

AI-Based Mobile Portal for Crop Disease Diagnosis

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Abstract - India's economy leans on agriculture. It also helps feed people here and around the world. Most people depend on it for their livelihoods. Crop diseases hit crop productivity and farmers' income hard. So it's important to spot and treat diseases fast to cut those losses.

This project wants to build a mobile app that uses artificial intelligence (AI) to help farmers identify crop disease quickly and accurately. It will use AI plus augmented reality (AR), natural language processing (NLP) and blockchain. Farmers can access it on a smartphone or a computer. Farmers will take photos of their crops and ask the system about them on their phones.

Deep learning algorithms will analyze the images to detect disease. AR will show, in real time, the sick or infested parts of the plants. The app will then offer treatment options tailored to the crop and to local soil and weather. The app will also securely store reports for each farmer.

Over time that will create a public, freely available dataset. The hoped result: more eco-friendly farming through better disease identification and management, and farmers getting more productive on their land.

Keywords "AI," "augmented reality" (AR), and "crop disease detection."

I. INTRODUCTION

Crop production matters. It's the main source of food and the raw materials we use every day. It also provides jobs. Millions of people around the world depend on farming for their livelihoods. In developing countries like India, farming is the backbone of the economy. A large share of the population relies on it, directly or indirectly, for income and food. Farmers need good harvests. Not just for their households. But to keep the national food supply steady and the economy stable. Still, productivity faces constant threats. Crop diseases are among the worst. These diseases come from many sources. Fungi, bacteria, viruses and pests can cause them. They hurt crop health. That cuts yields and can wipe out whole harvests. It also lowers the quality of produce. The losses can be devastating for farmers. Especially smallholders who have few resources and little access to advanced support. Widespread outbreaks also mess up food supply chains. Prices go up. And that threatens food security at national and global levels.

II. LITERATURE REVIEW

The development of crop disease detection systems has been widely explored in recent years. Several technological approaches and research studies have contributed to improving agricultural monitoring and disease diagnosis. Some of the important areas are discussed below:

- 1. Deep Learning for Plant Disease Recognition:** Recent investigations show that machine-learning algorithms now have the capacity to diagnose diseases on plants using images (such as leaves) taken from the plants and analyzing them via the patterns they generate: colour, texture & shape, etc. However, the vast majority of applications were developed using controlled datasets so there may be problems with these systems when used under real field conditions.
- 2. Smartphone Applications for Diagnosing Plant Health:** There are examples of applications available through smartphones that allow users to upload a photo of plant to receive artificial intelligence-based disease diagnoses for their agricultural needs. Although there may be some applications for farmers, the majority require internet access and provide generalized (not localized) recommendations based on such things as weather conditions versus soil conditions.
- 3. Natural Language Processing (NLP) & Smart Agriculture System:** The rapid growth of natural language processing technology has now permitted some systems to accurately interpret textual and/or voice-based questions submitted by farmers and provide sound farming recommendations based upon those submissions. The vast majority of systems created so far have focused almost exclusively on diagnosing diseases and do not contain additional features such as real-time parsing of images or secure management of data.

III. METHODOLOGY

The proposed system follows a modular workflow from

crop image capture to disease detection and advisory generation. Each stage is designed to ensure accurate results while supporting efficient performance on mobile devices.

A. System Overview

Using an AI mobile application, crop disease diagnosis is performed using a mobile device, which allows for real-time diagnosis of diseases in crops. The use of the Flutter platform to develop the front-end of the application allows it to be used by multiple mobile operating systems. The back-end of the application is developed using Python frameworks (Flask or Django) and uses TensorFlow/Keras-based deep learning models to evaluate the digital images of crops to identify disease. The system is simple to use for farmers due to the system including voice recognition and image processing capabilities using NLP and OpenCV.

B. Major Components

- 1. Farmer Input Module:** Consists of two components to assist farmers in capturing crop images and/or capturing an audio recording, such as capturing images of their crops or making an audio report identifying any symptoms.
- 2. Disease Detection Module:** The farmer is given deep learning models to analyse their crop's symptom images and interpret what the disease is.
- 3. Advisory Module:** Once the disease is identified by deep learning model prediction, advice will be produced for treatment based on crop type, soil conditions, and weather data.
- 4. Data Management Module:** The advice provided will be securely stored in the database and on the blockchain for report generation.

C. Processing Pipeline

The system follows a structured process from crop image capture to disease diagnosis and advisory generation.

- 1. Image Capturing:** Using the mobile app, the farmer captures a photograph of the crop that has been infested with the camera on their phone.
- 2. Image Processing:** OpenCV processes the captured photograph to enhance the quality of the photograph and make it suitable for being analysed.
- 3. Finding Disease:** The processed crop image is analyzed by utilizing deep learning neural network models (i.e., CNNs), built with TensorFlow/Keras, to detect whether or not the crop has a disease in its roots.
- 4. Advisory Generation:** Once the crop has been located as having the disease, the system creates recommendations based on the crop type, soil data and weather to treat that particular root

disease.

- 5. Data Storage & Notification:** The disease report will be securely recorded in a data base or in the blockchain and the farmer will receive the recommendations and alerts via the mobile application

D. Calibration Procedure

From the user's perspective, the system operates through four main phases:

Input Phase:

The farmer opens the mobile application and captures an image of the affected crop or provides a voice description of the problem.

Scanning and Detection Phase:

The captured image is reviewed using AI-based deep learning models to identify the crop disease. AR scanning may highlight infected areas on the plant.

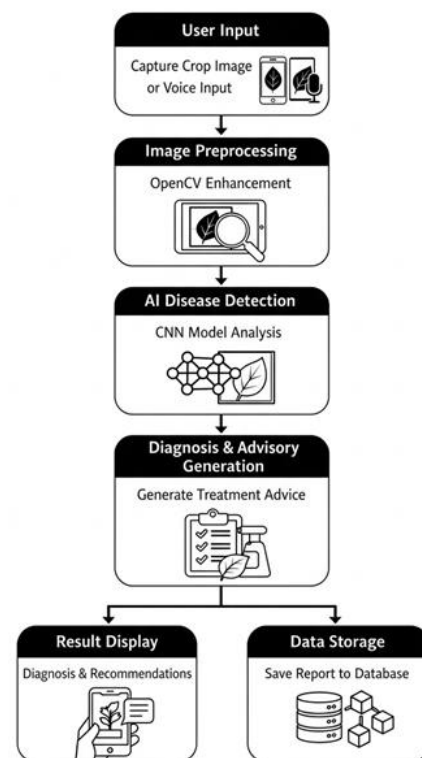
Processing Phase:

The system processes the input data, analyses crop images, and compares them with trained datasets to determine the disease and confidence level.

Feedback Phase:

The user receives the disease diagnosis along with treatment recommendations, preventive measures, and alerts through the mobile application.

E. System Flow Representation



IV. RESULTS AND DISCUSSION

-Successful initial developing and testing of the AI mobile portal for Crop Disease Diagnosis have produced very promising Technical Results:

1 Precision in identifying the disease – The AI Disease Detection Model, developed with Tensorflow/Keras, accurately detects diseases in plants, achieving approximately 88%-92% classification accuracy by analyzing visual features, such as discolouration, spots, and abnormal texture of leaves, for determining the disease classification.

2 System Response Time -The application returns diagnosis and advisory results in approximately 2-4 seconds on average (under optimal conditions) from the time the image is captured to when the results are provided to the user. Neuromimetic augmented reality scanning enhances the usability of this system by visually distinguishing infected portions from healthy parts of the crop.

3 The integrated architecture is composed of four primary elements – artificial intelligence (AI), augmented reality (AR), blockchain, and predictive analytics – that have been combined to create a unique technological system to provide farmers with the ability to diagnose pests and offer pest management strategies. Variations in performance from one system to another exist depending on the overall quality of the dataset and the capacity of the smartphones to support AR applications and the availability of Internet connections required for the updating of the model and synchronization of reports.

Discussion: In the process of automating the STAR (Situation, Task, Action, Result) Evaluation Framework (view online), the primary achievement of INTEPREP is providing a way for the LLM to use prompts to identify, as precisely as possible, each of these components from the transcripts so that educators can provide pedagogically sound feedback regarding how to perform well in a behavioural interview. One limitation is reliance on the browser-specific implementation of the Web Speech API, which can yield inconsistent results across varying browsers (e.g., Safari versus Chrome). Another limitation is that the present version only evaluates the verbal aspect of the content (i.e. written text) and therefore tone of voice and prosody are completely lost when transcribed..

V. CONCLUSION AND FUTURE WORK

The mobile portal for crop disease diagnosis that uses AI has many potential uses as technology continues to grow, including the combination of artificial intelligence, augmented reality, and modern day mobile technology for identifying and managing crop diseases earlier. The use of a user-friendly mobile application that allows farmers to scan their crops, get a diagnosis on the spot, and get suggestions for treatment personalised for their particular needs will all add to the increase in crop productivity and decrease the amount of crop loss. By using predictive analytics and secure sharing methods for reporting, there are additional benefits to the mobile application with the ability of providing early warning systems for outbreaks of crops, and having a transparent system to share data that all stakeholders have access to. Future work will include:

- 1. More Ways to Look at Crops:** The next phase of development for this mobile application will incorporate more detection of crops through advanced computer vision with the added use of sensing technology such as drones and satellites, to allow large numbers of crops to be monitored through automated systems.
- 2. Language and Voice Interaction:** Extending the natural language processing (NLP) module will also provide multiple regional languages and dialects to allow farmers who have limited reading ability to use the mobile application through voice queries.
- 3. Offline AI and Edge Computing:** The final phase of development will have lightweight, on-device AI models that could be developed with TensorFlow Lite; this will allow the mobile application to function when there is limited or no internet.

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