# Fertilizer Recommentation System For Disease Prediction

## Introduction

Quality agriculture relies on gathering comprehensive information from farmland, which includes not only the environmental information but also the plant's information. For example, the environmental condition, such as temperature, soil moisture, humidity, soil composition, solar radiation, wind speed and rainfall, are considered to reveal the weather change and soil pollution, and can help to improve management of fertilizer usage and other inputs. The plant information, such as plant growth, plant disease and insect pest, are useful to predict the production and make decision about pesticide or organic applications.

This Disease Prediction System will give a better prediction of disease on Brinjal and it will recommend suitable pesticide/ organic materials applications using Machine Learning. Python Language is most widely language for Machine Learning, AI, Data Science, Deep Learning and Image Processing because of its simplicity and power full library. Open source python language is used to implement this system with some libraries like Open CV, pytesseract, NumPy, SciPy, Tensor Flow etc.

In this Disease Prediction System, Machine Learning and Clustering Algorithms can be applicable for plant growth monitoring. In this solution aggregation of data helps to convert raw data coming from plant into exact accurate data which will be understood by farmers.

Finally exact accurate information processed by Disease Prediction system is conveyed to farmers via messaging / App service on their mobiles, which will help to predict the application of pesticide to the plants.

## Literature Review

**[1]** Survey on Plant Disease Prediction using MachineLearning and Deep Learning Techniques Gokulnath BV, Usha Devi G

The major agricultural products in India are rice, wheat, pulses, and spices. As our population is increasing rapidly the demand for agriculture products also increasing alarmingly. A huge amount of data are incremented from various field of agriculture. Analysis of this data helps in predicting the crop yield, analyzing soil quality, predicting disease in a plant, and how meteorological factor affects crop productivity. Crop protection plays a vital role in maintaining agriculture product. Pathogen, pest, weed, and animals are responsible for the productivity loss in agriculture product. Machine learning techniques like Random Forest, Bayesian Network, Decision Tree, Support Vector Machine etc. help in automatic detection of plant disease from visual symptoms in the plant. A survey of different existing machine learning techniques used for plant disease prediction was presented in this paper. Automatic detection of disease in plant helps in early diagnosis and prevention of disease which leads to an increase in agriculture productivity.

**Advantages:** This work is to analyze different machine learning techniques widely used inthe prediction of plant diseases

**Disadvantages:** More investigations have to be made in these techniques for achieving better prediction system.

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

The main objective of this paper is image analysis & classification techniques for detection of leaf diseases and classification. The leaf image is firstly preprocessed and then does the further work. K-Means Clustering used for image segmentation and then system extract the GLCM features from disease detected images. The disease classification done through the SVM classifier.

**Advantages:** The system detects the diseases on citrus leaves with 90% accuracy.

**Disadvantages:** System only able to detect the disease from citrus leaves.

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

**[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.

A**dvantages :** 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.

**[4]** Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018

This paper mainly focuses on the detecting and classifying the leaf disease of soybean plant. 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.

**Algorithm used:** SVM.

**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.

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

The current paper proposes an 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.

**Advantages:** It is simple and cost effective system for plant leaf disease detection.

**Disadvantages:** Any H/w failures may affect the system performance.

**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.

**[6]** The author proposes a method which helps us predict crop yield by suggesting the best crops. It also focuses on soil types in order to identify which crop should be planted in the field to increase productivity. In terms of crop yield, soil types are vital. By incorporating the weather details of the previous year into the equation, soil information can be obtained.

A**dvantages:** It allows us to predict which crops would be appropriate for a given climate. Using the weather and disease related data sets, the crop quality can also be improved. Prediction algorithms help us to classify the data based on the disease, and data extracted from the classifier is used to predict soil and crop.

**Disadvantages :** Due to the changing climatic conditions, accurate results cannot be predictedby this system.

**[7]** 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.

**[8]** 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 successfullyable to provide several features - crop recommendation using Random Forest algorithm, fertilizer recommendation using a rule based classification system, and crop disease detection using Efficient Net model on leaf images. The user can provide the input using forms on ouruser interface and quickly get their results. In addition, we also use the LIME interpretabilitymethod to explain our predictions on the disease detection image, which can

potentially helpunderstand why our model predicts what it predicts, and improve the datasets and models using this information.

A**dvantages :** 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]** Mohsen Azadbakht, Davoud Ashourloo, Hossein Aghighi, Soheil Radiom, and Abbas Alimohammadi. Wheat leaf rust detection at canopy scale under different lai levels using machine learning techniques. *Computers and Electronics in Agriculture*, 156:119–128, 2019.

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

.

**[3]** Ms. Kiran R. Gavhale, Ujwalla Gawande, Plant Leaves Disease detection using Image Processing Techniques, January 2014.
https://www.researchgate.net/profile/UjwallaGawande/publication/314436486_An_Overview_of_the_Research_on_Plant_Leaves_Disease_detection_using_Image_Processing_Techniques/links/5d3710664585153e591a3d20/An-Overviewof-the-Research-on-Plant-Leaves-Diseae detection-using-Image-ProcessingTechniques.pdf

**[4]** Semi-automatic leaf disease detection and classification system for soybean culture IET Image Processing, 2018

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

**[6]** Duan Yan-e, Design of Intelligent Agriculture Management Information System Based on IOT, IEEE,4th, Fourth International reference on Intelligent Computation Technology andAutomation, 2011
https://ieeexplore.ieee.org/document/5750779

**[7]** R. Neela, P. Fertilizers Recommendation System For Disease Prediction In Tree Leave International journal of scientific & technology research volume 8, issue 11, november 2019
http://www.ijstr.org/final-print/nov2019/Fertilizers-Recommendation-System-For-Disease-Prediction-In-Tree-Leave.pdf .

**[8]** Swapnil Jori1, 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