Leaf Disease Detection

A Synopsis Submitted to

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Abstract

Well, for starters, leaf disease detection plays a crucial role in various industries, from agriculture to ecology and conservation. It helps us understand the leaf kingdom better, which in turn can lead to the development of new medicines, more efficient farming practices, and even the preservation of endangered species of leaves.

Introduction

Leaf disease detection plays a crucial role in various industries, such as agriculture, pharmaceuticals, and ecology. Accurate identification of leaves helps in improving crop yields, developing new medicines, and understanding the ecological balance of an ecosystem.

For instance, in agriculture, identifying the right leaf specie can help farmers optimize their crop management practices, leading to higher yields and reduced costs. In the pharmaceutical industry, accurate identification of leaf specie can lead to the discovery of new medicines and treatments for various diseases.

Objective

- The Aim of this project is to develop a fully functioning Android application for the purpose of Identification of leaf diseases.
- Creating an attractive UI for the User to use the application.
- Enabling the user to upload photos of the leaf for which they want to identify in the android application.
- Upon clicking on the predict button, the user will be shown the actual disease of leaf along with some relevant Information about it.

Scope

Leaf disease detection is the art and science of improving the genetic makeup of leaf in relation to their economic use for mankind. The scope of leaf disease program is to find objectives of various improved characteristics in leaf for sustainable survival and optimum economic yield. The objective of leaf disease detection is to develop improved characteristics of leaf for more demanding economically as well as agronomically.

Study of Existing System

- Leaf disease detection systems are mostly built using image processing techniques where leaf is considered the main organ in entire leaf structure.
- In the past decade a lot of research has been done to develop efficient and robust Leaf disease detection systems.
- Wu et al have proposed on of the earliest Flower identification system. In their scheme, they have created their own dataset named Flavia, which has been used by various other researchers as standard dataset for their work. It consists of 1907 leaf images of 32 different Flower species.
- Aakif Proposed an algorithm which used Artificial Neural Network (ANN) with back propagation. An input vector of morphological features, Fourier descriptors were fed into the ANN which resulted in a classification accuracy of 96% for both the datasets.
- Hossain extracted a set of unique featured called “Leaf Width Factor (LWF)” with 9 other morphological features using the Flavia dataset. These features were used as inputs for classification of leaf shape features. A total of 1200 leaf images were used.

Project Description

The goal of this project is to develop an android application that aids in the identification and classification of leaf diseases. The application will provide users with an easy-to-use

interface where they can upload images or input relevant characteristics of a leaf and receive accurate information about its breed.

Key Features:

Disease Identification: The core functionality of the android application will be the disease identification feature. Users will be able to upload images of leaf or enter specific traits such as leaf shape. The application will use advanced image processing techniques and machine learning algorithms to analyse the input and provide the most likely disease matches for the plant.

Leaf Disease Database: The android application will integrate a comprehensive database of leaf diseases. This database will contain information about various diseases, including their botanical names, common names, key characteristics. Users can access this database to learn more about specific breeds and explore related information.

Methodology

- Start
- Choose and extract a dataset
- Split Images for training & testing
- Pre-processing of Images
- Train CNN Model
- Validate against testing dataset
- If Less Accuracy, modify split ratio
- Inherit the model to Android App
- End

Expected Outcome

The Final System would ensure a fully functional and fully trained model which will be capable enough to detect various kinds of leaf diseases and provide information about them through uploading their photos to android application.

Resources

- Windows 10 or above.
- Google Chrome, Firefox, or Internet Explorer.
- Leaf Disease Dataset.
- VS Code and Python IDE.
- Hardware Processor > 2GHz.
- Secured Local Area Network and Internet Connectivity.

Limitations

Leaf disease detection systems, while promising, still have some limitations that prevent them from being foolproof. Here are some key areas where they can fall short:

Accuracy and Generalization:

- Limited datasets: Many systems are trained on datasets collected in controlled environments, which may not reflect the real-world variability in leaf appearance due to factors like lighting, weather, and co-occurring diseases. This can lead to reduced accuracy in field applications.
- Early-stage detection: Detecting diseases at early stages, when symptoms are subtle, can be challenging for current systems. This can delay treatment and worsen outcomes.
- Multiple diseases: Some systems struggle to identify multiple diseases present on the same leaf or differentiate between similar diseases.
- Rare diseases: Systems trained on common diseases may not be able to detect rare or emerging ones.

Technical and Practical limitations:

- Computational requirements: Deep learning algorithms, often used in these systems, require significant computing power, which can limit their use on low-resource devices.
- Image quality: The quality of the input image significantly impacts the system's performance. Poor lighting, blurriness, or obstructions can lead to misdiagnosis.
- Limited disease coverage: Not all systems can detect diseases for all plant types or crops.

Additional challenges:

- Integration with other technologies: Seamless integration with farm management systems and decision-making tools is still evolving.
- Regulatory frameworks: Clear guidelines and regulations for the use of these systems in commercial agriculture are still being developed.

Despite these limitations, leaf disease detection systems are actively being improved. Researchers are working on developing more robust algorithms, expanding datasets, and addressing practical challenges. As the technology evolves, it has the potential to become a valuable tool for farmers and agricultural advisors in managing plant diseases more effectively.

Conclusion

Following the Proposed Solution Methodology, it would be possible to Identify some of the species of diseases in existence on the planet using deep learning fundamentals.

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