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AI BASED AGRICULTURE ADVISORY SYSTEM

[1]Mrs. M. Anusha, [2]B.V. Lakshmi Prasanna,[3]B. Karthik,[4]G. Pushpa Sri

[1]Assistant Professor, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

[2,3,4]U. G Student, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

ABSTRACT-*Agriculture plays a significant role in the economy of many countries, especially India, where a large population depends on farming for their livelihood.Farmers often face several challenges such as crop diseases,unpredictable weather conditions, improper fertilizer usage, pest attacks, and lack of timely agricultural guidance. These issues directly affect crop productivity and farmers' income. Traditional farming methods mainly rely on personal experience and expert consultation, which may not always be available at the required time. The AI Based Agriculture Advisory System is designed to provide intelligent and real-time support to farmers using Machine learning. The system enables farmers to upload crop images, describe agricultural problems, and receive accurate suggestions generated using the Machine learning. It also provides recommendations regarding crop health, diseases, fertilizers, pesticides, irrigation methods, soil suitability, and seasonal crop selection. he proposed system is developed using Python Flask as the backend framework, HTML,CSS,and JavaScript for the frontend, SQLite database for data storage, and Google Gemini API for AI-based recommendations. The application provides a simple and user-friendly interface so that farmers can easily interact with the system without requiring technical knowledge.*

KEYWORDS: Machine Learning, Agriculture Advisory System, Crop Disease Detection, Deep Learning, Flask Framework, Smart Farming, Image Processing, Precision Agriculture.

INTRODUCTION

Agriculture is one of the most important sectors that supports food production and economic development across the world. In India, a majority of the population depends on agriculture as their primary source of income. However, farmers continue to face numerous challenges, including crop diseases, pest infestations, changing climatic conditions, poor soil fertility, and limited access to agricultural experts. These

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problems often lead to reduced crop yield and financial losses. The AI Based Agriculture Advisory System is developed to provide an intelligent platform where farmers can obtain expert-level agricultural advice through a simple web application. Users can upload crop images, ask farming-related questions, and receive AI-generated recommendations using the weather API. The system also offers guidance on fertilizers, pesticides, irrigation, crop selection, and seasonal farming practices.

LITERATURE SURVEY

A comprehensive literature survey was conducted to understand the existing research in AI-based smart agriculture. Several researchers have proposed intelligent systems for crop monitoring, disease detection, fertilizer recommendation, and yield prediction. These studies demonstrate the importance of Machine learning in transforming traditional farming into smart agriculture. One research paper introduced a machine learning-based crop recommendation system that analyzes soil nutrients, temperature, humidity, and rainfall to recommend the most suitable crops. Another study developed a deep learning model using Convolutional Neural Networks for automatic plant disease detection from leaf images. The proposed model achieved high classification accuracy and reduced the dependency on agricultural experts.

RELATED WORK

Agriculture has experienced significant technological advancements over the past decade through the adoption of Artificial Intelligence (AI), Machine Learning (ML), Internet of Things (IoT), and cloud computing. Researchers have developed various intelligent agricultural systems to assist farmers in monitoring crop health, detecting diseases, predicting crop yields, and improving irrigation management. These technologies have helped increase agricultural productivity while reducing manual effort and operational costs. Several AI-based agricultural advisory systems mainly focus on crop disease detection using image processing and convolutional neural networks(CNN).Some research has introduced machine learning models that recommend suitable crops based on soil nutrients, rainfall, and climatic conditions.

EXISTING SYSTEM

Traditional agricultural advisory systems primarily rely on agricultural officers, local experts, and farmers' personal experience. Farmers typically visit agricultural service centers or consult experts to identify crop diseases and receive recommendations on fertilizers, pesticides, and irrigation

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practices. This manual process is time-consuming and often fails to provide immediate assistance, particularly for farmers in remote rural areas where expert support is limited. Several existing web-based agricultural applications offer only limited advisory services, such as weather forecasting, crop recommendations, or crop disease detection. Many systems require users to manually enter extensive agricultural data before generating recommendations, making them less convenient for farmers. Additionally, some solutions rely solely on machine learning classification models for crop disease detection and are unable to provide comprehensive responses to general farming-related queries. As a result, these systems lack intelligent, real-time interaction and personalized agricultural guidance.

PROPOSED METHOD

The proposed AI Based Agriculture Advisory System is designed to overcome the limitations of existing agricultural advisory platforms by integrating Machine learning, image processing, and conversational AI into a single web-based application. The system provides farmers with instant agricultural guidance through an easy-to-use interface developed using Flask, HTML, CSS, JavaScript, and SQLite. The application allows users to upload crop images and describe agricultural problems in natural language. The uploaded image and user query are processed using CNN, which analyzes crop conditions and generates accurate recommendations regarding crop diseases, fertilizers, pesticides, irrigation methods, soil suitability, and seasonal farming practices. Unlike conventional systems, the proposed model supports both image understanding and natural language conversations, making it highly interactive and efficient. The system also includes user authentication, history management, image storage, and personalized advisory services.

SYSTEM ARCHITECTURE

The AI Based Agriculture Advisory System is designed using a modular architecture that integrates Machine learning, image processing, database management, and web technologies to provide smart agricultural assistance. Initially, the user accesses the application through the login page. After successful authentication, the user is redirected to the dashboard. The farmer can upload a crop image and enter an agricultural query such as disease symptoms, fertilizer requirements, irrigation problems, or seasonal crop recommendations. The uploaded image is stored securely in the server and processed by the Flask backend.

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The backend sends the image and user query to the Machine learning model for analysis. Machine learning understands both the uploaded image and textual description, identifies the agricultural problem, and generates intelligent recommendations. The uploaded image is stored securely in the server and processed by the Flask backend. The backend sends the image and user query to the CNN model for analysis.

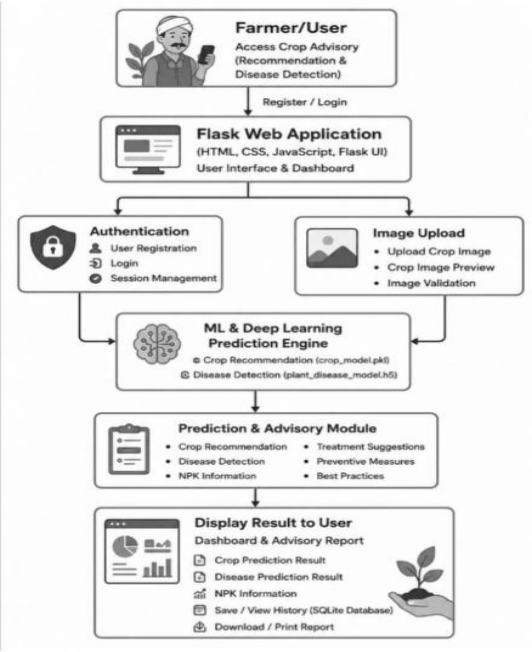

Fig 1: System Architecture

METHOD DESCRIPTION

The proposed AI Based Agriculture Advisory System follows a structured methodology to provide intelligent, accurate, and real-time agricultural guidance to farmers. The system begins with a secure user authentication process where farmers register by providing their personal details, including name, email address, username, and password. These details are securely stored in the SQLite database. After successful registration, users can log in to the system and access the dashboard, which serves as the central interface for all agricultural advisory services.Thisauthentication mechanism ensures data privacy and allows users to maintain their individual farming records for future reference. Once the user accesses the dashboard, the system collects essential agricultural information required for analysis. Farmers enter details such as crop name, soil type, cultivation season, and a brief description of the agricultural problem they are facing. In addition to textual information, the application allows users to upload an image of the affected crop. The uploaded image is validated and securely stored in the server's upload directory before being processed. Image preprocessing techniques are applied to ensure that the uploaded image is suitable for analysis, thereby improving the accuracy and reliabilityofthe AI-generated recommendations. The core functionality of the system is

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performed using the weather API, which analyzes both the uploaded crop image and the textual information provided by the user. The AI model identifies disease symtoms,evaluates crop health, and understands the farming-related query.

RESULTS AND DISCUSSION

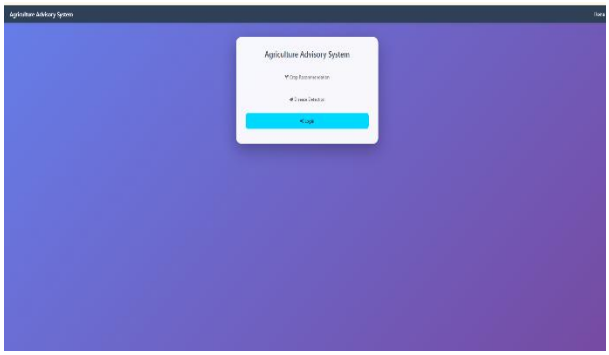

Fig 2: Home Page

The Home Page is the entry point of the AI Based Agriculture Advisory System. It provides an overview of the application and allows users to navigate to the registration or login page. The interface is designed to be simple, responsive, and user-friendly, enabling users to understand the purpose of the system and access its features easily.

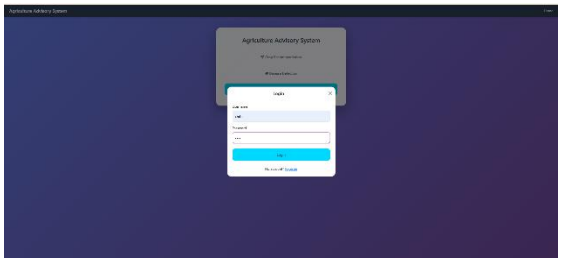

Fig 3: Login Page

The Login Page provides secure access to the AI Based Agriculture Advisory System by allowing registered users to enter their username and password. The system authenticates the user credentials using the SQLite database before granting access to the dashboard. This module ensures data security and protects user information from unauthorized access, enabling farmers to safely use the application's services.

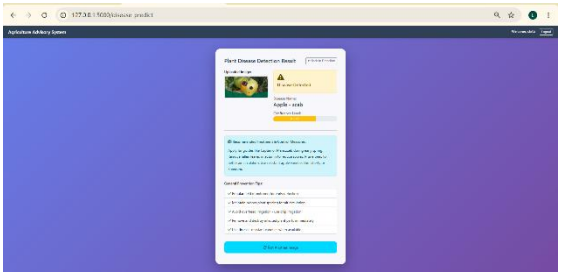

Fig 4: Crop Image Upload

Upload a clear image of the crop leaf or plant for accurate disease detection. The ML system analyzes the uploaded image using image recognition techniques and identifies the possible disease or healthy condition. Based on the analysis, it provides suitable treatment recommendations and preventive measures to help farmers protect their crop and improve productivity.

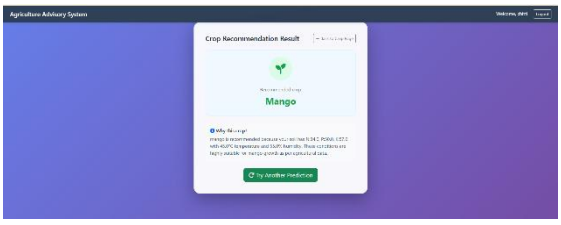

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Fig 5: Crop Recommendation Result

The crop recommendation result is generated using Machine Learning (ML) and Deep Learning (DL) models. Based on the input parameters such as soil type, temperature, humidity, rainfall, and season, the system predicts the most suitable crop for cultivation. This intelligent recommendation helps farmers select the right crop, improve productivity, and maximize agricultural yield.

CONCLUSION

The AI-Based Agriculture Advisory System successfully integrates Machine Learning (ML) and Deep Learning (DL) techniques to provide smart agricultural solutions. The system recommends suitable crops based on environmental conditions and detects crop diseases from uploaded images with high accuracy. It also offers treatment suggestions and AI-powered advisory support, helping farmers make informed decisions. This project improves crop productivity, reduces losses, and promotes efficient and sustainable farming practices.

FUTURE SCOPE

The future scope of this project includes improving the accuracy of ML and DL models by training them with larger and more diverse agricultural datasets. The system can be enhanced with real-time weather forecasting, IoT sensor integration, satellite imagery, and GPS-based recommendtions. Additional features such as multilingual support, voice assistance, mobile appliction development, and personalized fertilizer and irrigation recommendations can further help farmers adopt smart and precision agriculture.

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