Fertilizers Recommendation System For Disease Prediction

REPORT

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In the course of ,

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1. INTRODUCTION

1.1 Project Overview

Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence, early and accurate recognition of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.

The aim of our project is to create a Machine Learning Model to identify various kind of diseases in the plants by checking the symptoms shown on the leaves of the plant and predict what type of plant it is, whether healthy or unhealthy.

***Keywords*: Leaf Image Disease prediction, Image classification, Image Processing, Fertilizer recommendation, Deep Learning, CNN**

1.2 Purpose

The purpose of the project is to grow and produce healthy crops with good yield and nourishment. Nowadays, diseases on plants is playing major threat on food security.An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases.

2. LITERATURE SURVEY

2.1 Existing problem

Leaf Disease Identification and Remedy Recommendation System

Health of human beings depends on the type of food they consume. If the food is unhealthy,it certainly leads to poor nutrition and emergence of several types of health issues. Thus, having good crop productivity depends on healthy plants. Any type of disease in plants yields unhealthy

crops. Hence, detection of plant disease forms basic and most important step in yielding good crops. However, the manual mode of such detection is not accurate and is time-consuming. Hence, it is now possible to conduct such a detection using advanced technological support. Deep Learning technology can accurately detect presence of pests and disease in the farms. Upon this Machine learning algorithm can even predict accurately
the chance of any disease and pest attacks in future.

The authors in this paper**[1]** have used Convolution neural network to detect and classify plant diseases. The Network is trained using the images taken in the natural environment and achieved 99.32% classification ability. This shows the ability of CNN to extract important features in the natural environment which is required for plant disease classification. Image classification, Image Categories, Feature Extraction, and Training Data is carried out. The whole development of algorithm is done in Python tool. Using several toolboxes like Statistics and Machine Learning toolbox, Neural Network Toolbox and Image Processing Toolbox the outputs as of now are the training data in the form of image categories, image classification using K-Means clustering and moisture content along with predicting
of withstanding is implemented with training data and classification of given image dataset. The test input image is compared with the trained data for detection and prediction analysis. From the results, clearly model provides reliable results.

In this paper the authors**[2]** have addressed the fine-grained classification problems in the crop leaf disease image recognition. They proposed a method based on bi-linear residual networks (named DIR-BiRN). It integrated two 18-layer residual networks feature extractors by a bi-linear way. It can extract features more accurately and completely than the single residual networks model, while deploying and applying the model in an end-to-end way. So it has the advantages of both global model and local model. This experimental result approved that our bi-linear residual networks can extract more fine-grained crop disease features in the images, making our method able to realize more accurate disease recognition.

The authors**[3]** of this paper have devised a method for detection and classification of leaf diseases. The segmentation of the diseased part is done using K-Means segmentation. Then, GLCM texture features are extracted and classification is done using SVM. The method is tested

for detection of diseases in citrus leaves. Future work is to be carried out for classification of diseases in different plant species and to improve the classification accuracy.The proposed framework consists of four parts. They are (1) Image preprocessing (2) Segmentation of the leaf using K-means clustering to determine the diseased areas (3)feature extraction & (4) Classification of diseases. Texture features are extracted using statistical Gray-Level Co-Occurrence Matrix (GLCM) features and classification is done using Support Vector Machine .

In this paper**[4]** a study is performed for Soybean using leaf images. A rule-based semi-automatic system using concepts of k-means is designed and implemented to distinguish healthy leaves from diseased leaves. In addition, a diseased leaf is classified into one of the three categories (downy mildew, frog eye, and Septoria leaf blight). Experiments are performed by separately utilizing color features, texture features, and their combinations to train three models based on support vector machine classifier. Results are generated using thousands of images collected from PlantVillage dataset. Acceptable average accuracy values are reported for all the considered combinations which are also found to be better than existing ones. This study also attempts to discover the best performing feature set for leaf disease detection in Soybean. The system is shown to efficiently compute the disease severity as well. Visual examination of leaf samples further proves the suitability of the proposed system for detection, classification, and severity calculation.

The author **[5]** 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. The advantages are that 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.The disadvantages are that, Due to the changing climatic conditions, accurate results cannot be predicted by this system.

The authors**[6]** have here, proposed a new approach for the soil based fertilizer prediction system. The proposed system was able to analyze the soil nutrient type efficiently, leaf disease

2.2 References

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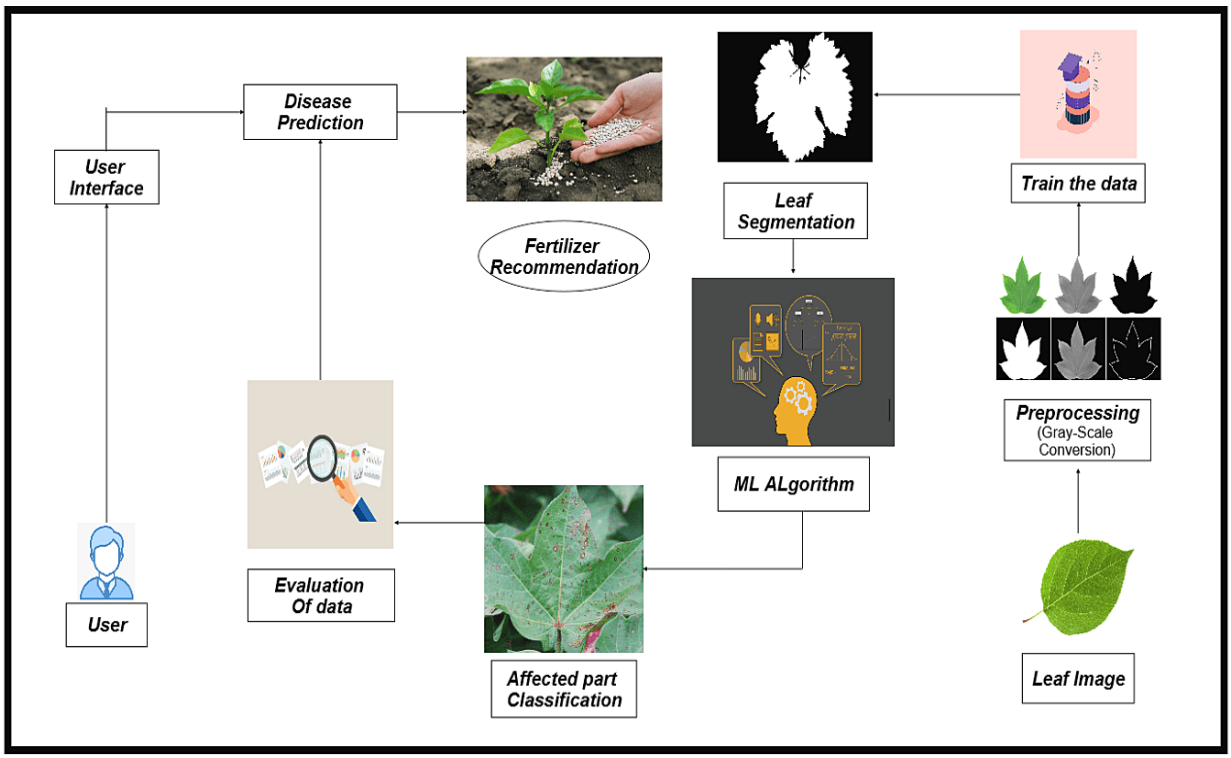
3. Solution & Technical Architecture

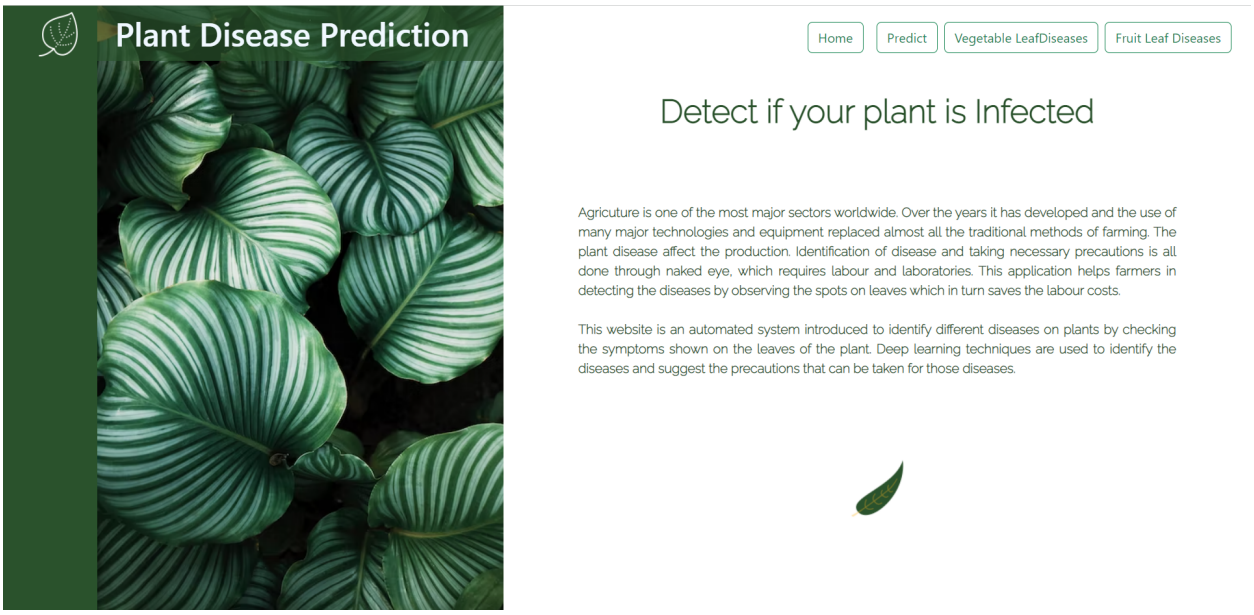
Solution Architecture

The leaf to be examined is taken and said to be pre-processed for getting accurate results. In pre-processing technique we have done gray-scale processing technique, where the leaf image is converted to eliminate every forms of colour information and leaves the colour on different shades of gray. White as the brightest and black as the darkest. Then ,the processed leaf image is trained and led to the segmentation technique. Here, the leaf parts are classified and analyzed carefully. This increases the surface area and the amount of light entering the plant.

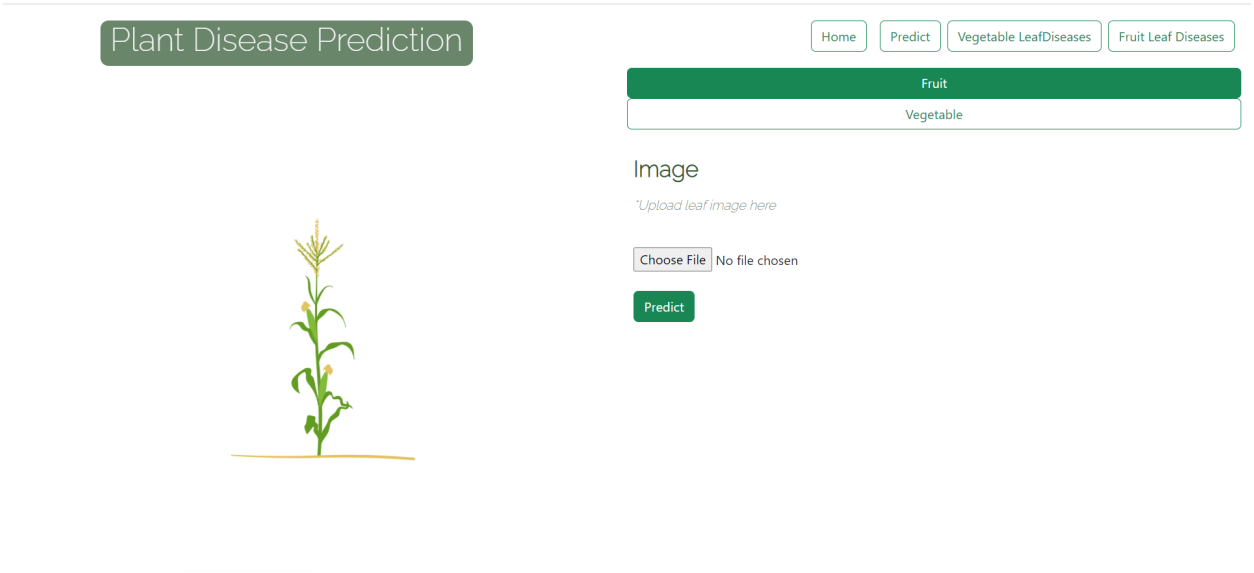
Then classification of what type of disease it is found. Then the data gathered is put into an Machine learning algorithm- CNN to build a model. The affected part of the plant is segmented and some evaluations are done to predict which type of disease the leaf is affected. The correct fertilizer is recommended along with the disease name.



4. Home Page



4.1 Predict Page



The code for both the pages were writen using html, css, and java script. Bootstrap is used for styling and responsiveness of the application. The backend is implemented through python flask for wich the code snippets are given below.

1. The image that is to be uploaded has to be clear to predict the image correctly
2. The model training time is prolonged as the images dataset takes long time to train
3. The CNN model used has an overspecialized neural network with high complexity.

5. CONCLUSION

This application promotes smart farming by recognizing the disease of fruits and vegetables and also recommending a fertilizer which is a very problem for many farmers but can be easily resolved using this application.

The following points are inferred from the observations in this application:

1. Both the fruit leaves and vegetable leaves dataset gave a high prediction accuracy of 97% and 99% respectively.
2. To get higher prediction accuracy the number of epochs which is the number of complete passes through the training dataset has to be increased. In our application we set the number of epochs = 15
3. Farmers as they can easily see what disease the leaves of fruits and vegetables are affected with.

6. FUTURE SCOPE

This project might further be extended to a Fully Automated Fertilizers Recommendation System For Disease Prediction, a Fog Layer based Application, where drones may be used to capture the leaf images and detect if a leaf is diseased or not. Further the disease positively detected images can be sent to the fog layer to classify for the type of disease and be provided with the right output, in order to recommend the right fertilizer.