# Plant Disease Detection and Fertilization Suggestion Using A.I

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***Abstract*** **Automation of plant diseases in agriculture is the primary concern of every country as the demand for food is increasing rapidly due to population growth. In addition, modern technology has improved the efficiency and accuracy of plant and animal disease detection. The detection process is the first step in a series of activities aimed at fighting diseases and limiting their spread. Some diseases are also transmitted between animals and humans, which is why the fight against them is difficult. For many years, scientists have been researching how to treat common diseases that affect both humans and plants. However, many aspects of the detection and discovery process have yet to be completed.**

**Some diseases will turn out to be pandemics because it is difficult to detect them in time due to the fact that the technology used in medical processes was not enough to detect all diseases in time. Our goal is to define ailments more deeply and show how AI can quickly identify them. We discuss how machine learning and deep learning can be used to automatically detect plant diseases. The shift from traditional machine learning to deep learning in the previous five years is another area of focus in our study. Deep discussions are also held on various datasets related to plant diseases. There is also a presentation of difficulties and problems with current systems. Automatic disease detection is a feature of the proposed system.**

***Keywords:*** **Agriculture, Artificial intelligence, Disease detection, CNN, Image processing.**

## I. INTRODUCTION

Automating plant diseases in agriculture is a key concern for any country as the demand for food is increasing rapidly due to population growth. Crop diseases are a major threat to food security, but early diagnosis remains challenging in many parts of the world. In addition, modern technologies have improved the efficiency and accuracy of disease diagnosis in both plants and animals. Various actions are taken to combat infections and stop their spread after the detection process Our main goal is to identify the disease introduced into the plant by observing its shape using image processing and machine learning. Pests and diseases cause destruction of crops or parts of plants, reducing food production and increasing food insecurity. A number of new technologies have emerged to reduce post-harvest processing, strengthen agricultural sustainability and increase production. A number of laboratory methods have been used to identify diseases, including polymer chain reaction, gas chromatography, mass spectrometry, thermography and hyperspectral techniques. These methods take a lot of time and are not very cost-effective. In the recent past, disease identification has been done using server-based and mobile-based approaches. These technologies have a number of high-resolution characteristics.

## II. LITERATURE SURVEY

A. In order to distinguish between healthy and diseased leaves from the generated datasets, this work uses Random Forest. The implementation phases included in this work are dataset construction, feature extraction, Classifier training, and classification. To categorize photos of diseased and healthy leaves, the created datasets of diseased and healthy leaves are combined and trained using Random Forest. Overall, a clear method for plant disease identification is provided by applying machine learning to train large publicly available datasets.

B. This project aims to clarify the details of diseases and how to quickly detect them using artificial intelligence. Machine learning and deep learning are used to automatically detect plant diseases. In the past five years, machine learning methods have shifted from traditional machine learning to deep learning. Furthermore, various datasets related to plant diseases are thoroughly discussed. Challenges and issues associated with existing systems are also discussed.

C. One of the important and tedious tasks in agricultural practices is disease detection in crops. It requires enormous time and also skilled work. This paper proposes a smart and efficient technique for crop disease detection that uses computer vision and machine learning techniques. The proposed system is able to detect 20 different diseases of 5 common plants with an accuracy of 83%.

D. The aim of this study is to classify plant diseases using leaf images and Extreme Learning Machine (ELM), a Machine Learning classification algorithm with a single-layer feedforward neural network. This paper proposed image features as input, with the image pre-processed using HSV color space and features extracted using Haralick textures. The features are then fitted into an ELM classifier, which is used to train and test the model.

E. Artificial intelligence has numerous applications in various fields. Artificial intelligence can be of great help in dealing with crop diseases because it is able to perceive problems, develop suitable reasons for them and find optimal solutions. The article provides a brief overview of the application of artificial intelligence in agriculture, its available techniques for agriculture and highlights various methods of crop disease detection.

F. This article describes an effective method for detecting maize leaf diseases. The proposed method uses image processing techniques to extract important features to highlight image features that could be used for identification. Machine learning techniques are used to classify the extracted features to distinguish between diseased and healthy plant leaves. Experimental results show that the modified machine learning techniques can be effectively used for the classification of plant leaf diseases, even with an accuracy of 96.7%.

## III. OBJECTIVES

A. The main objective of the proposed system is to develop models based on deep learning to accurately classify a given leaf image into a specific disease category.

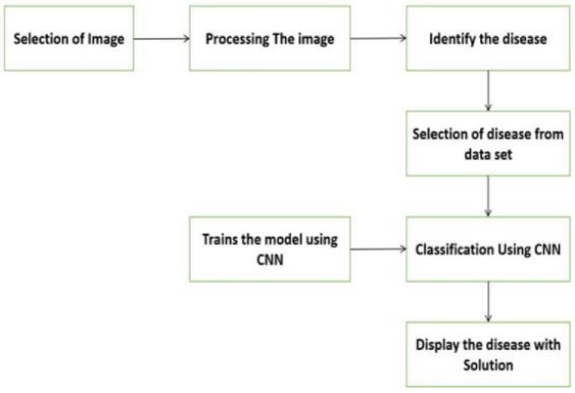
B. To distinguish an individual disease from a set of disease symptoms on an image of a single leaf.

## IV. METHODOLOGY

Below are important steps to design and implement a proper plant disease system

A. Collect the data set.
B. Choose a deep learning model.
C. Train the model using the dataset.
D. Export the trained model.
E. Create a user interface.
F. Import model.
G. Browse/Upload Image.
H. Process image.
I. Get a plant disease forecast.
J. Recommend fertilizer.

## V. BLOCK DIAGRAM




## VI. EDIBLE FRUITS AND DISEASE DISCRIPTION

We focused only on edible fruits such as (potatoes, tomatoes, grapes, corn, pepper, apple) only:

A. Apple (Malus domestica)

Apple scab disease: Vermicompost from Kraft Seeds or BRICS Neem Shakti can improve soil health, promote plant growth and increase plant resistance to this disease. Neem Shakti also has antifungal properties that can prevent the growth of disease-causing fungus. Black Rot Disease: BRICS Neem Shakti or without the need for pesticides. Neem Shakti can prevent the growth of the fungus that causes the disease, while the lack of pesticides indicates that the disease may not be severe enough to require chemical treatment.

B. Maize (Zea mays)

Cercospora Leaf Spot Disease: Bacterial and viral diseases Orcon or without the need for pesticides. Bacterial and viral diseases Orcon can improve plant immunity against bacterial and viral infections, which can prevent the spread of disease. Gray leaf spot disease: Orcon bacterial and viral disease or no need for pesticides. Bacterial and viral diseases Orcon can improve plant immunity against bacterial and viral infections, which can prevent the spread of disease.

C. Grapes (Vitis vinifera)

Black Rot Disease: BRICS Neem Shakti or without the need for pesticides. Neem Shakti can prevent the growth of the fungus that causes the disease, while the lack of pesticides indicates that the disease may not be severe enough to require chemical treatment.

D. Tomato (Solanum lycopersicum)

Bacterial spot: Nanopot Smart Plant Protector or without the need for pesticides. Nanopot Smart Plant Protector is a natural organic product that can improve plant resistance to bacterial and fungal infections.

E. Potatoes (Solanum tuberosum)

Early Blight Disease: BloomBuddy Fruit and Flower or Kraft Seeds Vermicompost or no need for pesticides. Both fertilizers can improve soil health and plant disease resistance. BloomBuddy Fruit and Flower also contains potassium, which can improve plant immunity against fungal infections. Late Blight Disease: BloomBuddy Fruit and Flower or Kraft Seeds Vermicompost or no need for pesticides. Both fertilizers can improve soil health and plant disease resistance. BloomBuddy Fruit and Flower also contains potassium, which can improve plant immunity against fungal infections.

F. Pepper (Capsicum annuum)

Bell Bacterial Spot Disease: Bacterial and viral diseases Orcon or without the need for pesticides. Bacterial and viral diseases Orcon can improve plant immunity against bacterial and viral infections, which can prevent the spread of disease.

The interface of our module consists of two buttons, namely "Image" and "Solution". The "Image" button allows users to upload an image to our model, which can then identify the name of the leaves and any diseases affecting them. On the other hand, the "Solution" button provides the best solution for the affected sheets whenever the user clicks on it.

## VII. MODULE INTERFACE


## VIII. WORKING

Here is how our project works :

A. In this project we will monitor apple, tomato, corn and grape plants. To train the system, we need a database of different plants. That's why we collect this database of plants from online sources.

B. The database contains details and images of leaves describing their condition and corresponding disease.

C. Choose a deep learning model and run the training data-set.

D. This database will be read by a deep learning engine that will learn the content/properties of the different sheets.

E. After learning the module, we will create a user interface (UI) in Python. The software we use to

process the previously taken image is called the user interface (UI).

F. In order to determine the plant disease, the characteristics of the leaves will be extracted accordingly.

G. A fertilizer recommendation will be made accordingly.

## IX. ADVANTAGE

A. Proper use of fertilizer
B. High quality of crop.
C. Proper fertilizer is detected.
D. Cost effective for farmer .
E. Less time consuming .

## X. APPLICATIONS

A. Gently used in agriculture to detect plant diseases.

B. It will also help the fertilizer shop owner to suggest the exact fertilizer depending on the disease detected.

## XI. FUTURE SCOPE

In addition to the proposed deep learning model for plant disease identification and fertilizer recommendations, the future scope of this project includes the implementation of a live scanner for real-time plant disease detection. This feature would be particularly beneficial for farmers, allowing them to quickly and efficiently identify diseases and take the necessary measures to prevent further damage to their crops. The application of this project could also be widely available to farmers around the world, helping to reduce crop losses and increase agricultural productivity. By leveraging technologies like deep learning and live scanning, we can revolutionize the agricultural industry and ensure a more sustainable future for food production.

## XII. CONCLUSION

This project provides effective, efficient and optimized software that can help in leaf specific disease detection targeting crop leaves.

Using the project will promote healthy leaves and provide the best results for the agricultural area. The project can see disease detection from the dataset.

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