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PLANTAECURE: Web-Based Plant Disease Detection and Remedy Recommendation System using Gemini AI

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ABSTRACT: Agriculture is one of the most important sectors in India, but plant diseases continue to affect crop productivity and quality. Early detection of diseases is necessary to reduce losses, but traditional methods require expert knowledge and are not always accessible to farmers.

This paper presents *Plantaecure*, a web-based plant disease detection and remedy recommendation system developed using **Python, Flask, HTML, CSS, JavaScript, MySQL, and Google Gemini AI**. The system allows users to upload plant leaf images through a simple website interface. The backend processes the image and sends it to the **Google Gemini AI model using the Google GenAI API**, which analyzes the image and identifies the disease.

The system not only detects the disease but also provides remedies and prevention suggestions, making it more useful for real-world applications. The aim is to create a simple, accessible, and intelligent system that can be used by farmers, students, and plant lovers.

KEYWORDS: Plant Disease Detection, Google Gemini AI, Google GenAI API, Flask, Web Application, Agriculture Technology

I. INTRODUCTION

Agriculture is the backbone of India's economy and supports a large portion of the population. Healthy crops are essential for good production and food security. However, plant diseases are a major issue that reduces crop quality and yield.

Traditionally, farmers identify plant diseases by observing leaf conditions or consulting agricultural experts. This process is slow and depends on experience. In rural areas, expert help is not always available, which leads to late detection and crop damage.

With the advancement of artificial intelligence, it has become possible to detect plant diseases using image analysis. AI models can identify diseases quickly and provide accurate results. However, many existing systems are complex or not easily accessible to common users.

To overcome these problems, this project introduces *Plantaecure*, a web-based system that uses **Google Gemini AI** for plant disease detection. The system is designed to be simple and user-friendly. Users can upload images through a website, and the system provides instant results along with remedies.

The main goal of this project is to make advanced AI technology easily accessible and useful for real-world agricultural applications.



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II. PROBLEM STATEMENT

1. Farmers and plant owners face difficulty in identifying plant diseases at an early stage. Traditional methods are:

- Time-consuming
- Dependent on expert knowledge
- Not always accurate

2. Most existing systems:

- Only detect diseases
- Do not provide remedies
- Are not user-friendly

3. There is a need for a system that:

- Detects diseases using images
- Provides remedies and prevention tips
- Is simple and accessible through a web interface

III. OBJECTIVES

- To develop a web-based plant disease detection system
- To integrate Google Gemini AI using Google GenAI API
- To allow real-time image upload by users
- To detect diseases accurately
- To provide remedies and prevention suggestions
- To create a simple and user-friendly interface

IV. LITERATURE REVIEW

Many research works have focused on plant disease detection using machine learning and deep learning. Earlier methods used image processing techniques such as color and texture analysis, which required manual feature extraction.

With the introduction of deep learning, Convolutional Neural Networks (CNNs) improved detection accuracy. However, these systems were mostly limited to datasets and research environments.

Some mobile applications were developed, but they mainly focused on detection and not on providing solutions. Also, many systems were not user-friendly for farmers.

Recent advancements in AI, such as **Google Gemini AI**, allow more advanced image understanding and intelligent response generation. However, its use in plant disease detection systems is still limited.

This project improves existing systems by combining:

- Web-based access
- AI-based detection
- Remedy recommendation

V. RESEARCH GAP AND NOVELTY

Research Gap

- Most systems focus only on detection
- Lack of real-time user interaction
- No remedy suggestions
- Not easily accessible



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Novelty

- Uses **Google Gemini AI** (latest AI technology)
- Integrates **Google GenAI API** for real-time processing
- Provides **disease + remedy + prevention**
- Fully **web-based and user-friendly**

VI. PROPOSED SYSTEM

The proposed system, *Plantaecure*, is designed to provide an easy and efficient solution for plant disease detection. It is a web-based application that integrates artificial intelligence with web technologies.

The system allows users to upload plant leaf images through a browser. The uploaded image is processed by the backend server and analyzed using **Google Gemini AI** through the **Google GenAI API**.

The main components of the system include:

- **Frontend:** Developed using HTML, CSS, and JavaScript for user interaction
- **Backend:** Developed using Python and Flask to handle processing
- **Database:** MySQL for storing user data
- **AI Model:** Google Gemini AI for disease detection

The system is designed to be simple and user-friendly so that even non-technical users can operate it easily.

VII. SYSTEM ARCHITECTURE

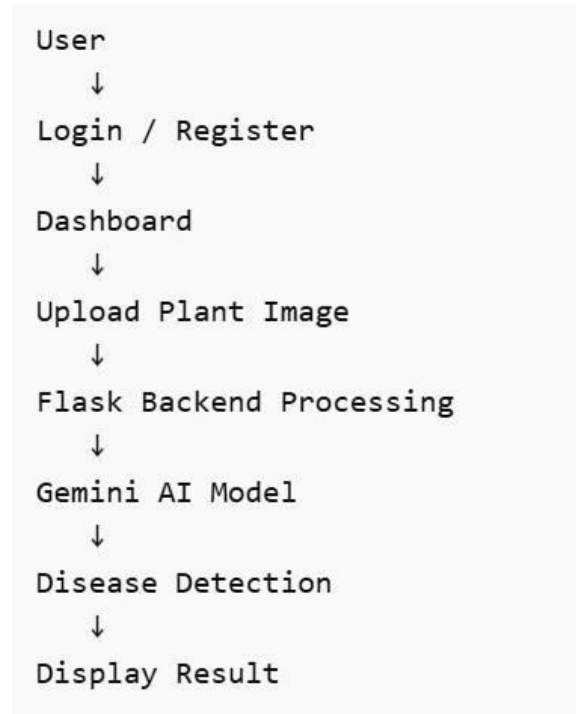


Fig 7.1: System Architecture



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VIII. METHODOLOGY

Image Upload:

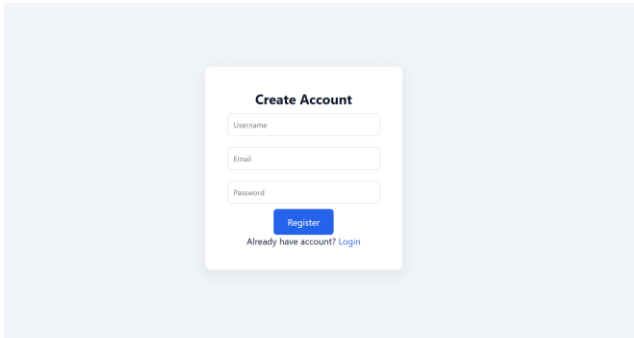


Fig 8.1: Create Account for Registration

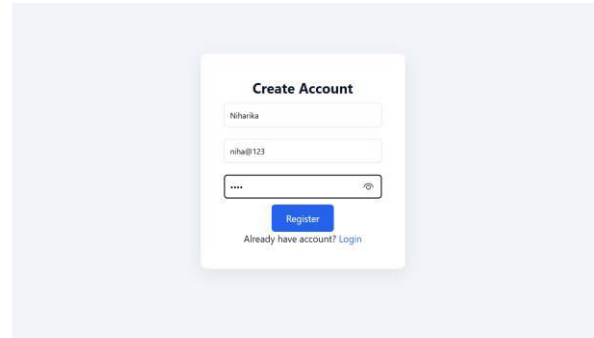


Fig 8.2: Fill the required details and register (Username, Email, etc)

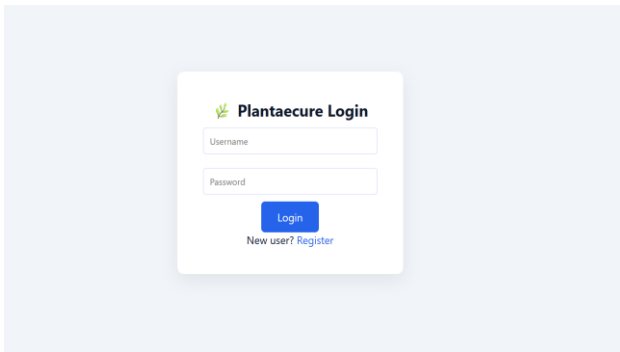


Fig 8.3: Login Page

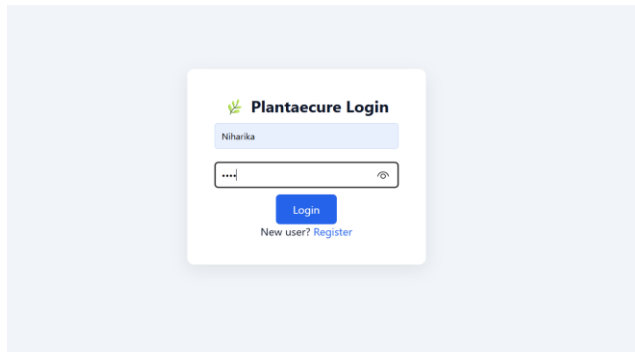



Fig 8.4: Fill Details for Login (Name, Password)

Plantaecure Welcome Niharika [Logout](#)

AI Plant Disease Detection

Upload a photo of your plant and let our AI-powered system detect diseases, provide treatment recommendations and help keep your plants healthy.



Upload Plant Image

No file chosen

Plantaecure



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Disease Detected

Insect Feeding Damage (Chewing Pests)

Description

The plant leaf shows extensive damage characterized by numerous irregular holes and chewed areas throughout the leaf blade. These holes range in size and are often accompanied by yellowish-brown discolored spots and margins, indicating tissue death or stress around the areas where pests have fed. This type of damage is typically caused by chewing insects such as caterpillars, slugs, snails, beetles, or grasshoppers.

Organic Treatment

Hand-picking: Manually remove visible pests like caterpillars, slugs, and snails from the leaves. **Neem Oil:** Apply a diluted neem oil solution to disrupt pest feeding and growth cycles. **Diatomaceous Earth:** Sprinkle food-grade diatomaceous earth around the base of the plant to deter crawling pests. **Bacillus thuringiensis (Bt):** Use a spray containing Bt kurstaki for specific control of caterpillars. **Slug and Snail Traps/Barriers:** Set beer traps or use copper tape around plant beds.

Chemical Treatment

Insecticidal Soap: Effective for softer-bodied insects, though less so for large chewing pests like adult beetles or caterpillars. **Pyrethrin-based Insecticides:** A relatively fast-acting insecticide derived from chrysanthemums, effective against many chewing insects. **Carbaryl or Permethrin:** For severe infestations, broad-spectrum insecticides can be used, following label instructions carefully. **Metaldehyde or Iron Phosphate Baits:** For persistent slugs.

Prevention

Regular Inspection: Frequently check plants for early signs of pests, especially on the undersides of leaves. **Garden Hygiene:** Remove fallen leaves, weeds, and other plant debris where pests can hide or lay eggs. **Encourage Natural Predators:** Attract beneficial insects like ladybugs, lacewings, and parasitic wasps by planting diverse flowers. **Row Covers:** Use physical barriers like floating row covers over vulnerable plants to prevent insect access. **Proper Plant Spacing:** Ensure good air circulation to reduce humidity, which can deter some pests and fungal issues.

Detect Another Image

Fig 8.5: Disease Detected Page with Treatments and Prevention



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8.1 Image Preprocessing

Before sending the image to the AI model, basic preprocessing is performed:

- Resizing the image to required dimensions
- Converting image format if needed
- Ensuring proper quality for analysis

These steps help improve the accuracy of the system.

8.2 Integration with Google GenAI API

The system uses the Google GenAI API to communicate with the Gemini AI model.

Steps involved:

1. Image is received by Flask backend
2. Backend prepares API request
3. Image is sent to Gemini AI through API
4. AI processes the image
5. Response is received in text format

8.3 Disease Detection using Gemini AI

Gemini AI analyzes the uploaded image and identifies:

- Type of disease
- Symptoms visible in the image
- Possible causes

The AI model uses advanced image understanding and pattern recognition to provide accurate results.

8.4 Remedy Recommendation

After detecting the disease, the system provides:

- Treatment suggestions
- Preventive measures
- Basic guidance for farmers

This feature makes the system more practical compared to basic detection models.

8.5 Database Management

The MySQL database stores:

- User registration details
- Login credentials

This ensures secure access to the system.

8.6 User Interface

The frontend is designed to be simple and clear. It includes:

- Login page
- Registration page
- Dashboard
- Upload section
- Result display

8.7 Working of the System

1. User registers or logs in
2. Opens dashboard
3. Uploads plant image
4. Flask backend processes image
5. Image sent to Google GenAI API
6. Gemini AI analyzes image
7. Disease is detected
8. Result with remedies is displayed



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Advantages

- Easy to use
- Real-time detection
- Uses advanced AI (Gemini)
- Provides remedies
- Accessible anywhere
- Reduces dependency on experts

IX. RESULTS AND DISCUSSION

The system was tested using multiple plant leaf images. The results showed that the Gemini AI model was able to correctly identify plant diseases in most cases.

The system provides results quickly, which helps users take immediate action. The addition of remedy suggestions makes the system more useful compared to traditional detection systems.

Some limitations include:

- Accuracy depends on image quality
- Internet connection required for API

Overall, the system performs effectively and is suitable for real-world applications.

X. CONCLUSION

This paper presented a web-based plant disease detection system using Google Gemini AI and Flask. The system allows users to upload images and get instant results with remedies.

It is simple, efficient, and useful for farmers and plant lovers. The project successfully combines AI and web technology to solve real-world agricultural problems. This paper presented *Plantaecure*, a web-based plant disease detection system using Google Gemini AI and Flask. The system allows users to upload plant images and receive instant disease detection results along with remedies.

The project successfully combines artificial intelligence and web technologies to solve a real-life agricultural problem. It is simple, efficient, and accessible to users without technical knowledge.

The system can help farmers detect diseases early, reduce crop loss, and improve productivity. It also demonstrates how modern AI tools can be used in agriculture for practical applications.

Future Scope

- Mobile app development
- More plant disease support
- Voice-based input
- Multilingual support
- Cloud deployment

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