FERTILIZER RECOMMENDATION SYSTEM
FOR DISEASE PREDICTION

Introduction:

☐ 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, 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 include different fundamental processes like segmentation, feature extraction and classification and so on. Mostly, the prediction and diagnosis of leaf diseases are dependent on the segmentation such as segmenting the healthy tissues from diseased tissues of leaves.

Literature Review:

1. 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 a simple and cost effective system for plant leaf disease detection.
   Disadvantages: Any H/w failures may affect the system performance.

2. Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018.

   Advantages: The system helps to compute the disease severity.
   Disadvantages: The system uses leaf images taken from an online dataset, so cannot be implemented in real time. Algorithm used: SVM. This paper mainly focuses on detecting and classifying the leaf disease of soybean plants. Using SVM the proposed system classifies the leaf disease in 3 classes like i.e. downy mildew, frog eye, and septoria leaf blight etc. The proposed system gives maximum average classification accuracy reported is ~90% using a big dataset of 4775 images.

3. 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 dependent 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.

4. 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.

5. In this paper, we propose a user-friendly web application system based on machine learning and web-scraping called the 'Farmer's Assistant'. With our system, we are successfully able to provide several features - crop recommendation using Random Forest algorithm, fertilizer recommendation using rule 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 get their results. In addition, we also use the LIME interpretability method to explain our predictions on the disease detection image, which can potentially help understand why our model predicts 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 the users might be able to help us with the lack. Also, we can use some unsupervised algorithms to pin-point the diseased

areas in the image. We intend to add these features and fix these gaps in our upcoming work.

References:

1) Cloud Based Automated Irrigation And Plant Leaf Disease Detection System Using An Android Application. International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.

2) Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018.

3) Ms. Kiran R. Gavhale, Ujwalla Gawande, Plant Leaves Disease detection using Image Processing Techniques, January 2014.

4) Duan Yan-e, Design of Intelligent Agriculture Management Information System Based on IOT‖, IEEE,4th, Fourth International Reference on Intelligent Computation Technology and Automation, 2011.

5) R. Neela, P. Fertilizers Recommendation System For Disease Prediction In Tree Leave International journal of scientific & technology research volume 8, issue 11, november 2019.

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