Mr.Umesh A. Patil, et. al. International Journal of Engineering Research and Applications
www.ijera.com
ISSN: 2248-9622, Vol. 12, Issue 4, (Series-III) April 2022, pp. 16-19

RESEARCH ARTICLE OPEN ACCESS

Review on Crop Yield Prediction on Indian Agriculture Using Machine Learning Algorithms

Mr.Umesh A. Patil (Assistant Professor), Miss Pradnya R. Kamble (Student), Miss.Tarannum K.Nadaf (Student), Miss.Shivali U. Jamdade(Student), Mr. Prashant T.Salunkhe(Student)
(Department of Computer Science & Engineering, D.Y.Patil Technical Campus Talsande, Kolhapur)

ABSTRACT
India is an Agriculture based economy whose most of the GDP comes from farming. The motivation of this project comes from the increasing suicide rates in farmers which may be due to low harvest in crops. Climate and other environmental changes have become a major threat in the agriculture field. Machine learning is an essential approach for achieving practical and effective solutions for this problem Predicting yield of the crop from historical available data like weather, soil, rainfall parameters and historic crop yield. We achieved this using the machine learning algorithm. We did a comparative study of various machine learning algorithms, i.e., ANN, K Nearest Neighbor, Random Forest, SVM and Linear Regression and chose Random Forest Algorithm which gave an accuracy of 95%. In this project a mobile application has been developed which predicts the crop yield in general and also for a particular crop. Along with that, it also suggests the user if it is the right time to use the fertilizer or not

Keywords – Agriculture, Crop, Fertilizer, yeild

Date of Submission: 09-04-2022 Date of Acceptance: 26-04-2022

I. INTRODUCTION

India is ranked 2nd worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 16.6 percent of the GDP 2009, about 50 percent of the overall workforce. The monetary contribution of agriculture to India‘s GDP is regularly declining. The crop yield of plants relies on different factors like on climatic, geographical, organic, political and financial elements. For farmers, it is difficult when there is more than one crop to grow especially when the market prices are unknown to them.

In recent times, it has become inevitable to use technology to create awareness about cultivation. The seasonal climatic conditions are also being changed against the fundamental assets like soil, water and air which lead to insecurity of food. In a scenario, crop yield rate is falling short of meeting the demand consistently and there is a need for a smart system which can solve the problem of decreasing crop yield.

Therefore, to eliminate this problem, we propose a system which will provide crop selection based on economic and environmental factors to reap the maximum yield out of it for the farmers which will sequentially help meet the elevating demands for the food supplies in the country. The proposed system uses machine learning to make the predictions. The system will provide crop yield and crop selection based on weather attributes suitable for the crop to get the maximum yield out of it for the farmers. The system makes predictions of the productions of crops by studying the factors such as rainfall, temperature, area (in hectares), season, etc. The system also helps in suggesting whether a particular time is the right one to use fertilizers.

II. PROPOSED SYSTEM

In general, the rainfall, temperature, pH , is low and highly variable which results in uncertain crop yields. Behind it’s uncertainly, the distribution of rainfall during the crop period is uneven, receiving high amount of rain, when it is not needed lack of it when crop needs it. Crop yield prediction is an important agricultural problem. The Agricultural yield primarily depends on weather conditions (rain, temperature, etc), pesticides. Accurate information about history of crop yield is important for making decisions related to agricultural risk management and future predictions.

III.OBJECTIVES

-To use machine learning techniques to predict crop yield.
-To provide easy to use User Interface.
-To increase the accuracy of crop yield prediction.
-To analyze different climatic parameters (cloud cover, rainfall, temperature).
-To predict the maximum yield of crop produced at minimum cost.
-To help increases yield and economic growth.
-Test the implemented system to check for accuracy and failures.

IV.LITERATURE SURVEY

Literature Survey is a systematic and thorough search of all types of published literature as well as other sources including dissertation, these in order to identify as many items as possible that are relevant to a particular topic. Predicting agricultural products plays a very important role in agriculture. It helps in increasing net produce, better planning and gaining more profits
To achieve better results, we studied a few research papers related to our project topic.

1. Machine learning approach for forecasting crop yield based on climatic parameters
Authors: S.Veenadhari, Dr. Bharat Misra & Dr. CD Singh
Publication: International Conference on Computer Communication and Informatics

2. Prediction of Crop Yield Using Machine Learning
Author: Rushika Ghadge, Juilee Kulkarni, Pooja More, Sachee Nene, Priya R L
Publication: International Research Journal of Engineering and Technology (IRJET)

3 Predicting Yield of the Crop Using Machine Learning Algorithm
Author: P.Priya, U.Muthaiah & M.Balamurugan
Publication: International Journal of Engineering Sciences & Research Technology (IJESRT)

V.METHODOLOGY

Data Pre-Processing
-Data Preprocessing is a method that is used to convert the raw data into a clean data set. The data are gathered from different sources, it is collected in raw format which is not feasible for the analysis. By applying different techniques like replacing missing values and null values, we can transform data into an understandable format. The final step on data preprocessing is the splitting of training and testing data. The final step on data preprocessing is the splitting of training and testing data. The data usually tend to be split unequally because training the model usually requires as much data points as possible. The training dataset is the initial dataset used to train ML algorithms to learn and produce right predictions.
-Factors affecting Crop Yield and Production
There are a lot of factors that affects the yield of any crop and its production. These are basically the features that help in predicting the production of any crop over the year. In this we include factors like Temperature, Rainfall, Area, Humidity and Wind speed.

VI. SYSTEM ARCHITECTURE

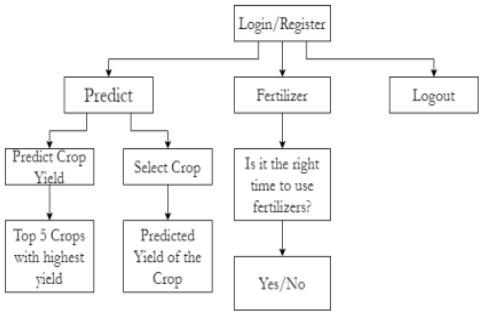


Fig 4.1 System Architecture

Figure 4.1 shows the System Architecture. The first step is to login or register to the application. At the next step, three options are available .i.e., Predict, Fertiliser and Logout. The user may select one of the three options and proceed further. Under Predict, the system offers two options that depend on whether the user knows what to plant already or is yet to decide the crop. The inputs are taken from the user in either case and the predicted value is given to the user. When the Fertilizer Module is selected, the user gets a pop up message that says whether or not they can use the fertilizer and it may or may not rain for the next 15 days. Last is the Logout that logs the user out and takes them back to the login/Register Page

VII. FLOWCHART

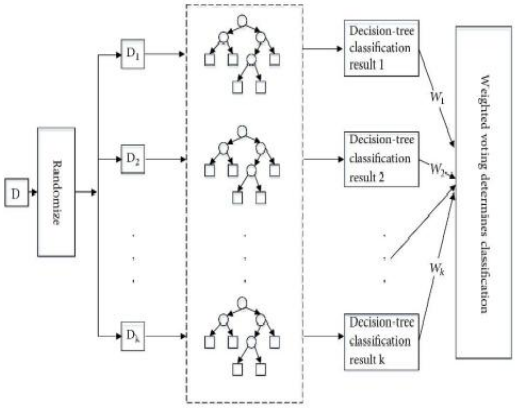
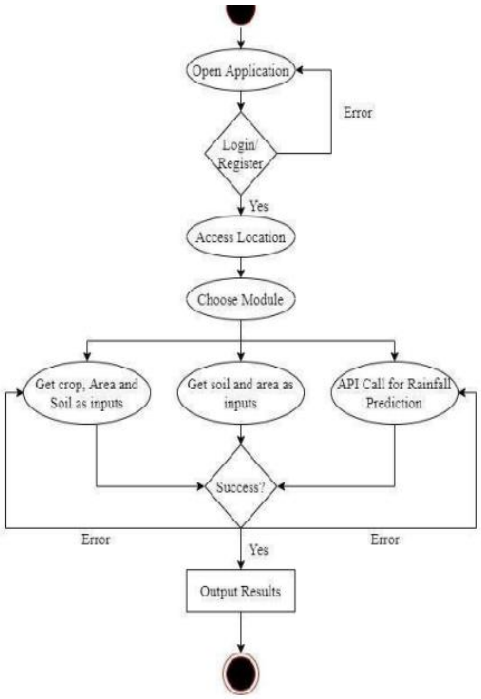


Fig 4.2 Flowchart of Random Forest Algorithm

This is the graphical representation of sequential steps of Random Forest Algorithm. This algorithm uses a sample dataset with n input variables and 1 output variable. First, it starts with the selection of random samples from a given dataset. Next, this algorithm will construct a decision tree for every sample. Then it will get the prediction result from every decision tree. Finally the average value of all the predictions is considered as the result.

VII.DATAFLOW DIAGRAM



Above represents the flow of operations in the system. As seen in the diagram the operational flow in the system is sequential until the location is tracked and is then branched as it provides three different functionalities i.e., to predict the yield of a given crop, to return a list of crops along with their yield based on the weather and soil conditions and to suggest whether it is the ideal time to use fertilizer.

VIII. IMPLEMENTATION

1. Crop Yield Prediction

This module returns the predicted production of crops based on the user's input. If the user wants to know the production of a particular crop, the system takes the crop as the input as well. Else, it returns a list of crops along with their production as output. These are the following steps of the algorithm implemented:

Step 1: Choose the functionality i.e., crop prediction or yield prediction.

Step 2: If the user chooses crop prediction:-

Take soil type and area as inputs.

These values are given as input to the random forest implementation in the backend and the corresponding predictions are returned.

The algorithm returns a list of crops along with their production predicted.

Step 3: If the user chooses yield prediction: - Take crop, soil type and area as inputs.

These values are given as input to the random forest implementation in the backend and the corresponding crop yield prediction is returned.

The algorithm returns the predicted production of the given crop.

2. Fertilizers Module:

This module is used to suggest the farmer on usage of fertilizer based on the rainfall in next few days.

To predict the rainfall for the next 15 days we are using an API service provided by _Open Weather‘. If it is likely to rain we suggest the farmer not to use the fertilizer.

These are the following steps of the algorithm implemented:

Step 1: On selection of this module, API call is made to the _Open Weather Services.

Step 2: The rainfall for the next 14 days is read from the result of the API call.

Step 3: If rainfall is above 1.25 the farmer is suggested not to use the fertilizer. Else, it is safe to use the fertilize.

IX.CONCLUSION

The Crop Recommender system helps the farmers to predict the yield of a given crop and also helps them to decide which crop to grow.

Moreover, it also tells the user the right time to use the fertilizer

The system tracks the user‘s location and fetches needed information from the backend based on the

location. Thus, the user needs to provide limited information like the soil type and area

The future work is focused on providing the sequence of crops to be grown depending on the soil and weather conditions and to update the datasets time to time to produce accurate predictions. The Future Work targets a fully automated system that will do the same.

REFERENCES

[1]. https://towardsdatascience.com/machine-learning-basics-part-1-a36d38c7916
[2]. https://healthcare.ai/machine-learning-versus-statistics-use/
[3]. https://medium.com/fintechexplained/machine-learning-algorithm-comparisonf14ce372b855
[4]. https://dataaspirant.com/2017/05/22/random-forest-algorithm-machine-learing/
[5]. https://scikitlearn.org/stable/modules/generated/sklearn.ensemble.Rando ForestClassifier.html
[6]. https://openweathermap.org/api/one-call-api?gclid=CjwKCAjwt-
[7]. https://ukdiss.com/examples/rainfall-prediction-machine-learning.php
[8]. https://iopscience.iop.org/article/10.1088/1748-9326/aae159
[9]. https://en.wikipedia.org/wiki/Agriculture_in_India
[10]. https://www.agricultureinformation.com/forums/threads/agriculture-in-india.101537/
[11]. https://en.wikipedia.org/wiki/Farmers%27_suicides_in_India
[12]. https://towardsdatascience.com/machine-learning-an-introduction-23b84d51e6d0

BOOKS

[13]. Groundnut Crop Yield Prediction Using Machine Learning Techniques by Vinita Shahand Prachi Shah.
[14]. Developing regression model to forecast the rice yield at Raipur condition by A Jain, JL Chaudhary, MK Beck and Love Kumar
[15]. Machine learning approach for forecasting crop yield based on climatic parameters by S.Veenadhari, Dr. Bharat Misra & Dr. CD Singh, International Conference on Computer Communication and Informatics (ICCCI - 2014), Jan, 2014
[16]. Predicting Yield of the Crop Using Machine Learning Algorithm by P.Priya, U.Muthaiah & M.Balamurugan, International Journal of Engineering Sciences & Researches