

Crop Yield Forecasting Using Machine Learning

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Abstract- Climate change has become a major issue in India in last two decades. Because of these agricultural crops are getting affected. Prediction of crop yield in advance can be helpful for farmers to decide the measurement of their storage and marketing as well as logistics for business can be planned. Because of this project farmers will get to know the yield of crop and then they can decide what to cultivate in their fields. By building a prototype of interactive prediction system it tries to solve the issue. By using machine learning algorithm and web based graphic user interface implementation of this system can be carried out and the prediction results will be available for farmers. There are different types of algorithms like random forest available for such kind of data analytics and using those algorithms we can predict the yield of crop. issues like temperature, weather, rainfall cannot be overcome as there is no proper solution. To increase the economic growth of crop yield in India, there are many ways. Data mining can also be used for prediction of crop yield production. In data mining, the data is analysed from various viewpoint and then summarize it into important information. Random forest operates by constructing multitude of decision trees at the time of training and generates output of the class that is mode of the classes (classification) or mean prediction (regression) of individual tree.

I. INTRODUCTION

Agriculture has very important role in India. It is called as backbone of our country. Cultivation of rice mainly depends on rainfall. If future crop productivity and analysis is made available for farmers timely then it will help farmers to increase the production of crop. Prediction of yield is an important agricultural problem. Farmers used to predict the yield of crop according to previous year yield experiences. There are different kinds of techniques and algorithms for this kind of data analytics. Using these techniques we can predict the crop yield.

Random forest algorithm is used for the yield prediction. Because of these algorithms and interrelation between them, range of applications and role of big data analytics techniques in agriculture is growing. Due to the invention of new technologies and techniques, agricultural field is slowly degrading. Because of these, people are concentrating on cultivating artificial products which leads to unhealthy life. Modern people have no awareness about the cultivation of crops at right time and right place. Due to these new cultivating techniques seasonal climatic conditions are also changing which is leading into insecurity of food. There is no proper solution or technique to overcome the problems or issues like weather, temperature and several factors. To increase the economic growth in India, there are several ways available. There are multiple ways available to improve the crop yield and its quality. Data mining is also used for prediction of crop production.

II. PROBLEM STATEMENT

To develop a web-based application for Crop Yield Forecasting using machine learning. There are different algorithms and with the help of those algorithms we can predict the yield of crop. There are different agricultural problems in India which depends on climatic parameters like temperature, rainfall. To develop a system which will help to solve all the issues and will help farmers to know their yield of crop before cultivating onto the field which will help them to make appropriate decision.

III. PROPOSED SYSTEM

Proposed system is designed with following objectives,

1. Use of machine learning techniques for the prediction of crop yield.
2. Analyzing climatic parameters.
3. Increasing the accuracy of crop yield prediction.
4. Providing easy to use User Interface

- System Requirements

Hardware Requirements

- RAM: minimum 4GB.
- Processor: i3 and higher.

Software Requirements.

- WAMP/XAMPP
- PyCharm

IV. METHODOLOGY

Sr. No.	Attribute	Description
1	District Name	Total 31 districts in Maharashtra
2	Crop list	Jowar, Bajra, Wheat
3	Soil list	Chalky, Clay, Loamy, Sandy, Silty
4	Area	Area of farm

TABLE I
ATTRIBUTES FROM DATASET

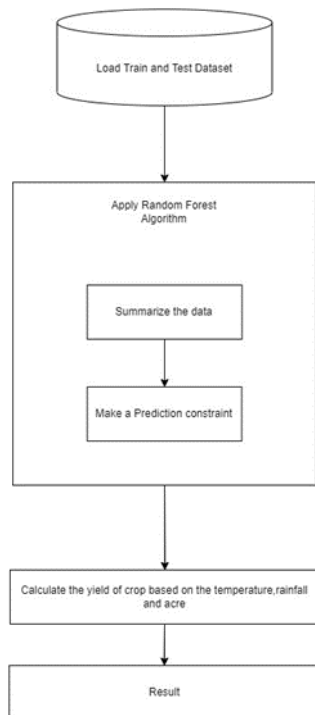


Fig. 1. Proposed Approach

This fig. shows the proposed approach and how the data is summarized, and Random Forest algorithm is applied, and the result is calculated.

A. Random Forest Algorithm

Random forest is the most popular, useful and powerful supervised machine learning algorithm capable of performing classification as well as regression tasks, that operate by constructing a multitude of decision trees at the time of training and generating outputs of the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. The more trees in a forest the more accurate the prediction.

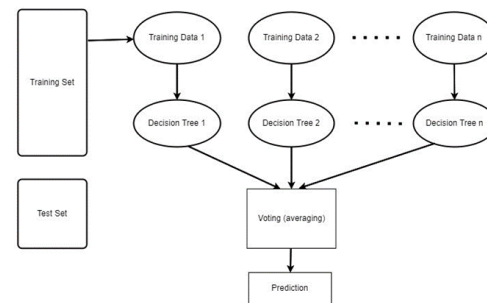


Fig. 2. Flowchart of Random Forest Algorithm

This fig. shows the working of Random Forest Algorithm.

- Step-1: Select random K data points from training set.
- Step-2: Construct the decision trees associated with these selected data points i.e., subsets
- Step-3: Choose number N for the decision trees that you want to build.
- Step-4: Repeat 1 and 2.
- Step-5: Then for the new data points, find the predictions of each decision tree, and then assign the new data points to the category that wins the majority votes.

- Advantages And Features

- 1) Random forest algorithm is suitable for both classifications and regression task.
- 2) It gives a higher accuracy through cross validation.
- 3) Random Forest classifier can handle the missing values and maintain the accuracy of a large

proportion of data.

- 4) If there are more trees, it doesn't allow over-fitting trees in the model.
- 5) It has the ability to work upon a large data set with higher dimensionality.

V. RESULT

Eg. No	District	Crop	Soil type	Area (in acres)	Prediction tons
1	Amravati	Jowar	Clay	234	300.6
2	Nandurbar	Bajra	Clay	424	923.5
3	Washim	Wheat	Sandy	56896	64560.0
4	Nanded	Jowar	Loamy	3984	2880.0
5	Osmanabad	Jowar	Clay	3984	8380.0
6	Kolhapur	Bajra	Sandy	3984	2900.0

TABLE II
SOME EXAMPLES OF YIELD PRODUCTION ACCORDING TO ATTRIBUTES

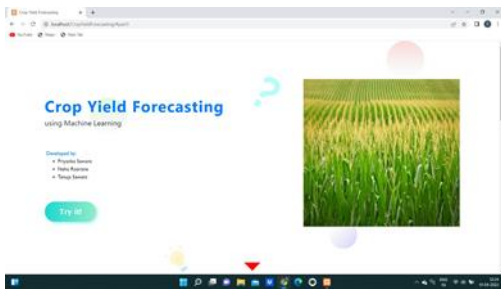


Fig. 3. Home Screen

This is the home screen of website where when you click on Try it button, a form will appear.

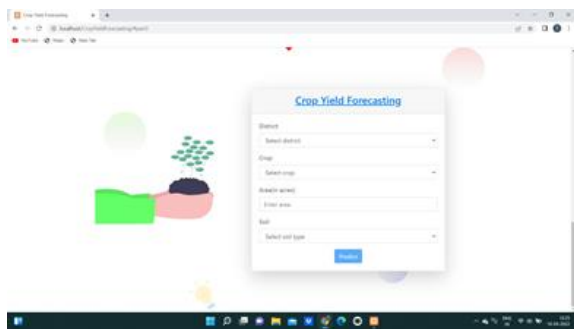


Fig. 4. Form Screen

This is a form. Here user have to choose district name, Cropname, area in acre and soil type as input.

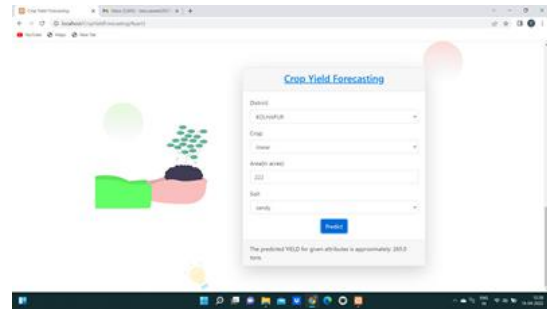


Fig. 5. Prediction

All these values are given as input to random forest algorithm in backend and corresponding yield prediction is returned. The algorithm then shows the prediction of that particular crop yield in tons after clicking on predict button.

CONCLUSION

A simple Web application is developed in order to provide the farmers or users an approximation on how much amount of crop yield will be produced depending upon their given inputs. This application uses a Random Forest Machine Learning model, which was trained on data from different districts of Maharashtra, along with automatic live weather fetching for prediction. The model can achieve an accuracy of around 86 percent and can be even further improved with more data.

FUTURE SCOPE

This web application will help farmer to grow financially stronger. It will help farmer to predict yield of given crop and also help them to decide which crop to grow. It will help farmers to predict the yield of crop before cultivating the crop.

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