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Android Application for Plant Disease Detection Using this Deep Learning

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Abstract: *In our first paper, we talked about the problems farmers face, and we introduced LeafAI, Plant disease detection app, as a way to help. Now, in this new paper, we're explaining how we actually made LeafAI work in the real world. Deep learning is a branch of artificial intelligence. In recent years, deep learning has brought tremendous improvements in the recognition accuracy of image classification and object detection systems. Hence, in this paper, we utilized convolutional neural network (CNN)-based pre- trained models for efficient plant disease identification. An Android application that utilizes deep learning techniques to detect and diagnose plant diseases from images of plant leaves. The application should empower users, including farmers and gardeners, to quickly identify and take action against plant diseases, there by improving crop health and yield.*

Keywords: Android Application, Deep Learning, Image Processing, Plant Leaf Disease Detection

I. INTRODUCTION

In our first research paper, we discussed the challenges farmers face and introduced LeafAI, a Plant Disease Detection App, as a solution. This second paper continues the story, focusing on how we actually put LeafAI into action. The android application is developed to provide users with an easy way to interact with the app to detect what is going on in their plant leaf. This app helps farmers to protect their crops. This app comes with a handy camera integrated to allow the farmer to click an image of the affected crop that he wishes to diagnose.

This image is processed in the backend using a deep learning model (CNN model) to classify the leaf disease. After getting the result of the image, We also add precaution information related to the diseases that are seen in the plants. In the application, we also added a feature to chatbot with other people if someone has any doubts about anything.

II. RELATED WORK

1. ALGORITHM

Convolutional Neural Networks (CNNs):

To train model by implementing Convolutional Neural Networks (CNNs) algorithm. Convolutional Neural Networks (CNNs) act like intelligent detectives in the world of computers, specifically designed to unravel the mysteries hidden within images. Picture these networks as virtual sleuths breaking down an image into smaller, manageable pieces, akin to how detectives scrutinize specific clues. The term "convolutional" refers to the process of sliding a metaphorical magnifying glass across the image, honing in on different areas to extract essential features, such as edges or shapes. This meticulous analysis allows the computer to discern and understand the intricate details within the image. If, for instance, the goal is to identify a cat in a picture, the CNN would focus on recognizing distinctive features like ears, whiskers, and tails. The network learns by repetitively examining examples, gradually becoming adept at understanding the defining characteristics of different objects. In essence, CNNs are like digital detectives with a keen eye for images, making them exceptionally proficient at tasks like object recognition.

To test model using test dataset and calculate accuracy of model and save in to HDF5 format. Below graph show our model training and testing accuracy and loss in detail graphical format.

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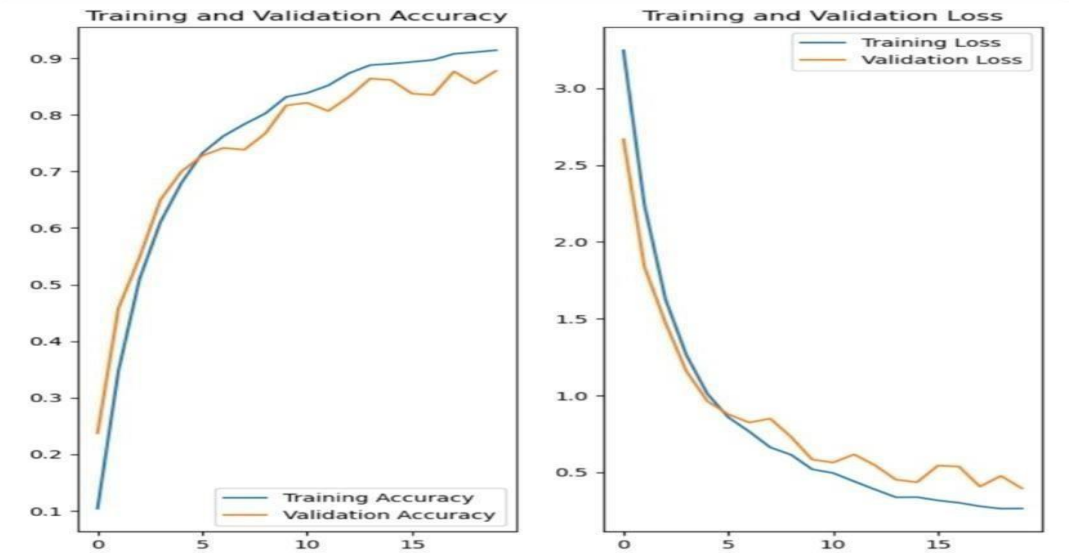

Fig 1: Model Accuracy and Loss

II. PLANT DISEASE DETECTION DATASETS

Although there are several datasets related to plant diseases, PlantVillage and PlantDoc .We used the PlantVillage Datasets. Uncertainty, the plant and disease accuracies obtained were 91.71% and 90.06%, respectively.

1) PlantVillage

PlantVillage is the largest plant disease dataset. The initial data records for 2016 contained 54,309 images spanning 14 crop species including- apple, blueberry, cherry, corn, grape, orange, peach, bell pepper, potato, raspberry, soybean, squash, strawberry, and tomato. These expertly curated images of healthy and infected crop leaves were made available through the existing online platform, PlantVillage (www.plantvillage.org). Diseases affecting these plants are divided into 17 fungal diseases, four bacterial diseases, two mold (oomycete) diseases, two viral diseases, and one mite disease. The dataset contains 38 classes of plant diseases and one class of background images, as shown in. This initial data setup was the beginning of an ongoing crowdsourcing effort to enable computer vision approaches to solve the problem of yield losses in crop plants owing to infectious diseases. From fields with crops infected with the disease, technicians collected leaves by removing them from the plant and placing them against a paper sheet that provided a grey or black background. All the images were captured under full illumination. Once the images were collected, they were edited by cropping away much of the background and orientating all leaves such that they tip pointed upward, as shown in Fig. 1. The images from this dataset are referred to as laboratory images

Fig 2: Apple scab leaf from the PlantVillage dataset.

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III. SYSTEM ARCHITECTURE

Android application for plant disease requires expertise and manpower. Furthermore, manual examination when identifying the type of infection of plants is subjective and time-consuming and sometimes the disease identified by farmers or experts may be misleading. This may lead to the usage of an unsuitable drug during the process of evaluating the plant disease, which may deteriorate the quality of the crops and end up polluting nature. Develop an Android application that utilizes deep learning techniques to detect and diagnose plant diseases from images of plant leaves. The application should empower users including farmers and gardeners to quickly identify and take action against plant diseases, thereby improving crop health and yield. The system is designed as an Android application. Where,

1. The farmer is able to take an image of a plant and check if the plant or leaf image is diseased.
2. The farmer gets a recommendation for precautions to be used for the disease.
3. The chatbot can solves the farmer queries.

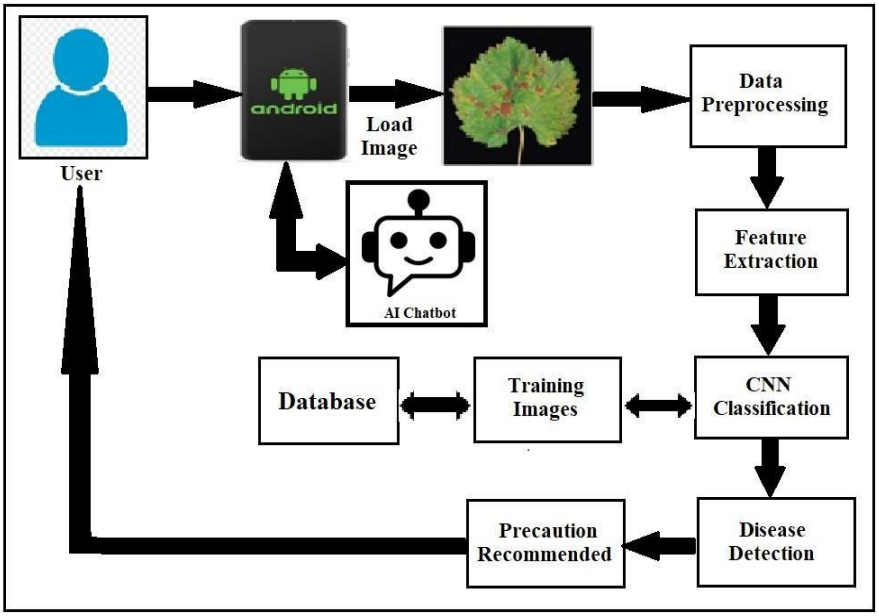

Fig 3: System Architecture

IV. RESULTS

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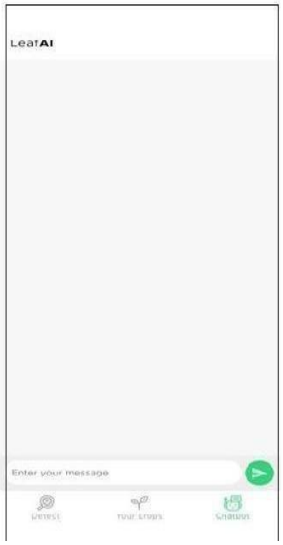

V. CONCLUSION

To sum it up, our journey with LeafAI, the Plant Disease Detection App, started with a big idea helping farmers overcome challenges. This paper dives into how we actually made it happen.. We explained the nitty- gritty details of how we used fancy tech terms like deep learning, API development, and user- friendly design to create something useful for farmers. Overall , the android application will be developed for plant disease detection and precautions will be given for the same. We will be adding a Chatbot for user can have any query.

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