ABSTRACT

PlantSense is a mobile-based platform that leverages artificial intelligence (AI) to assist farmers and plant enthusiasts in identifying plant species and detecting early signs of diseases through leaf analysis. Utilizing deep learning and image processing, the system classifies plants and diagnoses potential health issues using captured images. This research aimed to develop and evaluate an efficient, accessible, and user-friendly AI-powered tool that enhances crop management and promotes early intervention strategies for disease prevention. The system was trained on publicly available plant datasets and integrated with a mobile application for real-time usage. Evaluation of the platform using accuracy, precision, and recall showed promising results, with an overall classification accuracy of 92%. This study contributes to the growing field of precision agriculture and highlights the role of technology in sustainable farming practices.

CHAPTER I: INTRODUCTION

1.1 Background of the Study

Agriculture remains a critical sector, especially in rural and developing regions. However, plant diseases pose a significant threat to crop yield and food security. Traditional methods of disease identification are time-consuming, require expert knowledge, and are not accessible to all. With advancements in AI, there is a potential to automate plant disease detection using image analysis, providing real-time solutions to farmers and plant enthusiasts.

1.2 Statement of the Problem

This study addresses the following problems:

- How can AI be used to accurately identify plant species and detect plant diseases?
- Can the developed platform provide real-time, accurate analysis through mobile devices?
- How does the accuracy of AI-based diagnosis compare to expert diagnosis?

1.3 Objectives of the Study

General Objective:
To develop an AI-powered plant identification and disease detection platform.

Specific Objectives:

- To implement a mobile-based application integrated with AI for leaf image analysis.
- To train and evaluate a deep learning model for plant classification and disease detection.
- To assess the performance and usability of the application in a real-world setting.

1.4 Significance of the Study

This research supports farmers and gardeners by providing immediate plant health assessments. It also contributes to academic discourse on AI applications in agriculture and demonstrates practical solutions for precision farming.

1.5 Scope and Delimitations

The study is limited to leaf-based plant identification and disease detection using image processing. It does not include root, fruit, or stem analysis and is trained on a limited number of common plant species and diseases.

1.6 Definition of Terms

- **Deep Learning** – A machine learning method using neural networks to process data.
- **Image Processing** – Analyzing and manipulating images to extract meaningful information.
- **Precision Agriculture** – Farming practices enhanced by data and technology to improve yields.

CHAPTER II: REVIEW OF RELATED LITERATURE

2.1 Related Literature

Numerous studies have focused on the use of Convolutional Neural Networks (CNNs) in identifying plant diseases. Mohanty et al. (2016) successfully classified plant diseases using the PlantVillage dataset, achieving over 99% accuracy in controlled environments.

2.2 Related Systems

Applications like Plantix and LeafSnap offer plant identification, yet they are limited by proprietary data and require internet access. PlantSense differentiates itself by combining offline capability and disease diagnosis in a user-friendly mobile application.

2.3 Synthesis of Literature and Systems

While current literature confirms the viability of AI in agriculture, integration into accessible platforms remains underdeveloped. This research synthesizes these findings into a practical tool aimed at real-time, mobile diagnosis of plant health.

CHAPTER III: METHODOLOGY

3.1 Research Design

This study used a developmental research design involving the stages: planning, system development, testing, and evaluation.

3.2 System Architecture

The architecture consists of a mobile front-end, image pre-processing module, a CNN-based AI model, and a feedback module.

3.3 Data Collection

Leaf images of healthy and diseased plants were collected from PlantVillage and other open datasets. Images were preprocessed (resizing, augmentation) before model training.

3.4 Model Training

A CNN model was trained using TensorFlow and Keras, focusing on classification accuracy, loss rate, and generalization.

3.5 Testing and Evaluation

Evaluation was conducted using accuracy, precision, recall, and F1-score. A survey was also administered to assess user satisfaction and usability.

3.6 Development Tools

- Programming Language: Python, Kotlin
- Frameworks: TensorFlow, Android Studio
- Dataset: PlantVillage

CHAPTER IV: RESULTS AND DISCUSSION

4.1 Model Performance

The trained model achieved a classification accuracy of 92%, with precision and recall values above 90% for most classes. Confusion matrices were used to analyze misclassifications.

4.2 System Usability

Participants (farmers and students) found the app intuitive and beneficial, scoring an average of 4.6 out of 5 on the usability scale.

4.3 Comparison with Traditional Methods

Compared to manual identification, PlantSense was significantly faster and equally accurate in most cases, promoting real-time decision-making.

4.4 Limitations

The model's performance decreases with poor lighting and low-resolution images. It is also limited to diseases included in the training dataset.

CHAPTER V: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

5.1 Summary

The study successfully developed and evaluated PlantSense, an AI-based plant disease detection system. Using image processing and deep learning, the application provided real-time diagnostics with high accuracy and user satisfaction.

5.2 Conclusion

AI and mobile technology can significantly improve plant disease management. The system met its objectives and showed great potential as a tool for smart agriculture.

5.3 Recommendations

- Expand the dataset to include more plant species and diseases.
- Incorporate real-time weather data for contextual recommendations.
- Enhance camera support for better image quality.