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Agriculture Portal

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Abstract: The Agricultural Portal is an innovative platform designed to improve crop production by providing farmers with easy access to agricultural information, resources, and tools. The portal offers a wide range of features including weather forecasts, pest and disease management tips, soil health assessment, crop planning tools, and market prices. This technical paper outlines the development and implementation of the Agricultural Portal, highlighting its features and functionalities. The paper also explores the benefits of the portal for farmers, including increased productivity, improved decision-making, and enhanced profitability. The portal is built on a robust technology platform that is scalable and adaptable to the needs of farmers of different sizes and geographies. It is designed to be user-friendly and accessible on multiple devices, including mobile phones and tablets. The Agricultural Portal represents a significant step forward in the use of technology in agriculture. By providing farmers with easy access to information and resources, it has the potential to transform the way they farm and improve crop production across the globe.

Keywords: Agricultural portal, Machine Learning algorithms, crop production.

I. Introduction

Agriculture is the backbone of any country, and it has become the most significant growing sector all over the world because of increasing the population. About 60% of our country's population works in agriculture which contributes more to our country's GDP and employment. The main challenge in the agriculture industry is to improve farming efficiency and quality to fulfil the speedily increasing demand for food. Apart from the mounting population, the climate circumstance is also a huge challenge in the agricultural industry. In our project, Machine Learning algorithms are used to assist farmers to know future crop yield predictions and favourable weather predictions. It also assists the farmers to sell the crops directly to the customers.

An agricultural portal is an online platform that provides access to a variety of resources and services to farmers in the agriculture industry. The main objective of such a portal is to help farmers improve their crop production and profitability by providing them with information, tools, and services that can help them make informed decisions and adopt best practices. Some of the basic concepts that are central to an agricultural portal for better crop production include:

Weather data: Farmers must be able to plan their planting and harvesting schedules in accordance with the weather as it is so important to agriculture. Agricultural portals give farmers access to weather alerts and forecasts, which can aid them in making decisions regarding pest control, irrigation, and other tasks. exemplary practices.

Best Practices: Farmers must keep themselves updated with the most recent best practices and procedures used in agriculture because agriculture is a complicated and ever-evolving industry. It gives farmers access to a variety of tools and materials that can assist them advance their agricultural methods.

II. Previous work Analysis

[1] According to analysis, the most used features are temperature, rainfall, and soil type, and the most applied algorithm is Artificial Neural Networks in these models. The author used parameters like State, district, season, and area. The user can predict the yield of the crop in which year the user wants. The paper uses advanced regression techniques like Kernel Ridge, and Lasso to predict the yield and uses the concept of Stacking Regression for enhancing the algorithms to give a better prediction.

[2] In this paper, the author says, yield prediction was performed by considering farmers' experience on a particular field and crop. Different Data Mining techniques are used and evaluated in agriculture for estimating the future year's crop production. This is achieved by applying association rule mining on agriculture data. This research focuses on the creation of a prediction model which may be used for future prediction of crop yield.

This paper presents a brief analysis of crop yield prediction using a data mining technique based on association rules for the selected region.

[3] The author describes how the old farming data can be utilized to depict the future expectation of harvests and yield. It likewise proposes to the ranchers what kind of yield can be developed utilizing the climate station data and gives the appropriate data to incline toward the precise season for cultivating. The curse on the harvest yield is broken down by utilizing different ecological elements and Regression Analysis (RA), Linear Regression (LR) Algorithms utilizing the various data mining strategies how to improve harvest production.

[4] This paper uses machine learning algorithms, direct relapse demonstrated from insights, and two enhancement techniques, the Normal condition strategy, and the Gradient plunge technique to anticipate the weather based on a couple of parameters. this work utilizes the ordinary condition model's speculation and contrasts it and the angle plunge model to give a superior thought of the productivity of the models. This paper is about the use of machine learning. algorithms, direct relapse demonstrates from inside, and two enhancement techniques.

[5] This paper describes an approach to yield modeling that uses a semiparametric variant of a deep neural network, which can simultaneously account for complex nonlinear relationships in high dimensional datasets, as well as the known parametric structure and unobserved cross- sectional heterogeneity. Andrew Crane-Droesch et.al.have shown that their approach outperforms both classical statistical methods and fully nonparametric neural networks in predicting the yields of years withheld during model training. It is less pessimistic in the warmest regions and the warmest scenarios.

[6] This paper predicts the yield of almost all kinds of crops that are planted in India. This script makes novel by the usage of simple parameters like State, district, season, area and the user can predict the yield of the crop in which year he or she wants to. The paper uses advanced regression techniques like Kernel Ridge, Lasso, and ENet algorithms to predict the yield and uses the concept of Stacking Regression for enhancing the algorithms to give a better prediction.

[7] The author in this paper, predict the things like rainy, windy, sunny, stormy, floods and variations in temperature, etc. Nowadays, the weather is making a bad impact, as society is growing more and more, causing much damage, injury, and loss of life for farmers. Weather forecasting is very important for agriculture and terrace gardening. Weather forecasting will help remote areas for better crop production. In this paper, a low-cost solution for weather forecast prediction is discussed.

[8] This paper uses algorithms such as Random Forest, Support Vector Machine, Weather, and K Nearest neighbor, which are used for better performance results for each selected weather parameter. We also use soil and weather parameters such as soil type, soil fertility, maximum temperature, minimum temperature, and rainfall are used to identify suitable crops for specified farms or land. Ethiopia consolidates both remotely detected information (RSD) and agrarian overview information for a considerable beneficiary of specially appointed imported nourishment help.

III. Methodology

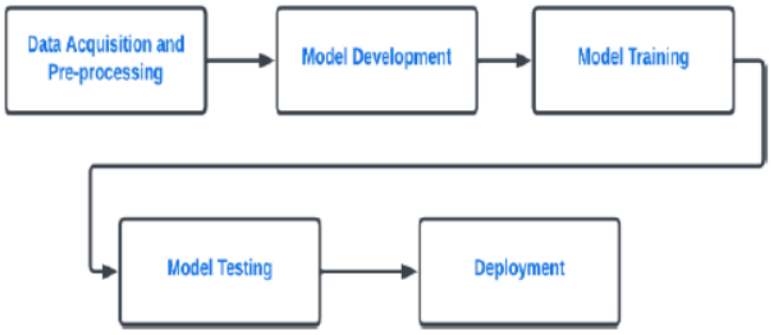

Fig no 3.1. Methodology

The methodology of developing and deploying a machine learning model, which typically involves the following steps: data acquisition and preprocessing, model development, model training, model testing, and deployment.

1. **Data Acquisition and Preprocessing**:
   - Identify the problem statement and the type of data required to solve it.
   - Collect the necessary data from various sources such as databases, APIs, or web scraping.
   - Clean the data by removing any irrelevant or inconsistent entries, handling missing values, and dealing with outliers.

- Preprocess the data by performing tasks like normalization, feature scaling, feature engineering, and encoding categorical variables.

2. **Model Development** :
   - Choose an appropriate machine learning algorithm or a combination of algorithms based on the problem type (classification, regression, clustering, etc.) and the nature of the data.
   - Split the pre-processed data into training and validation sets. The training set is used to train the model, and the validation set is used to tune its parameters and evaluate performance during development.
   - Define the model architecture or structure, including the number and type of layers (in the case of neural networks) or the configuration of the algorithm.
   - Set hyperparameters, such as learning rate, regularization strength, and batch size, which control the learning process.
   - Implement the model using a suitable programming language or a machine learning library/framework.

3. **Model Training** :
   - Feed the training data into the model and use an optimization algorithm (e.g., gradient descent) to update the model's parameters iteratively.
   - Monitor the model's performance on the validation set during training to detect overfitting or underfitting and adjust hyperparameters accordingly.
   - Continue training until the model achieves satisfactory performance on the validation set or converges to a stable state.

4. **Model Testing**:
   - Once training is complete, evaluate the trained model's performance on a separate, unseen test dataset.
   - Calculate various evaluation metrics (accuracy, precision, recall, F1 score, etc.) to measure the model's performance and assess its suitability for the problem at hand.
   - Analyze the model's performance and make any necessary adjustments or improvements based on the evaluation results.

5. **Deployment:**
   - Prepare the model for deployment by packaging it in a format suitable for the chosen deployment environment (e.g., a serialized model file or a containerized application).
   - Integrate the model into the target system, which may involve writing code to handle input/output, data preprocessing, and interacting with other components of the system.

Test the deployed model thoroughly to ensure it functions correctly in the production environment.

IV. Proposed System Design

The system design controls the major structural characteristics of the system. It as a major impact on the testability and modifiability of the system, and it affects its efficiency. Much of the designing software is spent in creating the system design. In the first level of the design process, the focus is on deciding which modules are needed for the system, the specification of these modules, and how the modules should be interconnected. This is called the system design or top level design.

The design activity begins when the requirement documents for the software to be developed is available. The goal of the design process is to produce a model or representation of the system, which can be used later to bind the system. The produced model is called design of the system. A structured design is a top down approach to minimize complexity and make a problem manageable by sub dividing it into smaller segments. The most creative and challenging phase of the system development of life cycle is system design. The design phase is translation from user-oriented document to document oriented programmers.

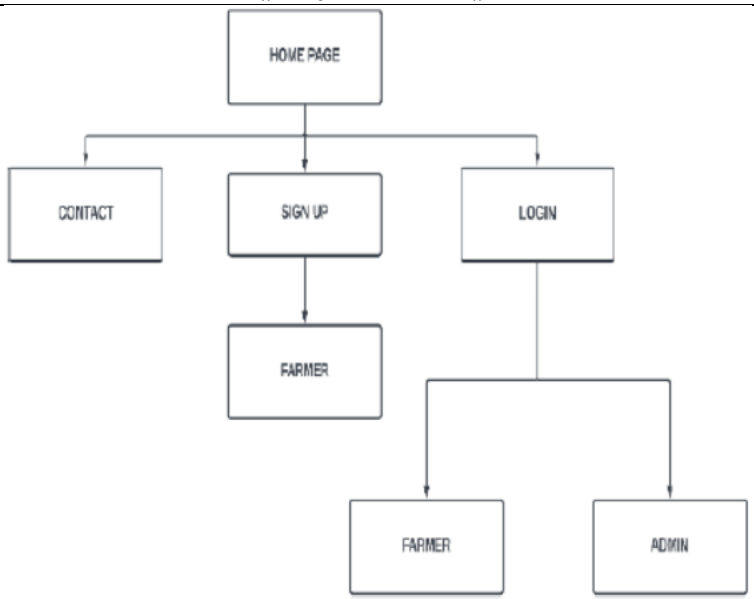

Fig no. 4.1 Homepage Flowchart

The above figure-4.1 is the design of our project Agriculture portal for better crop production. The Farmers can login to the portal and make use of various options available in their respective domain. times.

V. Software System Design

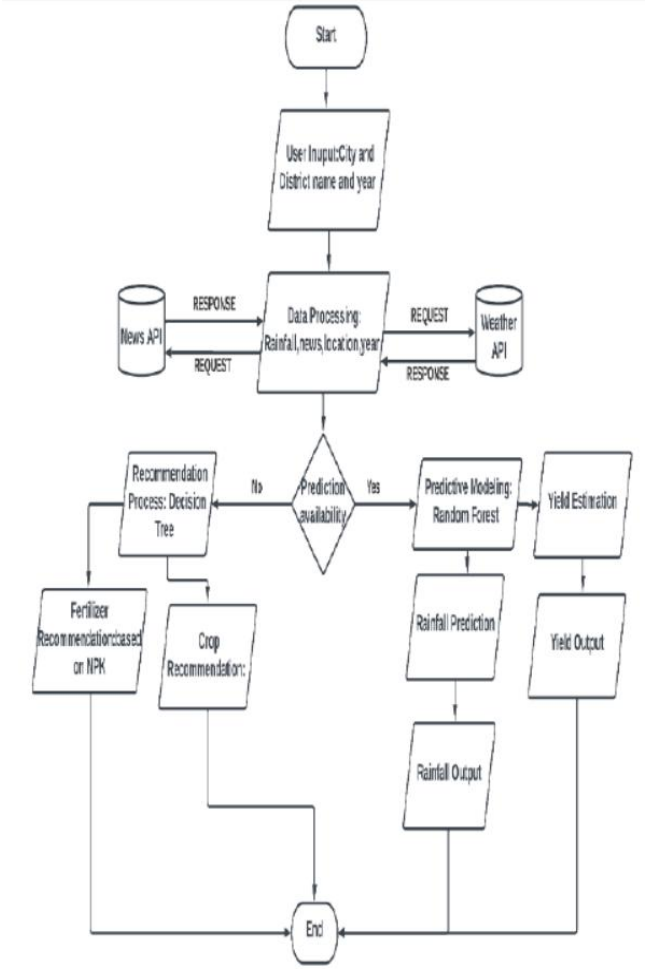

Fig no. 5.1 Portal's flowchart

This flowchart illustrates a comprehensive system aimed at providing agricultural recommendations tailored to specific regions and conditions. It initiates with user input, including city, district, and year, which the system then processes to gather essential data such as rainfall patterns and location specifics. The system first checks if historical rainfall data is available; if not, it retrieves current weather data from the Weather API. Subsequently, predictive modelling, employing the Random Forest algorithm, generates a rainfall prediction crucial for agricultural planning. Utilizing this prediction, another model estimates agricultural yield, aiding farmers in understanding potential crop productivity. Simultaneously, the system integrates additional API for news updates regarding agriculture. The fertilizer recommendation process, guided by a decision tree incorporating NPK values, offers tailored suggestions to optimize plant nutrition.

VI. Snapshots of Working Project

Fig. 6.1 Home-page of the portal

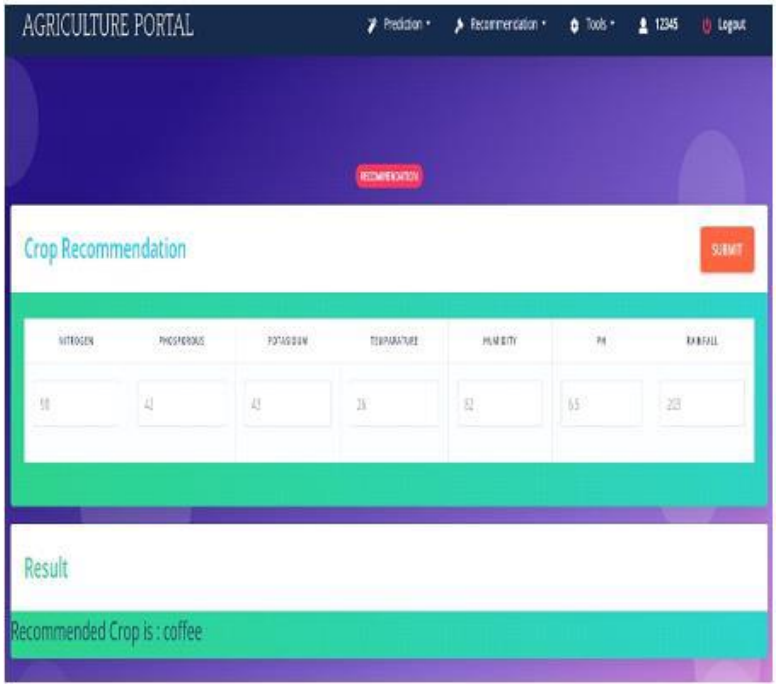

Fig. 6.2 Crop Recommendation

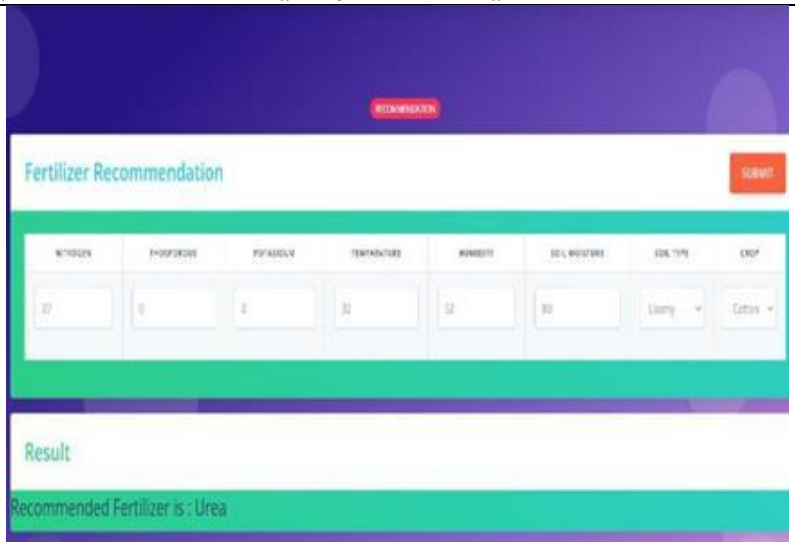

Fig.6.3 Recommended Fertilizer: Urea

Fig.6.4 Predicted crop yield in Quintals

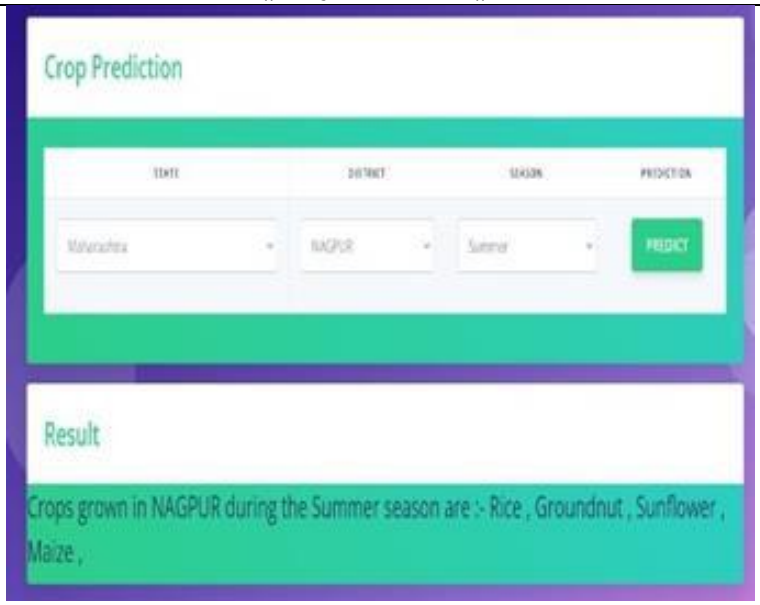

Fig.6.5 Information of Crop grown in city

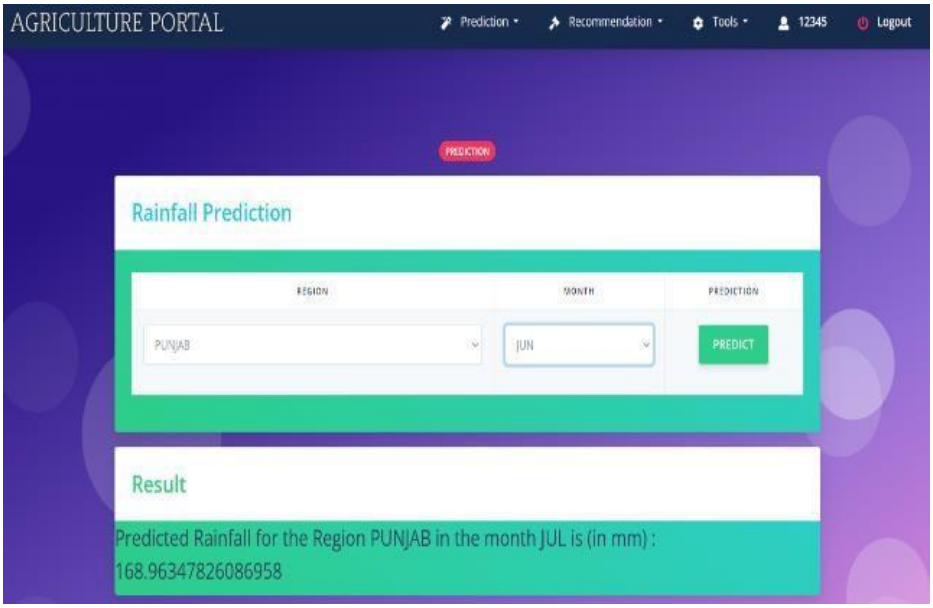

Fig.6.6 Prediction of Rainfall

VII. Conclusion

This project develops a website for predicting crop yield, weather, and fertilizer recommendation using machine learning algorithms. The decision tree is found to provide the most accurate predictions for crop yield, weather, and fertilizer recommendation.

The prediction system takes the inputs from the user and provides the best and most accurate predictive analysis for crop yield. The website also provides information on the best crop that is suitable and also which particular fertilizers are required for that crop.

Results also revealed that the Random Forest classifier gives the highest weather prediction and fertilizer recommendation accuracy. These will not only help farmers maintain the proper crop supply to grow but also in cost management also it can be helpful.

This project will empower farmers to make informed decisions regarding crop selection, fertilizer usage, and overall cost management. The robustness and reliability of our system have been validated through experiments conducted on a reliable dataset.

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