

Location based crop prediction using Data Mining and Machine Learning

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Abstract— Yield prediction is very popular among farmers these days, which particularly contributes to the proper selection of crops for sowing. This makes the problem of predicting the yielding of crops an interesting challenge. The kind of crops predictions is the toughest task for agriculture domain. Agriculture crops growth depends on different parameters, namely weather, soil characteristics, soil moisture and surface temperature. In our project, agriculture crop grow data are collected from different sensors from surface of farmland and lot of explorative data analysis is done. Further various regression models like linear, multi linear, support vector regression are tested for the effective kind of crops predictions. This work gives a better prediction for the farmers to plant which kind of crops to their farm field based on above mention parameters to improve the productivity. In our proposed model, we use machine learning techniques to fetch the crop prediction by analyzing the location using GPS module and fetch the data based on it. A system is been proposed which will gather information about all the crops that are cultivated from different places so that the farmers can use the system to know about the on growing crop details and to predict the best crop that allows him to get more profit.

Keywords—*Crop Analysis; Crop Yield; Data mining; Machine Learning; Prediction.*

I. INTRODUCTION

Crop forecasting or prediction is the art of predicting crop yields and production before the harvest actually takes place. India is a highly populated country and randomly change in the climatic conditions need to secure the world food resources. Farmer faces serious problems in drought conditions. Type of soil plays a major role in the crop yield. Suggesting the use of fertilizers may help the farmers to make the best decision for their cropping situation. The number of studies Information and Communication Technology (ICT) can be applied for prediction of crop yield. By the use of Data Mining, we can also predict the crop yield. By fully analyze the previous data we can suggest the farmer for a better crop for the better yield for the better yield we need to consider soil type and soil fertility things and also one of the major factors rainfall and groundwater availability, if it is dry land it is better to go for cash crops and if it is wetland it is better to go for wheat and sugarcane. There are 15 agro-climatic regions in

India these regions are divided on the bases of a type of the land. Each agro-climatic region can grow some specific crops. Based on that we need to suggest the farmer that which crop is best among those crops which belong to those climatic regions. Achieving the maximum crop at minimum yield is the ultimate Aim of the project.

Cultivating is one of the real divisions for developing yields or keeping creatures by individuals for sustenance and crude materials. Cultivating is a piece of farming. India is the world's third biggest economy worth \$ 2.1 trillion after the US and China. Second biggest maker of rice, wheat, sugarcane, groundnut, vegetables, foods grown from the ground. These are a portion of the stunning actualities about India.

- Decrease in agriculture GDP. The GDP of farming in India diminished to 4759.48 INR billion in the main quarter of 2018 from 5666.82 INR billion in the final quarter of 2017. Food grain creation has likewise demonstrated an expansion from 217.28 million tons in 2006-07 to 257.44 million tons in 2011-12.
- Organic Agricultural Export Market drives greening of agriculture. This advertises is one of the real drivers of greening of farming in India.
- Pesticide use increased more than 100%. A real subtlety for Indian agri-business is utilization of different pesticides, similar to bug sprays, weedicides, fungicides, rodenticides and so forth. As the editing design is ending up progressively thorough utilization of these pesticides is additionally extending.
- Bio-manure was 39,165Mt, which was just 4.8% of the absolute evaluate request. In any case, the legitimate creation and the appropriation of bio manures are under cautiousness of government. Notwithstanding the unremarkable development rate of over 200% underway limit and around 300% development rate.
- Increased warehousing capacity. Private segment enthusiasm for warehousing industry got after the "Provincial god own scheme" was under National Bank for Agriculture and Rural development (NABARD) and National Cooperative Development Corporation (NCDC). Savvy cultivating and accuracy agri-business include the joining of trend setting innovations into existing cultivating rehearses so as to build generation productivity and the nature of horticultural items.

II. DATA MINING

Data Mining is a process of extracting hidden information from a database and transform it into an understandable structure for further use. It is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The ultimate goal of data mining is prediction - and predictive data mining is the most common type of data mining and one that has the most direct business applications [1]. Throughout the years, many algorithms were created to extract knowledge from large sets of data. There are several different methodologies to approach this problem: classification, association rule, clustering, etc. Here we will focus on classification methodology. Classification techniques are designed for classifying unknown samples using information provided by a set of classified samples.

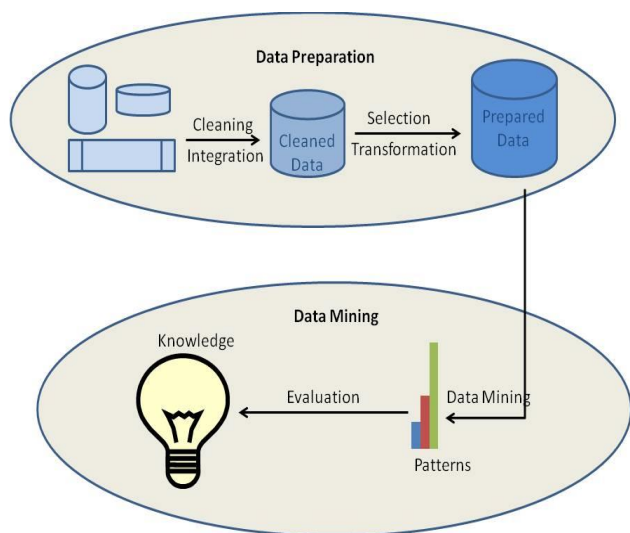


Figure 1: Data Mining Process

III. MACHINE LEARNING IN CROP PREDICTION APPLICATION AND TECHNIQUES

A Machine Learning (ML) deals with problems where the relation between input and output variables is not known or hard to obtain. The “learning” term here denotes the automatic acquisition of structural descriptions from examples of what is being described. Unlike traditional statistical methods, ML does not make assumptions about the correct structure of the data model, which describes the data. This characteristic is very useful to model complex non-linear behaviors, such as a function for crop yield prediction. ML techniques most successfully applied to Crop Yield Prediction (CYP).

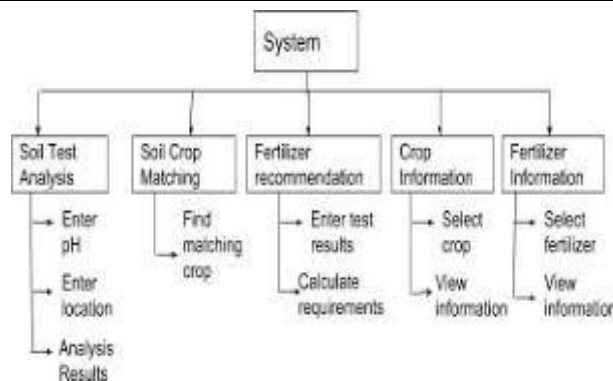


Figure 2: Prediction of Crop Yield using Machine Learning

- The system has five modules as depicted in figure. In soil test analysis user enters pH and location. Output of this module is analysis result of the percentage of nutrients in that soil.
- Soil crop matching module finds the matching crop that could be grown in that soil by comparison with the crop database.
- In fertilizer recommendation module, user is recommended with fertilizer that will give the highest crop yield. In the crop information module, user can select a crop and view information about it.
- In fertilizer information module, user can select a fertilizer and display information about it.

The applications of machine learning in crop yield prediction are:

a) Crop management:

- *Yield Prediction:*

Yield prediction is one of the most important and popular topics in precision agriculture as it defines yield mapping and estimation, matching of crop supply with demand, and crop management. State-of-the-art approaches have gone far beyond simple prediction based on the historical data, but incorporate computer vision technologies to provide data on the go and comprehensive multidimensional analysis of crops, weather, and economic conditions to make the most of the yield for farmers and population.

- *Crop Quality:*

The accurate detection and classification of crop quality characteristics can increase product price and reduce waste. In comparison with the human experts, machines can make use of seemingly meaningless data and interconnections to reveal new qualities playing role in the overall quality of the crops and to detect them.

b) Field Condition Management:

- *Soil management:*

For specialists involved in agriculture, soil is a heterogeneous natural resource, with complex processes and vague mechanisms. Its temperature alone can give insights into the climate change effects on the regional yield. Machine learning algorithms study evaporation processes, soil moisture and temperature to understand the dynamics of ecosystems and the impingement in agriculture.

Water Management:

Water management in agriculture impacts hydrological, climatological, and agronomical balance. So far, the most developed ML-based applications are connected with estimation of daily, weekly, or monthly evapotranspiration allowing for a more effective use of irrigation systems and prediction of daily dew point temperature, which helps identify expected weather phenomena and estimate evapotranspiration and evaporation.

IV. PROPOSED SYSTEM

In the proposed system, we are providing an easy and effective way to improve the agricultural decision for increasing profit to the farmers. Precision agriculture is an upcoming field which provides an alternative for traditional crop selection techniques. Traditional crop selection method mostly relies on farmer's crop instincts and intuition's. Combining Machine learning and data mining with traditional method would increase the efficiency of crop selection and thus will improve the efficiency of selecting crop. Here we use dataset model to compare the data fetched by analyzing the location using GPS module to forecast crop so that farmer can grow it and get good yield and sell in the market. So that farmers can make profit.

Advantages of proposed system:

- Manual is reduced.
- Accurate is increased.
- Crop for the particular soil is identified.
- Time consumption is reduced.
- Concentrated on crop growth based on the factors of the location.
- Forecasting to get good yield.

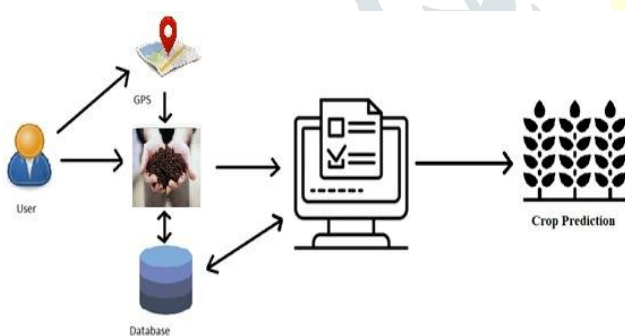


Figure 3: System Architecture of model

There is no system existing which recommends crops based on multiple factors in soil, Ph and weather components which include temperature and rainfall. The proposed system suggests an android and a web 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 are identified from the soil, PH 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 and web application. The previous production of the crops is also taken into account which in turn leads to precise

crop proposition. Location is the only input for the extrapolation system. Depending on the numerous scenarios and additional filters according to the user requirement the most producible crop is suggested.

V. CONCLUSION

Our application is mainly developed for the farmers. As farmers is the backbone of our nation. Hence this application will help to test the soil fertility and suggest which crop has to be planted. It predicts the crop yield and provides the region wise information about the crop. It also suggests the fertilizer which has to be added to the soil to increase the crop yield. Using our application farmers can share their information about their business using our farmer chat. The obtained result will be helpful for the farmers to know the Yield of the crop so, he can go for the better crop which gives high yield and also say them the efficient use of fertilizer so that he can use only the required amount of fertilizers for that field. This way we can help the farmers to grow the crop which gives them better yield.

VI. FUTURE ENHANCEMENT

As future work, we plan to integrate additional types of environmental sensors into our system to enrich the monitoring range. This could allow a wider analysis, further improve decision support, and enable additional agricultural insights and applications. Information about pesticides can be added to the crop to improve its growth and to prevent the plants from being affected by the pests. That gives the information about the crops that are currently planted by the other farmers in a particular location. Using these information farmers can get a clear idea about the crop to be planted.

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