# 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 analyse 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 include different 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:**

### Soil Fertilizer Recommendation System using Fuzzy Logic

**J. J. I. Haban, J. C. V. Puno, A. A. Bandala, R. Kerwin Billones, E. P. Dadios and E. Sybingco, "Soil Fertilizer Recommendation System using Fuzzy Logic," 2020 IEEE REGION 10 CONFERENCE (TENCON), 2020, pp. 1171-1175, doi: 10.1109/TENCON50793.2020.9293780.**

Soil nutrients and season have direct impact on the growth and yield of a crop. Deficiency on the nutrient level of the soil may result to plant disease while applying excessive amount of soil fertilizer on the other hand, may also cause negative results to the development of the crop. Nutrients on the soil also changes as the season changes from wet season to dry season. This study aims to develop a fuzzy logic-based program that will provide an appropriate amount of fertilizer to soil. The parameters such as season, nitrogen, phosphorus and potassium level are the inputs used on the fuzzy logic system

**ADVANTAGES:**

(1) Season, nitrogen, phosphorus and potassium level is used as input parameter of the fuzzy system.

(2) Different fertilizer combination is created depending on the range of input parameters used.

**DISADVANTAGES:**

(1) Used the recommended fertilizer to identify the accuracy of the result .

(2) Connect the program to a soil test analyzer.

## Farmer's Assistant: A Machine Learning Based Application for Agricultural Solutions

Shloka Gupta, Akshay Chopade, Nishit Jain, Aparna Bhonde," Farmer's Assistant: A Machine Learning Based Application for Agricultural Solutions" arXiv:2204.11340 https://doi.org/10.48550/arXiv.2204.11340

Farmers face several challenges when growing crops like uncertain irrigation, poor soil quality, etc. Especially in India, a major fraction of farmers do not have the knowledge to select appropriate crops and fertilizers. Moreover, crop failure due to disease causes a significant loss to the farmers, as well as the consumers. While there have been recent developments in the automated detection of these diseases using Machine Learning techniques, the utilization of Deep Learning has not been fully explored. Additionally, such models are not easy to use because of the high-quality data used in their training, lack of computational power, and poor generalizability of the models. To this end, we create an open-source easy-to-use web application to address some of these issues which may help improve crop production.

## ADVANTAGES:

1. The user can provide the input using forms on our user interface and quickly get their results.

## DISADVANTAGES:

1. 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.
2. Unable to find data on various brands and items available based on the N,P,K values.
3. Unable to detect the correct class for any out-of-domain data.

## CNN based Leaf Disease Identification and Remedy Recommendation System

**V. Suma, R. A. Shetty, R. F. Tated, S. Rohan and T. S. Pujar, "CNN based Leaf Disease Identification and Remedy Recommendation System," 2019 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), 2019, pp. 395-399, doi: 10.1109/ICECA.2019.8821872.**

Due to the improvement and development in technology where devices are smart enough to recognize and detect plant diseases. Recognizing illness can prompt faster treatment in order to lessen the negative impacts on harvest. This paper therefore focus upon plant disease detection using image processing approach This work utilizes an open dataset of 5000 pictures of unhealthy and solid plants, where convolution system and semi supervised techniques are used to characterize crop species and detect the sickness status of 4 distinct classes.

## ADVANTAGES:

1. The Network is trained using the images taken in the natural environment and achieved.

**DISADVANTAGES:**

1. If there is any simple disease, it may predict it as a complex disease

## Crop Recommender System Using Machine Learning Approach

**S. M. PANDE, P. K. RAMESH, A. ANMOL, B. R. AISHWARYA, K. ROHILLA and K. SHAURYA, "Crop Recommender System Using Machine Learning Approach," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), 2021, pp. 1066-1071, doi: 10.1109/ICCMC51019.2021.9418351.**

The proposed system provides connectivity to farmers via a mobile application. GPS helps to identify the user location. The user provides the area & soil type as input. Machine learning algorithms allow choosing the most profitable crop list or predicting the crop yield for a user-selected crop. To predict the crop yield, selected Machine Learning algorithms such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Random Forest (RF), Multivariate Linear Regression (MLR), and K-Nearest Neighbour (KNN) are used. Among them, the Random Forest showed the best results with 95% accuracy. Additionally, the system also suggests the best time to use the fertilizers to boost up the yield.

## ADVANTAGES:

1. This paper highlighted the limitations of current systems and their practical usage on yield prediction

## DISADVANTAGES:

1. The future work will be focused on updating the datasets from time to time to produce accurate predictions, and the processes can be automated.
2. An analysis of available statistical data needs to be done.

## KRISHI RAKSHAN - A Machine Learning based New Recommendation System to the Farmer

**D. N. V. S. L. S. Indira, M. Sobhana, A. H. L. Swaroop and V. Phani Kumar, "KRISHI RAKSHAN - A Machine Learning based New Recommendation System to the Farmer," 2022 6th International Conference on Intelligent Computing and Control Systems (ICICCS), 2022, pp. 1798-1804, doi: 10.1109/ICICCS53718.2022.9788221.**

The main purpose of this research work is to develop a machine learning-based recommendation system to increase agricultural productivity. A variety of datasets were used in this study to design and develop advanced models to estimate the crop, recommend fertiliser, and identify plant disease

## ADVANTAGES:

1. This system identifies the plant's ailment and presents the different treatment options.

## DISADVANTAGES:

1. Automation can be used for the data entries.
2. This system can be expanded to include additional features such as weather forecasting, drought conditions, and agricultural price forecasting depending on the season.

## Image-based Plant Diseases Detection using Deep Learning

**V. Panchal, S. C. Patel, K. Bagyalakshmi, P. Kumar, I. Raza Khan, M. Soni, "Image-based Plant Diseases Detection using Deep Learning", Materials Today: Proceedings, 2021, ISSN 2214-7853, https://doi.org/10.1016/j.matpr.2021.07.281.**

With the advance in Artificial Intelligence, there is a need to incorporate the facilities of the computer vision in the field of agriculture. Deep Learning rich libraries and user as well as developer friendly environment to work with, all these qualities make Deep Learning as the favourable method to get started with this problem. In this paper we have used Deep Learning because of the advantages it offers to work with images especially in image classification to get improvised results. The methodology includes taking leaves of infected

crops and label them as per the disease pattern. The images of infected leaves are processed pixel based operations are applied to improve the information from the image.

## ADVANTAGES:

1. We trained a naïve network of slightly smaller size of varying number of layers and completely tuned parameter four recent models: Inception-v3, and ResNet50, VGG19, VGG16.
2. Increased efficiency

## DISADVANTAGES:

1. Several diseases data collection for all stages can be done by using variety of sensors, like available in infrared camera also in multi camera.

## Soil Toxicity Prediction and Recommendation System Using Data Mining In Precision Agriculture

**M. Pawar and G. Chillarge, "Soil Toxicity Prediction and Recommendation System Using Data Mining In Precision Agriculture," 2018 3rd International Conference for Convergence in Technology (I2CT), 2018, pp. 1-5, doi: 10.1109/I2CT.2018.8529754.**

In this paper, the proposed system can help farmers by making them aware about their soil conditions. Farmers can maximize crops yield by knowing proportion of nutrients present in the soil. Soil toxicity affects the soil nutrients which indirectly affects crops health. The proposed system predicts the level of toxicity present in the soil and makes farmer aware about it. Many farmers are depending on rainfall which is the one of the factor for poor growth and decreases crops yield.

## ADVANTAGES:

1. The proposed system also informs farmers about toxicity level present in their soil as today the rate of pollution increasing very fast with industrialization.

## DISADVANTAGES:

1. If a single hardware fails, the total system halt.
2. Not able to reuse the hardware in the system

## Farmer's Assistant: A Machine Learning Based Application for Agricultural Solutions

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 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 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:

1. For crop recommendation and fertilizer recommendation
2. we can provide the availability of the same on the popular shopping websites
3. And possibly allow users to buy the crops and fertilizers directly from our application.

## DISADVANTAGES:

1. To provide fine-grained segmentations of the diseased portion of the dataset.
2. this is not possible due to lack of such data.
3. However, in our application, we can integrate a segmentation annotation tool where the users might be able to help us with the lack.
4. Also, we can use some unsupervised algorithms to pin-point the diseased areas in the image.
5. We intend to add these features and fix these gaps in our upcoming work

## Intelligent insecticide and fertilizer recommendation system based on TPF- CNN for smart farming

It is necessary to control them to ensure healthy crop production. Many techniques are used to identify the pest, suggest medications, and do soil nutrient analysis techniques separately. This paper applies the dual operator, Transition Probability Function (TPF), and Convolution Neural Network (CNN the) to process pest's image discretely and continuously for applying the recommended insecticide. The mathematical model with the objective function is derived in this paper. The proposed system combines two major aspects in farming: pest identification and insecticide recommendation using machine

vision and CNN. Secondly, the soil nutrient analysis uses a soil NPK sensor with the recommendation of fertilizers according to the obtained nutrient values. On-spot results are obtained, and the time required for insecticide recommendation is within 10 s, and for fertilizer recommendation, it is within 80 s.

## ADVANTAGE:

1. This system can be used anywhere as it is standalone and does not require an internet connection.
2. Acquires 99.8 of accuracy.

## DISADVANTAGE:

1. It any hardware fail, the whole system may fail