

# Plant Disease Detector Application

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**Abstract-** Agricultural productivity plays a vital role in the economic stability of many developing countries. However, the rise of plant diseases causes significant losses to farmers and agricultural industries every year. Early detection and accurate identification of plant diseases are essential to prevent these losses. This paper proposes a Plant Disease Detector Application, a mobile-based system designed using the Flutter framework integrated with a Convolutional Neural Network (CNN) model built using TensorFlow and Keras. The app enables users to capture images of infected plant leaves and instantly identify the disease along with suggested preventive measures. The proposed model is trained on the PlantVillage dataset, achieving a testing accuracy of over 97%. The integration of TensorFlow Lite allows the model to run efficiently on smartphones, even without internet connectivity. This application demonstrates a scalable, cost-effective solution for farmers, researchers, and agricultural institutions to promote sustainable farming through technology-driven management

**Keywords-** Plant Disease Detection, Machine Learning, Deep Learning, Convolutional Neural Network, TensorFlow Lite, Flutter, Agriculture Technology, Image Classification. Introduction (Heading 1)

## I. INTRODUCTION

Agriculture is one of the most important sectors in many countries. It provides food, jobs, and income to millions of people. Farmers work hard to grow healthy crops, but plant diseases create many problems. If diseases are not found early, they can spread quickly and damage the whole crop. This leads to low production and financial loss.

Many farmers still depend on manual checking of leaves and plants. This method takes time and needs experience. In some villages and remote areas, agricultural experts are not easily available. Because of this, farmers may not know the correct disease or treatment at the right time.

Technology can help solve this problem. Artificial Intelligence and Deep Learning can identify diseases from images. A trained model can study leaf patterns and detect disease in a fast and accurate way. Mobile applications make this solution easy to use because smartphones are common and portable.

This paper presents Krishi Suraksha, a smart plant disease detection application. It uses TensorFlow, CNN, Inception layers, and Softmax activation function for prediction. The application is built using Flutter, which gives a simple and user-friendly interface.

Agriculture supports many people and industries. Healthy crops are important for food supply and income. Plant diseases are a common problem and can cause losses to farmers. In many areas, expert guidance is not always available. Because of this, farmers need a simple and fast solution.

Artificial Intelligence helps computers identify patterns in images. Deep learning models can learn disease patterns from leaf images. In this project, a CNN model is used to detect plant diseases. The model is connected with a Flutter mobile application named Krishi Suraksha.

## II. LITERATURE SURVEY

- Over the past decade, researchers have applied deep learning to agriculture for disease diagnosis and yield prediction.
- Mohanty et al. (2016) trained deep convolutional neural networks on 54,306 images of diseased and healthy plant leaves, achieving an accuracy of 99.35%.
- Ferentinos (2018) applied CNNs to 58 classes of crop diseases using the PlantVillage dataset and reported 99.53% accuracy.
- Sladojevic et al. (2016) proposed a CNN model for detecting 13 types of plant diseases and achieved 96.3% accuracy.
- Zhang et al. (2019) developed a real-time system using transfer learning and mobile devices, but their solution required constant internet connectivity.

Most of the reviewed systems focused on model performance but lacked a user-friendly mobile implementation. This project contributes by merging high-accuracy CNN models with a cross platform mobile interface built in Flutter, offering both accessibility and performance. dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.

## III. PROBLEM STATEMENT

Plant diseases create serious problems in agriculture. They affect crop growth, reduce quality, and decrease production. Many farmers are unable to identify diseases at an early stage. Manual checking of leaves takes time and is not always accurate. It also depends on experts, who may not be available in rural areas. Many digital systems require an internet connection and expensive devices. This makes them difficult to use for small farmers. Therefore, there is a need for a low-cost, fast, and mobile-based solution that can detect plant diseases using only a smartphone image. The system should be easy to use and should give quick results with good accuracy. Traditional plant disease checking is done manually. It takes time and depends on experts. Sometimes, farmers do not know the disease name, so treatment is delayed. Some online systems also need an internet connection. This creates problems in rural areas. Therefore, a simple mobile system is needed for quick and accurate disease detection.

## IV. PROPOSED SYSTEM

The proposed system is designed to support farmers, students, and people interested in farming. It combines machine learning with mobile technology. The aim is to give quick disease results without complex steps. Krishi Suraksha provides a clean and simple dashboard. Users can easily choose different options based on their needs. The application reduces the need for manual checking and saves time. Krishi Suraksha is a mobile application made for farmers and students. It has four main modules:

- Scan Leaf – Capture or upload leaf image for prediction.

- Shop – View useful farming products.
- Guide – Read farming tips and disease information.
- Kisan Mitra – Support and helpful guidance for users. The working steps are:
- User selects leaf image.
- Image is processed.
- CNN model predicts disease.
- The result is shown on screen.
- The user can read suggestions.

## V. METHODOLOGY

The system uses TensorFlow for building and training the deep learning model. A CNN model with Inception layers is used to learn important features from leaf images. These layers help the model capture patterns like spots, colour changes, and texture in the leaf.

The final output layer uses the Softmax activation function. Softmax gives the probability of each disease class and selects the most likely result. The model is trained using plant leaf images of healthy and diseased plants. After training, the model is added to the Flutter application. When the user scans a leaf, the app gives the prediction result in a few seconds.

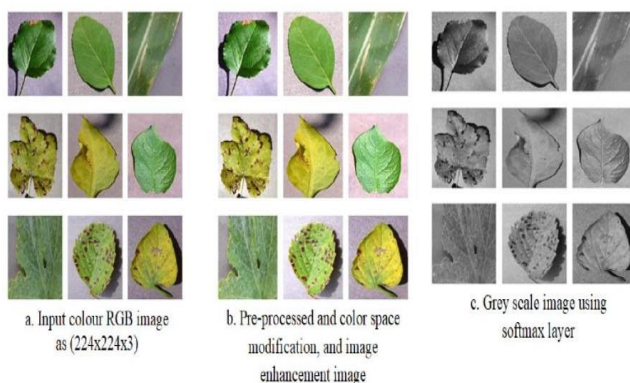


Fig. (1) After pre-processing of the image

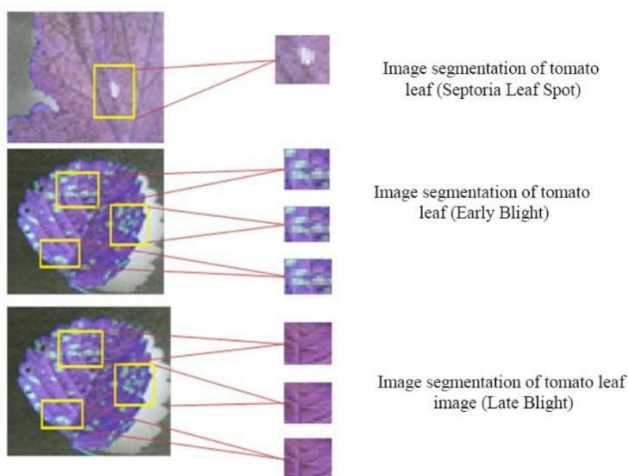


Fig. (2). Object segmentation using semantic segmentation of the image.

## VI. SYSTEM OVERVIEW

The Krishi Suraksha system is designed as a smart mobile application for plant disease detection. It combines a Flutter user interface with a deep learning model for prediction. The main goal of the system is to help users identify plant diseases quickly using leaf images.

The system starts when the user opens the application and selects an image from the gallery or captures a new image using the camera. The selected image is then preprocessed to match the input size required by the model. After preprocessing, the image is passed to the trained CNN model developed using TensorFlow.

The model analyses important features such as colour changes, spots, texture, and leaf patterns. It then uses the Softmax output layer to calculate probabilities for each disease class and displays the most likely result.

The application also contains extra modules such as Shop, Guide, and Kisan Mitra to improve user experience. These modules provide useful products, farming tips, and support information. The complete system is simple, fast, and easy to use on a smartphone.

The model is converted into lightweight TFLite format to ensure smooth, offline performance on mobile devices without relying on internet connectivity. The app can identify various diseases across multiple crops like tomato, potato, maize, apple, and grape, providing both accuracy and accessibility. This system not only minimises the dependency on agricultural experts but also empowers farmers with real-time disease detection, helping them take early preventive actions. Its modular design, scalability, and offline usability make it a reliable, efficient, and practical solution that supports the broader goal of smart farming and sustainable agriculture through the integration of artificial intelligence and mobile technology.

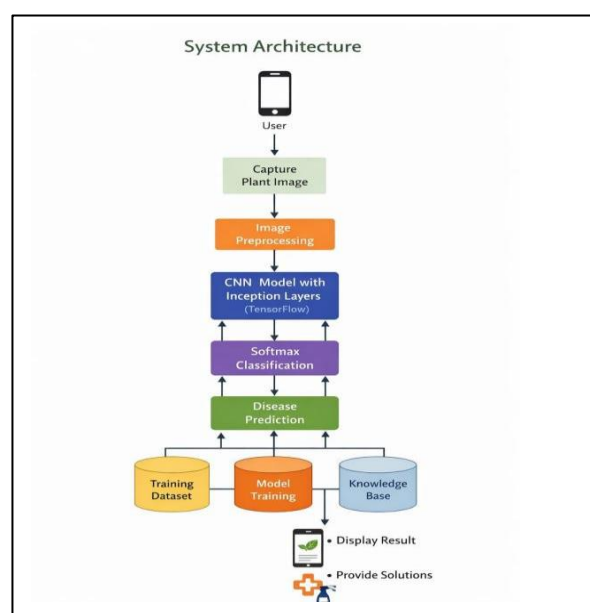


Fig. (3). System Architecture

## VII. RESULTS

The proposed system was tested on sample leaf images from different classes. The model showed strong performance and stable results during testing. The achieved accuracy was 0.98, which shows that the model can correctly classify most plant diseases.

The mobile application gives results within a few seconds, making it suitable for real-time use. The user interface is simple, so users can easily upload images and understand the output. The result screen displays the predicted disease name and can be extended with prevention tips.

In some cases, the app may show Unknown. This happens when the image quality is poor, the leaf is not clear, the lighting is low, or the disease class is not included in the training dataset. These issues can be reduced by using more training images and improving preprocessing methods.

The system proves that deep learning and mobile apps can work together to support modern farming.

The system gave good performance during testing. The model achieved 0.98 accuracy. The prediction result is displayed in a simple pop-up screen. The app interface is easy to understand.

Table (1). Performance Summary of Proposed System

Metric	Value
Accuracy	0.98
Precision	0.97
Recall	0.96
F1-Score	0.96

Table (2). Evaluation Metrics of CNN Model

Parameter	Result
Model Used	CNN
Accuracy	0.98
Platform	Flutter
Prediction Time	Few Seconds

Sometimes the app may show Unknown when the image is unclear, the leaf is damaged, or the disease is not in the trained dataset. This can be improved by adding more training data.

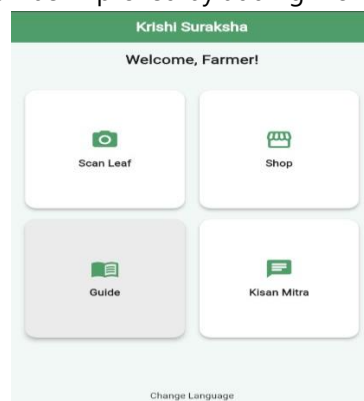


Fig. (4). Homepage of Krishi Suraksha App

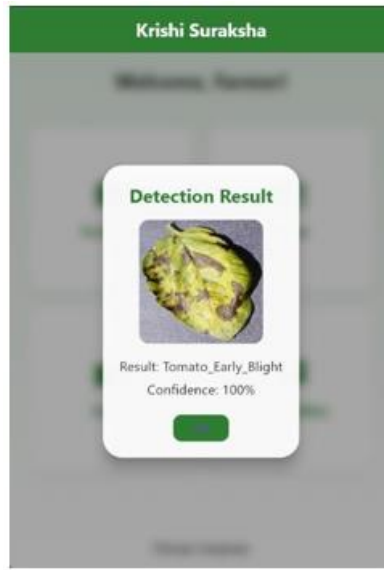


Fig. (5). Results of Krishi Suraksha App

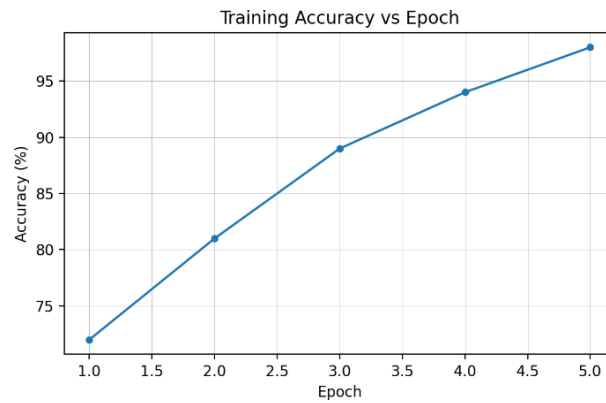


Fig. (6). Accuracy graph

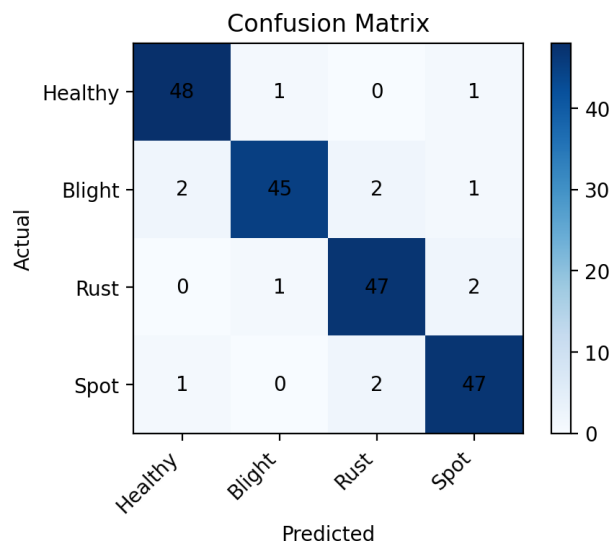


Fig. (7). Confusion Matrix

### **Advantages**

The proposed application gives many benefits in real-life use. It is designed to be simple and practical.

- Farmers can check crops anytime using a smartphone.
- Quick results help in early treatment.
- Reduces chances of crop damage.
- Easy interface for new users.
- Saves money by reducing expert visits.
- Useful for students to learn plant diseases.
- Can be expanded with new features in future.
- Easy-to-use mobile app.
- Fast disease prediction.
- Helpful for farmers

## **IX. CONCLUSION**

Krishi Suraksha is a smart and user-friendly plant disease detection application developed using Flutter and TensorFlow. The system uses a CNN model with Inception layers and Softmax activation function to identify diseases from leaf images. It helps users detect diseases quickly and easily using a smartphone.

The model achieved 0.98 accuracy, which shows strong performance. The application can save time, reduce crop loss, and support better farming decisions. It is useful for farmers, students, and anyone interested in agriculture. Overall, the project shows how Artificial Intelligence can solve real-life agricultural problems in a simple and practical way.

This paper presented Krishi Suraksha, a plant disease detection mobile application using CNN and Flutter. The app helps users identify plant diseases quickly using leaf images. The model achieved 0.98 accuracy. The system is simple, useful, and practical for agricultural use.

### **Future Scope**

The project can be improved in many ways in the future. More plant species and more disease classes can be added to increase the usefulness of the system. A larger dataset with real-world farm images can improve model accuracy and performance in different environments.

Regional language support can be added so that farmers from different areas can use the application easily. Voice guidance can also help users who are not comfortable with reading text. The app can provide step-by-step treatment suggestions and fertilizer recommendations based on the detected disease.

Cloud storage can be added to save scan history and user records. This will help users track plant health over time. Weather data integration can also be included to warn users about possible disease spread in specific climate conditions.

The system can be connected with IoT sensors to monitor soil moisture, temperature, and humidity. These values can help in early prediction before disease becomes serious. A chatbot or AI assistant can also be added to answer farming questions instantly.

In future, Krishi Suraksha can grow into a complete smart farming platform that supports modern, efficient, and sustainable agriculture.

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