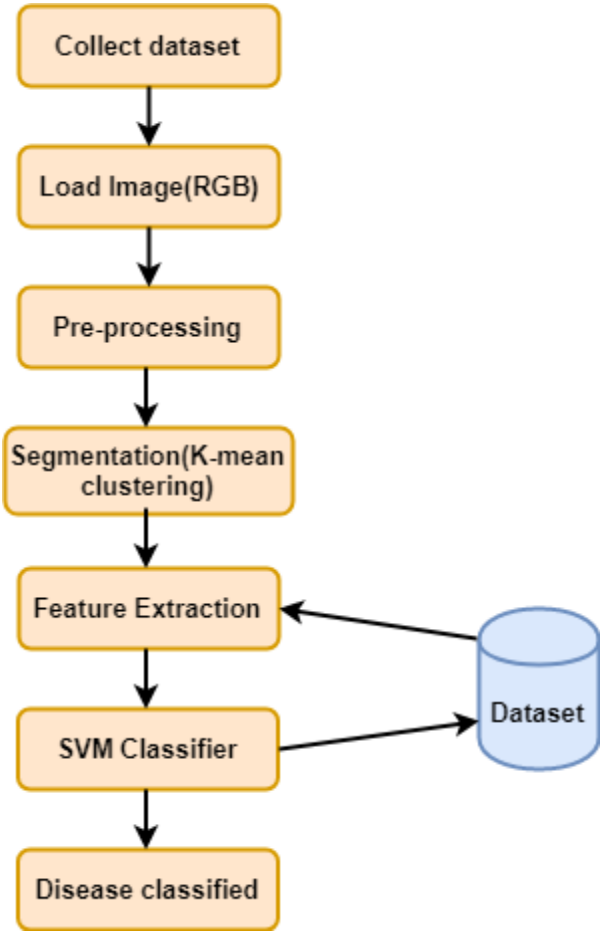
We intend to use the SVM technique. SVM training algorithm builds a model that assigns new examples into one category or the other, making it a non-probabilistic binary linear classifier. In addition to performing linear binary classification, SVMs can efficiently perform a non-linear binary classification using what is called the kernel trick, which maps their inputs into high-dimensional feature spaces.

ABOUT DATASET

The data is provided by PlantVillage dataset which is open and free for all. It consists of 54,306 images of plant leaves, which have a spread of 38 class labels assigned to them. Each class label is a crop-disease pair.
Here are the 38 classes of crop disease pairs that the dataset is offering

APPROACH

Work Flow



Collecting Dataset: Using a dummy dataset provided by PlantVillage which contains the information about the crop and the respective disease.

Loading Image
The image is captured using camera which is in RGB (Red,Green,Blue) format , color transformation structure for leaf is created and independent transformation is applied.

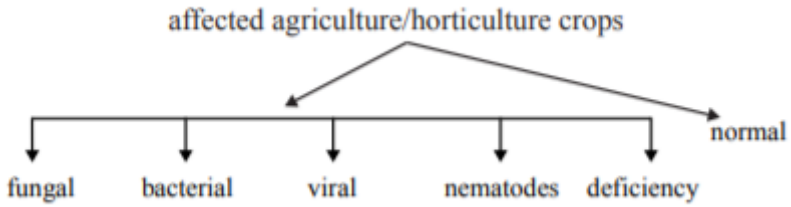
Pre-Processing
Image contains noise in the form of background or some other objects to remove it image clipping or cropping is carried out to get region of interest. This can be achieved by converting RGB images into Grey images. The enhancement of the image can be done by varying the contrast.

Segmentation
After loading the image, it needs to be segmented based on the area affected, which can be achieved by using K means clustering.

Feature Extraction
Extracting features is very important for classifying image. Color, Texture(how the color is distributed in image), Edges, Morphology etc can be the features to identify the disease of crop. Morphological features can be used to give features better than other features like color and texture. The morphological features refer to the external feature and physical form of the plant.

SVM Classifier
The extracted features and the segmented image is fed to the SVM classifier to classify the plant as affected by disease or healthy.

Disease Classified



EVALUATION

Different metrics can be used to evaluate the model, some of them are mean precision, mean recall, mean F1 score, accuracy, Confusion matrix.