Prediction Of Soil Quality Using Machine Learning Techniques

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ABSTRACT

Agribusiness is the foundation of India. In India 50 % of the remaining task at hand depends upon agribusiness. Commitment of agriculture part in Indian economy is higher than some other division in India. In any case, Farmers utilized customary strategy for developing harvests which comes to less profitability of yields. Additionally, a soil erosion and is integration is likewise a principle motivation to less profitability of yields. This will impact in diminishes fruitfulness level. Loss of soil supplements through different courses is likewise motivation to diminish soil richness level. The supplements like potassium (K), nitrogen (N) and phosphorus (P) are basic for the development of a plant. The advancement in agriculture is important to tackle these issues in agribusiness part and shrewd cultivating is the appropriate response.

Farmers usually follow a method called crop mutation after every consequent crop yield. The crop mutation allows the soil to regain the minerals that were used by the crop previously and use the left-over minerals for cultivating the new crop. To know if the soil has reached the point where it is unfit to yield the particular crop, farmer has to experience a loss in yield. One financial year for a farmer is very crucial to accept the loss. This paper implements a that would help in maintaining the soil fertility consistently. This method is traditionally implemented in many countries where the change in crop is done after a loss in yield for cultivating the same crop continuously. There are three soil parameters that come into consideration when we have to predict the soil quality. This method suggests the solution for the above stated problem using Machine Learning Techniques. This paper suggests a software enabled solution considering crucial soil parameters and soil factors to predict the soil quality.

Keywords: - *Machine learning, soil quality, mutation, Artificial Intelligence*

1. INTRODUCTION

India is a country which has huge no. of natural as well as human resources, and its economy is growing at a rapid rate. A large part of Indian economy is dependent upon agriculture sector and to improve agricultural practices it is necessary to accurately predict responses of the crop yield which can be done with the help of Machine Learning. Agricultural soil quality depends on the soil macro as well as micro nutrient content like S, K, pH, C, Mg, P, Ca, B etc. Our main objective is the examination, adaptation, and formulation of soil properties and crops growth factors. The main aim of this project is the examination of macro and micro soil properties such as organic content, essential plant nutrients, that affects the crop yield and find out the rank of a given soil based on the previously graded soil using Supervised Learning. The main aim of this project is the examination of macro and micro soil properties such as organic content, essential plant nutrients, that affects the crop yield and find out the rank of a given soil based on the previously graded soil using Supervised Learning. This method suggests the solution for the above stated problem using Machine Learning Techniques. There are three soil parameters that come into consideration when we have to predict the soil quality as

- Chemical Parameters
- Physical Parameters
- Biological Parameters

2. SCOPE

The crop mutation allows the soil to regain the minerals that were used by the crop previously and use the left-over minerals for cultivating the new crop. This process will help in maintaining the soil fertility consistently. To know if the soil has reached the point where it is unfit to yield the particular crop, farmer has to experience a loss in yield. One financial year for a farmer is very crucial to accept the loss.

The following are the drawbacks of the existing manual System:

- Scope for redundancy
- Time Delay
- Less accuracy
- Needs more human effort
- Requires more laboratory

3. METHODOLOGY

Technology used in this Project is Machine Learning. Application of various classification algorithms like Support Vector Machine, Random Forest Classification and Decision Tree is done and based on the RMSE (Root Mean Squared Error) the suitable model is selected. After having collected all the information we need to select the relevant column of data required and discard the rest. This is what was done in this step. This was done directly in spreadsheet. MLaaS is another tool which can prove beneficial. This is generally used in places with really huge datasets.
Machine Learning is the scientific field which gives the machine the ability to learn without being intervention of human being.
The prediction of SOIL ANALYSIS AND CROP FERTILITY PREDICTION USING MACHINE LEARNING is done by Random Forest Algorithm.
Random forest is a supervised machine learning algorithm. It has random decision forests with an ensemble learning method for classification problems, it has usually trained with the “bagging” method. The bagging method is that a mixture of learning models increases the overall result. It uses for both classification and regression problems.
By using this algorithm, we can add randomness to our model. Random forest looks for the most important parameter among all while doing splitting of any node, then from the subset of random features it searches for the best among them. This eventually generates a model which has higher accuracy in wide diversity. In this algorithm only selective features are taken into account for the splitting of a node. The trees can be made more random, by using random thresholds for the feature set rather than searching for the best thresholds possible. The training algorithm for random forests applies the general technique of bootstrap aggregating, or bagging, to tree learners. Given a training set where, X = x1, … xn with responses Y = y1, ..., yn, continuously bagging b times by selecting a random sample with replacement of the training set and fitting trees to these samples as shown in Fig 1.RESULTS AND DISCUSSIONS

In this section all the results and the discussions should be made.

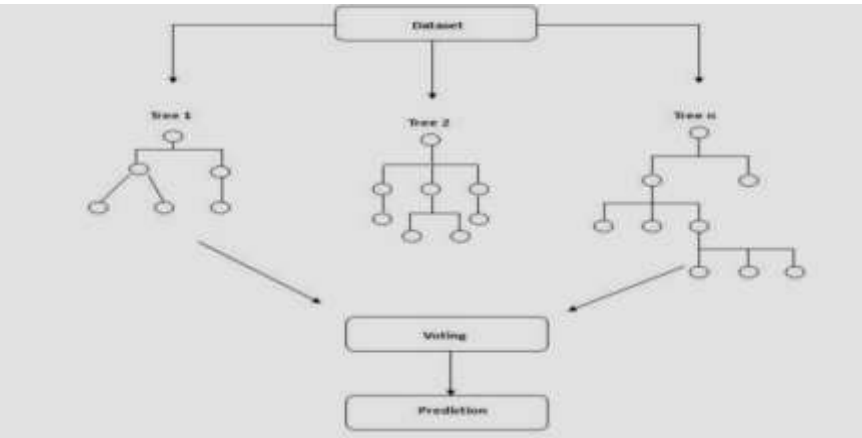

Fig -1 : Results and Discussions

4. COMPONENTS USED

- Dataset:
  - Soil Dataset
  - Crop Dataset
  - Yield Dataset
- Method and Experimentation
  - Training Dataset
  - Testing Dataset

5. FLOWCHART

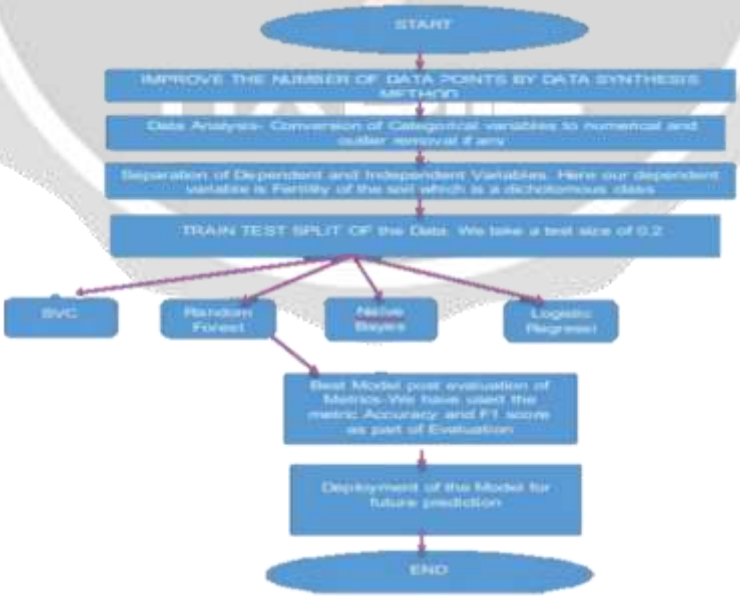

Chart-1: Flow diagram to predict if the soil is fertile or Not

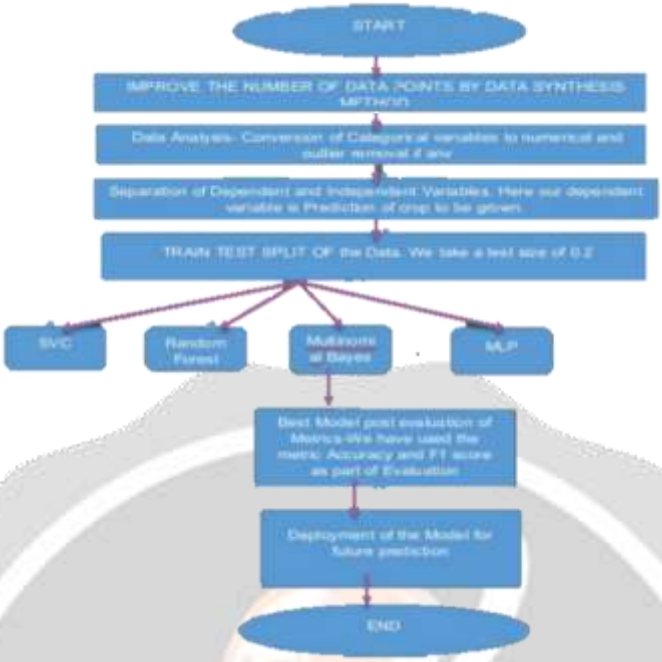

Chart-2: Flow diagram to predict the type of crop to be grown

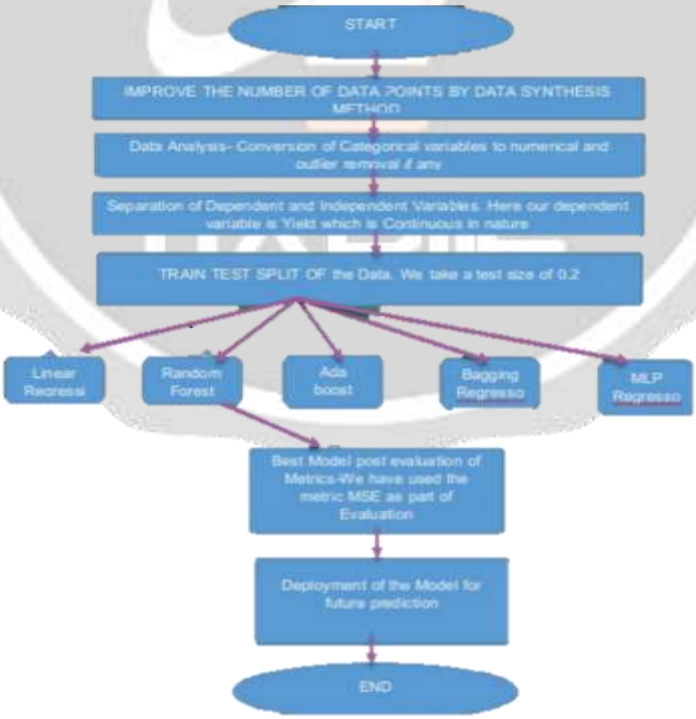

Chart-3: Flow Diagrams to Predict the Yield of a Crop

6. OBJECTIVE

Nowadays farmers without knowing about their soil they add fertilizers, grow which affects the health of the soil as well as yield of the crop. So, taking this as a problem, with the help of machine learning we will analyse the nutrient of the soil and tell whether the soil is fertile or not. And after analyzing the soil nutrients and climate condition of an area we will predict the best crop for that soil for that condition and we will also predict the yield of crops in that area. The main goal of this research is to design the crop yield prediction and soil fertility analysis model by machine learning. The real-time data of soil and crop are collected from the different online repository. The datasets are divided into two category training dataset and testing dataset to build the model. Then different Machine learning algorithms are applied to classify the soil whether the soil is fertile or not by using soil micronutrients and chemical features. The system aims to help farmers to cultivate proper crop for better yield production. The end user is provided with proper recommendations about fertilizers suitable for every particular crop The results of the two algorithms will be compared and the one giving the best and accurate output will be selected. Thus, the system will help reduce the difficulties faced by the farmers and stop them from attempting suicides.

7. CONCLUSION

The system uses supervised Machine learning algorithms like Linear Regression Multi-Variate, Support Vector Machine, Random Forest Classifier and gives best result based on error analysis. The results of these algorithms will be compared and the best among them i.e., Random Forest Classifier which gives the best and accurate output is chosen. Therefore, this system will help reduce the struggle faced by the farmers. Analysis of the important soil properties and based on that we are dealing with the Grading of the Soil and Prediction of Crops suitable to the land. This will act as simple solution to equip the farmers with necessary information required to obtain great yield and therefore maximizing their surplus and therefore will reduce his difficulties.

A model is proposed for predicting the soil fertility and crop yield with types of the crop can grow on fertile soil. The research has done on soil datasets and crop datasets of the Indian region. The influence of the machine learning techniques and their parameters was investigated and discussed in this project. The performed comparative analysis indicates their different influence that may increase or decrease the overall soil analysis accuracy**.** The model has been tested by using a different machine learning algorithm. The project will assist the farmers in increasing the agriculture yield and take efficient care of food production.

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