SVM CLASSIFIER BASED CROP DISEASE DETECTION

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Abstract

Generally diseases in plants are caused by the cuss and pathogens; therefore the productivity is attenuated to massive scale if proper care is not taken in a limited time. Since the detection of disease in plant plays a crucial role in the agricultural field, as a disease in plants are quite common. If correct care isn't taken during this space and it becomes tedious to the cultivators to observe the crops often over massive areas. These problems are needed to be solved at the initial stage to save time and money for the farmer. The proposed system which automatically detects diseases by analyzing the leaf image using machine learning technique. By this strategy, the plant maladies can be recognized at the underlying stage itself and based on the diseases the pesticide can be recommended based on the Agricultural Pesticides Committee (APC).

Index Terms—APC, Disease detection, Leaf image, Machine Learning, Pesticide.

1 Introduction

The Indian economy is largely based upon agricultural products. The rising population in India increases the demand for a food product, advancement in the agriculture sector is required to meet the demand. Farmers have found difficulty in selecting suitable pesticides for crops. Disease on crop prompts a critical decrease in both the quality and amount of rural items. Observing of wellbeing and sicknesses on plant assumes a significant job in fruitful development of yields in the structure.

The presence of sickness in plants is thought about by indications leaves. So there is a need for a programmed, less expensive, and accurate system for detecting diseases from the leaf of the plant and to suggest a proper pesticide to rectify the plant disease. Various technologies are used to detect the crop diseases some technologies are Image processing, thermography, gas chromatography, mass spectrometry, polymerase chain reaction. These techniques are highly time-consuming and low accuracy.

Present-day approaches for example, deep learning, and machine learning algorithms has been utilized to improve the accuracy and the recognition rate of the results. Different investigates have taken place under the field of deep learning and machine learning for plant disease detection and diagnosis, such Artificial Intelligence algorithms like Artificial Neural Network(ANN), Random forest, K-Means Clustering, K-Nearest Neighbor(KNN), Support Vector Machine(SVM), Convolutional Neural Networks(CNN) are used.

2 Literature Review

Ernest Mwebaze, Godliver Owomugisha, John A Quinn and Michael Biehl, proposed a KNN classifier algorithm to classify the healthy and unhealthy plants using the spectral data of plants leaf and the overall accuracy of spectral data is found to be 90.1% and the standard deviation is 5.4% [1].

Shweta, Astonkar and Shandilya introduced a method in which the images are segmented by using K-means clustering algorithm to generate the initial centroid and the final segmented result [2].

R. V.Kshirsagar and P .R. Rothe, utilized Hu's moments as distinctive attribute. To constrain the essentialness inside the infection, spot active contour model used, the numerous class problems are tackles by BPNN classifier and the classification accuracy of about 85.52% is achieved by this technique [3].

Kanaka Durga and Anuradha, proposed a method

in which the leaves of the tomato plant are pick out and the disease is identified using SVM and ANN algorithms. In this they combined two algorithms which are found an accuracy of about 87.4% [4].

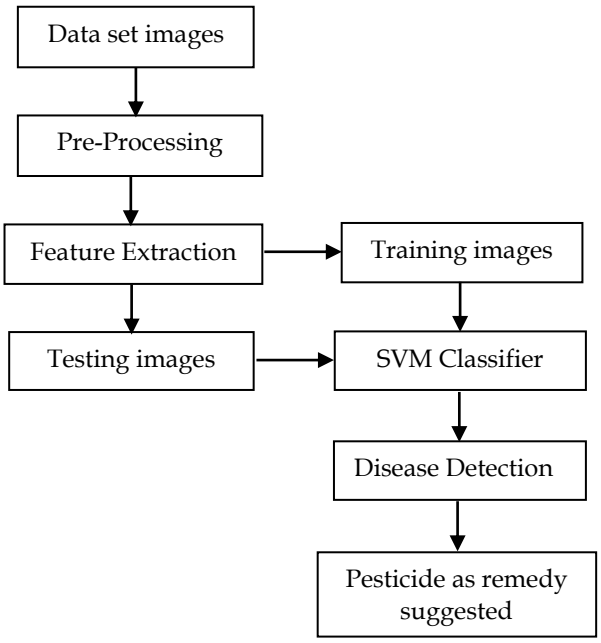
Mihir Pendse, Prathamesh Rane, Sanjay Mirchandani, and Ashwini Vedula proposed the technique which uses the ANN algorithm to classify and detect the type of the disease of plant leaves and the system gives an accuracy of 88.12% [5].

Yi Fang and Ramasamy presented a technique in which the plant disease can be detected by utilizing the thermography, fluorescence imaging and hyperspectral strategies the author found a specific difference in wavelength intervals in the green, near-infrared and mid-infrared region and obtained a classification accuracy of 81% [6].

Thangadurai and Padmavathi have taken the relative consequences of RGB and Grayscale pictures in leaf ailment discovering process. They considered RGB pictures and Grayscale RGB pictures and utilized the middle channel for picture upgrade and division for extraction of the sick bit which are utilized to distinguish the malady level. Sickness of the plant is acknowledgment model, in light of leaf picture arrangement, by the utilization of profound convolution systems is created [7].

3 Proposed work

3.1 Block diagram



3.2 Dataset

The dataset images were taken and it is split into training and testing images. 20% of dataset images are randomly taken for testing using train_test_split function. Accumulate a training test. The training set desires to be a consultant of the real-world use of the feature.

Fig.1 Bell pepper bacterial spot

Fig.2 Bell pepper healthy

Fig.2 Potato early blight

Fig.3 Potato healthy

Fig.4 Tomato Target Spot

Fig.5 Tomato mosaic virus

Fig.6 Tomato Yellow Leaf Curl Virus

Fig.7 Tomato Bacterial spot

Fig.8 Tomato Early blight

3.3 Preprocessing

In the pre-processing the intention is to enhance the configures of a picture for subsequent approaches via casting off the noise and unwanted objects and improving the visual appearance and all the dataset images are resized to 300*400. Determine the enter feature and the structure of the learned feature. In this project RGB colour and spatial features (height and width) are taken for feature extraction.

3.4 Feature Extraction

HSI model is primarily based on perception of humans. HSI is expanded as Hue, saturation, Intensity model. After transformation, the Hue color location in HSI is considered as desired location because it has the necessary details. The Hue region appears as green color pixel which represents healthy region in a leaf.

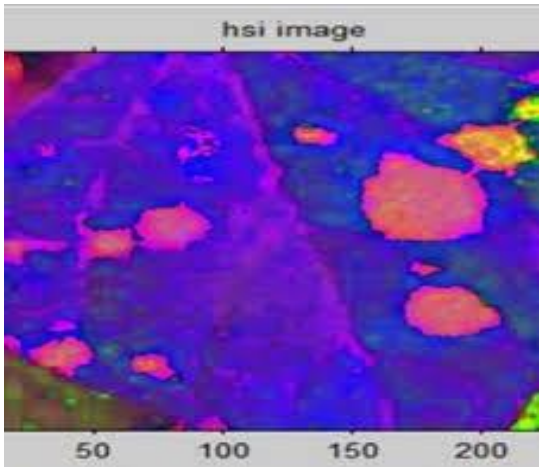


Fig.9 HSI conversion of leaf

The infected part of the leaf is extracted by means of segmenting the diseased and healthful component with different similar colored parts. The image processing is completed over the healthy region described at the threshold level. The comparison and analysis of functions such as location, perimeter and the inflamed percent of the leaf were performed succeeding the segmentation process. After creating the design run the learning algorithm on the gathered training set.

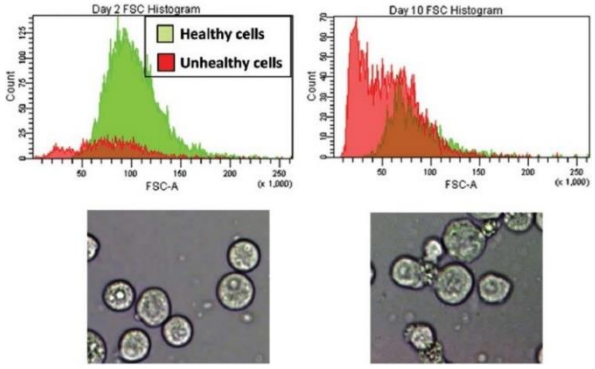


Fig.10 Histogram Plot for healthy and unhealthy leaf

3.5 Algorithm Description

In machine learning, the Support Vector Machine (SVM) algorithm will fall under a category of supervised learning. Supervised learning is the version is getting trained on a labeled dataset. The labeled dataset is one that has input and output parameters. On this learning type training and validation, datasets are labeled.

The algorithm used here is Support Vector Algorithm (SVM) which is employed for both classification and regression problems. The main use of the Support vector Algorithm is to define the boundary line or decision to separate the n-dimensional spaces. SVM predicts the correct data for the category by using a boundary line called a hyperplane. SVM helps to find the best boundary line or decision called a hyperplane.

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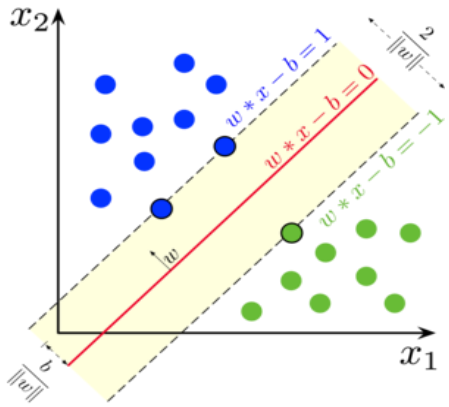

Fig.11 SVM algorithm diagrammatic representation

4 Result

The dataset images contain nearly 15,000 images from, bell pepper, potato, and tomato plant leaves. All the images are trained to the system and 20% of images are split for testing purposes using train_test_split function. The SVM model gives an accuracy of 89.2% and the model suggested pesticide according to the plant disease.

```
actual_picture : Tomato_Late_blight
Model output : Tomato_Late_blight
Model predicted correctly
pesticide ================> Dithane M 45
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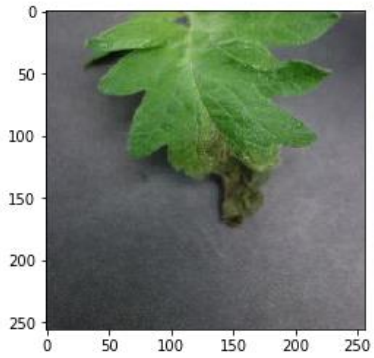

Fig.12 Model output

5 Conclusion

In the early stage itself crop diseases are detected by using the SVM algorithm. To regulate the infected disease the remedy pesticide is recommended to the former. The SVM algorithm is often expanded for the detection of multiple crop diseases on a significantly large scale. If this system is developed within the sort of website or android application it's going to convince be a great asset to the agricultural sector. It had been concluded that the amount of training samples increases the accuracy of disease detection also increases.

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