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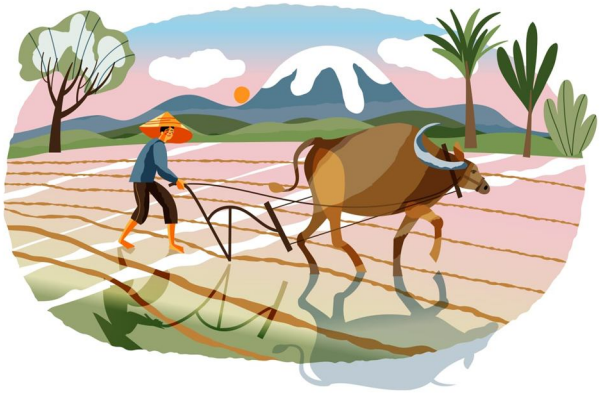
SmartAgro

Lect. Manoj Damahe[1], Vikram Nandanwar[2], Mayur Chaudhary[3], Harshal Vyawhare[4], Tejas Kotalkar[5], Parth Jadhav[6]
[1]*Lecturer, Dept of Computer Engineering, NIT Polytechnic Nagpur, India*
[2, 3, 4, 5, 6]*Diploma Student, Dept of Computer Engineering, NIT Polytechnic Nagpur, India*

Abstract: ***Agriculture is a key contributor to economic growth and food security, yet farmers continue to face problems such as climate uncertainty, crop diseases, inefficient irrigation, and limited access to expert advice. Recent developments in Artificial Intelligence (AI) and web technologies make it possible to support farmers through intelligent digital platforms. This review paper presents SmartAgro, an AI-based web application that provides crop recommendations, disease identification support, irrigation guidance, and weather-based advisories. The proposed system focuses on a low-cost, website-only approach that avoids the use of expensive hardware. SmartAgro aims to enhance productivity, sustainability, and ease of access for farmers, particularly small and marginal farmers.***



I. INTRODUCTION

Agriculture plays a crucial role in the overall development of many developing and developed countries. Traditional farming methods mainly depend on experience, manual observation, and seasonal knowledge, which are often insufficient to address modern agricultural challenges. Issues such as climate change, unpredictable rainfall, soil degradation, and the rapid spread of crop diseases have increased risks in farming activities.

Artificial Intelligence has emerged as a powerful tool to support data-driven decision-making in agriculture. By analyzing large volumes of data related to soil conditions, weather patterns, and crop history, AI-based systems can provide accurate and timely recommendations to farmers. Web-based agricultural platforms further improve accessibility by allowing farmers to access information using simple internet-enabled devices. In this context, SmartAgro is proposed as an AI-powered agriculture support system that delivers essential farming guidance through a user-friendly website without relying on complex or costly hardware infrastructure.

II. OBJECTIVES

The main objective of the SmartAgro system is to provide intelligent agricultural assistance through a web-based platform. The system aims to recommend suitable crops by analyzing soil properties, climate conditions, and seasonal data. Another objective is to support early identification of crop diseases using data analysis and image-based inputs, enabling timely preventive action. The platform also focuses on providing weather-based guidance to help farmers plan irrigation, sowing, and harvesting activities effectively. Overall, SmartAgro seeks to promote efficient resource utilization, sustainable farming practices, and improved agricultural productivity.

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III. LITERATURE REVIEW

Several research studies have demonstrated the effectiveness of Artificial Intelligence and machine learning techniques in modern agriculture. Researchers have applied machine learning algorithms to predict crop yield by analyzing soil nutrients, weather conditions, and historical agricultural data. Deep learning and image processing techniques have also been widely used for early detection of plant diseases, helping farmers reduce crop losses through timely treatment.

Precision agriculture systems have shown positive results in optimizing the use of water, fertilizers, and pesticides, thereby increasing productivity and reducing environmental impact. However, many existing smart agriculture solutions depend on expensive hardware such as sensors, drones, and IoT devices, which increases implementation costs and limits adoption by small-scale farmers. Compared to these approaches, SmartAgro emphasizes a low-cost, web-based solution that utilizes AI algorithms and publicly available data sources, making intelligent agricultural support more affordable and accessible.

IV. METHODOLOGY

The SmartAgro system follows a structured methodology to deliver agricultural recommendations through a web platform. Initially, the user provides basic information such as soil type, crop preference, farm location, and season through the website interface. This user input is combined with external weather data, including temperature, rainfall, and humidity, obtained from reliable online sources.

The collected data is pre-processed to remove inconsistencies and ensure accuracy. AI and machine learning algorithms then analyze the processed data to generate crop recommendations, disease-related insights, and irrigation suggestions. Finally, the results are displayed to the user in a simple and understandable format through the website.

V. FEATURE

A. Crop Recommendation

The crop recommendation feature analyzes factors such as soil characteristics, climate conditions, rainfall, and temperature to suggest suitable crops for a specific region. Selecting crops that match local environmental conditions helps farmers achieve higher yields while reducing production risks and costs.

B. Disease Identification

Disease identification focuses on detecting crop diseases by analyzing visible symptoms such as discoloration, leaf spots, or abnormal growth patterns. Machine learning and image-based analysis enable early detection, allowing farmers to take preventive measures and minimize crop damage.

C. Weather Advisory

The weather advisory module provides information related to rainfall, temperature, humidity, wind speed, and extreme weather events. This guidance helps farmers plan farming activities such as sowing, irrigation, fertilization, and harvesting more effectively.

D. Irrigation Guidance

Irrigation guidance assists farmers in managing water resources efficiently. Recommendations are based on crop type, growth stage, soil condition, and current weather data. Proper irrigation improves crop health, conserves water, and reduces energy consumption.

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E. Farming Tips

The farming tips section offers practical guidance on soil preparation, crop rotation, pest control, and balanced fertilizer use. These scientifically recommended practices support long-term soil fertility, sustainable farming, and improved productivity.

VI. TECHNOLOGY USED

SmartAgro utilizes Artificial Intelligence and Machine Learning techniques to process agricultural data and generate intelligent recommendations. Machine learning models analyze historical and real-time data related to soil, crops, location, and climate. Web technologies are used to deliver these insights through a simple and user-friendly online platform that can be accessed using standard devices.

VII. LIMITATION

One major limitation of the SmartAgro system is its dependence on internet connectivity. In regions with limited or unstable internet access, farmers may face difficulties in using the platform. Another limitation is the availability and quality of datasets used to train AI models. Incomplete or outdated data can reduce the accuracy of recommendations. Additionally, incorrect user input may lead to less reliable results, highlighting the importance of accurate data entry.

VIII. ADVANTAGE

SmartAgro offers a low-cost and easy-to-use agricultural support solution suitable for farmers of all scales. The system provides timely crop recommendations, disease identification assistance, and weather-based guidance through a single web platform. By promoting efficient use of water and other resources, the system supports sustainable and eco-friendly farming practices while improving productivity and profitability.

IX. FUTURE SCOPE

The SmartAgro platform can be further enhanced by developing a dedicated mobile application for easier access. Integration of voice-based assistance can help farmers with limited literacy or technical skills. Future improvements may
also include IoT sensor integration for real-time data collection and multilingual support to reach farmers from different regions and language backgrounds.

X. ACKNOWLEDGMENT

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XI. CONCLUSION

SmartAgro highlights the potential of AI and web technologies in supporting modern agriculture. By offering crop recommendations, disease identification support, irrigation guidance, and weather advisories through a low-cost web-based platform, the system helps farmers make informed decisions and reduce agricultural risks. The website-only approach ensures affordability and accessibility, making SmartAgro a practical solution for promoting sustainable and efficient farming practices.

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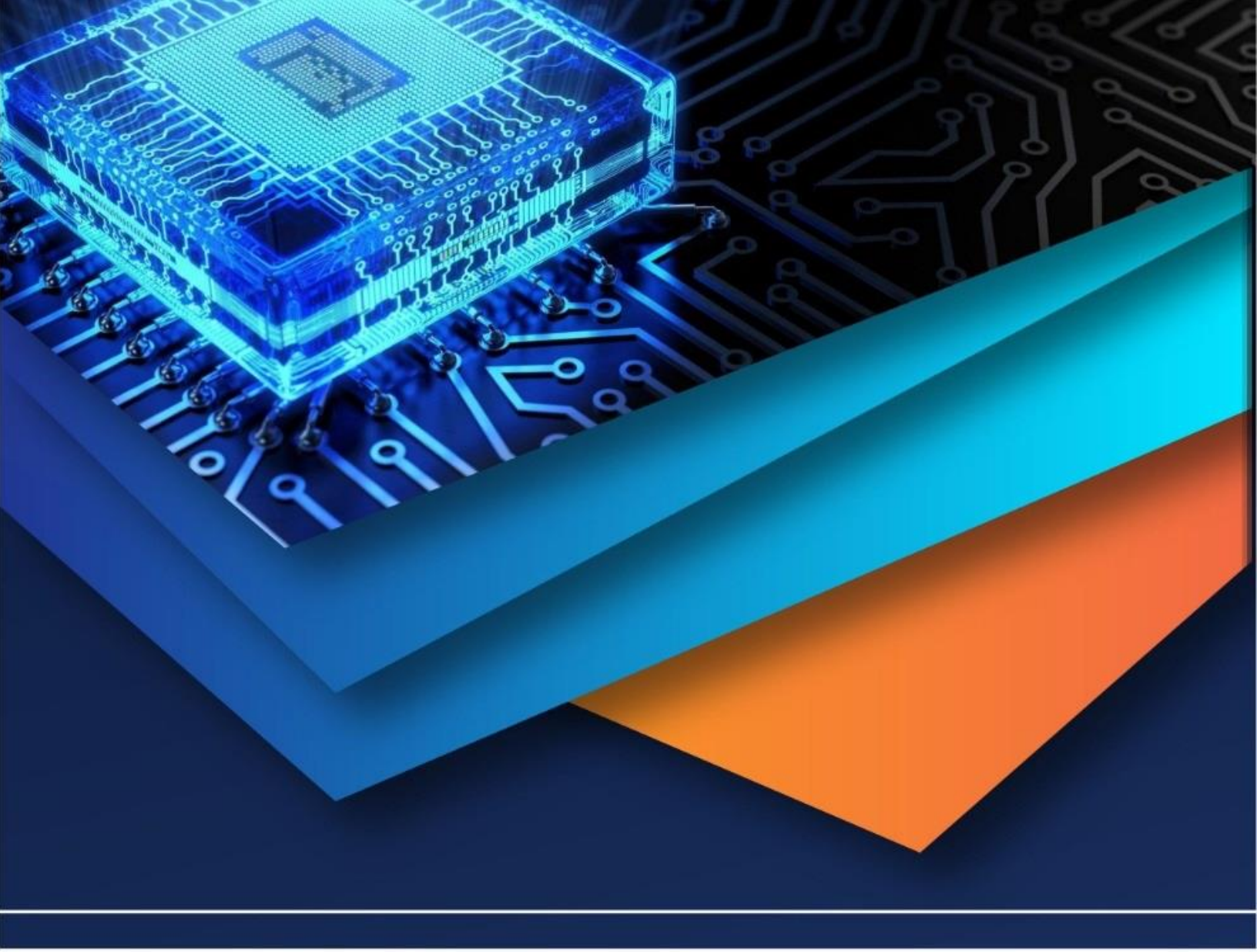

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