**Fertilizer Recommendation System for Disease Prediction**

# Introduciton

Detection and recognition of plant diseases using machine learning are very efficient in providing symptoms of identifying diseases at its earliest. Plant pathologists can analyze the digital images using digital image processing for diagnosis of plant diseases. Application of computer vision and image processing strategies simply assist farmers in all of the regions of agriculture. Generally, the plant diseases are caused by the abnormal physiological functionalities of plants. Therefore, the characteristic symptoms are generated based on the differentiation between normal physiological functionalities and abnormal physiological functionalities of the plants. Mostly, the plant leaf diseases are caused by Pathogens which are positioned on the stems of the plants. These different symptoms and diseases of leaves are predicted by different methods in image processing. These different methods includedifferent fundamental processes like segmentation, feature extraction and classification and so on. Mostly, the prediction and diagnosis of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.

# Literature Review

1] The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.
Advantages : The prediction and diagnosing of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.
Disadvantages : This further research is implementing the proposed algorithm with the existing public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.
[2] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems(ICIIECS), IEEE, 2017.
Advantages: The system detects the diseases on citrus leaves with 90% accuracy.
Disadvantages:System only able to detect the disease from citrus leaves.

The primary goal of this paper is to describe image analysis and classification methods for the identification and classification of leaf diseases.
The leaf image undergoes initial preprocessing before undergoing further processing.
K-Means Clustering is used to segment the images, and from the images that have disease detection, the system extracts the GLCM features.
the SVM classifier's classification of diseases.

Algorithm used: Gray-Level Co-Occurrence Matrix (GLCM) features, SVM, K-Means Clustering .

[3] System for classifying and detecting semi-automated leaf diseases in soybean culture 2018 IET Image Processing
Advantages:The system helps to compute the disease severity. Disadvantages:The system uses leaf images taken from an online dataset, so cannot implement in real time.

This essay primarily focuses on identifying and categorising soybean plant leaf diseases.The proposed system divides the leaf diseases into three classes, including septoria leaf blight, frog eye, and downy mildew, using SVM.Using a large dataset of 4775 images, the proposed system provides maximum average classification accuracy reported to be around 90%.Utilized algorithm: SVM.

Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.
Advantages:It is simple and cost effective system for plant leaf disease detection. Disadvantages:Any H/w failures may affect the system performance. The current paper proposesan android application for irrigation and plant leaf disease detection with cloud and IoT. For monitoring irrigation system they use soil moisture and temperature sensor and sensor data send to the cloud. The user can also detect the plant leaf disease. K-means clustering used for feature extraction.
Algorithm used: K-means clustering,
Other than this there are some other levels which can be used for sentimental analysis these are- document level, sentence level, entity and aspect level to study positive and negative, interrogative, sarcastic, good and bad functionality, sentiment without sentiment, conditional sentence and author and reader understanding points.

[5] The author suggests a method that, by recommending the best crops, aids in crop yield prediction.
In order to determine what crop should be planted in the field to increase productivity, it also focuses on soil types.
Soil types are crucial for crop yield.
Information about the soil can be obtained by factoring in the weather information from the previous year.
Advantages:
It enables us to foresee which crops would thrive in a specific climate.
Crop quality can also be increased using data sets related to weather and disease.
We can categorise the data using prediction algorithms according to the disease, and we can predict soil and crops using the data that was extracted from the classifier.
Disadvantages :Due to the changing climatic conditions, accurate results cannot be predicted by this system.
[6] The current work examines and describes image processing strategies for identifying plant diseases in numerous plant species. BPNN, SVM, K-means clustering, and SGDM are the most common approaches used to identify plant diseases.
Disadvantages : Some of the issues in these approaches include the impact of background data on the final picture, optimization of the methodology for a specific plant leaf disease, and automation of the technique for continuous automated monitoring of plant leaf diseases in real-world field circumstances.
[7] The proposed method uses SVM to classify tree leaves, identify the disease and suggest the fertilizer. The proposed method is compared with the existing CNN based leaf disease prediction. The proposed SVM technique gives a better result when compared to existing CNN. For the same set of images, F-Measure for CNN is 0.7and 0.8 for SVM, the accuracy of identification of leaf disease of CNN is 0.6 and SVM is 0.8.
Advantages : The prediction and diagnosing of leaf diseases are depending on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.
Disadvantages : This further research is implementing the proposed algorithm with the existing public datasets. Also, various segmentation algorithms can be implemented to improve accuracy. The proposed algorithm can be modified further to identify the disease that affects the various plant organs such as stems and fruits.
[8] In this paper, we propose a user-friendly web applicationsystem based on machine learning and web-scraping calledthe 'Farmer's Assistant. With our system, we are successfully able to provide several features - crop recommendation using Random Forest algorithm, fertilizer recommendation using arule based classification system, and crop disease detection using EfficientNet model on leaf images. The user can provide the input using forms on our user interface and quickly

gettheir results. In addition, we also use the LIME interpretability method to explain our predictions on the disease detectionimage, which can potentially help understand why our modelpredicts what it predicts, and improve the datasets and models using this information.
Advantages : For crop recommendation and fertilizer recommendation, we can provide the availability of the same on the popular shopping websites, and possibly allow users to buy the crops and fertilizers directly from our application.
Disadvantages : To provide fine-grained segmentations of the diseased portion of the dataset. this is not possible due to lack of such data. However, in our application,we can integrate a segmentation annotation tool where theusers might be able to help us with the lack. Also, we can usesome unsupervised algorithms to pin-point the diseased areas in the image. We intend to add these features and fix thesegaps in our upcoming work.

## Referenes:

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[6] Swapnil Joril, Rutuja Bhalshankar2, Dipali Dhamale3, Sulochana Sonkamble , Healthy Farm: Leaf Disease Estimation and Fertilizer Recommendation System using Machine Learning, International Journal of All Research Education and Scientific Methods (IJARESM), ISSN: 2455-6211

[7] Detection of Leaf Diseases and Classification using Digital Image Processing International Conference on Innovations in Information, Embedded and Communication Systems(ICIIECS), IEEE, 2017.

[8] Shloka Gupta „Nishit Jain ,Akshay Chopade, Farmer's Assistant: A Machine Learning BasedApplication for Agricultural Solutions.