



CROP PREDICTION IN AGRICULTURAL ENVIRONMENT USING FEATURE SELECTION METHODS AND CLASSIFIERS

Dr.A.Mummoorthy¹,

Professor
Department of Information
Technology
Malla Reddy College Of Engineering
& Technology
Hyderabad,India.

Aduri Mano Rashmitha²,

Final Year Student
Department of Information
Technology
Malla Reddy College Of Engineering
& Technology
Hyderabad,India.

Chintakayala Bhavesh³,

Final Year Student
Department of Information
Technology
Malla Reddy College Of
Engineering & Technology
Hyderabad,India.

Bommu Naveen Kumar⁴,

Final Year Student
Department of Information
Technology
Malla Reddy College Of Engineering
& Technology
Hyderabad,India.

ABSTRACT

In India, agriculture is a major source to increase the Indian economy. Generally, based on conventional methods like depending on agriculture field, the farmers are used to cultivating the specific crop type such as Wheat, Rice, Maize, Muskmelon, etc. But sometimes due to the bad weather conditions, the farmers will get poor crop yield and sometimes they lose the entire crop. Based on the traditional process, only experts can predict the crop type with previous knowledge but sometimes this prediction will get false results. Therefore, based on machine learning methodologies, it will improve the accuracy of crop prediction and fertilizer suggestion, because in modern automatic technologies the machine learning methods are providing good results. So that we would like to implement the ML classification techniques such as KNN, RF, DT, SVM and Voting ensemble classifiers to predict the crop type. In this work, we have collected a crop dataset with parameters such as temperature, humidity, rainfall, pH which is trained with all ML algorithms to obtain the best accuracy model. Here the experimental results evaluated that the Voting ensemble classifier is providing the best accuracy with 95% compared to other classifiers.

I. INTRODUCTION

Achieving maximum rates with limited land resource is the goal of agriculture planning in agro-based country. Earlier farming predictions was performed based on farmers past experience in a particular field of crops.[8] Now-a-days as the conditions are changing there is a need of advancement in the farming activities. What happens the farmers in rural areas are not aware about the new crop and their benefits while farming

them? The work uses machine learning and prediction algorithms to give the best and good crops for the farmers. The aim of the system is to reduce the losses due to drastic climatic changes and increase the yield rates of crops. The system gathers the data obtained from the past prediction, current weather and soil condition due to this farmer gets the idea and list of crops that can be cultivated.[4] Machine Learning methods are widely used in prediction techniques like SVM (Support Vector Machine), linear regression. This will provide the best crop for cultivation based on the current environment condition. The proposed system considers the rainfall amount of past, current and future and also the type

of soil the farmer has. Based on this parameter the suitable crops for the given condition are predicted using the machine learning algorithms more accurate prediction results are produced.

II. EARLIER WORK

Based on traditional methods crop cultivation will be performed which leads to obtaining poor crop yields and mitigating food production, so the automatic technologies ML approaches are used in agriculture in many earlier kinds of work for the prediction of a specific crop, but not provided the methodology for the prediction of multiple crops, so still the prediction of various crop is a challenging task in agriculture. Therefore, in this work, we are proposing the Boosting and Ensemble techniques for multiple crop predictions.

[1] The work enhances existing procedures in three different ways. To start with, a remote detecting network is applied to propose a working methodology. Next, a novel dimensionality reduction procedure and uses a convolutional neural network (CNN) including long-term memory.

Drawbacks:

- Dependency on Historical Data.
- Lack of Personalization.
- Dependency on Weather Patterns.
- Crop-Specific Challenges.

III. PROPOSED METHOD

The aim of the work is to perform an analysis of various classification approaches and based on performance evaluations the best classification model will be chosen for crop prediction and fertilizer suggestion by submitting the soil content and weather parameters.

[6] The purpose of the Crop Prediction in Agricultural Environment using Feature Selection Methods and Classifiers is to develop a system that helps farmers predict crop more accurately. By analyzing various environmental variables such as temperature, rainfall, humidity, etc. Using machine learning classifiers, the system learns from historical data to make predictions about future crop outcomes.[7] The ultimate goal is to provide farmers with a tool that assists in decision-making, optimizing their crop, and improving overall crop. The proposed work uses classifiers and the system will identify and prioritize the most influential factors such as temperature, weather conditions, humidity, etc. [3] The aim of the Proposed work is to perform an analysis of various classification approaches and based on performance evaluations the best classification model will be chosen for crop prediction.

The administrator will collect the crop dataset and store it in the database and monitoring by the administrator. This system will implement the data pre-processing technique for feature extraction of crop datasets. The crop dataset will be split as a training and test set with 70-30 ratios with help of the independent and target features.[5] All ML approaches

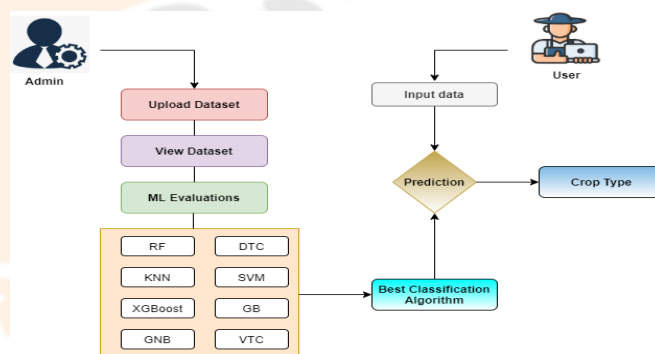
SVM, NB, DT, RF, KNN, GB, XGBoost, and Voting classifier will be trained with a training dataset. Generating the bar charts with scores of ML classification performance evaluations such as accuracy, precision, recall, f1-score, and kappa. Finally, choose the best predictor model for crop prediction by entering the input parameters temperature, humidity, pH, and rainfall.

The work can find type of crop using ML algorithms & based on that crop type it can Crop prediction and fertilizer suggestion based on ML classification techniques. This work is to enhance agricultural productivity and resource management through advanced data science techniques.[3] By leveraging machine learning models and feature selection methods and offers several potential benefits This in return gives the best crop for cultivation based on the current environment condition.

Advantages:

- Accurate Prediction.
- Handling Multidimensional Data.
- Real-time Decision Support.
- Automation of Decision-Making.
- User-Friendly Interface.

IV. METHODOLOGY



The administrator will be uploading the crop dataset into the database server and they can be monitoring the uploaded datasets when updating the new dataset. The admin will calculate the accuracy of the all-machine learning algorithms and generate the table format with all algorithm's performance metrics. [2] This system also generates the system experimental results with bar charts based on ML performance metrics. All-ML analysis, the voting classifier has given the best accuracy results so that, the user will enter the current crop field details and weather details such as temperature, humidity, pH, and rainfall then this system will return the prediction results as crop type like rice, pomegranate, papaya, etc. and which fertilizers can be used for the generate crop.

Dataset Collection:

In this work, we are using the prediction of crop type dataset which was gathered from internet resources. This dataset has four independent attributes such as temperature, humidity and rainfall, and one dependent attribute or target attribute is a target label such as rice, papaya, coconut, groundnut, etc.

Data Preprocessing:

The crop dataset will be in the form of raw data which will be not understood by ML algorithms. So, in the data preprocessing stage, this system will read the data from the .csv file format and will get converted it into data frames. Later it will check the dataset contains any missing values like question marks, special characters, and null values. But the selected dataset does not contain any missing values.

Train and Test Split:

After the pre-processing stage, the crop dataset will be split into 80 to 20 ratios. By using of train_test_split () method this system will split the 80% training dataset and 20% testing dataset.

Training the models:

After splitting the dataset as training and testing, then this system will train the ML models with help of the fit () method with input parameters as independent variables x_train and target column values y_train of the training dataset.

Predicting the model:

Here the trained model will predict the crop name with help of predict () method with an input parameter of testing data x_test then it returns the list of predicted crop names as predicted values and also the list of fertilizers.

ML Evaluations:

In the ML evaluations, this system will compare the algorithm performances between all ML techniques, so finally, the input parameters of predicted values and actual values then this system will calculate all performance metrics such as accuracy score, precision, recall, f1score, MCC, and Kappa scores.

Crop Prediction:

From the ML evaluations, this system will select the best classification model based on performance metrics. According to this system results, the voting classifier model was selected as the best model which is predicted with 95% accuracy. So, that the user enters the testing data like temperature, humidity, pH, and rainfall then this system predicts the different crop names such as rice, papa, watermelon, etc. with various testing data points.

V. LITERATURE SURVEY**Monali Paul, Santosh K Vishwakarma, Ashok Verma [1]**

This paper provided to predict the yielding of crops; the crops are analysed based on analysis they are categorized. This categorization is done on data mining algorithms like KNN, Naïve Bayes. This will be beneficial for developing our project with the help of data mining.

Abdullah Na, William Isaac, Ekaram Khan [2]

In this paper a smart phone-based application which will measure the pH value of soil, temperature and humidity in

real time. This paper assists in remote analysis of soil through various techniques.

S. Nagini, Dr.T.V. Rajnikanth, B.V. Kiranmayee [3]

This paper theorizes an exploratives data analysis about designing various prediction models. Various regression techniques like linear regression are used for prediction for suitable crops. Using various machine learning algorithm prediction are made for most suitable crop for the farmer.

Awanit Kumar, Shiv Kumar [4]

The paper proposed techniques for prediction of crop production of current year. The system uses prediction mechanism in the form of Fuzzy Logic. Fuzzy Logic is ruling based prediction logic where set of rules are applied on the land for farming, rainfall and prediction for crops. The system uses K-means can be used to analyse data set obtained.

Pooja More, Sachi Nene [5]

This paper uses advanced artificial neural network technology along with machine learning algorithms like SVM, Linear regression is used for prediction of most suitable crops.

Rakesh Kumar I, M.P. Singh [6]

The paper proposed techniques for appropriate crop selection using CSM (Crop Selection Method), and Machine.

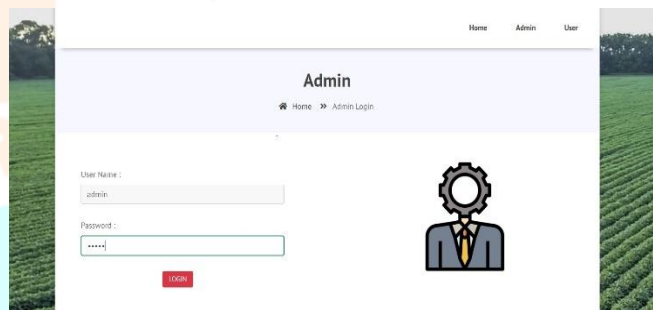
VI. RESULT AND ANALYSIS

Figure 1: Admin Login



Figure 2: Admin Interface

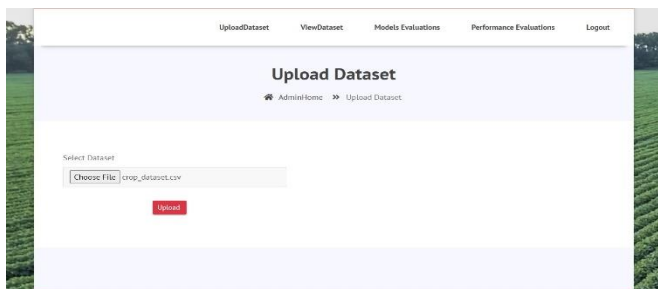


Figure 3: Upload Dataset

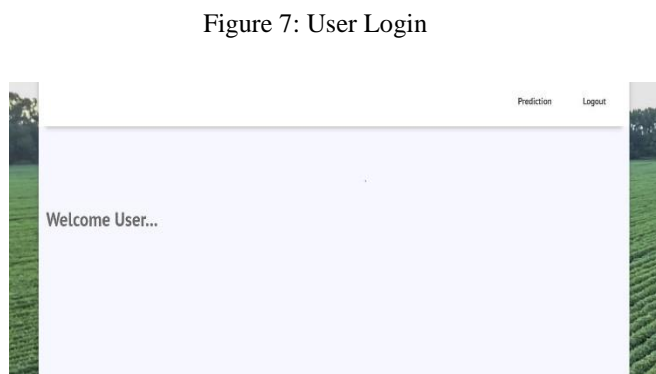


Figure 7: User Login

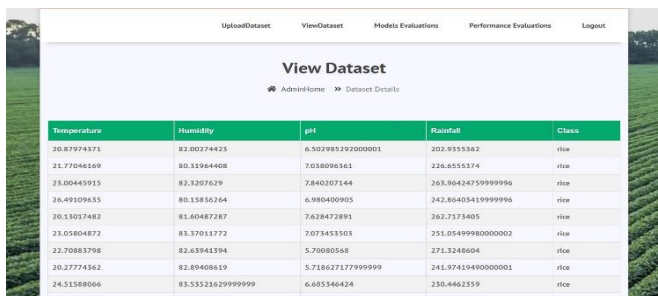


Figure 4: View Dataset

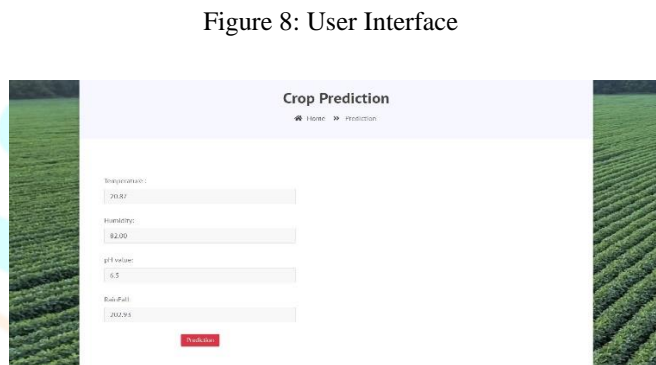


Figure 8: User Interface

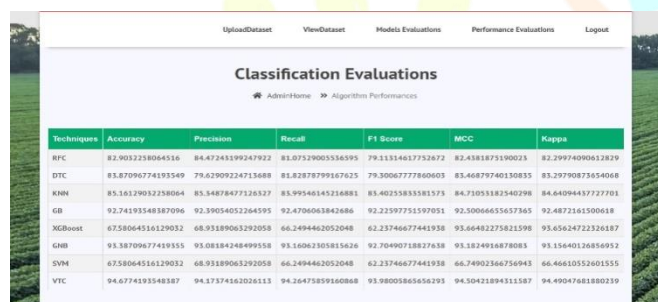


Figure 5: Classification Evaluations



Figure 9: Crop Prediction



Figure 6: Performance Evaluations

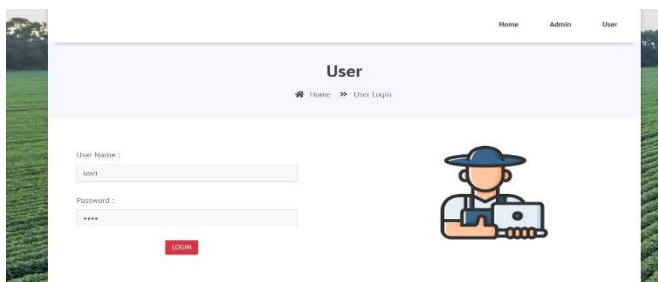


Figure 10: Predicting the Suitable Crop

VII. CONCLUSION

This work will focus on crop prediction and fertilizer recommendation with several machine learning algorithms such as K-NN, RF, DTC, GNB, SVM, GB, XGBoost and Voting classifier. Based on crop dataset we have calculated accuracy of all models. This system experimental results concluded that Voting classifier was given highest accuracy with 95 percent compared to other algorithms. Therefore, this system useful for users like farmers to predict the crop name or type to cultivate specific crop in various agriculture fields. In the future scope, we will implement several machine learning algorithms to prediction of crop.

VIII. REFERENCES

[1] Aakash Parmar & Mithila Sompura, "Rainfall Prediction using Machine Learning", 2017 International Conference on (ICIIECS) at Coimbatore Volume: 3, March 2017.

[2]. Prof. D.S. Zingade, Nilesh Mehta, Shubham Ghodekar, Chandan Mehta, "Machine Learning-based Crop Prediction System Using Multi-Linear Regression," International Journal of Emerging Technology and Computer Science (IJETCS), Vol 3, Issue 2, April 2018.

[3] Nithin Singh & Saurabh Chaturvedi, "Weather Forecasting Using Machine Learning", 2019 International Conference on Signal Processing and Communication (ICSC) Volume: 05 | DEC-2019.

[4] Priya, P., Muthaiah, U., Balamurugan, M." Predicting Yield of the Crop Using Machine Learning Algorithm", 2015.

[5] Mishra, S., Mishra, D., Santra, G. H., "Applications of machine learning techniques in agricultural crop production", 2016.

[6] Arun Kumar, Naveen Kumar, Vishal Vats, "Efficient Crop Yield Prediction Using Machine Learning Algorithms", International Research Journal of Engineering and Technology (IRJET)- e-ISSN: 2395-0056, p-ISSN: 2395-0072, Volume: 05 Issue: 06, June-2018.

[7] Vinita Shah & Prachi Shah, "Groundnut Prediction Using Machine Learning Techniques ", published in IJSRCSEIT. UGC Journal No: 64718, March-2020.

[8] Ramesh Medar & Anand M. Ambekar, "Sugarcane Crop Prediction Using Supervised Machine Learning" published in International Journal of Intelligent Systems and Applications Volume: 3 | August 2019.

[9] van Klompenburg, T.; Kassahun, A.; Catal, C. Crop yield prediction using machine learning: A systematic literature review. *Comput. Electron. Agric.* **2020**, *177*, 105709.

[10] Vashisht, S.; Kumar, P.; Trivedi, M.C. Improved Extreme Learning Machine for Crop Yield Prediction. In Proceedings of the 3rd International Conference on Intelligent Engineering and Management (ICIEM), London, UK, 27–29 April 2022; pp. 754–757.

