



Crop Yield Estimation Using Machine Learning Algorithms

Tanvi Borekar, Akansha Yadav , Avantika Damdhar, Pragya Shriwas , Prof.Snehal Wasankar
Department of Computer Science and Engineering
Sipna College of Engineering and Technology

ABSTRACT

Agriculture, since its invention and inception, be the prime and pre-eminent activity of every culture and civilization throughout the history of mankind. Agriculture is first and foremost factor which is important for survival. Machine learning (ML) could be a crucial perspective for acquiring real-world and operative solution for crop yield issue. The prediction made by machine learning algorithms will help the farmers to come to a decision which crop to grow to induce the most yield by considering factors like temperature, rainfall, area, etc. This bridges the gap between technology and agriculture sector. The classifier models used here. The farmers not able to produce high production, so taking the historical agricultural data records we can predict the crop yield using machine learning techniques like comparative analysis are done with decision tree, or other ML algorithms using these to achieve the high accuracy and model performance is computed.

INTRODUCTION

Agriculture is not only an enormous aspect of the growing economy, but it's essential for us to survive. It's also a crucial sector for Indian economy and also human future. New sorts of hybrid

varieties are produced day by day. However, these varieties don't provide the essential contents as naturally produced crop. These unnatural techniques spoil the soil. It all ends

up in further environmental harm. Most of these unnatural techniques are wont to avoid losses. Machine learning, a fast-growing approach that's spreading out and helping every sector in making viable decisions to create the foremost of its applications. The core emphasis would be on precision agriculture, where quality is ensured over undesirable environmental factors. when the producers of the crops know the accurate information on the crop yield it minimizes the loss. Machine learning, a fast-growing approach that's spreading out and helping every sector in making viable decisions to create the foremost of its applications. Most devices nowadays are facilitated by models being analyzed before deployment. The main concept is to increase the throughput of the agriculture sector with the Machine Learning models. Another factor that also affects the prediction is the amount of knowledge that's being given within the training period, as the number of parameters was higher comparatively. The core emphasis would be on precision agriculture, where quality is ensured over undesirable environmental factors. So as to perform accurate prediction and stand on the inconsistent trends in temperature and rainfall various machine learning classifiers are applied to urge a pattern. Using past information on weather, temperature and a number of other factors the information is given. The Application which we developed, runs the algorithm and shows the list of crops suitable for entered data with predicted yield value.

LITERATURE SURVEY

In this paper, the authors persist to research the environmental parameters that affect the crop yield and related parameters. The System is applied to find the relationship between explanatory variables hence the crop yield as a response variable.

Here, the authors centered on the users and expert reviews across three product categories that are sellers, products and experimental products were conducted. Here the bulk of research cited attempted to finalize the consequences of a user reviews on a product cost and the probability of a purchase. The results of this work help illuminate the contradictory findings across the discrete research study.

The authors have presented an internet site that uses Machine learning methods to predict the

SYSTEM ARCHITECTURE

System architecture represented in the Fig.3 mainly consists of weather API where we fetch the data such as temperature, humidity, rainfall etc. The crop yield prediction is a method to achieve a high yield of the crop using previous available data like crop name, season, area, production, soil parameters continuously involves all features that used for high yield of the crop. Selection of features which are necessary for target feature. Some are not precisely consider as a yield. additionally analysis play an important role in the prediction, linear regression approach having two factors response and explanatory variables. Here input parameters acts as independent and the way of predicting variables are dependent variables.

The architecture system combines all small parts and completes the purposed work. This work will proposes a system that processing methods to predicts analyzed agricultural datasets. Our agriculture dataset consists of crop, crop year, seasons, area, crop production

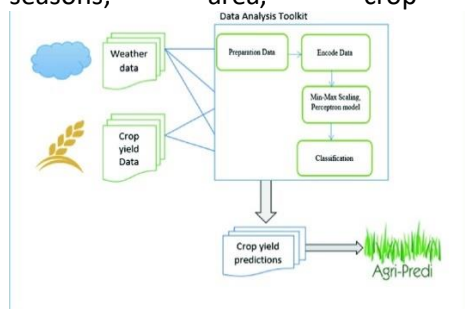


Fig. System Architecture

foremost profitable crop in the current weather and soil conditions and with current environmental conditions. This system helps the former with a sort of option for the crops that will be cultivated, which will be helping them over the long run.

Thus, authors have concluded Machine Learning algorithms can predict a target outcome by using Supervised Learning. This paper focuses on supervised learning techniques for crop yield prediction. To get the specified outputs it needs to generate an appropriate function by set of some variables which can map the input variable to the aim output. The paper conveys that the predictions can be done by ML algorithm which attain the crop prediction with best accurate value by considering least number of models.

METHODOLOGY

A. 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. The training dataset is the initial dataset used to train ML algorithms to learn and produce right predictions.

B. 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 paper we include factors like Temperature, Rainfall, Area, Humidity and Windspeed.

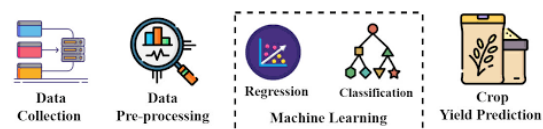
C. Comparison and Selection of Machine Learning Algorithm

Machine Learning is the best technique which gives a better practical solution to crop yield problem. There are a lot of machine learning algorithms used for predicting the crop yield.

The proposed model will mainly focus on crop production based on four factors and one Machine Learning algorithm. We used to classify whether rice can grow in that area based on the data from soil, temperature and rainfall. And also implementing a web application with HTML, CSS, and JavaScript. The web application can be used to interact with the Machine Learning model and by providing inputs we can get the prediction output.

Machine learning algorithm that comes under the supervised category and is used for binary classifications problems. The objective of this algorithm is to plot a hyper plane in an N-dimensional space, where N is the number of features that are going to be in a dataset, that distinctly classify the data points.

ARCHITECTURE DIAGRAM



SYSTEM ANALYSIS

- Python 3.8.5(Jupyter Notebook) - Jupyter Notebooks illustrates the analysis process and gives out the needed result.
- Weather_API (Open Weather Map): Weather API is an application programming interface used to access the current weather details of a location.
- Android Studio (Version 3.4.1): Android Studio is the official integrated development environment (IDE) for Android application development.
- Python Flask Framework (Version 2.0.1): Flask is a micro framework in python. Flask is based on WSGI(Web Server Gateway Interface) toolkit.

CROP YIELD CALCULATION

The crop which was predicted by the ML was mapped to the production of predicted crop. Then the area entered by the user was divide from the production to get crop yield.

$$\text{Yield} = \text{Production} / \text{Area}$$

crop name predicted with their respective yield helps farmers to decide correct time to grow the right crop to yield maximum result.

RESULTS

This paper reinforces the crop production with the aid of machine learning techniques. The technique which results in high accuracy predicted the right crop with its yield. The machine learning algorithms are implemented on Python (Jupyter Notebook) having input libraries such as Scikit Learn, Numpy, Pandas. Developed Android application queried the results of machine learning analysis. Flutter based Android app portrayed crop name and its corresponding yield.

CONCLUSION

The proposed technique helps farmers in decision making of which crop to cultivate in the field. This work is employed to search out the gain knowledge about the crop that can be deployed to make an efficient and useful harvesting. This project is a small contribution to the agriculture field and dedicated to all the farmers, to help them in their farming, so that they can get profits and benefits of the new technologies which they don't have any idea of. So finally we want to conclude that as an Engineer we should take responsibility and contribute our knowledge to the betterment of our society or country.

FUTURE SCOPE

In coming years, can try applying data independent system which is an format our system should work. In reference to rainfall can depict whether extra water availability is needed or not. Integrating soil details to the system is an advantage, as for the selection of crops knowledge on soil is also a parameter. This research work can be enhanced to higher level by availing it to whole India.

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