International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 05 Issue: 05 | May - 2021 ISSN: 2582-3930

CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING

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Abstract*—This Agriculture is extremely important to the country's economic growth and sustainability. Farmers do not select the best crop for planting due to a lack of kno wledge of soil contents and environmental conditions, which is a significant and serious setback in crop productivity. To address the above shortcomings, we presents a system that offers a Smart Agriculture solution by tracking the agricultural field and assisting farmers in greatly enhancing productivity. The method is proposed in the context of a website. Two methods were incorporated into the scheme. We used the 'Crop Features Data Collection' for the first methodology, which includes rainfall, temperature, soil PH, and humidity fo r a specific crop and predicts crop using a random forest classifier. Since soil type is an important factor in crop recommendations, the device can forecast soil type using a teachable model method. To make recommendations for the appropriate crop recommendation. *Keyw ords*— *Agriculture, Crop Prediction, Random Forest.

I. IN TROD UCTION

Agriculture is an important sector for Indian economy and also human future. It is first and foremost work which is essential for life. It also contributes a large portion of employment. As the time passes the need for production has been increasingly exponentially. In order to produce in mass quantity people are using technology in a wrong way. New kinds of hybrid varieties are produced day by day. However, these varieties do not provide the essential contents as naturally produced crop. These unnatural techniques spoil the soil. It all leads to further environmental harm. Most of these Unnatural techniques are used to avoid losses. But when the producers of these crops know the accurate information on the crop yield it minimizes the loss. To achieve this project is made. Using past information on weather, temperature and several other factors the information is given.

The two most common types of machine learning methods are supervised and unsupervised learning. In supervised learning, a named list of training data is used to estimate or map the input data to the target value. Unsupervised learning methods, on the other hand, lack labelled examples and do not take the output into consideration during the learning process. In supervised learning, training data is input data that has a fixed label or result, such as spam/not-spam. A model is created using a training process that forces it to make predictions and corrects it when those predictions are incorrect. The training procedure is replicated until the model p has been created.We present an intelligent system called "Crop Recommendation System" in this paper, which aims to help Indian farmers make educated decisions about which crop to grow based on the sowing season, his farm's geographical location, soil characteristics, and environmental factors including temperature and rainfall.

II. LITERATURE REVIEW

In the article of **"**Crop Yield Prediction using Machine Learning Techniques**"**, proposed by Ramesh Medar, Vijay S.Rajpurohit, Shweta. The paper presented the various machine learning algorithms for predicting the yield of the crop on the basis of temperature, rainfall, season and area. Experiments were conducted on Indian government dataset. This will not only help farmers in choosing the right crop to grow in the next season but also bridge the gap between technology and the agriculture sector.

In the article of "Soil Classification using Machine Learning Methods and Crop Suggestion Based on Soil Series" proposed by Sk Al Zaminur Rahman, Kaushik Chandra Mitra, S.M. Mohidul Islam. In this paper author focused on these soil because soil is an important ingredient of agriculture. There are several kinds of soil. Each type of soil can have different kinds of features and different kinds of crops grow on different types of soils. We need to know the features and characteristics of various soil types to understand which crops grow better in certain soil types. The problem arrived in above system is that if soil contents are matched for the particular crop and the weather condition are not matched so in this case the accuracy of the result is decreased.

In the article of "Improving Crop Productivity Through A Crop Recommendation System Using Ensembling Technique" proposed by Nidhi H Kulkarni, Dr. G N Srinivasan, Dr. B M Sagar, Dr.N K Cauvery. In this system crop recommendation system is to be developed that uses the ensembling technique of machine learning. The ensembling technique is used to build a model that combines the predictions of multiple machine learning models together to

recommend the right crop based on the soil specific type and characteristics with high accuracy. The independent base learners used in the ensemble model are Random Forest, Naive Bayes, and Linear SVM. Each classifier provides its own set of class labels with an acceptable accuracy.

In the article of "Supervised Machine learning Approach for Crop Yield Prediction in Agriculture Sector" proposed by Dr. Y. Jeevan Nagendra Kumar1, V. Spandana2, V.S. Vaishnavi3, K. Neha4, V.G.R.R. Devi5. Sujatha describes how the old farming data can be utilized to depict the future expectation of harvests and yield. It likewise proposes the ranchers about what kind of yield can be developed utilizing the climate station data and gives the appropriate data to incline toward the precise season for greatness cultivating.

III. METHODOLOGY

A. Decision Tree

It is a supervised learning algorithm where attributes and class labels are represented using a tree. Here, root attributes are compared with the record's attribute and subsequently, depending upon the comparison, a new node is reached. This comparison is continued until a leaf node with a predicted class value is reached. Therefore, a modeled decision tree is very efficient for prediction purposes. A decision tree is a graphical representation for obtaining all possible solutions to a problem/decision based on given conditions. It is labeled after root node, which, like a tree, begins from the root node and extends on further branches to form a tree-like structure.

B. KNN

It is a non-parametric method used for making predictions. In this, the predicted value is a class membership. The first step of the K-NN algorithm is to identify the k nearest neighbors for each incoming new instance. The instance is classified by a majority vote of these neighbors. In the second step, depending on the label sets of the k neighbors, a label is predicted for the new instance. The K-NN algorithm is a non-parametric algorithm, which means it makes no assumptions about the underlying results. It's also known as a lazy learner algorithm because it doesn't learn from the training set immediately instead, it saves the dataset and performs an operation on it when it comes time to classify it. During the training process, the KNN algorithm simply stores the dataset, and as it receives new data, it classifies it into a group that is somewhat close to the new data.

C. Random Forest

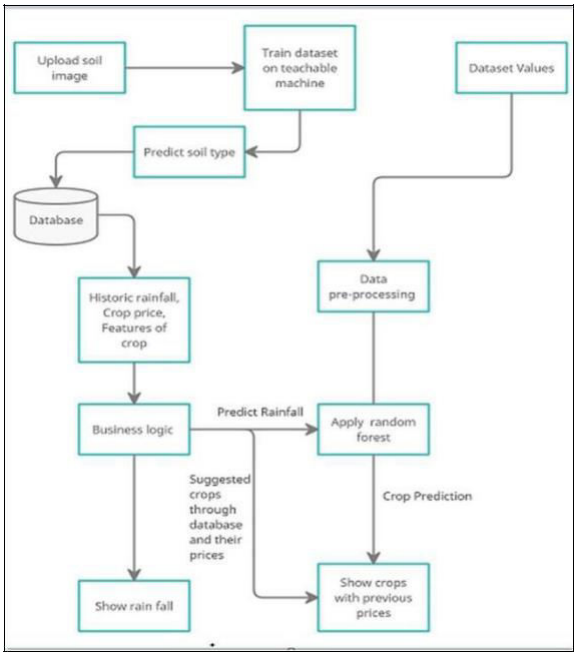
It is an ensemble method of learning that is commonly used for both classification and regression. In order to train the model to perform prediction using this algorithm, the test features must be passed through the rules of each randomly created tree. As a result of this, a different target will be predicted by each random forest for the same test feature. Then, votes are calculated on the basis of each predicted target. The final prediction of the algorithm is the highest votes predicted target. The fact that random forest algorithm can efficiently handle missing values and that the classifier can never over-fit the model are huge benefits for using this algorithm.

D. Proposed System

We have proposed a system that offers a Smart Agriculture approach by tracking the agricultural field and assisting farmers in greatly rising productivity. The method is proposed in the context of a website. Two methods are incorporated into the system. We used the 'Crop Features Collected Data for the first methodology, which includes rainfall, temperature, soil PH, and humidity for a specific crop and predicts crop using a random forest classifier. . Since soil type is an important factor in crop recommendations, the system will predict soil type using a teachable machine technique. Other criteria considered in recommending the best crop system included environmental characteristics, rainfall, soil characteristics (N, P, K, type), area, season, and so on. By considering these parameters, the system provides farmers with a variety of agricultural crops. Users will view past crop prices to help them make the best crop decision. As a result, our proposed system will assist farmers in making the best crop selection.

- Collect the data
- Pre-process the collected data
- Train and test data
- Predict soil type
- Apply the machine learning algorithm and database logic
- Predict crops, rainfall, prices.

E. Architecture



IV. RESULTS

Fig.2 Predict soil type, Rainfall, Crops and prices

Crop	Price (Per KG)	Year
Groundnut	14	2020
Groundnut	15	2019

Fig.3 Previous year prices of crops

Crop	Price (Per KG)	Year
Rubber	21	2020
Rubber	27	2019
Rubber	30	2018

Fig.4 Prices of crops

V. CONCLUSION

Thus, In this paper we have successfully proposed and implemented an intelligent crop suggestion system that is simple to use by farmers . Based on a number of environmental and geographical factors, this system will assist farmers in making an intelligent decision about which crop to cultivate. Additional functions, such as rainfall and prices for all forecast crops, have been integrated to provide more advantages and reliable crop choices. Both of these features have strong accuracies, making them very useful for both realistic and real-time applications.

VI. FUTURE WOR K

In the future, the model introduced in this paper may be expanded to include a function that predicts crop rotations. This will maximize yield because the choice of crop to cultivate would now be influenced by which crop was harvested in the previous cycle. We would also try to extend the module further by suggesting fertilizers to farmers depending on soil suitability.

VII. ACKN OWLED GEMEN T

We take this opportunity to thank our Project Guide Prof. N. G. Bhojne and Head of the Department Prof. M. P. Wankhade for their valuable guidance and for providing all the necessary facilities, which were indispensable in the completion of this project report. We are also thankful to all the staff members of the Department of Computer Engineering of Sinhgad College of Engineering, Pune for their valuable time, support, comments, suggestions and persuasion. We would also like to thank the institute for providing the required facilities, Internet access and important books.

VIII. REFER ENCES

[1] Ramesh Medar, Vijay S. Rajpurohit,and Shweta Crop Yield Prediction using Machine Learning Techniques, 2019.

[2] Sk Al Zaminur Rahman, K aushik Chandra Mitra and S.M. Mohidul Islam, Soil Classification using Machine Learning Methods and Crop Suggestion Based on Soil Series" proposed, 2018