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# Plant Disease Identification

Prof. Ashvini Bhosale[1], Sanjana Shinde[2], Rani Pawar[3], Priyanka Gosavi[4], Aryan Pansare[5]

Computer Department, GS Moze College of Engineering, Pune, India.

**ABSTRACT**

As we all know that to keep this mother earth alive, it is necessary to maintain a pollution free environment so as to keep the nature sustained followed by the other living beings which help us indirectly in various aspects like farming, milk, etc. Total 1,00,000 living beings including trees, animals, etc get infected through wide spread of diseases every year out of which some of them survive whereas the remaining ones die. There have been several reports and analysis of the real life data which was stored by capturing various real life events in the form of records, tables, models, images, etc. With the help of technology and devices, it has become quite easy to store and retrieve such large amount of data for various purposes like education, development, etc. The following project analyzes the data of trees and identifies the condition of them using CNN algorithm which is nothing but a deep learning algorithm.

**Keywords:** plants, disease, datasets, cnn, fungicides, prototype, supplements, etc.

## INTRODUCTION

As discussed earlier, the extinction of plants has become quite severe with most of them either being unhealthy or malnourished since birth while the others are being rapidly found under the clutches of some sort of diseases. Of course, the scientists and other researchers have been working on the cure for the diseases since ages but with the acknowledgement of the current technology, it has boosted the method to not only inject or use some sort of supplements to increase the immune system of the plants but also has reduced extinction and deaths of most plants. Anyways, this is all about getting the plant out of disease or making them healthier but what about the detection or identification of these diseases? The experts too require plenty amount of time and efforts to identify the problem of a single leaf or whole plant. This project, therefore, discusses on the ways or methods to identify and provide cure for a specific plant with the use of current technology and also showcases a prototype for the same.

### Study area

Convolutional Neural Network is an algorithm that analyzes the image based dataset and determines the characteristics, quality and condition of it. This project mainly focuses on the usage of CNN algorithm and deep learning aspects. The data contains the input in the form of image datasets which comprises of various leaves of different plants in healthy, unhealthy and infected conditions.

This project is based on Deep Learning which uses Convolutional Neural Network algorithm to detect and identify the diseases amongst healthy, unhealthy and infected plants by analyzing the datasets in the form of images that were captured in laboratory and outdoors.

### Need for implementation

Earlier, with the availability of no datasets, tools and technologies, it was more difficult and time-consuming task to analyze the plants and provide the cure and solution for the infected ones followed by the increase in growth of the healthy ones. Thus, to reduce the time, stress and extra steps taken for achieving the same result, the proposed system has been brought into consideration with minimal and easy usage.

## LITERATURE REVIEW

[1]. Lili Li, Shujuan Zhang, Bin Wang, et al. have also conveyed through their research that in order to realize the rapid and accurate identification of apple leaf disease, a new lightweight convolutional neural network RegNet was proposed. A series of comparative experiments had been conducted based on 2141 images of 5 apple leaf diseases (rust, scab, ring rot, panonychus ulmi, and healthy leaves) in the field environment. The results show that RegNet-Adam with a learning rate of 0.0001 obtained an average accuracy of 99.8% on the validation set and an overall accuracy of 99.23% on the test set, outperforming all other pre-trained models.

[4]. The proposed system of Jahnavi Kolli, Dhara Mohana Vamsi, V. M. Manikandan, et al. consists of two parts, a preprocessing step, and a CNN-based classification step. In the preprocessing step, the leaf images are converted into grayscale images, followed by a segmentation process to obtain the leaf regions. The segmented leaf regions are then resized to a fixed size, and a feature extraction process is applied to generate the feature vectors for the training and testing phase.

[6]. David P. Hughes, Marcel Salathe et al. have proposed a research paper which states that they trained a deep convolutional neural network to identify 14 crop species and 26 diseases (or absence thereof) of a public dataset of 54,306 images which includes diseased and healthy plant leaves collected under controlled conditions.

[7]. As proposed by the research of Sammy V. Militante, Bobby D. Gerardo, Nanette V. Dionisio, et al. their study provides an efficient solution for detecting multiple diseases in several plant varieties specifically apple, corn, grapes, potato, sugarcane, and tomato. The system can also detect several diseases of plants. Comprised of 35,000 images of healthy plant leaves and infected with the diseases, the researchers were able to train deep learning models to detect and recognize plant diseases and the absence these of diseases. The trained model has achieved an accuracy rate of 96.5% and the system was able to register up to 100% accuracy in detecting and recognizing the plant variety and the type of diseases the plant was infected.

[8]. Singh et al. proposed a dataset of field images called PlantDoc, a dataset for visual plant disease detection containing 2,598 data points across 13 plant species and up to 17 classes of diseases. Although it contains many laboratory images, PlantDoc has been used in some studies on plant disease detection, but has achieved very low performance.

## METHODOLOGY

The following steps were taken into account before starting with the project.

**Criteria for identification of plant's condition**

1. Gathering and downloading datasets onto local disk for offline purpose.
2. Merging all the mentioned datasets into one dataset.
3. Creating a python program to train the dataset and create the model.
4. Creating a python program which would make use of CNN algorithm to analyze the images. Thus, two working methods were created where each one of them had advantages and disadvantages.

1. First method-Projectv3

The first method used keras and tensorflow and was able to only identify the disease of three datasets.

A. This method could only identify up to four images and some infections.
B. The current keras model only supported some species of plants.
C. Complexity went to near impossible with the current system and tools.
D. It also has lot of glitches and bugs.

2. Second method - Project v4

The second method used many tools to not only identify the diseases or problem of the plants but also provides cure in the form of steps and supplements.

1. This method not only supports five datasets but also supports images outside the datasets.
2. It uses many tools to produce effective and robust results which are enough to satisfy the needs. 3. It also predicts and forecasts the cure for the disease followed by its solution.

4. It has separate technologies used at the frontend and backend to provide better user experience.

**Table 1: Datasets that are used in the project.**

| Name | Merged Dataset |
|---|---|
| Apple Plant Disease | All |
| Corn Plant Dataset | All |
| Tomato Plant Dataset | All |
| Grape Plant Full | All |
| Potato Dataset | All |

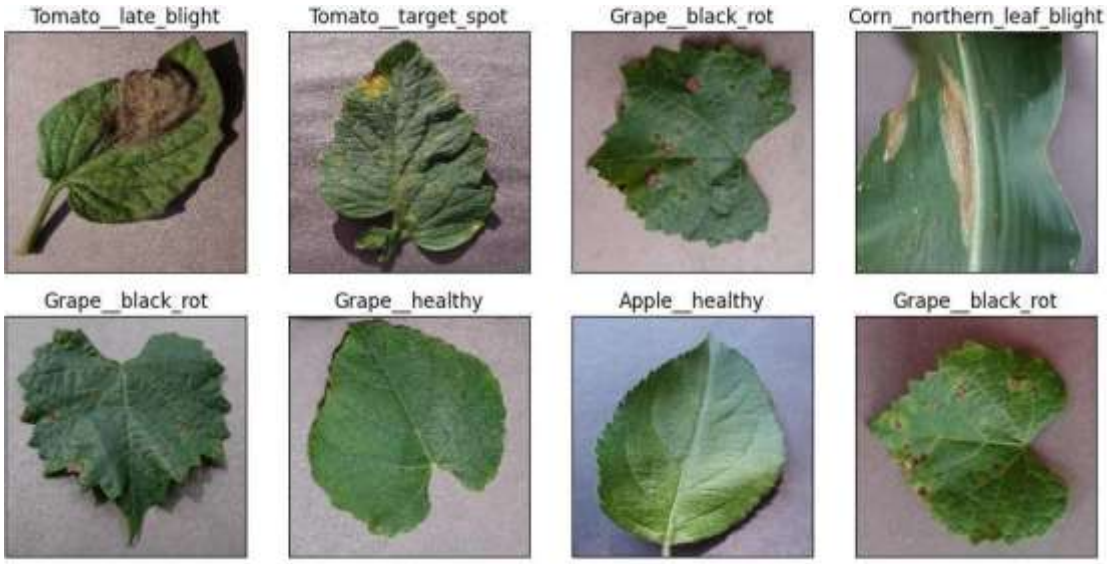


**Figure 1: Samples of the datasets.**

## RESULT & DISCUSSION

**Result of first method (Project v3):**

The first method could only identify up to four images and some infections whereas the current keras model only supports some species of plants and also with lot of glitches and bugs such that the complexity went to near impossible with the current system and tools.

**Result of second method (Project v4) :**

The second method not only supports five datasets but also supports images outside the datasets as it uses many tools to produce effective and robust results which are enough to satisfy the needs. It also predicts and forecasts the cure for the disease followed by its solution and has separate technologies used at the frontend and backend to provide better user experience. Moreover, it also shows the information and required fertilizer for the healthy plants in case if anyone wants to boost the immunity of the plant. It achieves the expected results with less efforts and in no time and also makes use of training concepts to train the data.

## CONCLUSION

This project has extensively used the technologies and tools to the edge and is in the process to create a digital product to identify the condition of plants and provide solution for the same in the safest method at an ease. Furthermore, on the developer side, it gives in-depth knowledge about web and application development sectors along with deep learning, algorithms and data binding strategies.

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