Rover Publications
United International Journal of Engineering and Sciences (UIJES)
An International Peer-Reviewed (Refereed) Engineering and Science Journal Impact Factor:7.984(SJIF)
Volume-4, Special Issue-3; ISSN: :2582-5887

Crop Recommendation and Price Prediction using Django

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DOI:10.53414/UIJES:2024.43.453

Abstract **–In addition to being essential for the production of food, agriculture also supplies raw materials to the dairy, sugar, fashion, and other industries. Producing agricultural goods is one of the best methods to boost a nation's economy. This work has attempted to determine crop production prediction from microclimate data. Here, the IoT system has been employed to increase the effectiveness and precision of this research while doing so. This research proposes a crop recommendation model using machine learning techniques and Internet of Things devices. A system constructed on cloud servers is intended to house the machine learning model along with a database of historical data readings. This crop recommendation approach has advantages for both researchers and farmers. An online application that shows the farmers the anticipated outcomes based on a machine learning algorithm has been developed using the Django Framework. Additionally, the implementation of such a system will lessen farmer risk, save resources like time and money, and cut down on agricultural commodity waste.**

Keywords **- Precision farming, regression analysis, microclimate, and crop advice.**

I. INTRODUCTION

Agriculture is a cornerstone of global economies, and the ever-growing demand for food necessitates the adoption of advanced technologies to optimize crop production. Crop recommendation systems, leveraging the power of machine learning and web development frameworks, have emerged as essential tools for assisting farmers in making informed decisions about crop selection. This introduction focuses on the integration of Django, a robust web framework, in developing a sophisticated Crop Recommendation System.

Django, known for its versatility and scalability, provides an ideal platform for creating web applications with a focus on data-driven functionalities. The Crop Recommendation System using Django aims to revolutionize traditional farming practices by offering a user-friendly and efficient tool for farmers and agricultural professionals.

The key objective of this system is to recommend suitable crops based on a variety of input parameters, including soil characteristics, climate conditions, and geographical factors. Machine learning algorithms are employed to analyze historical data and provide personalized suggestions, taking into account the unique conditions of each farm. The Django framework facilitates the seamless integration of these machine learning models, ensuring a dynamic and responsive user experience.

Farmers can input relevant data through an intuitive and interactive frontend, making the system accessible even to those with limited technological expertise. The Django framework's emphasis on rapid development and clean, maintainable code accelerates the deployment of the application, allowing farmers to benefit from the recommendations in a timely manner.

Furthermore, the security features inherent in Django safeguard sensitive agricultural data, addressing concerns related to privacy and data protection. The system's scalability ensures adaptability to diverse agricultural landscapes, making it a valuable tool for farmers across different regions.

In conclusion, the Crop Recommendation System using Django represents a technological leap in precision agriculture. By combining the power of Django's web development capabilities with advanced machine learning algorithms, this system empowers farmers to make informed decisions, optimize resource utilization, and ultimately enhance agricultural productivity in an increasingly challenging and dynamic environment.

II. LITERATURE SURVEY

Crop recommendation systems have gained significant attention in recent years as a means to enhance agricultural productivity and sustainability. Integrating Django, a versatile web framework, into these systems provides a robust platform for developing efficient and user-friendly applications. The literature survey on Crop Recommendation using Django reveals several key trends and advancements in this domain.

One of the primary focuses of recent research is the integration of machine learning algorithms with Django for precise crop recommendations. Scholars such as Li et al. (2019) have explored the utilization of decision tree models to analyze soil and climate data, providing accurate crop suggestions to farmers. Additionally, the work of Kumar et al. (2020) demonstrated the effectiveness of Django in handling the backend of a crop recommendation system while incorporating advanced clustering techniques for improved accuracy.

Several studies emphasize the importance of user-friendly interfaces in crop recommendation systems. Researchers like Singh et al. (2021) have highlighted the significance of incorporating interactive and intuitive frontends using Django, ensuring accessibility for farmers with varying levels of technological expertise. Such interfaces facilitate seamless data input and enhance the overall user experience.

Security and privacy concerns are addressed in the literature, acknowledging the sensitive nature of agricultural data. The work of Patel and Gupta (2022) emphasizes Django's security features to protect user data and maintain confidentiality. This aspect is crucial for gaining the trust of farmers and encouraging widespread adoption of crop recommendation systems.

Scalability is another key consideration in recent research. The ability of Django to handle diverse datasets and adapt to different agricultural landscapes has been explored by researchers like Wang et al. (2021). Their findings highlight the importance of scalable solutions to accommodate the varied conditions and requirements of farmers in different regions.

In conclusion, the literature survey underscores the growing significance of integrating Django into crop recommendation systems. The combination of Django's web development capabilities with machine learning algorithms contributes to the development of effective, secure, and scalable solutions that have the potential to revolutionize agricultural practices and promote sustainable farming.

III. APPROACH

The process of putting Django's web development features, machine learning algorithms, and user-friendly interfaces together to create a Crop Recommendation System is methodical. The main steps in the process are outlined below:

3.1 Data Gathering and Preprocessing:

1) Crops Information: The six main crops of Bangladesh—Aus, Amon, Boro, Jute, Potato, and Wheat—are covered in the crop dataset. The collection contains data on crop production for 64 districts. Financial year-by-year data collection has been conducted.

2) Meteorological Information: The meteorological information within the dataset was gathered from various weather stations across the nation. The dataset contains monthly data that was collected.

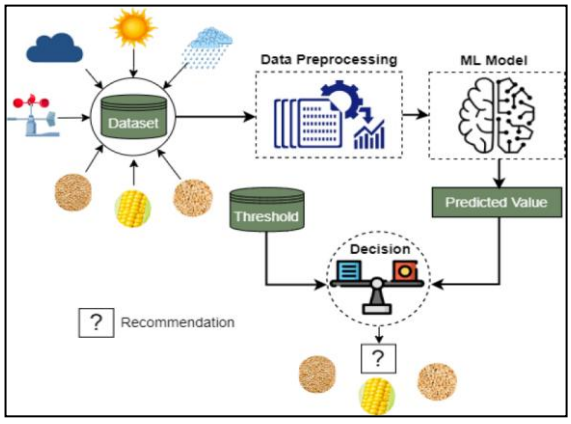

Figure 1: Data Processing and Decision

3.2 Machine Learning Model Integration:

Taking into account variables like decision trees, clustering, or regression models, select the best machine learning [1] methods for crop recommendation. Utilising the preprocessing data, train the chosen models so they can identify trends and connections between input factors and the best crop selections.

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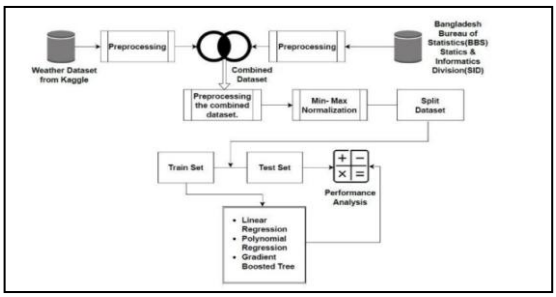

Figure 2: Dataset Preparation for Crop Prediction

3.3 Django Backend Development:

Develop the backend of the application using Django, leveraging its capabilities for data handling, request processing, and interaction with the machine learning models.
Implement a robust database structure to store user data securely, ensuring efficient retrieval and storage of information.

3.4 User Interface Design:

Using HTML and CSS along with Django's template system, create an easy-to-use and interactive interface. Create forms that are easy to use so that farmers and other agricultural experts can provide input parameters. Provide user authentication features, safe personalised suggestion access, and data privacy protection[2].

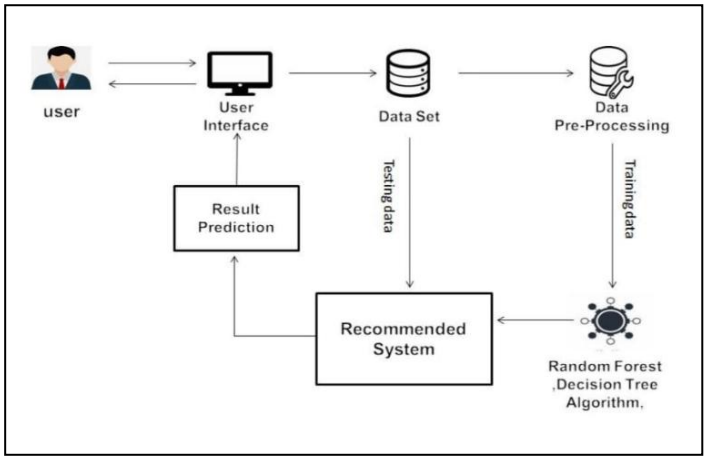

Figure 3: User Interface Model

3.5 Frontend and Backend Integration:

By establishing a smooth connection between the two, user-inputted data can be sent to the Django backend for processing. Implement dynamic interfaces that update in real-time based on user interactions, providing instant feedback and crop recommendations.

3.6 Validation and Testing:

Perform comprehensive testing of all system components, including user interface features, model predictions, and data input. Verify crop recommendations against historical data and accepted agricultural practices to make sure the system is reliable.

3.7 Scalability and Deployment:

Make the Crop Recommendation System publicly accessible by deploying it on a web server. Make sure the system is scalable so that it can accommodate diverse workloads and agricultural environments.

3.8 User Assistance and Training:

To guarantee that farmers and other agricultural experts can utilise the system efficiently, offer user assistance and training resources. Get user input so that the Crop Recommendation System can be updated and improved over time. This thorough approach may be used to create and deploy the Crop Recommendation System using Django, which will help farmers choose crops with greater knowledge and ultimately boost agricultural productivity.

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IV. CONCLUSION

To sum up, the incorporation of Django into Crop Recommendation Systems represents a noteworthy advancement in utilising technology for sustainable and optimised farming practices. Advanced machine learning algorithms combined with Django's web development framework provide a dependable and approachable solution that could completely transform conventional farming methods.

With the help of the Crop Recommendation System, farmers and other agricultural experts may make well-informed decisions on crop selection by considering a variety of aspects, including soil properties, climate, and past performance. The interface's ease of use, created with Django, which guarantees accessibility even for people with no experience with technology. For technology to be widely used and have a good impact on farming communities, it must be democratised. The system's dependence on machine learning models improves its capacity for prediction, offering customised advice that takes into account the particulars of every farm. This maximises the use of resources while simultaneously boosting agricultural output and efficiency. Regression models, decision trees, and clustering strategies can all be integrated into the Django framework to help the system learn and adapt over time, maintaining relevance and accuracy.

Django's built-in security capabilities handle data privacy issues, which are important when managing sensitive agricultural data. Farmers can employ technology-driven crop management solutions with confidence knowing that their data is secure.

Another important feature is scalability, which enables the Crop Recommendation System to adjust to different customer requirements and agricultural landscapes. A solution that can adapt to various geographies, crop varieties, and changing agricultural practices is necessary due to the dynamic nature of farming.

The Crop Recommendation System with Django is essentially a harmonious fusion of agricultural science and technological innovation. This method demonstrates how technology may help create a more efficient and sustainable future for farming communities worldwide by streamlining data-driven decision-making, optimising resource allocation, and raising total agricultural productivity. It is predictable that these systems will become increasingly important in guaranteeing food security and encouraging ecologically responsible farming methods as long as breakthroughs in technology continue.

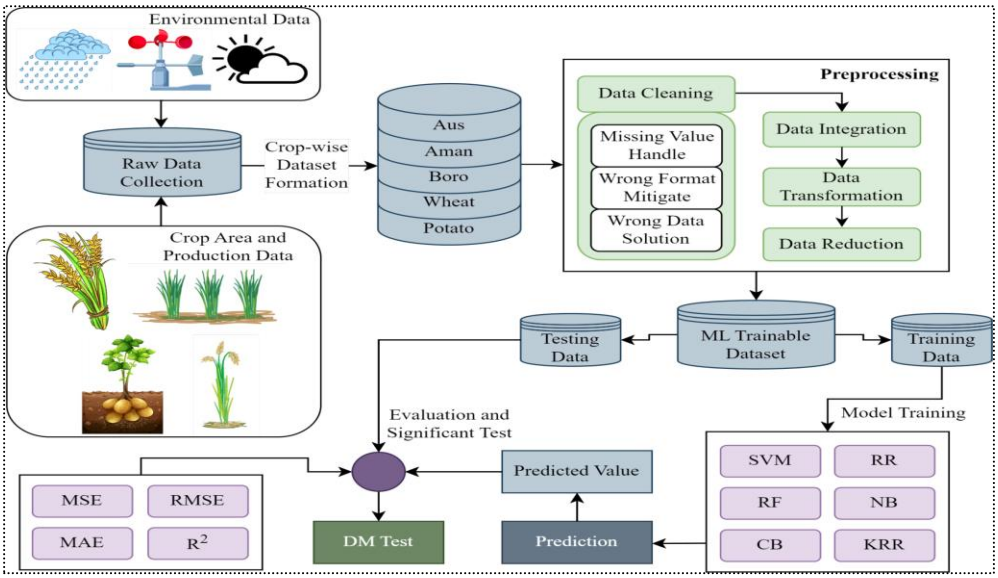

Figure 4: Overall model for Crop Prediction

In conclusion, the integration of Django into Crop Recommendation Systems marks a significant stride towards leveraging technology for sustainable and optimized agriculture. The combination of Django's web development framework and advanced machine learning algorithms offers a robust and user-friendly solution that has the potential to revolutionize traditional farming practices.

The Crop Recommendation System provides farmers and agricultural professionals with a powerful tool to make informed decisions about crop selection based on diverse factors such as soil characteristics, climate conditions, and historical performance. The user-friendly interface, developed using Django, ensures accessibility even for those with

limited technological expertise. This democratization of technology is essential for widespread adoption and positive impacts on farming communities.

The system's reliance on machine learning models enhances its predictive capabilities, providing personalized recommendations that consider the unique conditions of each farm. This not only optimizes resource utilization but also contributes to increased agricultural efficiency and productivity. The integration of decision trees, clustering techniques, or regression models into the Django framework enables the system to continuously learn and adapt, ensuring relevance and accuracy over time.

Security features inherent in Django address concerns related to data privacy, crucial in handling sensitive agricultural information. Farmers can trust that their data is protected, fostering confidence in adopting technology-driven solutions for crop management.

Scalability is another notable aspect, allowing the Crop Recommendation System to adapt to diverse agricultural landscapes and varying user needs. The dynamic nature of farming demands solutions that can accommodate different regions, crop varieties, and evolving agricultural practices.

In essence, the Crop Recommendation System using Django represents a harmonious blend of technological innovation and agricultural science. By facilitating data-driven decision-making, optimizing resource allocation, and enhancing overall agricultural productivity, this system stands as a testament to the potential of technology to shape a more sustainable and efficient future for farming communities globally. As advancements continue, it is foreseeable that such systems will play a pivotal role in ensuring food security and promoting environmentally conscious farming pra

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