International Journal of Scientific Research in Computer Science, Engineering and Information Technology
ISSN : 2456-3307 (www.ijsrcseit.com)
doi :https://doi.org/10.32628/IJSRCSEIT

FarmTrack – A Smart Way of Farming

Ankita Ashok Dhamale[1], Anupriya Vijay Dongare[1], Shubham Rohidas Hundare[1], Prof. Dipali M. Mane[2]
[1]Department of Computer Engineering, ZCOER, Pune, Maharashtra, India
[2]Assistant Professor, Department of Computer Engineering, ZCOER, Pune, Maharashtra, India

Article Info
Volume 8, Issue 2
Page Number: 479-483

Publication Issue :
March-April-2022

Article History
Accepted: 10 April 2022
Published: 22 April 2022

ABSTRACT

Many growing countries are having agriculture as their primary source of revenue. A continuously developing technique for agricultural advances and farming techniques is the modern agriculture. It turns out to be difficult for the farmers to meet our planet's evolving necessities and the expectancies of merchants, customers, etc. Here, we aim to discover the best model for crop prediction, which can help farmers decide the variety of crop to be grown based on the climatic conditions and nutrients present in the soil. This paper compares popular classifier models such as K-Nearest Neighbor (KNN), Decision Tree, Naive Baiyes and Random Forest using two different criterions, Gini and entropy. Results reveal that Random Forest model gives the highest accuracy amongst them. Alongside to this, we have made a web application which gives us the live weather prediction, and also manages the farmers data securely.

Index Terms- Application Programming Interface (API),Crop Prediction, Farming, Management, K-Nearest Neighbor (KNN), Decision Tree, Naïve Bayes, Random Forest, Weather Prediction.

I. INTRODUCTION

In India, Agriculture plays an important role for the economic development of the country. Croppredictionis a complicated process in agriculture and multiple models have been proposed and tested to this end.In recent times, modern people don't have the complete awareness about the cultivation of the crops in a right season and at a right location. Due to which modern farmers lack the knowledge of proper selection of crops. Selecting a wrong crop for cultivation may lead to loss in achieving high yield rate and also simultaneously leads to shortage of food. These difficulties imply the need of smart farming which can be achieved with various machine learning algorithm.

II. RELATED WORKS

Aksheya Suresh, et.al[1] describes "Crop Selection and its Yield Prediction". In this paper, they have considered various parameters of agriculture wherein they mainly focus on the season and location to cultivate the crop. This requirement isimplemented with Machine Learning algorithm likeDecisionTree. Themodel gives an accuracy of 88.7% when tested.

This model can be tested with different dataset for improved accuracy. This proposed system reduces the need for costlier hardware and the time to acquire the knowledge about suitable crops. But the accuracy is still not so good.

S.P.Raja, et.al[2] describes"Crop Prediction Based on Characteristics of the Agricultural Environment Using Various Feature Selection Techniques and Classifiers".Here, they have mentioned about the need of crop prediction using machine learning in today's world where the environmental conditions are changing frequently and creates problem for the farmer.Also, they have explained about various classification techniques that can be used.

Madhuri Shripathi Rao, et.al [3] describes"Crop Prediction using MachineLearning". The objective of the study is to find the best crop prediction model that can help farmers select what sort of crop to cultivate based on meteorological conditions and soil nutrients. The study examines three distinct supervised machine learning models (KNN, Decision Tree, and Random Forest) to suggest the best-suited crop for a certain plot of land, which can assist farmers in growing crops more effectively. Ultimately, they found that the crop prediction dataset had the best accuracy with Random Forest Classifier, with 99.32 percent in both Entropy and Gini Criterion. KNearest Neighbor, but in the other hand, has the lowest accuracy of the three at 97.04 percent, whereas Decision Tree Classifier's accuracy is midway between KNN and Random Forest Classifier.

V. Vanarase, et.al [4] describes "Crop Prediction Using DataMining and Machine Learning Techniques". This research has developed a system using a machine learning algorithm that selects the best crop depending on the nitrogen, phosphorus, and potassium content of soil for the benefit of farmers. The results of three algorithms, comprising SVM, Nave Baiyes, and Decision Tree, are compared, with decision tree achieving the best accuracy.The technology can also respond to the farmer's queries, which helps to boost profit margins.

M. Keerthana,et.al [5] describes "An EnsembleAlgorithm for Crop Yield Prediction". This study examines the use and application of ensemble approaches for forecasting crop type based on location parameters. Machine learning can predict the outcomes consisting of a collection of input factors using unsupervised or supervised learning approaches. The most essential characteristics taken into account in this search approach are climatic conditions such as temperature, rainfall, and crop type. Decision trees employ parameters such as maximum depth and n-estimators, which can be tweaked to improve outcomes. After conducting research, they discovered that a combination of Decision Tree and AdaBoost regressors provided significant accuracy.Crop yield prediction includes crop yield prediction based on previously collected data. Finally, using this technique, they were able to determine which crop should be grown.

Nischitha K, et.al [6] describes "Crop Prediction using Machine Learning Approaches".Here, based on soil contents and weather parameters such as temperature, humidity, and rainfall, the proposed algorithm will predict the best crop for a given piece of land. Rainfall and soil PH The loading of external agricultural datasets starts the crop prediction process. After the dataset has been read, multiple stages of pre-processing will be performed, as explained in Data Processing in advance section. After pre-processing the data, train the models in the training set by using Decision tree classifier. Based on list data, the Decision Tree algorithm will predict the crop.

Pavan Patil,et.al [7] describes "Crop Prediction System usingMachine Learning Algorithms". This research presents a good crop recommendation system based on classifier models. Since it may be used to evaluate different crops, the technology is scalable.This document aids in determining which crops are suitable for a certain region. As per this paper, using a combination classification algorithm such as Naive Bayes and Decision Tree classifiers outperforms that using a single classifier model. The

end findings of this research reveal that when there is variety in the dataset, Nave Bayes performs better than Decision Tree, but Decision Tree performs poorly.

Miss Vaishali Patil, et.al [8] describes "Crop Prediction System using MachineLearning". This research examines at the nutrients in the soil composition as well as the rainfall value for crop prediction depending on location. The system comprises supervised machine learning techniques and provides the most precise findings. The Decision Tree Algorithm was used in the development of this model.

III. PROPOSED SYSTEM

We have proposed a system which determines the best-suited crop depending on the percentage of nitrogen, phosphorous, and potassium in the soil; it also considers temperature, humidity, pH value, and rainfall in the surrounding. So, by considering all these input parameters a perfect crop for cultivation is predicted. This system or application predicts the crop based on the analysis done on the data from the dataset. In order to get the preferred output, we have tested the machine learning model using different algorithms such as Logistic Regression, Decision Tree, Naïve Bayes, and Random Forest; amongst these Random Forest classifier gave the best accuracy. This system also provides live weather prediction using Open Weather API and management of some farming activities. This proposed system reduces the need for costlier hardware and also the time to acquire the knowledge about suitable crops. Figure 1 overall shows the architecture of the proposed model.

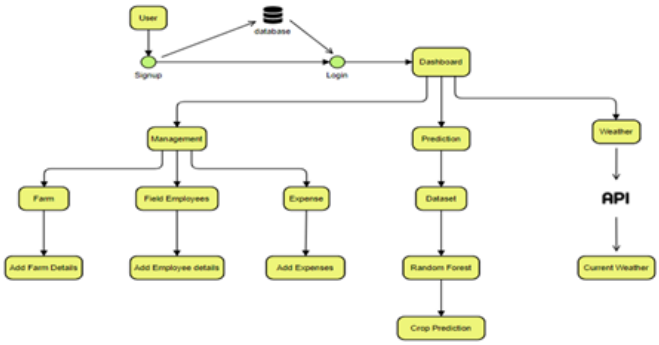

Figure 1. System Architecture

Figure 2 shows the 3 main functionalities of the Farm Track system.

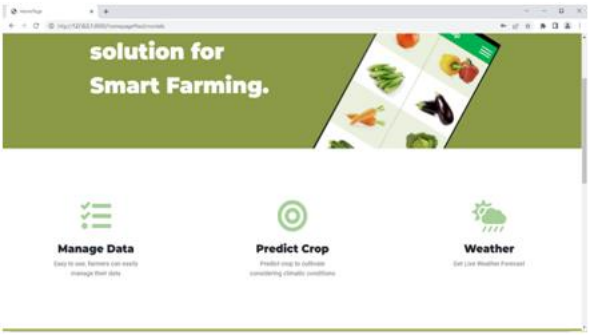

Figure 2. System Modules

IV. IMPLEMENTATION

A. **Dataset Overview**: The first step to start with any machine learning technique is to gather the necessary data together in a file. Here, we have used a dataset from Kaggle. The data is collected in 8 different variables which are nitrogen (N), phosphorus (P), potassium (K), temperature, humidity, pH, rainfall and label. Here, label is the target variable, i.e., predicted crop. Figure 3 shows the first 10 rows of the dataset.

```
df=pd.read_csv('Crop_recommendation.csv')
df.head(10)
```

	N	P	K	temperature	humidity	ph	rainfall	label
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice
5	69	37	42	23.058049	83.370118	7.073454	251.055000	rice
6	69	55	38	22.708838	82.639414	5.700806	271.324860	rice
7	94	53	40	20.277744	82.894086	5.718627	241.974195	rice
8	89	54	38	24.515881	83.535216	6.685346	230.446236	rice
9	68	58	38	23.223974	83.033227	6.336254	221.209196	rice

Figure 3. Dataset

B. **Data Preprocessing**: The subsequent step is to preprocess the data. Preprocessing converts the raw data into clean data. The missing values are removed by imputing the null values, if any from the dataset.Also, label encoding method converts word labels into numbers to let the algorithms work on them. For the structured dataset this is an important pre-processing step in supervised learning. This ensures that the data in the dataset are in the specified format for usage in the algorithm.

C. **Splitting the dataset**: We need to split the dataset into training and testing before training the dataset for crop prediction.

D. **Predicting the crop**:The prediction of suitable crop is dependent on various factors such as N, P, K, temperature, humidity, pH, and rainfall values in order to predict the crop accurately. These factors are given as input to the model. Based on the classification made by the algorithm, it provides a suitable crop to be cultivated by using random forest classifier giving 99.09% accuracy amongst 3 other algorithms. Figure4 shows the accuracy comparison of various algorithms used which includes Logistic Regression, Decision Tree, Random Forest, and Naïve Bayes. These four classifiers were trained on the dataset.

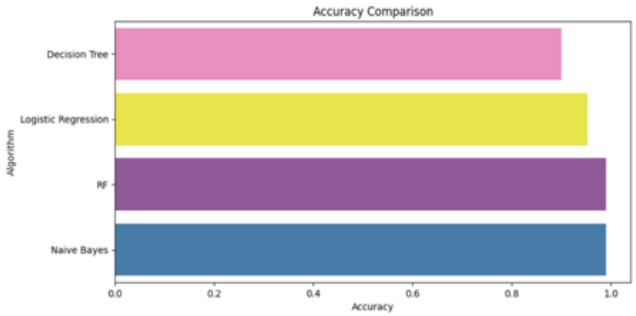

Figure 4. Accuracy Comparison plot of various algorithms

Figure 5 shows the prediction made for the suitable crop to be cultivated depending on the various input factors.

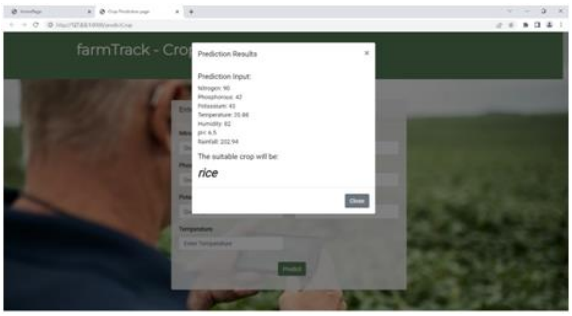

Figure 5. Crop Prediction

E. **Weather API:**It is used to fetch the current weather data such as temperature, humidity, rainfall etc. of a particular location. For retrieving the weather data, we have used the Open Weather Map API. By entering the city name, we get a small report of current weather conditions of that place.

Figure 6 shows the system weather forecast of a particular city.

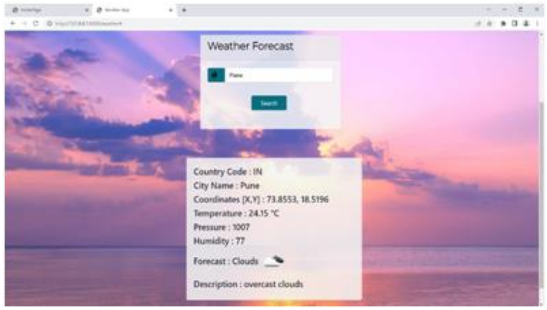

Figure 6. Weather Forecast

F. **Management features:**Various farm management activities such as adding details of the farm, field employees, expenses involved in farming activities, etc. can be done using this system. Figure 7 shows the system management activities page.

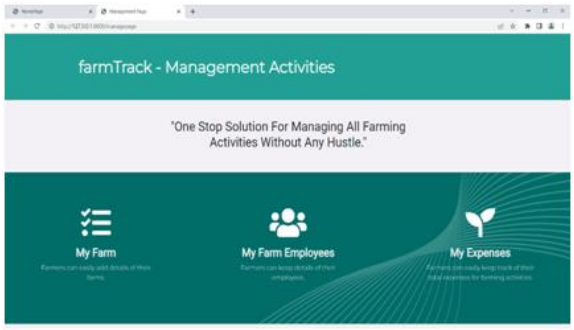

Figure 7. Management Activities

V. CONCLUSION

Crop selection is still remaining as a challenging issue for farmers.This paper focuses on the prediction of crop with the help of machine learning techniques. Several machine learning methodologies were used for the calculation of accuracy of different models. The Random Forest classifier gave the best accuracy. Thus, we have proposed a model that helps the user to predict a suitable crop to cultivate in a wider way and cost efficiently use the system for managing the farm activities as well as getting the live weather conditions of a particular place.

VI. REFERENCES

[1]. Aksheya Suresh, K. Monisha, R. Pavithra,B. Marish Hariswamy. “Crop Selection and its Yield Prediction” in International Journal of Recent Technology and Engineering (IJRTE), March 2020.

[2]. S.P.Raja, Barabara Sawicka, ZoranStamenkovic, G. Mariammal. “Crop Prediction Based on Characteristics of the Agricultural Environment Using Various Feature Selection Techniques and Classifiers” in IEEE Access (IEEE), March 2022.

[3]. Madhuri Shripathi Rao, Arushi Singh, N.V. Subba Reddy and Dinesh U Acharya. “Crop Prediction using Machine Learning” in Journal of Physics: Conference Series, 2022.

[4]. V. Vanarase, V. Mane, H. Bhute, A. Tate and S. Dhar, "Crop Prediction Using Data Mining and Machine Learning Techniques," 2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA), 2021, pp. 1764-1771, doi: 10.1109/ICIRCA51532.2021.9544724.

[5]. M. Keerthana, K. J. M. Meghana, S. Pravallika and M. Kavitha, "An Ensemble Algorithm for Crop YieldPrediction,"2021ThirdInternationalConferenceonIntelligentCommunicationTechnologiesand Virtual Mobile Networks (ICICV), 2021, pp. 963-970, doi:10.1109/ICICV50876.2021.9388479.

[6]. Nischitha K, Dhanush Vishwakarma, Ashwini, Mahendra N, Manjuraju M.R. “Crop Prediction using MachineLearningApproaches” inInternationalJournalofRecentTechnologyandEngineering(IJRTE), August2020.

[7]. Pavan Patil, Virendra Panpatil, Prof. Shrikant Kokate. “Crop Prediction System using Machine Learning Algorithms” in International Research Journal of Engineering and Technology (IRJET), Feb 2020.

[8]. Miss Vaishali Patil, Prof.Sachin Deshpande. “Crop Prediction System using Machine Learning” in JETIR Publication, May 2019.

[9]. https://scikit-learn.org/stable/modules/tree.html

[10]. https://www.geeksforgeeks.org/random-forest-regression-in-python/