AGRICULTURAL PRODUCTION OPTIMIZATION ENGINE

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Abstract: - As an agricultural country, India's economy is predominantly depended over production of yield from agriculture. About half of the population of India depends on agriculture for its livelihood, but its contribution towards the GDP of India is only 14 per cent. One possible reason for this is the lack of adequate crop planning by farmers. There is no system in place to advice farmers what crops to grow. During the last decade the climate has become very uncertain. Due to this the farmers who were planting traditional crops are now facing problems, the yield of their traditional crops is getting reduced, therefore the rate of suicide done by farmers has increased specifically in India. In our study we found out that if farmers knew the yield of the crop that they are planting beforehand, they would choose the crop that will produce better yield based on the climate of that region. Knowing the crop yield before the harvest will also help farmers and policy makers to make important decisions. The application that is developed in our research will help the user to predict the crop yield based on the climatic parameters, previous yield and soil attributes. Using appropriate machine learning techniques, the model learns the correlation between the yield and features like soil type, rainfall. The predictions can be useful for industries in the agricultural sector and farmers for proper choice of crops etc.

1. INTRODUCTION

Agriculture is the best utility region especially inside the developing worldwide areas like India. Usage of records age in agriculture can substitute the circumstance of decision making and Farmers can yield in higher manner. About portion of the number of inhabitants in India relies upon on farming for its occupation however its commitment towards the GDP of India is just 18 percent. One suitable explanation behind this is the deficiency of adequate decision making by farmers on yield prediction. There isn't any framework in location to suggest farmer what plants to grow. The proposed machine learning approach aims at predicting the best yielded crop for our country by analyzing various factors like rainfall, soil pH and past records of crops grown.

1.1) MOTIVATION

Agriculture is the most important sector that influences the economy of India. It contributes to 18 percent of India 's Gross Domestic Product. People of India are practicing Agriculture for years but the results are never satisfying due to various factors that affect the crop yield. To fulfill the needs of around 1.2 billion people, it is very important to have a good yield of crops. Due to factors like soil type, rainfall, temperature lack of technical facilities etc. the crop yield is directly influenced. The system focuses on implementing crop yield prediction system by using Machine learning techniques by doing analysis on agriculture dataset.

1.2) OBJECTIVES

1. To use machine learning technique to predict crop yield.
2. To provide easy to use user interface and optimize agricultural production.
3. To increase the accuracy of crop yield prediction.
4. To analyze different parameters for predicting a crop.

2. LITERATURE SURVEY

In [1], authors have designed a web-based system to predict the crop based on soil classification. The main aim of us is to build a user-friendly system based on soil parameters. We have done data pre-processing by data cleaning, data integration, data transformation, data reduction. Data is taken from multiple resources. The five algorithms we have used are Support Vector Machine, Bagged Tree, Naive Bayes, and Artificial Neural Network.

In [2], The authors concentrated on the use of applications of machine learning techniques in the agricultural field. The project proposes a model which can predict the crop based on the soil nutrient values (NPK values) and pH given as the input. The authors discussed the main objective of this work was finding the desired data models that give high accuracy and high generality in terms of the yield forecasting capabilities.

In [3], the authors suggested a smart way to forecast the crop yield and also suggested the ideal climatic factors to maximize the crop yield. In this the linear regression, decision tree regression, and K-Nearest Neighbors were used to forecast the crop yield per acre. We have utilized diverse relapse strategies like straight relapse, choice tree relapse, K-closest Regression, Support vector Regression.

In [4], the authors used the sliding window non-linear regression method to suggest crop yield and price by evaluating patterns from the past data. The authors proposed a system designed in such way that it suggests the best crop choices for a farmer to do farming. The designed system had done demand level classification. The demand level classification means the demand for the crops is predicted by classifying the dataset of change in the market prices of crops.

In [5], the authors proposed a method named Crop Selection Method (CSM). The authors specify the proposed method to help to find out the crop selection problems and also help to raise the net yield rate of crop over seasons and help to get maximum economic growth. The authors discussed the different influencing parameters which can be used for crops by different forecasting models. The authors also specify the machine learning and different methods of machine learning. The proposed Crop Selection Method classified crops as seasonal crops, whole year crops, short time plantation crops, long time plantation crops.

In [6], authors have developed a user-friendly web application, the farmer will interact with the user interface of this system. There are three main entities of the system: User, Server, Climate Forecast API. User will select the name of the district, name of the crop and the area of his field then he will submit this information to the server. The processing of this information will be done at the server side. The model is trained at server side using the random forest algorithm and the dataset.

In [7], authors have developed a system that will rely majorly on attributes (such as location, soil type, weather, etc.) required for maximizing profit related to specific crops. The regression model will take care of these attributes and help predict the crop yield for any crop for the next few years. We have experimented with a few machines learning models like XGBoost Regression model, LGBoost regression model, Random Forest Regression model. The model with the most suitable output was the XGBoost regression model. Thus, this model is used for prediction of crop yield.

In [8], author has developed a web site for finding out the influence of climatic parameters on crop production in selected districts of Madhya Pradesh. The selection of districts has been made based on the area under that particular crop. Based on this criterion first top five districts in which the selected crop area is maximum were selected. The crops selected in the study is based on the predominate crops in the selected district. The selected crop includes: Soybean, Maize, Paddy and Wheat. In the present study only, the climatic parameters were considered in predicting the crop yield, though, the crop yield is influenced by many other input parameters such as irrigation, fertilizer ap- plication, pesticide application etc.

In [9], author has designed a system that helps the analysts to predict or identify useful information from a raw dataset, documents or business models to analyze a problem and solve it by making decisions. Crops based on multiple factors such as Nitrogen, Phosphorus and Potassium nutrients in soil and weather components which include temperature and rainfall is a new innovation system to this existing world. The proposed system precisely predicts the advanced profitable crop to the farmer.

In [10], The proposed system aims at predicting or forecasting the crop yield by learning the past data of the farming land. By considering various factors such as soil conditions, rainfall, temperature, yield and other entities the system builds a predicting a model using machine learning techniques. Here we make use of different machine learning techniques such random forest, Polynomial Regression, Decision Tree. Performance is evaluated based on predicted accuracy.

In [11], The datasets have been collected and refined based on commonality uses such as location, crop, Area, soil type, temperature, humidity etc. From these parameters name of the crop and net yield rate of the crop can be predicted. By using KNN algorithm, the particular crop has been analyzed and predicted by taking various parameters into an account such as soil type area and location.

In [12], The proposed system suggests an android-based application, which can precisely predict the most profitable crop to the farmer. The user location is identified with the help of GPS. According to user location, the feasible crops in the respective location is identified from the soil and weather database. These soils are compared with past year production database to identify the most profitable crop in the current location. After this processing is done at server side, the result is sent to the user's android application.

3. PROPOSED SYSTEM

The system aims to help farmers to cultivate proper crop for better yield production. To be precise and accurate in predicting crops, the project analyzes the nutrients present in the soil and the crop productivity based on location. It can be achieved using unsupervised and supervised learning algorithms. A machine learning model is developed considering the various, different sets of data to obtain the output. The system takes input from various sources and uses KNN algorithm to predict the best suitable crop for any given area. The developed user interface is flexible and highly interactive which will encourage the farmers to use it frequently.

3.1) KNN (K- Nearest Neighbor)

K-nearest neighbor method can be used for both regression and classification predictive problems. This method helps in interpret output, calculate time and predictive power. The Machine learning techniques are used in various fields. KNN is also one of the machine learning methods. This is also called as method of sample-based learning. This will contain the data of past datasets and can be used while predicting the new datasets. This will apply function called as distance function like Manhattan or Euclidean distance. This can be used to compute distance from samples to all other training samples. It calculates the target value for new samples. The target vale will be the weighted sum of target values of the k nearest neighbors. The valve of K can be directly proportional to the prediction. Whenever the valve of K is small this indicates there is high variance and there is low bias. If the valve of the K is larger than this indicates that there is low variance and high bias. The main advantage of this KNN is it does not require any training or the optimization. This KNN uses data samples when predicting the new datasets. Hence it is having higher complexity and also more time consumption.

4. SYSTEM ARCHITECTURE

System architecture is the conceptual model that defines the structure, behavior, and more views of a system. System architecture of our project is System design defines the system architecture. It also describes the modules and inter- faces. The system architecture provides an insight of how the flow of process will be. The yield prediction will rely majorly on attributes (such as location, soil type, weather,) required for maximizing profit related to specific crops. The model will take care of these attributes and help predict the crop yield for any crop for the next few years. The system consists of datasets consisting of soil, weather and past production data. Once a user opens the website, user just shares some basic farm details, the model used for the prediction fetches the data and outputs its prediction. The diagram consists of the basic flow of how the model will be trained, what practices will be followed to achieve good accuracy and finally feeding real-time data on the trained model.
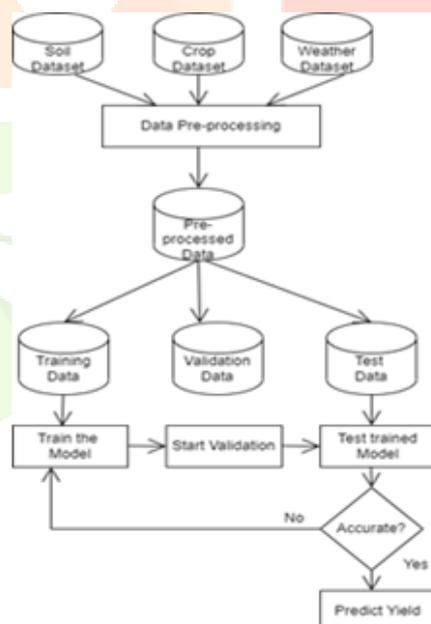

Fig 1) System Architecture

5. LIMITATIONS

There are some limitations to this project which can be worked upon in the future. Some of them are as follows:
1. Choosing appropriate dataset, after choosing dataset tuning of the parameters which makes project more efficient to get the desired results.
2. Crop genotype and environmental factors changing spatially and temporally makes the yield prediction more challenging.

6.CONCLUSION

Among worldwide, agriculture has the major responsibility for improving the economic contribution of the nation. However, still the most agricultural fields are under developed due to the lack of deployment of ecosystem control technologies. Due to these problems, the crop production is not improved which affects the agriculture economy. To prevent this problem, Agricultural sectors have to predict the crop from given data set using machine learning techniques. Systematic efforts are being made in this study to design a system that results in crop production prediction. The proposed framework considers the information identifying with the yield of season, area, soil parameters and past year and recommends which are the best beneficial harvests that can be developed in the right natural condition.

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