IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, November 2025
Impact Factor: 7.67

Artificial Intelligence and Internet of Things Solution for the Crop Disease Detection

Mr. Bhujbal Shubham[1], Mr. Lokhande Rutik[2], Mr. Poul Aniket[3], Prof. Miss. Karpe. P. K[4]
Student, AI&DS Department[123]
Professor, AI&DS Department[4]
Jaihind College of Engineering Kuran, Pune, India

Abstract: *The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) presents a transformative solution for addressing challenges in modern agriculture, particularly in the early detection and management of crop diseases. This project proposes an AI-IoT–based system designed to monitor crop health in real time, identify disease symptoms, and assist farmers in taking timely corrective actions. The system employs IoT-enabled sensors to collect environmental and soil data such as temperature, humidity, and moisture levels, while cameras capture images of crop leaves. The collected data are transmitted to a cloud platform where AI algorithms—especially deep learning models such as Convolutional Neural Networks (CNNs)—analyze the images to detect and classify potential diseases. Upon detection, the system alerts farmers via a mobile or web application, providing insights and recommendations for treatment. This approach reduces the dependency on manual inspection, enhances accuracy in disease identification, and supports sustainable agricultural practices through data-driven decision-making. Overall, the proposed AI and IoT solution offers an efficient, scalable, and cost-effective framework to improve crop yield, minimize losses, and promote smart farming.*

Keywords: Artificial Intelligence (AI), Internet of Things (IoT), Crop Disease Detection, Smart Agriculture, Precision Farming, Machine Learning (ML) , Deep Learning (DL),Convolutional Neural Networks (CNN), Computer Vision, Image Processing ,Edge Computing, Cloud Computing, IoT Sensors, Data Analytics, Environmental Monitoring, Predictive Analytics , Real-Time Monitoring , Sustainable Agriculture, Smart Farming System, Agricultural Automation, Remote Sensing, Plant Disease Classification, Sensor Network, Decision Support System (DSS, Agricultural IoT Architecture

I. INTRODUCTION

Agriculture plays a vital role in sustaining the global economy and ensuring food security for an ever-growing population. However, one of the major challenges faced by farmers worldwide is the occurrence of crop diseases, which can lead to severe yield losses and economic hardship. Traditional methods of disease detection—such as manual inspection— are often time-consuming, labor-intensive, and prone to human error. In recent years, emerging technologies such as Artificial Intelligence (AI) and the Internet of Things (IoT) have offered new opportunities to address these challenges through automation, accuracy, and real-time monitoring.

II. PROBLEM STATEMENT

Develop an AI and IOT-based solution to accurately detect and monitor crop diseases in real time to improve yield and reduce losses..

III. OBJECTIVES

- Develop an ai and iot-based crop disease detection model.
- Monitor crops in real-time using iot sensors and cameras.
- Use machine learning to identify disease symptoms early.
- Provide actionable insights to farmers via cloud-based dashboards.

DOI: 10.48175/IJARSCT-29656

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, November 2025
Impact Factor: 7.67

• To make effective monitoring of crop diseases to enhance agricultural productivity.
• To make reduce losses.
• To make support sustainable farming practices.

IV. LITERATURE REVIEW

MUHAMMADUMAR,SAUDALTA (2024). Precision Agriculture Through Deep Learning
MUHAMMADUMARand his team checked out Tomato Plant Multiple Diseases Recognition With CNN and Improved YOLOv7
EMMANUEL MOUPOJOU,.(2024) Food is wasted because of plant diseases or disorder EMMANUEL MOUPOJOU team The Food and Agriculture Organization of the United Nations suggests increasing the food.
WEI CHEN ,LIJUAN ZHENG (2024). SE attention mechanism modules
WEI CHEN and friends Agricultural production is an indispensable component of national economic development.
ANUJA BHARGAVA ,AASHEESH SHUKLA (2024). PLANT DISEASE DETECTION SYSTEM.
Agriculture is the ultimate imperative and primary source of origin.

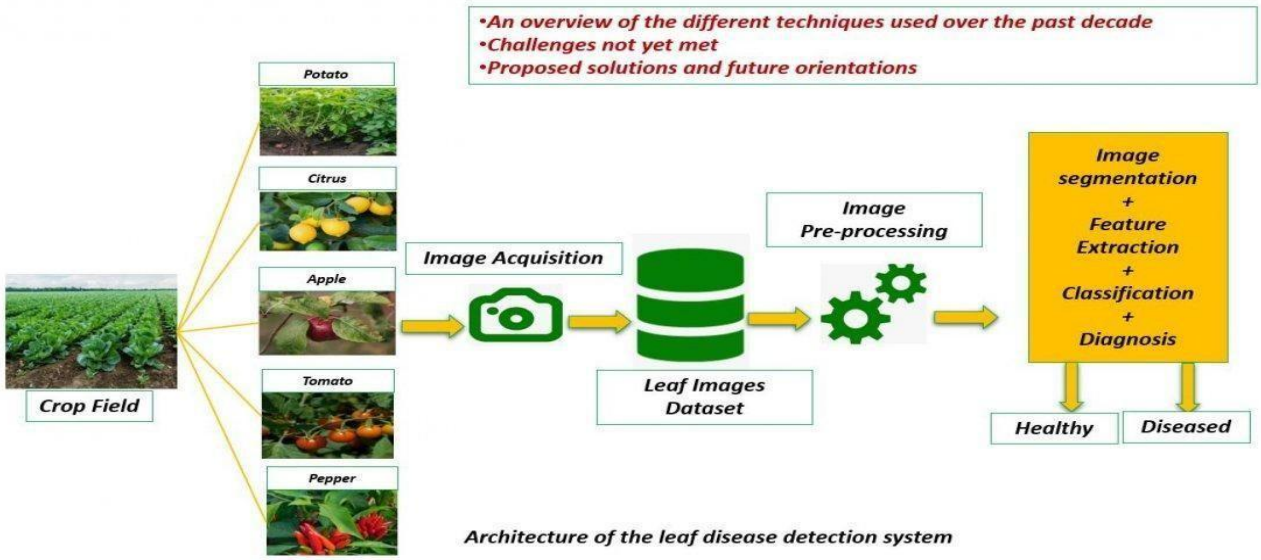
V. METHODOLOGY

• Research: Comprehensive review of scholarly sources from Scopus, and Science Direct Gather data from agricultural experts, open datasets, and journals.
• Design: Checklist icon for selection criteria Simple, icon-based interface for low-literacy users, Framework icon for development , IOT/AI icon for tools & Techniques
• Tools & Techniques: Predictive analytics models. Sensor data integration with CNN & YOLO algorithms.
• Testing: Field testing with actual farmers for feedback
• Deployment: Install IoT devices ,Sensors for soil moisture, pH, temperature, humidity,Weather stations,Livestock trackers

VI. RESULT

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, November 2025
Impact Factor: 7.67

VII. SYSTEM ARCHITECTURE



Architecture of the leaf disease detection system

System Architecture – Main and Key Points

Data acquisition layer (IOT sensing layer):

IOT sensors (temperature, humidity, soil moisture, light intensity) cameras or drones for capturing images of crops data transmission layer (communication layer) :

This layer ensures the reliable transfer of data from iot devices to the processing or cloud servers.

Data processing layer (edge/cloud processing layer) :

This layer handles the computation and analysis of the collected data. Edge computing devices (for on-site processing) cloud servers (for large-scale data analysis and storage) application layer.

(decision-making and user interface):

This is the user-facing layer that presents processed information and

Actionable insights to the farmer. Web and mobile applications dashboards and alert systems.

VIII. BENEFITS TO CORP

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) in crop disease detection provides numerous advantages that contribute to improving agricultural productivity, sustainability, and efficiency. AI algorithms can analyze real-time data from IoT sensors and cameras to identify crop diseases at an early stage, allowing farmers to take timely corrective actions and prevent disease spread. Machine learning and image recognition models can detect even subtle symptoms that may go unnoticed by the human eye, reducing errors and increasing the reliability of diagnosis.

IX. CONCLUSION

The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) offers a transformative solution for addressing one of the most critical challenges in agriculture — crop disease detection. Traditional methods of identifying crop diseases are often slow, subjective, and labor-intensive, leading to delayed interventions and significant yield losses. By combining IoT-based sensing and monitoring systems with AI-driven data analysis, farmers can now detect diseases early, accurately, and efficiently.

X. FUTURE SCOPE

1. Integration with Government Agriculture Schemes
2. Wider Crop & Region Coverage

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, November 2025
Impact Factor: 7.67

3. Solar Powered Devices
4. Integrate with drone-based crop spray
5. Integration with Edge and Cloud Computing.
6. Predictive Analytics and Early Warning System

REFERENCES

[1]. A. Dwivedi, A. Goel, M. Raju, D. Bhardwaj, A. Sharma, F. Kidwai, N. Gupta, Y. Sharma, and S. Tayal, ‘‘Precision agriculture: Using deep learning to detect tomato crop diseases,’’ in Proc. Int. Conf. Innov. Comput. Commun. Singapore: Springer, 2024, pp. 857–865.

[2]. F1 Score in Machine Learning: Intro & Calculation. Accessed: Feb. 21, 2023. [Online]. Available: https://www.v7labs.com/blog/f1-score-guide.

[3]. D. Liu, F. Lv, J. Guo, H. Zhang, and L. Zhu, ‘‘Detection of forestry pests based on improved YOLOv5 and transfer learning,’’ Forests, vol. 14, no. 7, p. 1484, Jul. 2023. Accessed:

[4]. Food and Agriculture Organization. (2019). New Standards to Curb the Global Spread of Plant Pests and Diseases. Nov. news/story/en/item/1187738/icode/. 8, 2022. [Online]. Available: https://www.fao.org/

[5]. O. Getch. Rice Knowledge Bank: Your Information Source for Rice Farming. Accessed: Jan. 30, 2023. [Online]. Available: http://www. knowledgebank.irri.org/step-by-step-production/growth/pests-anddiseases/diseases.

[6]. S. Mahadik, P. M. Pawar, and R. Muthalagu, ‘‘Efficient intelligent intrusion detection system for heterogeneous Internet of Things (HetIoT),’’ J. Netw. Syst. Manag., vol. 31, no. 1, p. 2, Jan. 2023

[7]. Cornell University Center for Teaching Innovation, "Collaborative learning: Active learning approaches," Cornell University, 2024. [Online].

[8]. K. Syama, J. A. A. Jothi, and N. Khanna, ‘‘Automatic disease prediction from human gut metagenomic data using boosting GraphSAGE,’’ BMC Bioinf., vol. 24, no. 1, p. 126, Mar. 2023.