Title: A DEEP LEARNING APPROACH FOR PLANT LEAF DISEASE DETECTION

Presented by

245622737006: BHAVAGNYA KANDUNURI
245622737001: ADEVELLI MEGHANA
245622737301: ABRABOINA HARSHITHA

Students of IT-A

Name of the Guide: KV NANDA KISHORE

Abstract

This project introduces an intelligent image classification system based on deep learning to accurately detect diseases in plant leaves. The system uses the MobileNetV2 model, a fast and efficient convolutional neural network, trained on a large dataset of over 70,000 leaf images from 38 different categories, including both healthy and diseased samples. A simple and interactive web interface was developed using Streamlit, allowing users to upload plant leaf images and receive instant disease predictions. Designed with user-friendliness in mind, the application requires no technical expertise to operate, making it ideal for home gardeners, plant hobbyists, students, and researchers. This tool supports early disease detection and encourages better plant care by providing quick and accurate results in real time, demonstrating how deep learning can be effectively applied to solve practical, real-world problems in an accessible and impactful way.

Keywords: Deep Learning, MobileNetV2, Image Classification, Streamlit Web Application, Convolutional Neural Network (CNN)

Problem Statement

Plants are highly vulnerable to numerous diseases that can negatively affect their growth, productivity, and overall health. Traditionally, identifying plant diseases has relied on manual inspection, which is not only time-consuming but also prone to human error and typically requires expert agricultural knowledge. This process can be challenging for individuals without formal training, such as home gardeners, nursery caretakers, or small-scale farmers. Therefore, there is a growing need for an automated, efficient, and accurate solution that can detect and diagnose plant leaf diseases using just an image. Such a system would simplify plant care, enable timely treatment, reduce crop losses, and support sustainable agriculture by empowering users with minimal technical expertise.

Requirements for the Proposed Project

Hardware Requirements:

Desktop/Laptop (Intel i3/i5 or above, 4 GB RAM minimum, 64-bit OS, Stable Internet Connection, GPU optional – Colab GPU used)

Software Requirements:

Windows 10/11 OS, Visual Studio Code, Python 3.11, Google Colab

Libraries & Tools :

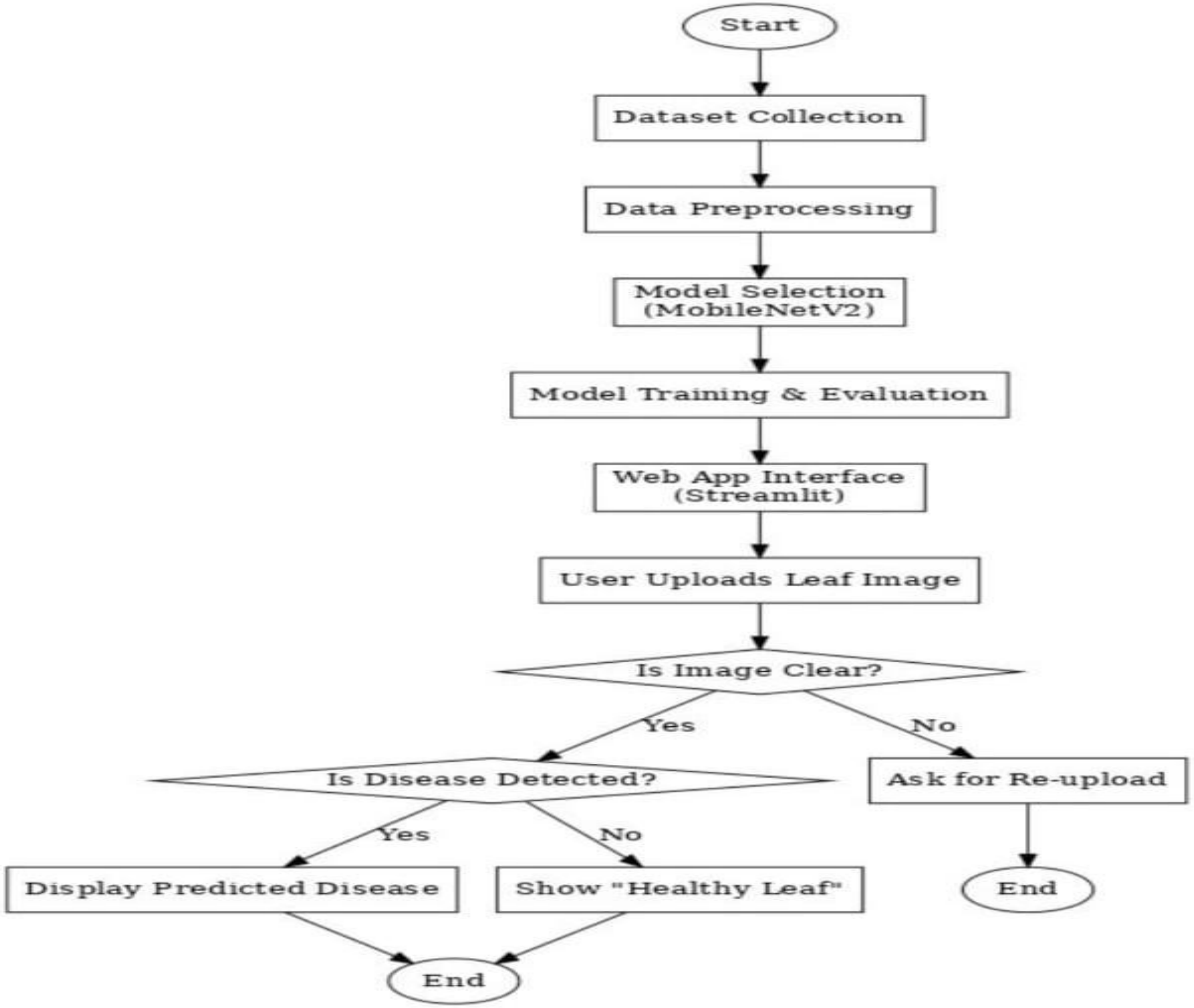
TensorFlow / Keras (for CNN), OpenCV (for image handling), NumPy, Streamlit (for web interface)

Desktop Interface: Python-based GUI using Streamlit for image input and displaying CNN model predictions.

Literature Survey

Title	Authors	Year	Methodology	Key Findings	Limitations
Plant Leaf Disease Detection Using Deep Learning Techniques *(Base Paper)*	S. V. Sawant, V. Kimbahune, K. N. Vhatkar	2025	CNN (Image Processing + Classification)	Used CNN to detect plant diseases from images; provides early, automated detection through deep learning	Needs large, clean datasets; may struggle with low-quality or real-field images
Crop Disease Prediction using ML and DL: An Exploratory Study	B. Mondal, M. Bhushan, I. Dawar, M. Rana, A. Negi, S. Layek	2023	Machine Learning, Deep Learning	DL algorithms help early identification of plant diseases; reduces crop loss	Poor dataset quality can lead to incorrect predictions
Identifying Crop Diseases using CNN	V. Telukula	2023	CNN + Preprocessing	CNNs efficiently detect diseases by learning features automatically from plant images	Dataset creation and annotation are resource-intensive
Crop Disease and Pest Identification Using a Single CNN	S. Yang	2022	CNN (Unified model for pest & disease)	Combined detection simplifies monitoring with 95% accuracy	Complex model; high training and inference cost

Proposed Methodology



Novelty

- Lightweight & Efficient Model (MobileNetV2)

  We employed MobileNetV2 — a fast, efficient, and mobile-friendly CNN architecture — making our model ideal for real-time, on-device applications with limited computational power.

- User-Friendly Web Interface using Streamlit

  A simple, interactive, and deployable web application allows users to upload leaf images and instantly get predictions — no technical background needed.

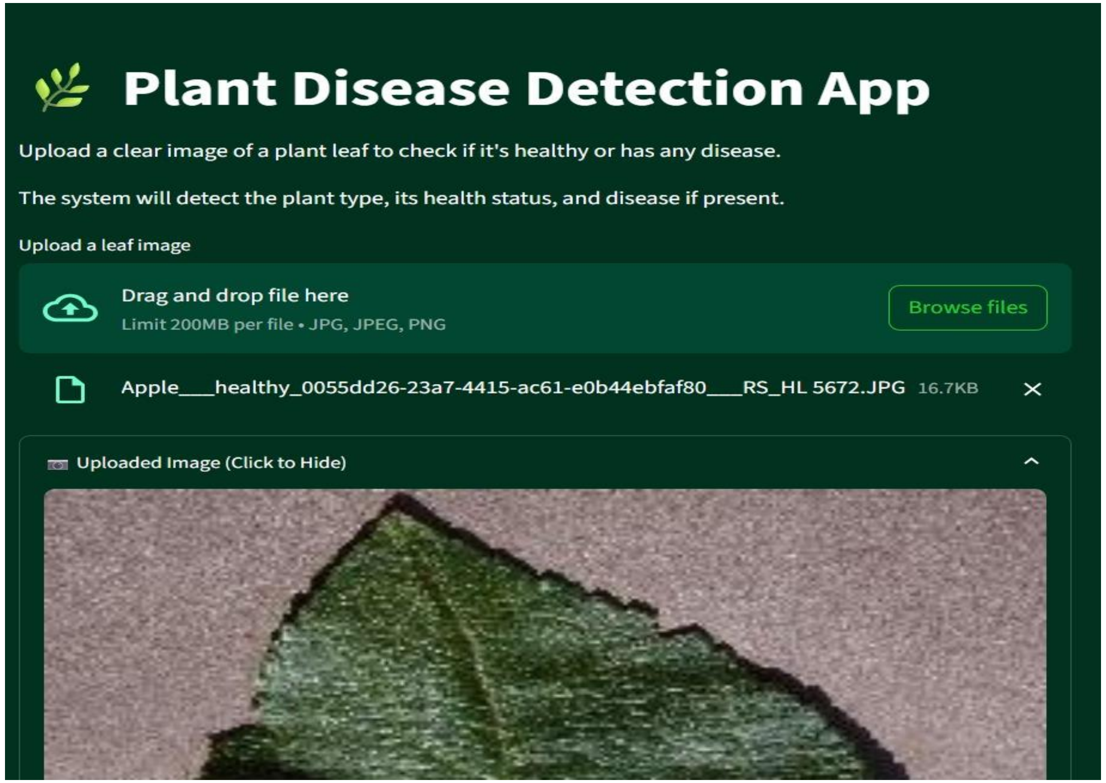
- High Accuracy in Disease Detection

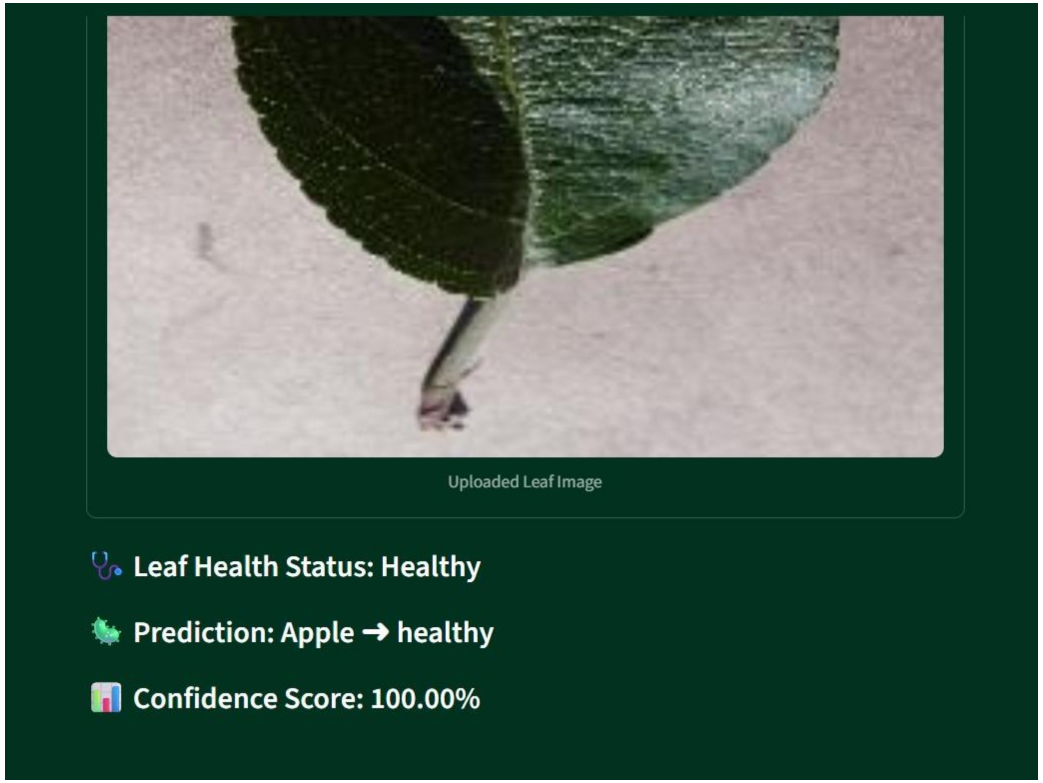
  Achieved an impressive 94.68% accuracy in classifying 38 plant disease categories and 99% accuracy in distinguishing between healthy and diseased leaves.

- Smart Image Validation with Confidence Scoring

  The app detects blurry images and low-confidence predictions (below 70%), prompting users to re-upload, thereby improving the system's reliability and trustworthiness.

Result


Plant Disease Detection App
Upload a clear image of a plant leaf to check if it's healthy or has any disease.
The system will detect the plant type, its health status, and disease if present.
Upload a leaf image
Drag and drop file here
Limit 200MB per file • JPG, JPEG, PNG
Browse files
Apple___healthy_0055dd26-23a7-4415-ac61-e0b44ebfaf80___RS_HL 5672.JPG 16.7KB
Uploaded Image (Click to Hide)

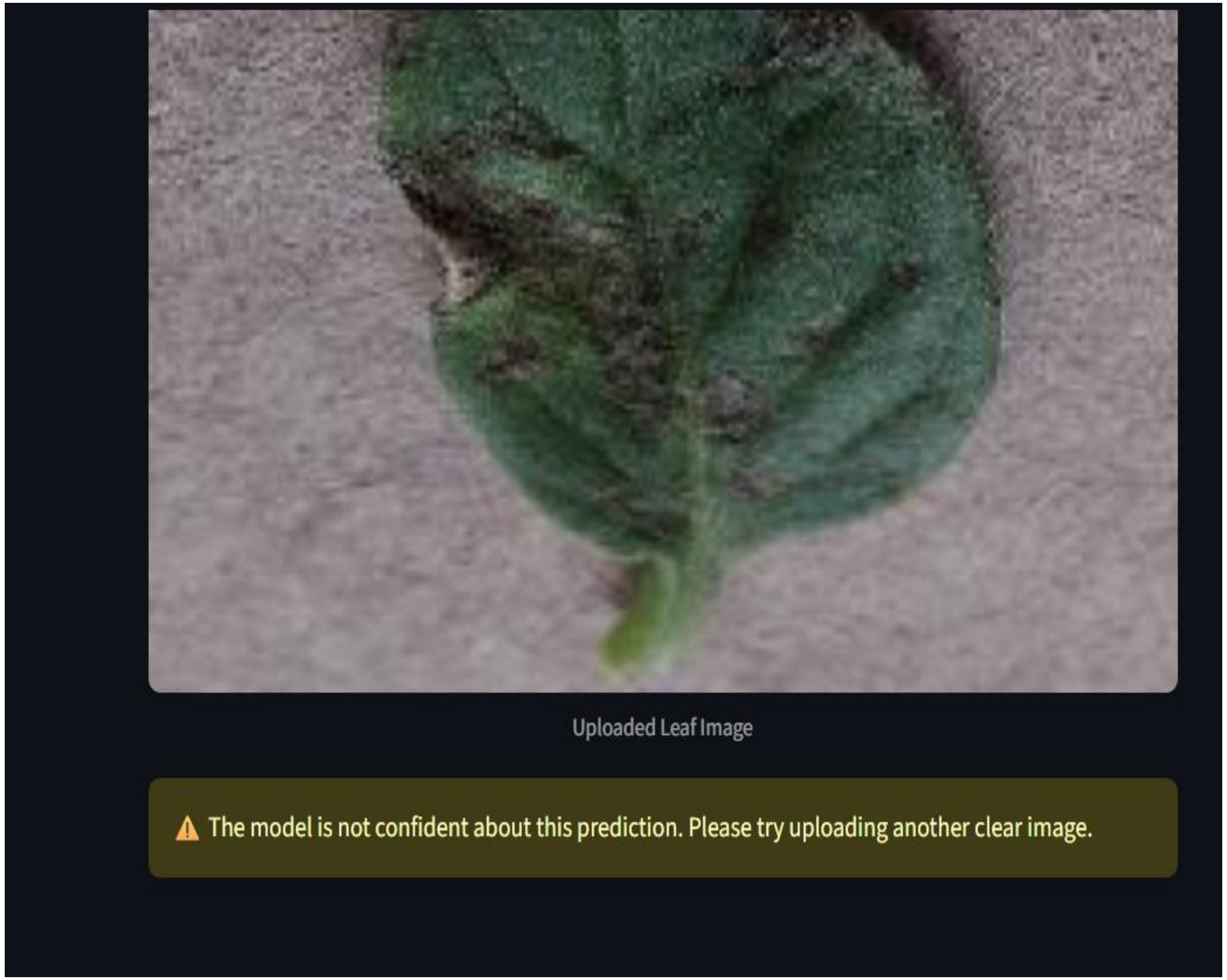

Uploaded Leaf Image
Leaf Health Status: Healthy
Prediction: Apple ➜ healthy
Confidence Score: 100.00%

Result


Plant Disease Detection App
Upload a clear image of a plant leaf to check if it's healthy or has any disease.
The system will detect the plant type, its health status, and disease if present.
Upload a leaf image
Drag and drop file here
Limit 200MB per file • JPG, JPEG, PNG
Browse files
AppleScab1.JPG 8.8KB
Uploaded Image (Click to Hide)


Uploaded Leaf Image
Leaf Health Status: Diseased
Predicted Disease: Apple ➜ Apple scab
Confidence Score: 99.57%

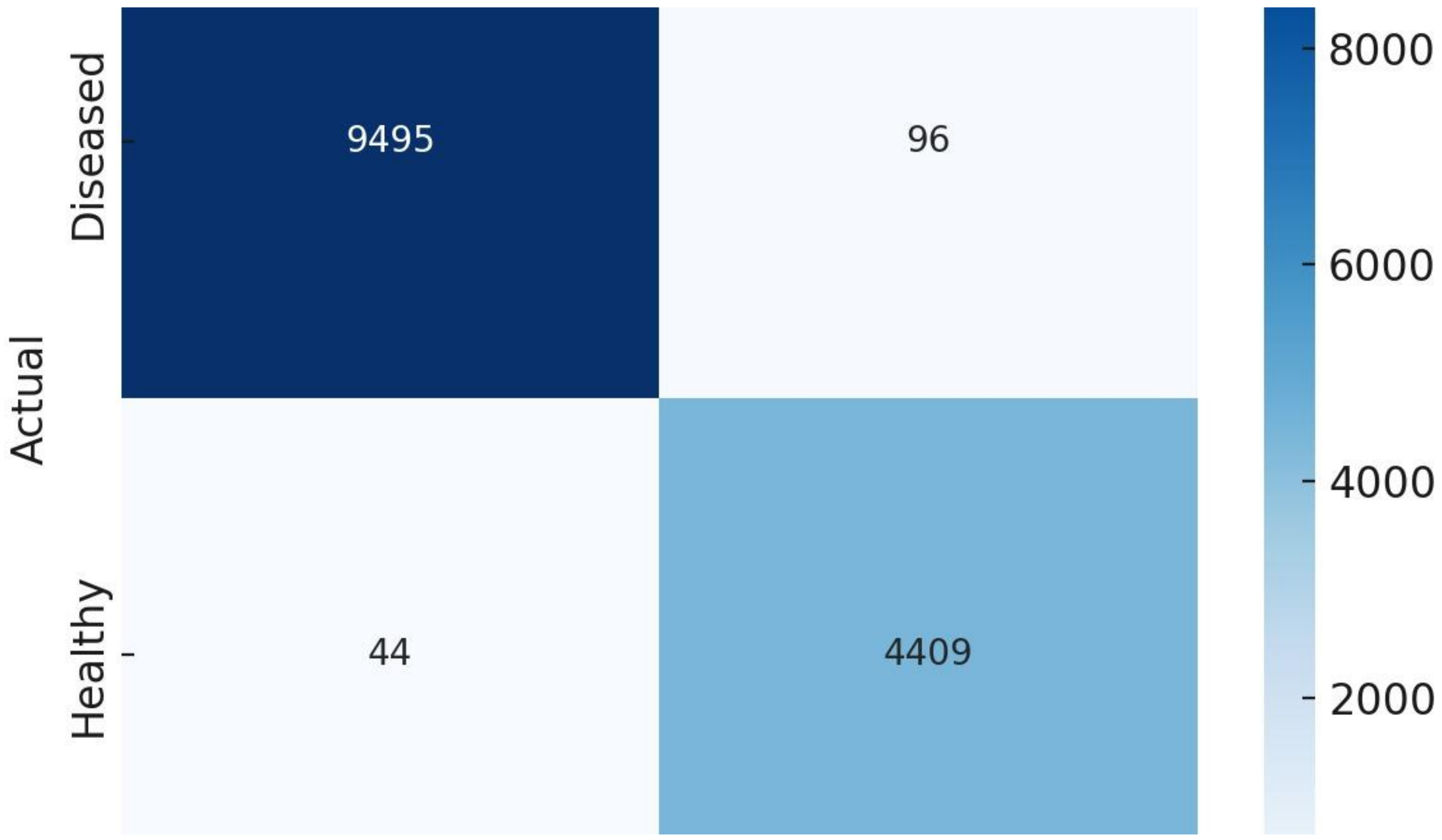
Result


Uploaded Leaf Image
The model is not confident about this prediction. Please try uploading another clear image.

Performance Metrics

Sl. No	Metric	Multiclass (38 classes)	Binary (Healthy vs Diseased)
1.	Accuracy	94.68%	99.00%
2.	Precision	95.00%	99.00%
3.	Recall	95.00%	99.00%
4.	F1 Score	95.00%	99.00%

Confusion Matrix



Future Scope

- Expansion of Dataset
  Incorporating more plant species, various environmental conditions, and region-specific disease patterns can enhance the model’s adaptability and accuracy, making it more useful for farmers, researchers, and home gardeners.

- Mobile and Offline Deployment
  Optimizing the system for mobile devices and low-power embedded systems will allow real-time disease detection in remote and rural areas without requiring continuous internet access, thereby supporting accessibility for all users.

- Intelligent Recommendation System
  Future versions can include a feature that suggests preventive measures, possible treatments, and care tips based on the identified disease. This would be valuable not only for farmers but also for researchers studying plant health and gardeners managing home plants.

Conclusion

This mini project was developed with the objective of detecting plant leaf diseases using deep learning techniques, particularly the MobileNetV2 convolutional neural network. The model was trained on a comprehensive dataset of over 70,000 leaf images from 38 classes, comprising both healthy and diseased samples. The system achieved an overall accuracy of 99% in classifying whether a leaf is healthy or diseased. Furthermore, for diseased leaves, the model accurately identified the specific disease with an accuracy of 94.68%.

To enhance usability, a Streamlit-based web application was developed, enabling users to upload leaf images and receive real-time predictions in an intuitive and accessible manner. The interface requires no technical expertise, making it ideal for farmers, plant enthusiasts, and researchers.

This project successfully demonstrates the effectiveness of lightweight deep learning models in real-world agricultural scenarios. It supports early disease detection, reduces dependency on expert diagnosis, and promotes better crop management. Overall, the system offers a practical, scalable, and intelligent solution that contributes to precision agriculture and sustainable farming practices.

References

- S. V. Sawant, V. Kimbahune, and K. N. Vhatkar, "Plant Leaf Disease Detection Using Deep Learning Techniques," 2025 IEEE International Students' Conference on Electrical, Electronics, and Computer Science (SCEECS), pp. 1–6, 2025, doi: 10.1109/SCEECS64059.2025.10940981.
- B. Mondal, M. Bhushan, I. Dawar, M. Rana, A. Negi, and S. Layek, "Crop Disease Prediction using Machine Learning and Deep Learning: An Exploratory Study," in Proc. Int. Conf. Sustainable Computing and Smart Systems (ICSCSS), 2023.
- V. Telukula, "Identifying Crop Diseases using Convolutional Neural Networks," in Proc. Int. Conf. on Computational Intelligence and Sustainable Engineering Solutions (CISES), 2023.
- S. Yang, "Crop Disease and Pest Identification Using a Single Convolutional Neural Network," in 2022 IEEE Conf. on Telecommunications, Optics and Computer Science (TOCS), pp. 187–190, 2022, doi: 10.1109/TOCS56154.2022.10015910.

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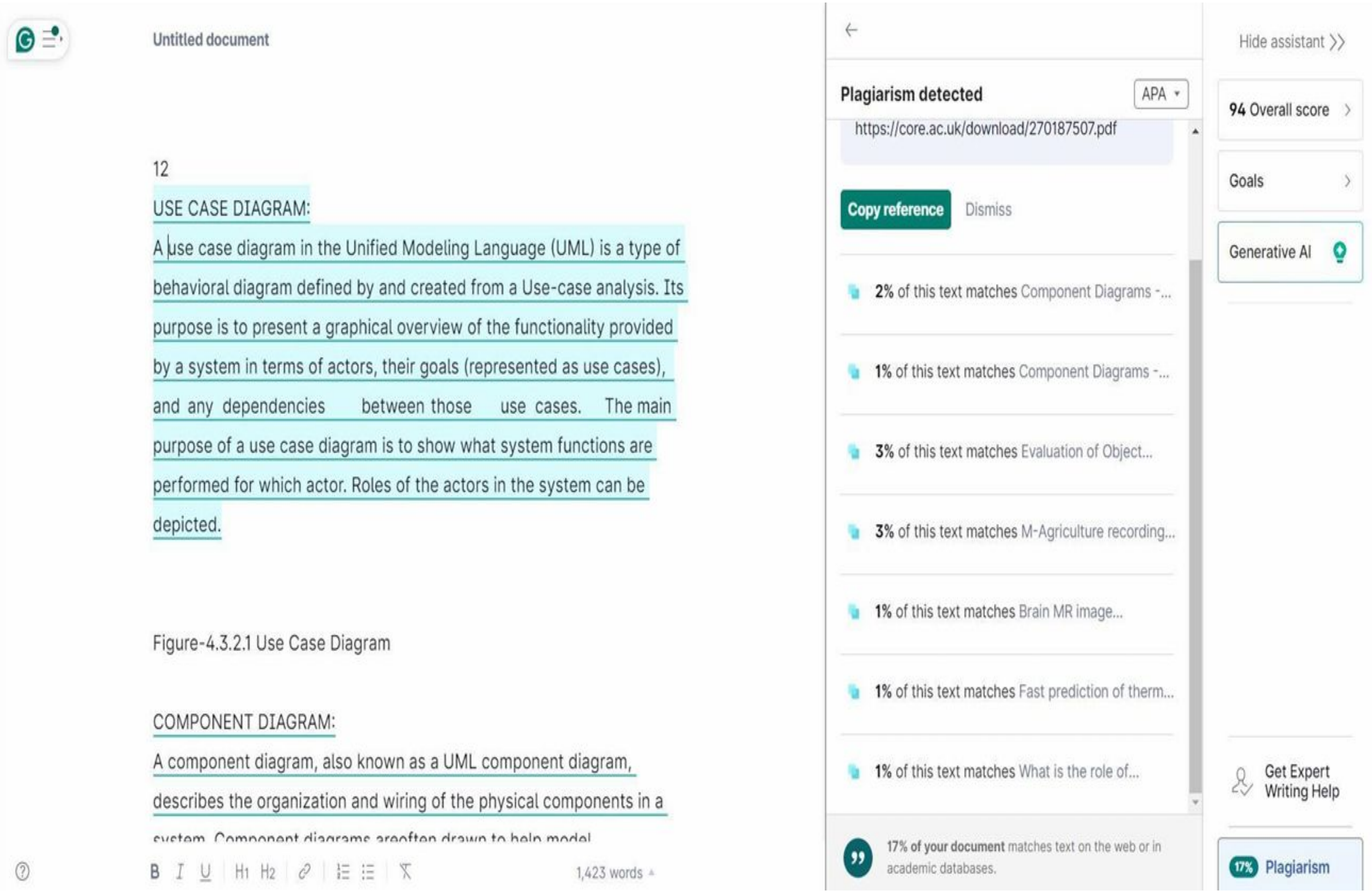
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USE CASE DIAGRAM:
A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.
Figure-4.3.2.1 Use Case Diagram
COMPONENT DIAGRAM:
A component diagram, also known as a UML component diagram, describes the organization and wiring of the physical components in a
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