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Farm Connect Harvestify using ML

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Abstract: *Agriculture in India and around the world faces challenges such as low productivity, incorrect use of fertilizers, and late detection of crop diseases. To tackle these issues, this project proposes **Harvestify**, an intelligent agricultural assistant that uses machine learning to provide smart solutions for farmers. Harvestify integrates three core ML models: **Crop Recommendation**, which suggests the most suitable crop based on soil and environmental conditions; **Fertilizer Recommendation**, which advises the best fertilizers based on nutrient levels and crop type; and **Disease Detection**, which identifies plant diseases using image recognition. The system is built using a modern tech stack including React.js, Node.js, Express.js, and MongoDB, ensuring a smooth and responsive user experience. By enabling data-driven decision-making, Harvestify empowers farmers to improve yield, reduce losses, and adopt sustainable practices. This tool bridges the gap between technology and agriculture, aiming to make farming more efficient, accessible, and intelligent..*

Keywords: Smart agriculture, Machine learning in farming, Crop recommendation system, Fertilizer recommendation, Plant disease detection, Precision agriculture, AgriTech, Sustainable farming

I. INTRODUCTION

Agriculture plays a vital role in the economic and social development of countries like India, where a large portion of the population depends on farming for their livelihood. Despite advancements in other sectors, many farmers still rely on traditional methods that are often inefficient and unproductive. Key agricultural decisions, such as crop selection, fertilizer usage, and disease management, are frequently made based on guesswork or outdated practices. These challenges lead to reduced crop yield, poor soil health, and economic losses, highlighting the urgent need for modern, data-driven solutions in agriculture.

The integration of **Machine Learning (ML)** and **Information Technology** into agriculture presents an opportunity to revolutionize the way farming is done. With the rise of accessible computing power and user-friendly platforms, it is now possible to analyze vast amounts of data and generate actionable insights for farmers. **Harvestify** is one such initiative designed to support farmers by offering intelligent recommendations using machine learning models. The project features three core components: a **Crop Recommendation System**, a **Fertilizer Suggestion Module**, and a **Plant Disease Detection System**—each aimed at addressing critical pain points in the farming process.

II. LITERATURE SURVEY

[1] Manojit Chattopadhyay, Surajit Chattopadhyay, "Elucidating the role of topological pattern discovery and support vector machine in generating predictive models for Indian summer monsoon rainfall", Theoretical and Applied Climatology, pp. 1-12, July 2015, DOI: 10.1007/s00704-015-1544-5

Weather forecast is one of the most important ways to predict the weather in any country. This paper proposes a rain forecast model using Multiple Linear Regression (MLR) on the Indian database. Input data has more weather parameters and rainfall prediction more accurately. Mean Square Error (MSE), precision, correlation parameters are used to validate the proposed model. From the results, the proposed machine learning model provides much better results than other algorithms in the textbooks.

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[2]Kumar Abhishek, Abhay Kumar, Rajeev Ranjan, Sarthak Kumar," A Rainfall Prediction Model using Artificial Neural Network", 2012 IEEE Control and System Graduate Research Colloquium (ICSGRC 2012), pp. 82-87, 2012.The multilayered artificial neural network with learning by back-propagation algorithm configuration is the most common in use, due to of its ease in training. It is estimated that over 80% of all the neural network projects in development use back-propagation. In back-propagation algorithm, there are two phases in its learning cycle, one to propagate the input patterns through the network and other to adapt the output by changing the weights in the network. The back-propagation-feed forward neural network can be used in many applications such as character recognition, weather and financial prediction, face detection etc

[3] Aswin S, Geetha P and Vinayakumar R, "Deep Learning Models for the Prediction of Rainfall", International Conference on Communication and Signal Processing, April 3-5, 2018, India, pp. 0657-0661.

Rainfall is one of the major source of freshwater for all the organism around the world. Rainfall prediction model provides the information regarding various climatological variables on the amount of rainfall. In recent days, Deep Learning enabled the selflearning data labels which allows to create a data-driven model for a time series dataset. It allows to make the anomaly/change detection from the time series data and also predicts the future event's data with respect to the events occurred in the past. This paper deals with obtaining models of the rainfall precipitation by using Deep Learning Architectures (LSTM and ConvNet) and determining the better architecture with RMSE of LSTM as 2.55 and RMSE of ConvNet as 2.44 claiming that for any time series dataset, Deep Learning models will be effective and efficient for the modellers.

[4]Jain A. "Analysis of growth and instability in the area, production, yield, and price of rice in India", Journal of Social Change and Development, 2018; 2:46-66

Agriculture and its related industries are without a doubt the most important sources of income in India. Furthermore, the agriculture sector makes a significant contribution to the country's GDP (GDP). The vastness of the rural area is a gift to the country.. In any event, the harvest yield per hectare is appallingly low in comparison to international standards. This could be one of the reasons for a higher rate of self- destruction among India's periphery ranchers. As information, the client provides the region and soil type. AI computations permit for the choice of the maximum nice harvest listing or the prediction of harvest yield for a client-decided on crop. Machine Learning computations such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Random Forest (RF), Multivariate Linear Regression (MLR), and K-Nearest Neighbor (KNN) are used to predict crop production. Among these, the Random Forest produced the best results, with a precision of 95%. In addition, the framework suggests the optimal time to use composts to aid increase production.

[5]Manjula E, Djodiltachoumy S, "A model for prediction of crop yield" International Journal of Computational Intelligence and Informatics, 2017 Mar; 6(4):2349-6363..

Data Mining is emerging research field in crop yield analysis. Yield prediction is a very important issue in agricultural. Any farmer is interested in knowing how much yield he is about to expect. In the past, yield prediction was performed by considering farmer's experience on particular field and crop. The yield prediction is a major issue that remains to be solved based on available data. Data mining techniques are the better choice for this purpose. Different Data Mining techniques are used and evaluated in agriculture for estimating the future year's crop production. This research proposes and implements a system to predict crop yield from previous data. This is achieved by applying association rule mining on agriculture data. This research focuses on creation of a prediction model which may be used to future prediction of crop yield. This paper presents a brief analysis of crop yield prediction using data mining technique based on association rules for the selected region i.e. district of Tamil Nadu in India. The experimental results shows that the proposed work efficiently predict the crop yield production.

III. PROPOSED SYSTEM

The proposed system, **Harvestify**, is a smart agricultural assistant designed to provide farmers with accurate recommendations and real-time insights using machine learning and web technologies. The system is structured around three main modules: Crop Recommendation, Fertilizer Recommendation, and Disease Detection. Each of these

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modules is powered by a machine learning model trained on agricultural datasets, enabling data-driven decisions tailored to the user's specific conditions.

1. Crop Recommendation Module:

This module suggests the most suitable crop based on various parameters like soil nitrogen (N), phosphorus (P), potassium (K), pH, temperature, humidity, and rainfall. The input is taken via a web form, and a trained ML model (e.g., Random Forest or Decision Tree) processes this data to predict the ideal crop. This helps farmers optimize yield by choosing crops suited to their local environmental and soil conditions.

2. Fertilizer Recommendation Module:

After selecting a crop, farmers can get fertilizer suggestions based on the current nutrient levels in the soil. The model compares the actual N-P-K values with the ideal values for the selected crop and recommends fertilizers to balance deficiencies or excesses. This ensures proper nutrient management, avoids overuse, and supports sustainable farming.

3. Disease Detection Module:

This component allows users to upload images of affected crops. A convolutional neural network (CNN) model analyzes the images to detect diseases and provides the name and type of disease along with suggestions for treatment. The model is trained on a large dataset of labeled crop disease images and can detect multiple common plant diseases with high accuracy.

The entire solution is designed to be accessible via web browsers, with a mobile-first approach to make it usable for rural farmers with limited resources. The use of real-time inputs, intelligent recommendations, and an easy-to-use interface makes Harvestify a reliable and scalable solution for improving agricultural productivity and sustainability.

IV. TOOLS AND LANGAUGES USED

The development of Harvestify involves a combination of web development tools and machine learning frameworks, ensuring both a smooth user experience and intelligent data processing. The following tools and programming languages were used in the project:

1. HTML, CSS, and JavaScript:

These core web technologies are used to build the frontend of the Harvestify platform.

HTML (HyperText Markup Language) structures the content and layout of the web pages.

CSS (Cascading Style Sheets) is used to style and design the interface for a clean, responsive look.

JavaScript adds interactivity to the user interface, enabling dynamic content rendering and user input validation.

2. Python:

Python is the primary language used for developing and training the Machine Learning models. Libraries such as:

scikit-learn for the Crop and Fertilizer Recommendation models,

TensorFlow or Keras for the Disease Detection model (CNN), were used for model building, training, and prediction.

Python's simplicity and strong support for data science make it ideal for implementing intelligent systems.

3. Node.js and Express.js:

Node.js serves as the runtime environment for the backend of the application, while Express.js is used to build the server and handle API requests. These tools manage the communication between the frontend, database, and the machine learning models

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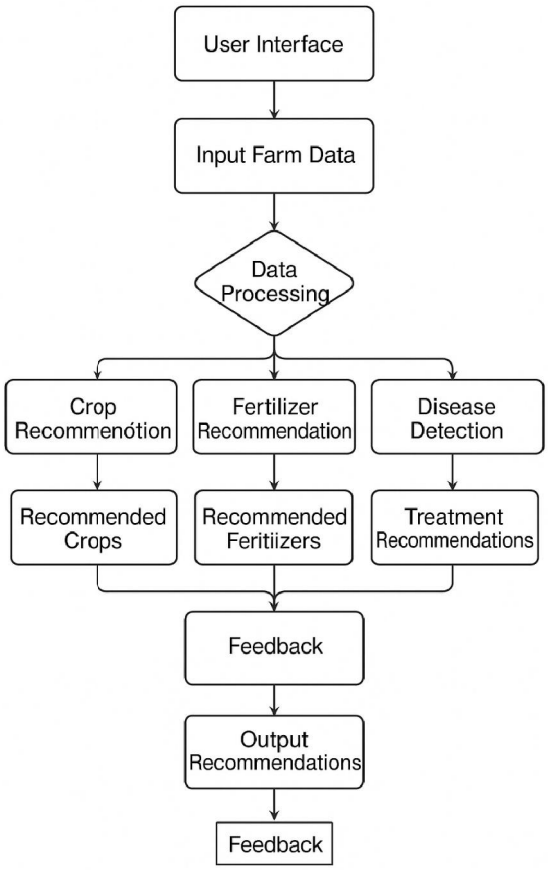
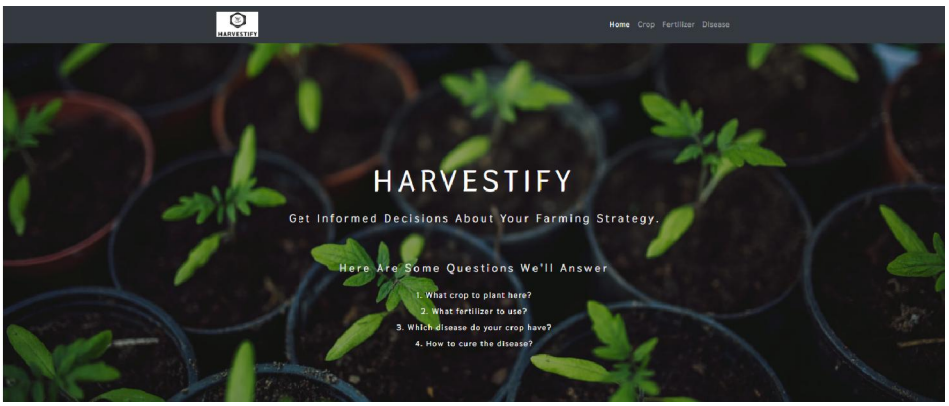
Flowchart:



V. RESULT

I. HOME WINDOW



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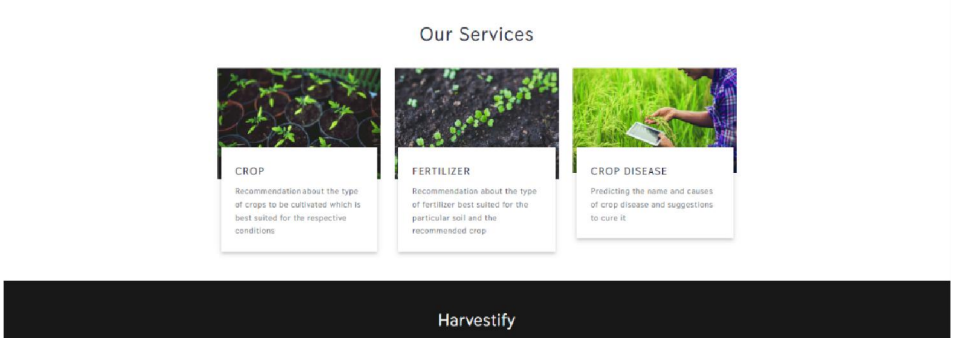
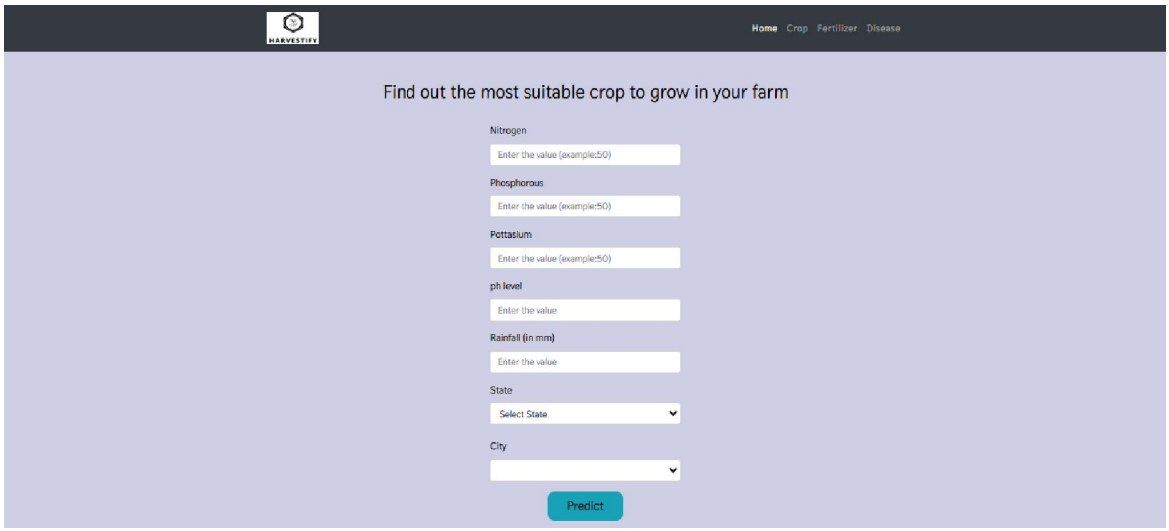
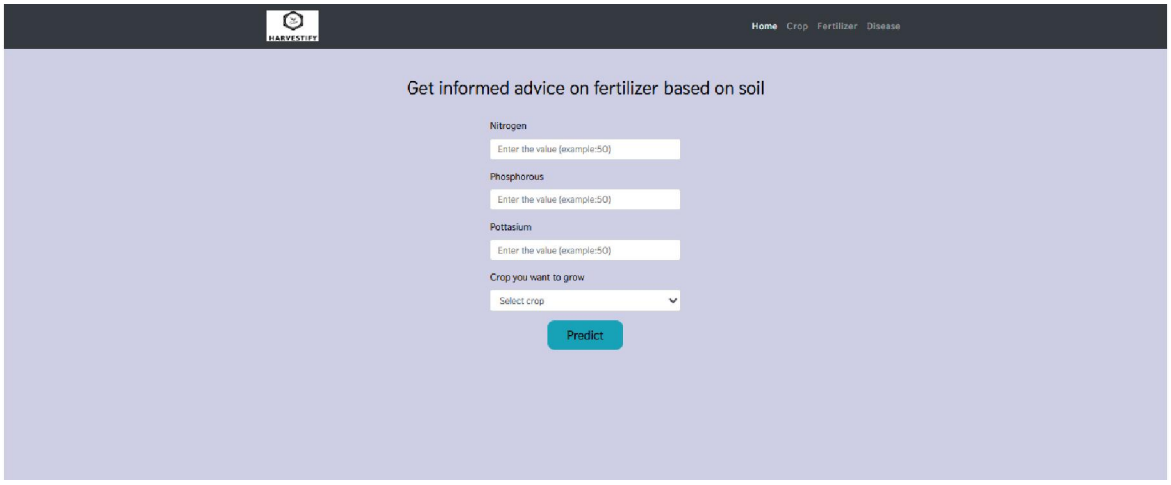


II. CROP RECOMMENDATION PAGE



III. FERTILIZER RECOMMENDATION



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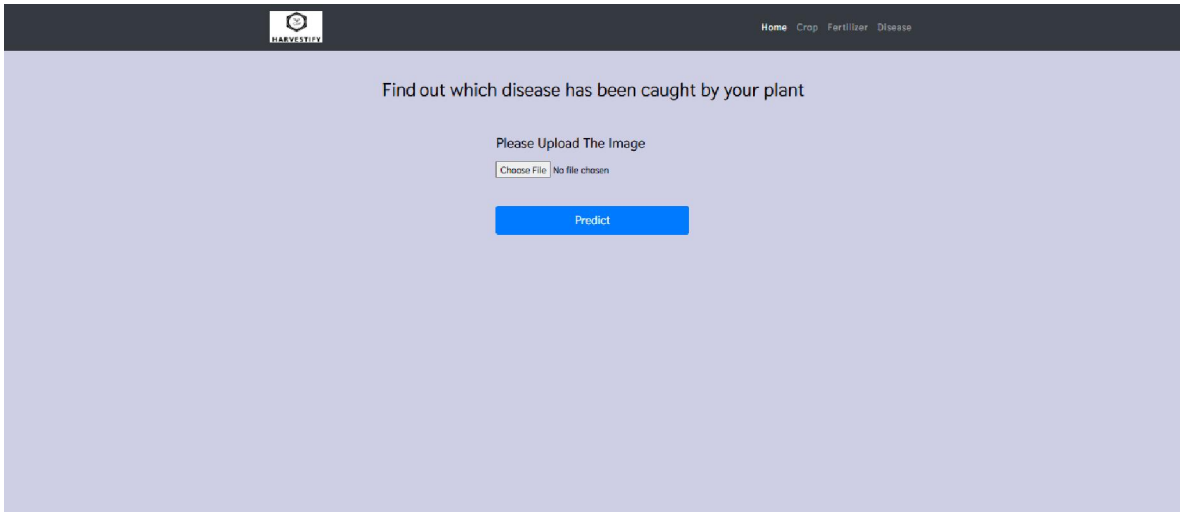
IV. CROPDISEASE DETECTION



VI. CONCLUSION

The Harvestify project demonstrates the potential of combining modern web technologies with machine learning to solve real-world agricultural problems. By offering three core functionalitiescrop recommendation, fertilizer suggestion, and plant disease detectionthe system provides farmers with accurate, data-driven support to enhance productivity and make informed decisions. Each module is designed to reduce guesswork, improve yield quality, and promote sustainable farming practices.

The platform's user-friendly interface, built using HTML, CSS, and JavaScript, along with a robust backend powered by Python and Node.js, ensures accessibility for users with minimal technical knowledge. By integrating image-based disease detection and real-time environmental inputs, Harvestify empowers farmers to respond quickly to changing conditions, minimizing losses and maximizing efficiency.

Overall, Harvestify represents a step toward smart agriculture, where technology bridges the gap between traditional farming and modern innovation. With further expansion and localization, this system has the potential to support millions of farmers and contribute to food security and sustainable development on a larger scale.

VII. ACKNOWLEDGMENT

We are profoundly grateful to Prof. Sanjay Jadhavfor his expert guidance and continuous encouragement throughout to see that this project rights its targets since it commencement to its completion.

We would like to express deep appreciation towards Dr. Geeta Lathkar (Director of Mahatma Gandhi Mission's College of Engineering and Technology), Dr. Rajesh Kadu (Head of Department of Computer Engineering) whose invaluable guidance supporting us in completing this project.

At last we must express our sincere heartfelt gratitude to the all staff members of Computer Engineering Department who helped us directly or indirectly this course of work.

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