SOIL CLASSIFICATION AND CROP SUGGESTION USING MACHINE LEARNING ALGORITHM

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Abstract: Agriculture is the basic source of food supply in all the countries of the world—whether underdeveloped, developing or developed. Besides providing food, this sector has contributions to almost every other sector of a country. According to the report, 2017, about 17 % of the country's Gross Domestic Product (GDP) is a contribution of the agricultural sector, and it employs more than 45% of the total labor force. In light of the decreasing crop production and shortage of food across the world, one of the crucial criteria of agriculture now-a-days is selecting the right crop for the right piece of land at the right time. Therefore, in our research we have proposed a method which would help suggest the most suitable crop(s) for a specific land based on the analysis of the data on certain affecting parameters like temperature, humidity, air quality and PH of soil using machine learning. In this paper we used geometric progression for predicting best suited crop in field. A GUI is developed in Python to suggest a crop which can be grown in farm according to condition of farm. Geometric progression algorithm is used for predicting crop. To know the type of soil, in this work we perform descriptive study on agricultural data using various machine learning techniques.

Keywords: Geometric progression, Python, machine learning, soil classification.

I. INTRODUCTION

In our country, agriculture is a major source of food production to the growing demand of the human population. In agriculture, irrigation is an essential process that influences crop production by supplying water to the needed land. Farmers have to visit their land to check how much amount of water is required for their field. This irrigation method takes alot of time and effort particularly when a farmer needs to irrigate multiple agriculture fields distributed in different geographical areas. Traditionally farmers will present in their fields to do irrigation process. But nowadays farmers need to manage their agricultural activity along with other occupations. Automation in irrigation system makes farmer work much easier. Sensor-based automated irrigation system provides a promising solution to farmers where the presence of farmer in the field is not compulsory.

For a country, one of the most crucial aspects of its development circles around its capacity to produce food. For decades, agriculture has been associated with the production of essential food crops. The rate of urbanization at present is by-far the most superior aim of our civilization. In doing this, we are ignorantly diminishing our capacity for agriculture; especially in terms of land and fertility. As the amount of land will not be increasing in this era of urbanization and globalization, we will have to focus on making the most of what we have. Due to this issue, we have to device newer ways to farm arable lands and extract the absolute most from these limited land resources. In this age of technology and data-science, if implemented properly, the agricultural sector may also be greatly affected. It is true that a farmer is the best decider of crop selection and crop cultivation. However, machine learning techniques can be applied in this field for far greater precision and stability of selection. In this research, we have attempted to come up with a few techniques that will lead us to choose suitable crops based on specific state, specific district, season, and some other environmental aspects.

In a number of engineering problems, such as geo technics, petroleum engineering, etc., the conventional techniques to identify soil could be inadequate, majorly due to a continuous requirement of an expert for efficient classification. In this paper the approach is develop for automating the classification procedure of soil.

II. LITERATURE SURVEY

Crop yield is a highly complex trait determined by multiple factors such as genotype, environment, and their interactions. Accurate yield prediction requires fundamental understanding of the functional relationship between yield and these interactive factors, and to reveal such relationship requires both comprehensive datasets and powerful algorithms. In the 2018 Syngenta Crop Challenge, Syngenta released several large datasets that recorded the genotype and yield performances of 2,267 maize hybrids planted in 2,247 locations between 2008 and 2016 and asked participants to predict the yield performance in 2017. As one of the winning teams, we designed a deep neural network (DNN) approach that took advantage of state-of-the-art modeling and solution techniques. Our model was found to have a superior prediction accuracy, with a root-mean-square-error (RMSE) being 12% of the average yield and 50% of the standard deviation for the validation dataset using predicted weather data. With perfect weather data, the RMSE would be reduced to 11% of the average yield and 46% of the standard deviation. We also performed feature selection based on the trained DNN model, which successfully decreased the dimension of the input space without

significant drop in the prediction accuracy. Our computational results suggested that this model significantly outperformed other popular methods such as Lasso, shallow neural networks (SNN), and regression tree (RT).

To know the status of crop production, in this work we perform descriptive study on agricultural data using various machine learning techniques. Crop yield estimates include estimating crop yields from available historical data such as precipitation data, soil data, and historic crop yields. This prediction will help farmers to predict crop yield before farming. Here we are utilizing three datasets like as clay dataset, precipitation dataset, and production dataset of Karnataka state, then we structure an assembled data sets and on this dataset we employ three different algorithms to get the genuine assessed yield and the precision of three different methods. K-Nearest Neighbor(KNN), Support Vector Machine(SVM), and Decision tree algorithms are applied on the training dataset and are tested with the test dataset, and the implementation of these algorithms is done using python programming and spyder tool. The performance comparison of algorithms is shown using mean absolute error, cross validation and accuracy and it is found that Decision tree is giving accuracy of 99% with very less mean square error(MSE). The proposed model can exhibit the precise expense of assessed crop yield and it is mark like as LOW, MID, and HIGH.

The results from paper [3] states that The controller shows the number of hours it should work and a number of times it should water the field and the duration between each cycle, after selecting these parameters the status of the motor is to be selected. IOT based smart farming system can turn out to be extremely useful for agriculturists since over and in addition less water system isn't useful for cultivating.

Edge esteems for climatic conditions like stickiness, temperature, dampness can be settled in light of the ecological states of that specific district. This framework creates water system plan in light of the detected constant information from field and information from the climate store. This framework can prescribe agriculturist whether or not, is there a requirement for water system [4].

For future improvements it can be upgraded by building up this framework for huge sections of land of land. Additionally the framework can be coordinated to check the nature of the dirt and the development of harvest in dirt. The sensors and microcontroller are effectively interfaced and remote correspondence is accomplished between different hubs. All perceptions and test tests demonstrate that this venture is an entire answer for field exercises and water system issues. Usage of such a framework in the field can enhance the yield of the harvests and general generation [5].

The framework includes a custom sensor plan for control productivity, cost adequacy, shoddy segments, and also adaptability end convenience. In future there are a few assignments that ought to be done and would build up the framework to a more develop state. The framework might be additionally reached out for outside usage [6].

'Internet of Things' is far and wide castoff in relating gadgets and social event insights. This horticulture observing framework fills in as a solid and effective framework and remedial move can be made. The created framework is more effective and advantageous for agriculturists. It gives the data about the temperature, stickiness of the air in rural field through MMS to the rancher, in the event that it aftermath from ideal range. The utilization of such framework in the field can propel the collect of the harvests and worldwide creation [7].

The mechanized water system framework has been outlined and executed in this paper. The framework created is valuable and works in financially savvy way. It diminishes the water utilization to a more prominent degree. It needs insignificant upkeep. The power utilization has been lessened in particular. The framework can be utilized as a part of green houses. The System is extremely helpful in territories where water shortage is a noteworthy problem. The edit efficiency increments and the wastage of harvests is particularly decreased utilizing this water system framework. The created framework is more useful and gives more practical outcomes [8].

This paper [9] talked about the improvement of a framework that could address these issues. It likewise talked about the plan necessities and the procedure on the best way to union the outline with promptly accessible devices. The brilliant water system controller was appeared to have the capacity of remote organization of programming. This capacity will give a helpful method to make updates to the framework without pestering the end client. Programming has been made and transferred to the controller for manual utilize. The subsequent stage will be further growing the product's usefulness and begin taking a shot at information stockpiling also, examination for mechanization purposes. With the improvement of innovation, agrarian field picked up significance in limiting the human power.

In that way IOT and Image handling innovation has been utilized to recognize the plant sicknesses. The worldwide water system situation is arranged by expanded interest for higher horticultural profitability, poor execution and diminished accessibility of water for agribusiness. Be that as it may, our plan will build the execution of horticultural field and keeping up the field keeping from illnesses [10].

III. PROPOSED SYSTEM

Data of different parameters affecting soil like temperature, humidity, air quality and PH of soil are stored in excel sheet. According to value of different parameters of soil, a list of best suited crop is selected from all crops. Values of monitoring parameters are adjusted according to optimal condition required for particular crop. All the data is stored on database. A GUI is developed in Python to suggest a crop which can be grown in farm

according to condition of farm. Geometric progression algorithm is used for predicting crop.

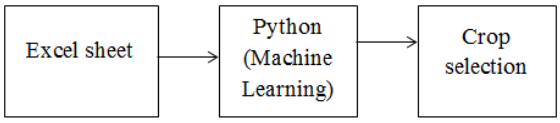

Fig 2 block diagram of proposed system

A geometric sequence is a sequence such that any element after the first is obtained by multiplying the preceding element by a constant called the common ratio which is denoted by r. The common ratio (r) is obtained by dividing any term by the preceding term, i.e.

$$r = \frac{a_2}{a_1} = \frac{a_2}{a_1} = \cdots \quad \frac{a_n}{a_{n-1}}$$

where r common ratio
a1 first term
a2 second term
a3 third term
an-1 the term before the n th term
an the n th term

The geometric sequence is sometimes called the geometric progression or GP, for short.

For example, the sequence 1, 3, 9, 27, 81 is a geometric sequence. Note that after the first term, the next term is obtained by multiplying the preceding element by 3.

The geometric sequence has its sequence formation: $a_1, a_1r, a_1r^2, \ldots, a_1r^{n-1}, a_1r^n$

To find the nth term of a geometric sequence we use the formula:

$$a_n = a_1r^{n-1}$$

where r common ratio
a1 first term
an-1 the term before the n th term
n number of terms

Finding the sum of terms in a geometric progression is easily obtained by applying the formulas:

nth partial sum of a geometric sequence

$$S_n = \frac{a_1(1-r^n)}{1-r}, \qquad r \neq 1$$

sum to infinity

$$S_\infty = \sum_{n=1}^{\infty} ar^{n-1} = \frac{a_1}{1-r}, -1 < r < 1$$

where Sn sum of GP with n terms
S∞ sum of GP with infinitely many terms
a1 the first term
r common ratio
n number of terms

IV. CONCLUSION

Agriculture plays a significant role in the growth of the national economy. It relay on weather and other environmental aspects. Some of the factors on which agriculture is dependent are Soil, climate, flooding, fertilizers, temperature, precipitation, crops, insecticides and herb. The crop yield is dependent on these factors and hence difficult to predict. To know the type of soil, in this work we perform descriptive study on agricultural data using various machine learning techniques.

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