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Smart AI Based Agri Webpage with E-Commerce

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Abstract: *Agriculture remains one of the most important sectors, as it directly influences food availability and the economic well-being of farmers. However, many farmers continue to face difficulties such as plant diseases, changing weather patterns, insufficient technical support, and poor access to agricultural markets. To tackle these challenges, this paper introduces a Smart AI Based Agri WebApp with E-Commerce that leverages artificial intelligence along with web-based technologies to deliver effective farming assistance. The proposed application offers features including intelligent crop suggestions, crop disease identification using image analysis, weather-based insights, and recommendations for appropriate pesticides and fertilizers. Furthermore, an integrated e-commerce platform enables farmers to easily purchase essential agricultural inputs such as seeds, fertilizers, and farming equipment. The system is developed with secure login mechanisms and an easy-to-use interface to ensure wider usability. By utilizing machine learning techniques to analyze agricultural and environmental data, the solution supports informed decision-making, enhances crop yield, minimizes losses, and contributes to improved farmer income while encouraging sustainable agricultural practices*

Keywords: Smart Agriculture, Artificial Intelligence, Crop Disease Detection, Machine Learning, Agri Web Applications, E-Commerce, CNN, Logistic Regression

I. INTRODUCTION

Agriculture is one of the most important sectors for economic growth and food security, especially in developing countries. Despite its significance, farmers continue to face several challenges such as unpredictable weather conditions, crop diseases, lack of timely technical guidance, and limited access to quality agricultural products and markets. Traditional farming practices often rely on experience rather than data-driven decisions, which can lead to reduced productivity and financial losses.With the rapid advancement of artificial intelligence and web technologies, smart agricultural solutions can provide effective support to farmers. This project presents a Smart AI Based Agri WebApp with E-Commerce, designed to assist farmers by offering intelligent, real-time agricultural insights through a single digital platform. The proposed system integrates machine learning techniques to provide crop recommendations, plant disease detection using image analysis, weather forecasting, and suitable pesticide and fertilizer suggestions.Additionally, the application includes an integrated e-commerce module that allows farmers to purchase essential agricultural products such as seeds, fertilizers, and tools directly through the platform. The system features secure user authentication and a simple, user-friendly interface to ensure easy adoption. By combining AI-based decision support with e-commerce services, the proposed web application aims to improve crop productivity, reduce losses, and enhance farmers' income while promoting smart and sustainable agriculture.

II. LITERATURE REVIEW

In 2016, Sladojevic and his team introduced a deep learning–based method for identifying plant diseases using leaf images. Their work utilized Convolutional Neural Networks (CNNs) to classify different crop diseases with good accuracy. The study showed that image-based disease detection can support farmers in identifying crop problems at an early stage, which helps in minimizing crop damage and yield loss.

Later, in 2018, Kamilaris and Prenafeta-Boldú carried out an extensive review on the use of Artificial Intelligence in agriculture. Their study explored various applications of machine learning and deep learning techniques, including crop

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monitoring, yield estimation, disease detection, and smart farming practices. The authors emphasized that AI-driven systems can significantly improve decision-making in modern agriculture.

In 2019, Mohanty, Hughes, and Salathé developed a deep learning-based framework for plant disease detection using a large collection of leaf images. Their research demonstrated that deep learning models are capable of achieving accuracy comparable to agricultural experts, highlighting the effectiveness of AI in precision farming.

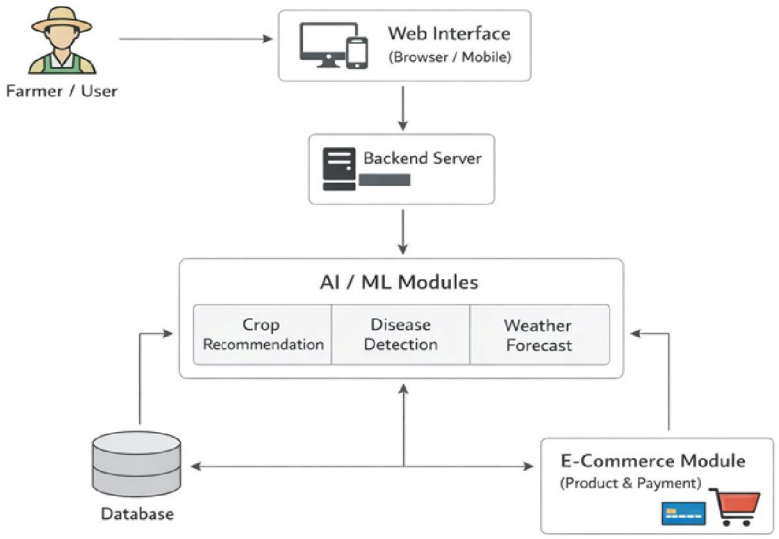
In 2020, Liakos et al. reviewed the role of machine learning in agriculture, focusing on crop management, soil analysis, and weather-based prediction models. The study stressed the need for integrating data-driven approaches into agricultural decision-support systems to enhance farming efficiency.

More recently, in 2021, Kamble, Gunasekaran, and Gawankar discussed the importance of digital platforms and smart technologies in agricultural supply chains. Their work highlighted how e-commerce solutions can improve market connectivity by linking farmers directly with suppliers and buyers.

III. PROBLEM STATEMENTS

Farmers face several challenges such as unpredictable weather, crop diseases, lack of timely guidance, and difficulty in accessing quality agricultural products and markets. Most existing agricultural systems focus on only one service, either crop advisory or e-commerce, which forces farmers to use multiple platforms. This reduces efficiency and limits the adoption of smart farming technologies. Hence, there is a need for an integrated solution that combines AI-based agricultural guidance with an easy-to-use e-commerce platform. The proposed Smart AI Based Agri WebApp with E-Commerce aims to provide accurate decision support, improve accessibility to resources, and help farmers increase productivity while reducing crop losses.

System Architecture of Smart AI Based Agri WebApp with E-Commerce



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V. DESIGN OF THE PROJECT

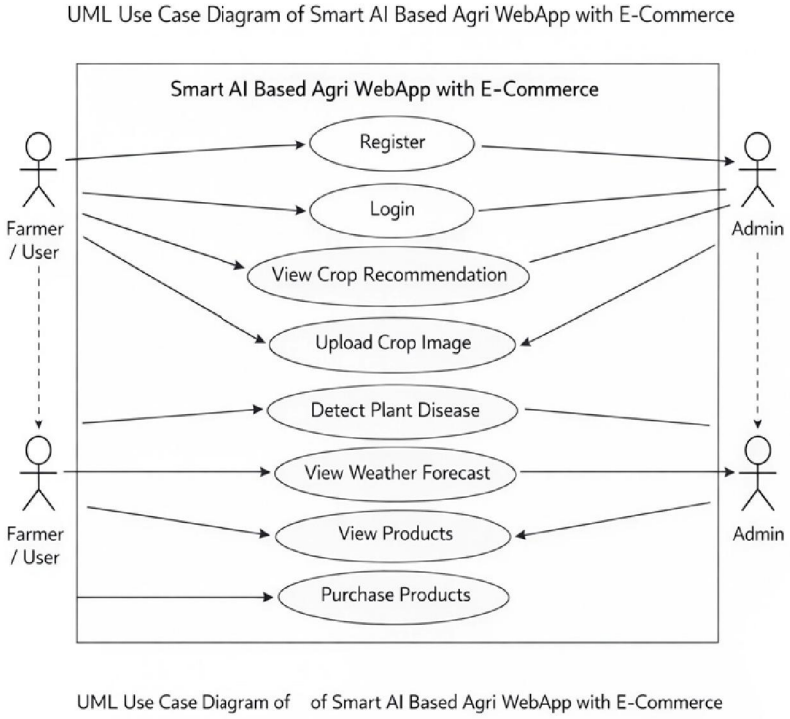

Figure: UML Case Diagram

VI. DESIGN AND IMPLEMENTATION CONSTRAINTS

There are three major components for our system are client App, cloud (Back-end) and data sources.

6.1 External Interface Requirements

- User Interfaces - The system provides a web-based interface that allows farmers to register, log in, view crop recommendations, detect plant diseases, check weather forecasts, and purchase agricultural products. An admin interface is provided for managing products and users.
- Hardware Interfaces - No special hardware is required. The system can be accessed using smartphones or computers. Crop images captured through device cameras are used for disease detection.
- Software Interfaces - The system uses a web frontend, cloud-based backend server, AI/ML models for analysis, and external APIs for weather data. A database is used to store user and e-commerce information.
- Communications Interfaces: The web application communicates with the backend server over the internet. Data exchange between users, AI models, APIs, and the database is handled securely through standard communication protocols.

6.2 Other Non Functional Requirements

- Performance Requirements - The application is designed to provide timely and accurate agricultural information to farmers. AI-based crop recommendation, disease detection, and weather updates are processed efficiently using cloud-based services. The system ensures smooth performance for multiple users accessing the platform simultaneously.

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- Safety Requirements - There are no major safety risks involved in the system. Regular backups of the database are maintained to prevent data loss and ensure data recovery in case of system failure.
- Security Requirements - User authentication and authorization mechanisms are implemented to ensure that only valid users can access the system. Sensitive user data and e-commerce transactions are protected using secure communication methods.

Software Quality Attributes

- Availability - The web application is designed to be available at all times, allowing users to access services whenever required.
- Reliability - The system provides reliable results by ensuring data accuracy from AI models and external APIs. Consistent response time and correct information delivery improve user trust in the application.

6.3 Software Hardware Reqiurements

- Programming Languages: Python (Flask), HTML, CSS, JavaScript
- AI/ML Libraries: TensorFlow / Scikit-learn
- Database: MySQL
- APIs: Weather API for real-time weather data
- Tools: Visual Studio Code, Browser (Chrome/Edge)
- Hardware Requirements
- Client Devices: Smartphone or Computer with internet access
- Server: Cloud-based server for backend and AI processing
- Input Device: Camera (for uploading crop images)

VII. TEST CASES

In this phase, all the modules of the Smart AI Based Agri WebApp with E-Commerce are integrated and tested to ensure proper functionality of the system. Testing is performed at different levels including unit testing, integration testing, and functional testing to verify that each feature works as expected.

- Black Box Testing
- Integration Testing
- Scenario-Based Testing

Requirement gathering and analysis:

In the requirement gathering phase, all necessary information related to the proposed system is collected. A detailed literature survey of relevant IEEE and research papers is carried out to understand existing agricultural solutions and identify system requirements.

- Requirements related to crop recommendation and agricultural advisory services.
- Requirements for plant disease detection using crop images and AI models.
- Requirements for e-commerce functionality such as product listing, purchasing, and order management.
- Requirements for weather forecasting using external APIs.
- Requirements for user authentication, data storage, and secure access to the system.

System Design:

- In the system design phase, the overall structure of the Smart AI Based Agri WebApp with E-Commerce is developed based on the requirements gathered and the literature survey. This phase focuses on defining system components, data flow, and interactions between different modules. Software and hardware requirements necessary for the implementation of the project are also identified.

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- UML Diagrams (Use Case Diagram and Class Diagram) to represent system functionality and structure.
- DFD Level 0, Level 1, and Level 2 to illustrate the flow of data within the system at different levels of abstraction.

Implementation:

In the implementation phase, all the developed modules of the Smart AI Based Agri WebApp with E-Commerce are integrated and tested to ensure proper system functionality. The implementation focuses on connecting the frontend, backend, AI models, database, and e-commerce services. Testing is performed using unit testing, integration testing, and functional testing.

- AI/ML modules for crop recommendation and plant disease detection using user-provided data and images.
- Weather forecasting module integrated using external APIs to provide real-time weather information.
- E-commerce module for product listing, purchasing, and order management.
- User authentication and database integration for secure access and data storage.

Deployments of System:

After completing functional testing, the Smart AI Based Agri WebApp with E-Commerce is deployed on a cloud-based server and made accessible to users through web browsers. The system deployment process and usage guidelines are provided in the user manual to ensure smooth adoption by farmers and administrators.

- User Feedback: User feedback is collected to evaluate system usability and improve features and performance.
- User Security: Security measures such as user authentication and secure data handling are implemented to protect user information and transactions.

Maintenance:

In the maintenance phase, issues that arise after deployment of the Smart AI Based Agri WebApp with E-Commerce are identified and resolved. This phase ensures smooth system operation by fixing bugs, updating features, improving AI model accuracy, and handling user-reported issues. Regular updates and database maintenance are performed to enhance system performance and reliability.

- User Guide: A user guide is provided to help users understand system features, usage steps, and basic troubleshooting.

Phases	Cost / Hour (₹)
Requirement Gathering	200
System Design	200
Code (Planning)	200
Code Development	200
Implementation	200
Testing	200
Total Cost	

Cost Estimation

Project Risk Management includes the processes of risk planning, identification, analysis, response planning, and risk control throughout the project lifecycle. The main objective of risk management is to reduce the possibility and impact

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of negative risks while improving the chances of successful project completion. Risk identification is one of the most important activities, as it helps in recognizing potential issues that may affect project development and deployment.

In the proposed Smart AI Based Agri WebApp with E-Commerce, major risks are related to data availability, model accuracy, and dependency on external services such as weather APIs. However, these risks are minimized by clearly understanding end-user requirements during the requirement gathering phase. The project requirements are stable and well-defined, reducing the chances of requirement changes during development. The development team is skilled and has adequate knowledge of web technologies, databases, and AI/ML tools used in the project. All team members are actively involved at each stage of development, ensuring proper coordination and workload distribution. The number of team members is sufficient to complete the project within the given timeline. Hence, the overall project risk is considered low and manageable.

Risk Analysis:

The risks for the project are analyzed considering constraints related to time, quality, and system performance.

ID	Risk Description	Probability	Impact
1	Internet Connectivity Issues	Low	Medium
2	Data Security and Privacy Issues	Low	High
3	Dependency on External APIs	Medium	Medium
4	Server Downtime or Failure	Low	Medium

Table: Risk Analysis

Probability	Value	Description
Low	0–30%	Risk is unlikely to occur
Medium	31–60%	Risk may occur occasionally
High	61–100%	Risk is very likely to occur

Table: Probability

Impact	Value	Description
Low	0–30%	Minimal impact on system
I Medium	31–60%	Moderate impact on functionality
High	61–100%	Severe impact on system or data

Table: Impact

VIII. OVERVIEW OF RISK MITIGATION, MONITORING, MANAGEMENT

Risk ID	1
Risk Description	Internet connectivity issues affecting application access
Category	Development Environment
Source	Web Platform (Agri Web Application)
Probability	Low
Impact	Medium
Response	Managed by the Admin
Strategy	Ensure stable internet connection and server monitoring
Risk Status	Occurred

Table: Risk-2

Software Requirement Specification:

- System Implementation Software Required:
- Web-based application framework and cloud server environment.

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- Programming Languages: Python (Flask) for backend, HTML, CSS, JavaScript, React for frontend.
- Tools: Visual Studio Code, Jupyter Notebook , Web Browser (Chrome/Edge).
- Database: MySQL for storing user data, product details, orders, and application records**.**

Product Scope:

The Smart AI Based Agri WebApp with E-Commerce is designed to support farmers by providing easy access to smart agricultural solutions through a single web platform. The application helps farmers make better decisions by offering AI-based crop recommendations, early detection of plant diseases using crop images, and real-time weather updates. It also allows farmers to conveniently purchase essential agricultural products such as seeds, fertilizers, and farming tools through the integrated e-commerce feature. By combining agricultural guidance and online purchasing in one system, the application aims to reduce crop losses, improve productivity, and make modern farming practices more accessible. Overall, the product focuses on simplifying agricultural processes and promoting sustainable and technology-driven farming.

IX. RESULT

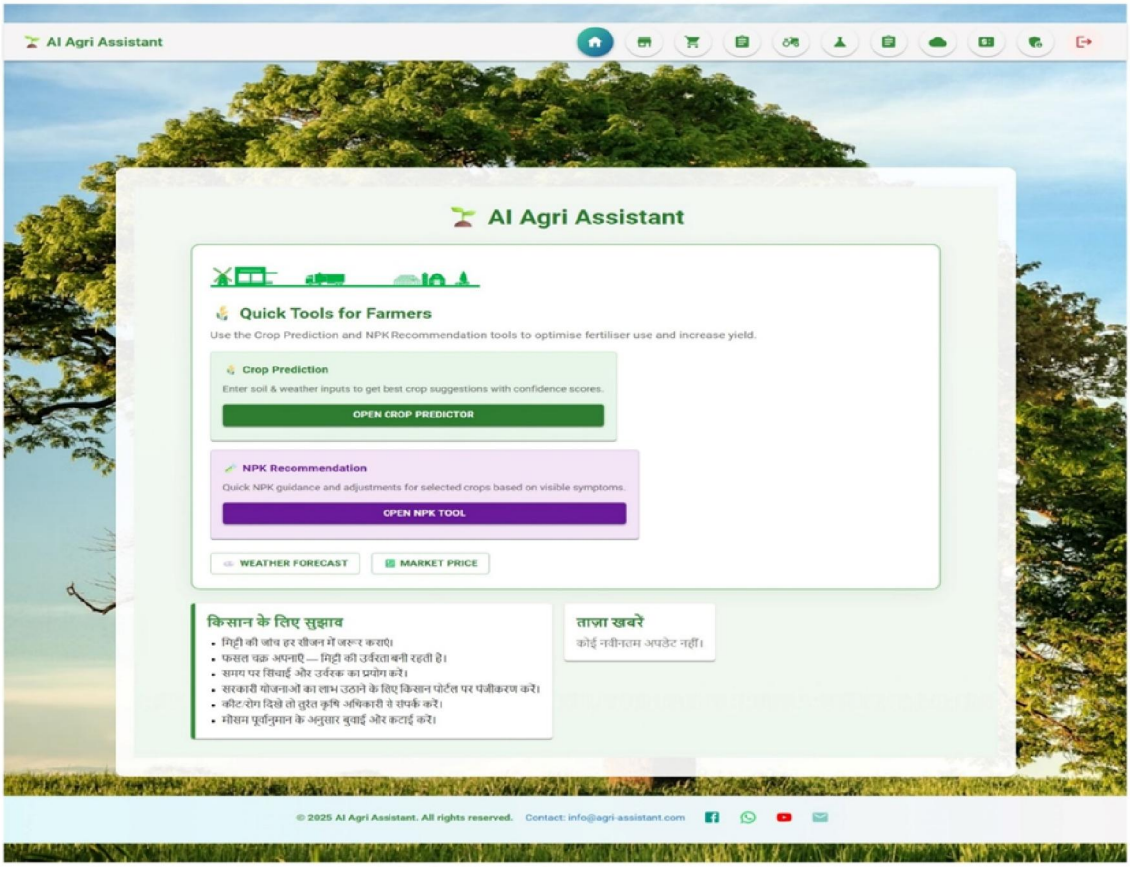

Image: Homepage

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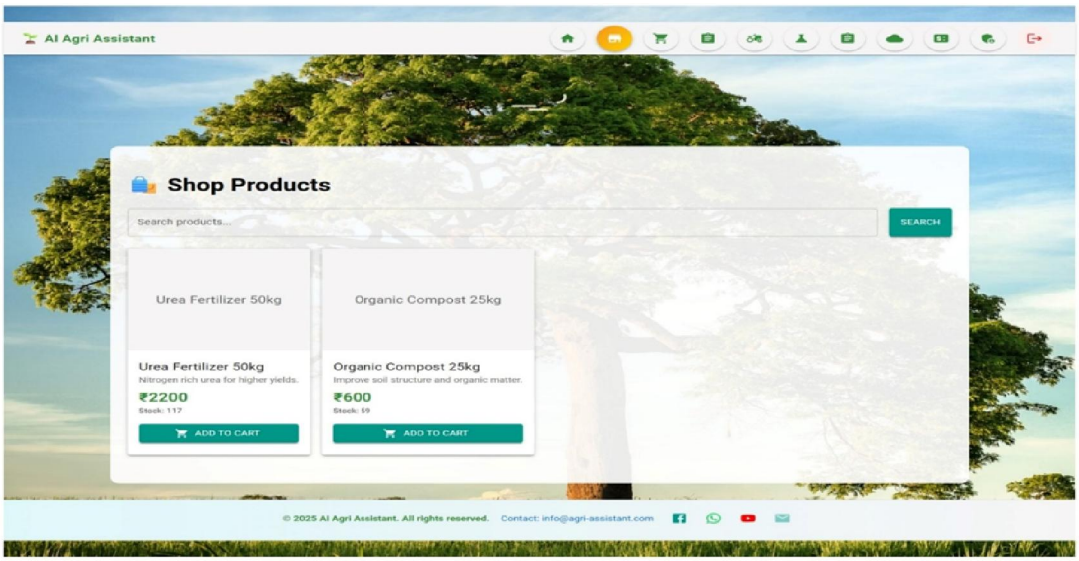

Image: Shopping Module

X. Conclusion

The Smart AI Based Agri WebApp with E-Commerce is developed to help farmers by providing useful agricultural support through a single web platform. The system offers crop recommendations, plant disease detection, and weather updates to assist farmers in making better decisions. It also includes an e-commerce feature that allows farmers to easily purchase agricultural products online. The application is simple to use and reduces the need for multiple platforms. Overall, the proposed system helps improve farming efficiency, reduce crop loss, and support modern and sustainable agriculture

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