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Intelligent Crop Recommendation System using Machine Learning

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***Abstract*—Agriculture plays a critical role in the entire life of a given economy. Choosing the wrong crop for the farmer based on the soil needs results in significant losses. Therefore, the problem with this approach is addressed to agricultural accuracy.**

Precision agriculture is the science that helps increase yields and make management decisions using advanced technology and new tools. It is a new concept adopted globally to increase productivity, reduce labor time, and provide effective fertilizer management and irrigation systems. This can help the farmer by choosing the right crop according to the needs of the soil.

***Keywords*—Agriculture, Precision Agriculture, Crop Recommendation.**

I. INTRODUCTION

Agriculture plays a major role in economic growth and development. More than 70% of rural households depend on agriculture. Agriculture is an important sector of the Indian economy as it contributes about 17% of the total GDP and provides employment for more than 60% of the population. Agriculture provides food, clothing, and shelter. It helps people to enjoy a better quality of life. The farmer's decision about which crop to plant is often obscured by his intentions and other unimportant factors such as making a quick profit, lack of knowledge about market demand, and over consideration of the world's ability to support a particular Crop. Low commodity prices, pressure, and family obligations are the main causes of a farmer's suicide. In a country like India where agriculture and related sectors account for about 20.4% of gross value added (GVA), such misconceptions will have a negative impact not only on the farmer's family but also on the entire regional economy.

Therefore, in this regard, we have proposed a so-called intellectual plant program that will take into account environmental parameters such as temperature, rainfall, geographical location, and soil characteristics such as pH value, soil type, and nutrient concentration before the most appropriate recommendation.

II. LITERATURE SURVEY

[1] Prof. Rakesh Shirsat, 2017, "Agricultural Decision-Making System Use Data Mining" recommends crops. In this proposed system different types of methods are adopted using. A registration-based system allows for customizable results, ANN provides a way to define neurons to solve complex errors. -Android contains two farmer and moderator modules.

The main note noted in this proposed application is that the Android app has an access module in which the user (farmer) must log in and enter the crop viewing information and find the same plants after the process shows crop recommendations. Pre-planted plants known for the system of using this plant are recommended. The user feedback method is used to know plant information and update information.

[3]S.Pudumalar, E.Ramanujam, 2016 "Crop Recommendation System for Precision
Agriculture" this paper contains the requirements and planning required for a precision farming software model. The method used in the proposed system states that Random Tree can be built on both name and number data.
CHAID: Based on adjusted value tests. It also looks like a decision tree but uses only a condition based on chi-squared. By default, it uses multiple methods.
KNN is a simple algorithm that keeps all cases and equally new cases classified. The distance is calculated using the Manhattan or Euclidean range.

Naive Bayes: This section is based on a Bayesian vision. It is a strategy to create models that divide the category. Class labels are taken from a limited set.

[2]Miftahul Jannat Mokarrama, 2017 "RSF: A Recommendation System for Farmers" software helps users find the best product based on their preferences, needs, etc., Methodology Adopted Location Detection Module this contains user space is important in providing. user location. Users are identified using GPS-enabled devices. Using the Google API helps to determine the correct location. Data Analysis and Storage Module, the next step is to analyze agroecology and statistics location information stored on the same site. In the same location detection module in this module, we find very similar locations for current users. The recommendation module to keep the recommendation module is done using AL algorithms

III. EXISTING SYSTEM

More and more researchers are beginning to recognize this problem in Indian agriculture and are increasingly devoting their time and efforts to help alleviate the problem. The model is trained to detect climatic conditions in the apple orchard. Then it accurately predicts the yield of apples supported by the monthly weather conditions.

Plant-based crop selection predicts using several algorithms such as Artificial Neural Network, K Neighbors, and the Common Greedy Forest. Additional features included in the program are predicting pesticides and online commerce based on agricultural products.

Limitations:

One mistake we have identified in all of this is the fact that the authors of this paper focus on a single parameter (either weather or soil) for predicting plant growth potential. However, in our view, both factors must be considered at the same time to produce the most accurate and accurate prediction. This is usually because a particular type of soil is also suitable for supporting one type of crop, but if the regional climate is not conducive to this type of crop, the yield will be affected.

IV. PROPOSED SYSTEM

To eliminate the barriers mentioned above, we propose a Sensible Plant Recommendation program - which considers all acceptable parameters, including humidity, temperature, rainfall, and soil conditions, to predict crop suitability. This approach focuses on performing the first function of an Argo Consultant, providing crop recommendations on algorithms for farmers. It also provides profit analysis for plants grown in multiple regions, giving the user an easy and reliable understanding of how to make a decision and plant crops.

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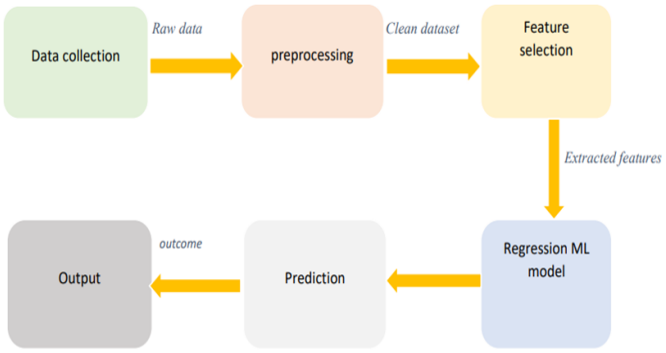
FIG.1. SYSTEM ARHITECTURE



The flow of the Proposed System

As demonstrated in the figure1, the methodology to extract the sentiment contains the several steps that are described below:

(1) Data Collection:

The dataset consists of parameters like Nitrogen(N), Phosphorous(P), Potassium(K), PH value of soil, Humidity, Temperature, and Rainfall. The datasets are obtained from the Kaggle website. The data set has 2200 instances or datathat are taken from past historic data. This dataset includes eleven different crops like rice, maize, chickpea, kidney beans, pigeon peas, moth beans, mung bean, black gram, lentil, pomegranate, banana, mango, grapes, watermelon, muskmelon, apple, orange, papaya, coconut, cotton, jute, and coffee.

(2) Pre-Processing (Noise Removal):

For the successful application pre-processing is required. The information which is acquired from different resources is sometimes in raw form. It should contain some incomplete, redundant, or inconsistent data. Therefore, during this step, such redundant data should be filtered. Data should be normalized.

(3) Feature Extraction:

This step is specializing in identifying and using the foremost relevant attribute from the dataset. Through this process, irrelevant and redundant information is removed for the application of classifiers.

(4) Methodology:

This proposed system applied different Machine Learning algorithms like Logistic Regression (LR), Random Forest (RF), and XGBoost.

Logistic Regression (LR)

The Logistic Regression model may be a broadly used statistical model that, in its basic form, uses a logistic function to model a binary dependent variable; more complex extensions exist. In Regression Examination, Logistic regression is predicting the parameters of a logistic model; it is a sort of Binomial regression.

We've got applied Logistic Regression (LR) in our model as:

(i) Importing library LogisticRegression from sklearn. linear Class

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(ii) Now we create the LogReg classifier object

(iii) In the last, we fit our data

Random Forest (RF):

Random Forest is an ML algorithm. In an exceedingly training situation multitude of choices, and trees are made and therefore the output is going to be divided and supported by several classes i.e., classification, prediction of sophistication i.e., regression. The number of trees is proportional to the accuracy of prediction. The datasetincludes factors like humidity, temperature, and production. These factors within the dataset are used for training. Only two-thirds of the dataset is taken into account. The remaining dataset is used on an experimental basis. The algorithm random forest has 3 parameters: n tree, which describes the n number of trees required to grow, and m try, which mentions the number of variables taken at a node split. Node size - In terminal nodes, it suggests the number of observations that must to taken.

We have got applied Random Forest (RF) in our model as:

(i) Importing library RandomForestClassifier from sklearn.ensemble Class

(ii) Now we create an RF classifier object

(iii) Within the last we fit our data

XGBoost:

eXtreme Gradient Boosting (XGBoost) is an adaptable and improved rendition of the gradient boosting algorithm designed for viability, computational speed, and model performance. XGBoost is well-known to produce better solutions than other machine learning algorithms. It's an open-source library and part of the Distributed Machine Learning Community. XGBoost provides a parallel tree boosting (also called GBDT, GBM) that solves many data science problems quickly and accurately.

We have applied XGBoost in our model as:

(i) Importing library xgboost

(ii) Now we create the XB classifier object

(iii) In the last, we fit our data

V. EXPERIMENTAL RESULTS

We have used three popular algorithms for this project: Logistic regression and Random Forest Classifier, and XGBoost Classifier.

(i) Probability of crops grow when Temperature>30

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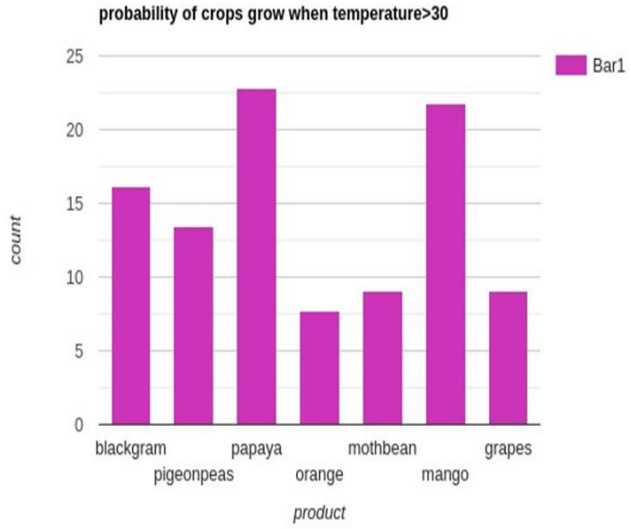
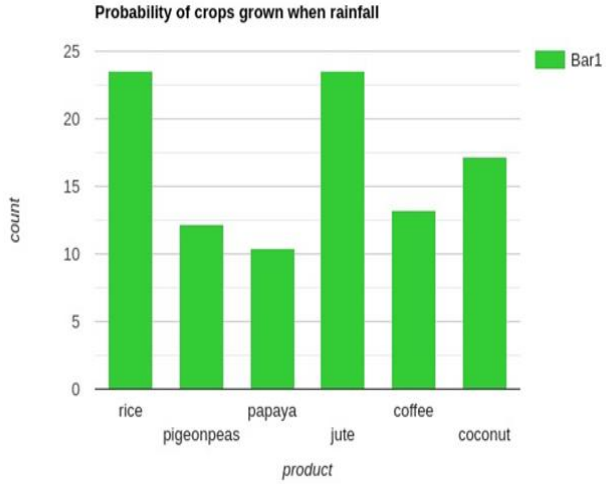


(ii) The probability of crops growing when rainfall>150mm



(iii) Probability of crops grow when ph>7.5 i.e. alkaline nature

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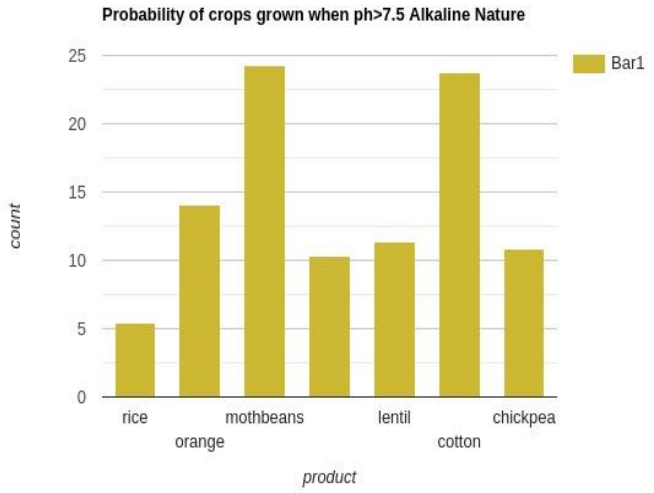
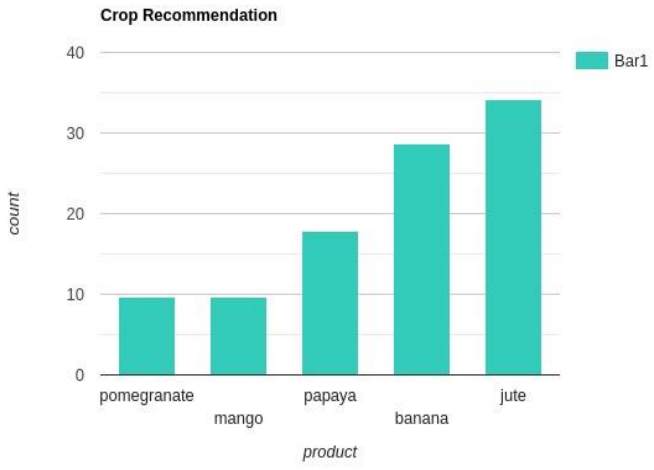


Accuracy Analysis:

Algorithm	**Accuracy**
Logistic Regression (LR)	95%
Random Forest (RF)	99%
XGBoost	99%

Crop Recommendation:



VI. CONCLUSION

In this paper, we have effectively proposed and implemented an intelligent crop recommendation system, which can be easily used by farmers all over India. This system would help the farmers in making an informed decision about which crop to grow depending on some parameters like Nitrogen, Phosphorous, Potassium, PH Value, Humidity, Temperature, and Rainfall. By using this research, we can increase the productivity of the country and produce a profit from such a technique. In this manner, the farmers can plant the right crop.

VII. ACKNOWLEDGMENT

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