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Plants Pathology using Machine Learning (ML) Techniques.

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A B S T R A C T

The project titled "Plants Pathology using Machine Learning (ML) Techniques" Plants are very essential in our life as they provide source of energy and overcome the issue of global warming. Plants now a days are affected by diseases like bacterial spot, late blight, Septoria leaf spot. These diseases effect the efficiency of crop yield. So, the early detection of diseases is important in agriculture. Detection of diseases as soon as they appear is vital step for effective disease management. Aim of the project is to detect plant leaf disease by Machine Learning using image and videos. For Image, the proposed algorithm is Random forest classifier-Machine learning Algorithm used for classification and for video the proposed technique is Resnet50- Deep Learning Algorithm. These techniques will obtain prediction results using various metrics like accuracy, precision and efficiency. This project can be implemented in agriculture, nursery, college gardens etc.

Keywords: plants, agriculture, diseases detection , advance learning, global priorities

1. Introduction

Plant diseases pose a significant threat to global agriculture, leading to substantial crop losses and impacting food security. Traditional   methods of disease detection and diagnosis often rely on expert knowledge and manual observation, which can be time-consuming and prone to error. With the rapid advancement of technology, machine learning (ML) has emerged as a powerful tool in automating and enhancing the accuracy of plant disease detection. This project aims to harness the potential of machine learning techniques to develop an efficient and reliable system for the detection and classification of plant diseases. By analyzing images of affected plants, the model can identify specific diseases at an early stage, allowing for timely intervention and minimizing crop damage. The integration of ML in plant pathology not only improves diagnostic precision but also offers scalable solutions that can be deployed across diverse agricultural settings. The project's scope includes the collection and preprocessing of plant image data, the selection of appropriate machine learning algorithms, and the implementation of a robust model that can generalize well across various plant species and disease types. Ultimately, this research contributes to the broader goal of sustainable agriculture by providing farmers and agronomists with advanced tools for disease management.

2. Illustrations

"A clean, minimalist illustration features a side-by-side comparison: on the left, a vibrant, healthy plant leaf, and on the right, the same leaf with visible disease symptoms like brown spots or yellowing. Bridging the two is a magnifying glass or camera icon, representing the machine learning model. Arrows flow from the diseased leaf to a small screen or data icon, showing the model analyzing the image and diagnosing the disease. The image captures the essence of how machine learning transforms simple observations into actionable insights for plant health."

3. Requirements

3.1. Hardware Requirements

- Leaf
- Smart Phone / Camera
- Laptop

3.2. Software Requirements

- Operating system   :   Windows 10

- Coding Language   :   Python / Anaconda
- Database   :   SQL

4. System Analysis and Design

1. **System Analysis:**

Diseases such as rust, bacterial infections, late blight etc can plague the leaves of common crop plants. It is a common occurrence in the agricultural sector. Detecting the diseases and identifying their possible remedies is a cumbersome and tedious task. It is also often inaccurate and requires expert help. Farmers often lose out on their yields due to this. Getting an expert to come down and manually check out the leaves is time-consuming and often unreliable. In this project, we focus on creating a solution that would be an easy fix for the leaf disease detection problems. We have collected a large dataset consisting of images of healthy and diseased leaves.

We build an iPhone app for the detection of the disease a crop leaf is afflicted with, based on a picture of the leaf. The app will make use of ML algorithms to analyze and predict the disease a leaf has. It will use a model that has been trained on pre-identified diseased leaf images. Based on it, any newly encountered diseased leaf will be identified by its disease. The input image can be either an uploaded one or clicked through the phone camera. The output will be the disease name it has been identified with. Thus, a classification and identification of the disease is enabled. An option to look up remedies for the disease will also be provided. An additional option for a front-end is also made- a Rest Api service that hosts a website to allow entering of a picture name and display its output class.

2. **Design Analysis:**

The data set to be modelled for consists of pictures of leaves. Derived from the Crowd Ai Plant Village dataset available on the net. Contains images of healthy and diseased leaves. We have chosen the diseases affecting the tomato leaf for the purpose of this project.

The data used by us has the following classes: -

Target spot Septoria Spider mites Bacterial spot Early Blight Late Blight Healthy

The data set consists of 7000 images in total, of which 6902 have been used for training and 98 have been used for testing.

Each training class has 986 images, and each testing class has 14 images. The images are all of size 256 x 256 pixels and are all saved with the extension .JPG All the images are coloured. Apart from these, a few images have also been downloaded from the internet to test the model after its training.

5. Conclusion

In conclusion, the "**Plants pathology using machine learning techniques**" project presents a comprehensive approach to addressing the critical challenges of this project proposes a CNN model to enable the detection of the disease that has affected a given leaf image. A neural network was built and trained upon the data set. The generated model was saved and tested. The model is further deployed in 2 ways as an Ios app and as a Rest Api. Python was used to develop the model. The dataset consisted of 7 classes of images, each of size 256x256. In total, there were 7000 images in the data set. A user can upload the image to be checked on the Ios app and view the predicted disease type and the suggested remedies too. Another alternative method to use the model is through the Rest Api, where the user enters the name of the image file to check, on the site and the result is displayed on the site itself. The project model can be used to aid farmers in identifying the diseases that plague their crop/leaves and lead to a timely and convenient detection process. It is beneficial for botany students and people who take gardening as a passion. These people can get real- time disease detection and remedy solutions provided to them. It saves up a lot of time and money. It is beneficial in education people about how to take care of their plants in less time possible. Calling a specialist and waiting for him to analyze and then go ahead with a remedy can sometimes be too late and lead to major loss of crops.

References

Mrunalini R. Badnakhe and Prashant R. Deshmukh, "An Application of K-Means Clustering and Arti- ficial Intelligence in Pattern Recognition for Crop Diseases", pp. 135-137, 2011.

Manisha Bhangea and H.A Hingoliwala, "Smart Farming: Pomegranate Disease Detection Using Image Processing", 58 pp. 280 – 288, 2015.

Jagadeesh D. Pujari, Rajesh Yakkundimath and Abdulmunaf S.Byadgi, "Image Processing Based detection of Fungal Diseases in Plants", 46 pp. 1802–1808, 2015.

Pranjali B. Padol and Anjali A. Yadav, "SVM classifier based grape leaf disease detection",pp. 3288-3294, 2016.

Arti N. Rathod, Bhavesh Tanawal and Vatsal Shah, "Image Processing Techniques for Detection of Leaf Disease", pp. 397-399, 2013.

Sanjay B. Patil and Dr. Shrikant K. Bodhe, "Leaf Disease Severity Measurement Using Image Processing", pp. 297-301, 2011.

Smita Naikwadi and Niket Amoda, "Advances in Image Procesing For Detection of Plant Diseases", pp. 168-175, 2013.

Anand.H.Kulkarni and Ashwin Patil R. K., "A plying image rocessing techni ue to detect plant diseases", pp. 3661-3664, 2012.

Amar Kumar Dey, Manisha Sharma and M.R.Meshram, "Image Processing Based Leaf Rot Disease, Detection of Betel Vine", pp. 748-754, 2016.