AN EFFICIENT WAY FOR MAKING ECO-FERTILIZATION USING MACHINE LEARNING

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ABSTRACT

Farmers often have minimal control over the use of fertilisers. For the proper use of these fertilisers, farmers need skilled assistance in order to increase yields and decrease fertiliser loss. Additionally, there is a connection between rainfall volume and nutrient loss for various fertilizer applications after each rainfall event.In order to estimate the amount of nutrients needed for different crops by evaluating rainfall patterns and crop fertility, this article gives nutrient recommendations using an upgraded iteration of the random forest method, which is based on time-series data. The strategy described in this paper is useful for increasing soil fertility by suggesting nutrients for the best growing conditions for crops and lowering the likelihood of leaching and runoff.

Keywords — crop, random forest algorithm, nutrients.

INTRODUCTION

In terms of the development of the national economy, agriculture is crucial. India's GDP is derived from the agricultural sector, which ranks second globally in terms of farm output. Fertilizers are necessary for plants, and they replace the nutrients that crops draw from the top layer of soil. The amount of crop output might be drastically reduced in the absence of fertilizers. However, fertilization demands for exact action. When utilizing fertilizers, one must take into account the timing of rainfall and the quantity of nutrients required for a particular crop. In terms of the development of the national economy, agriculture is crucial.

India's GDP is derived from the agricultural sector, which ranks second globally in terms of farm output. Fertilizers are necessary for plants, and they replace the nutrients that crops draw from the top layer of soil. Following each rainfall event, there is a correlation between rainfall volume and nutrient loss for different fertiliser treatments. Moderate rainfall that occurs at the correct time can aid in the penetration of nutrients into the soil's rooting zone and the dissolution of dry fertiliser. However, excessive rain can speed up the rate at which nutrients like nitrogen (N), which is important, phosphorus (P), and potassium (K), which are crucial, as well as manganese (Mn) and boron (B), which are present in the soil, can flow off the surface.

Yields are typically influenced by the weather. In the development of the national economy, agriculture is crucial. The nutrients that crops consume from the top layer of soil are replaced by fertilisers. Less fertiliser use may result in lower agricultural yields. The suggested system employs machine learning and requires two user inputs. Farmers can use this model on their own to learn how much nutrition is lost and how much is needed, which benefits them and educates them about crops. The model predicts the necessary amount of nutrients after using the algorithm. The crop is difficult to anticipate because of temperature and rainfall. The best learning method for output prediction nowadays is the machine learning algorithm, which is frequently utilised

LITERATURE SURVEY

A list of past studies into this issue is provided after a thorough examination of the literature in the field. The authors show that, to a certain extent, predicting fertiliser usage can assist farmers in achieving a proper yield with little loss by lowering plant toxicity and deficiency. The usage of fuzzy logic systems makes it possible to use less fertiliser, which increases agricultural yield. Additionally, it shows that the enhanced effectiveness of fertilisers is insufficient to solve the potential issues brought on by compaction. The solution to these issues is to improve fertiliser recommendations, which ask for the establishment of a quantitative relationship between the application of N and P fertilisers and agricultural productivity, nitrogen requirement, and nitrate residue.

Nitrogen leaching is more likely to happen in no-till management zones, which could lead to crop loss, claim Laura J.T. Hess et al. in. Because of stochastic rainfall patterns and temperature volatility, crop yield prediction is difficult. Hence, as mentioned, we can employ a variety of data mining approaches to forecast agricultural yield.

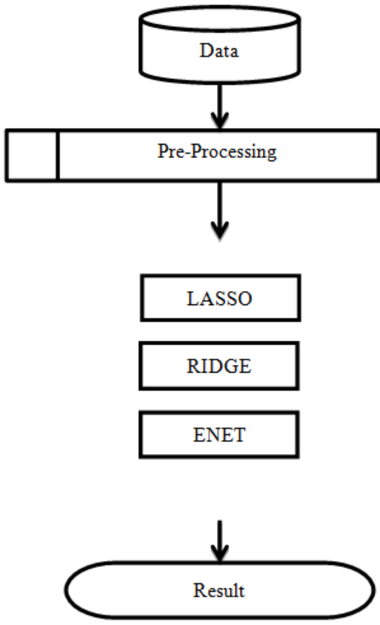
The main objective is to look at the typical changes in the creation and components of soil populations and capabilities as a result of the collaboration between long-term treatment and precipitation variations in order to ascertain whether preparation history has an effect on the water-obstruction of soil microorganisms. Also, based on rainfall, it forecasts agricultural productivity. This is accomplished by giving a broad picture of how rainfall impacts production and the possible yield of a certain crop given the amount of rainfall received.

The suggested way of evaluation is better than other approaches that are already in use because it takes into account all regression technique. A lot of the crops in India were predicted by Potnuru Sai Nishant et al. This script's imaginative use of common elements like state, district, and region allows the user to forecast agricultural yields for any given year. To train a model to recognise patterns in the information so that it might later be used to anticipate agricultural harvests, we could employ Transfer Learning techniques. It presents a thorough technique to predict crop sustainability using supervised algorithms that boost crop yields, cut down on the amount of labour, time, and energy required for various agricultural tasks, and choose plants depending on particular soil conditions. A machine learning model's comprehension and evaluation of data were demonstrated in the research.

Senthil Kumar Swami Durai et al. propose a comprehensive solution that addresses pre-cultivation activities. The purpose of this study is to improve the operational efficiency of a small farm in order to boost productivity and reduce costs. It also helps in estimating total growth costs. One's future plans will benefit from it. Pre-cultivation efforts lead to a comprehensive solution in agriculture. M.S. Suchithra and Maya L. Pai use the rapid learning classification technique known as Extreme Learning Machines (ELMs) with various activation functions to address the challenges associated with the classification of soil nutrients. A tiny farm can be made more productive with the aid of this research.

Agricultural diseases are one of the main factors affecting the overall yield. This study is carried out in the Kashmir Valley utilising an Internet of Things system, and a model for the prediction of apple disease is proposed using data analysis and machine learning. The difficulties of integrating modern technologies into conventional farming techniques are highlighted in this paper

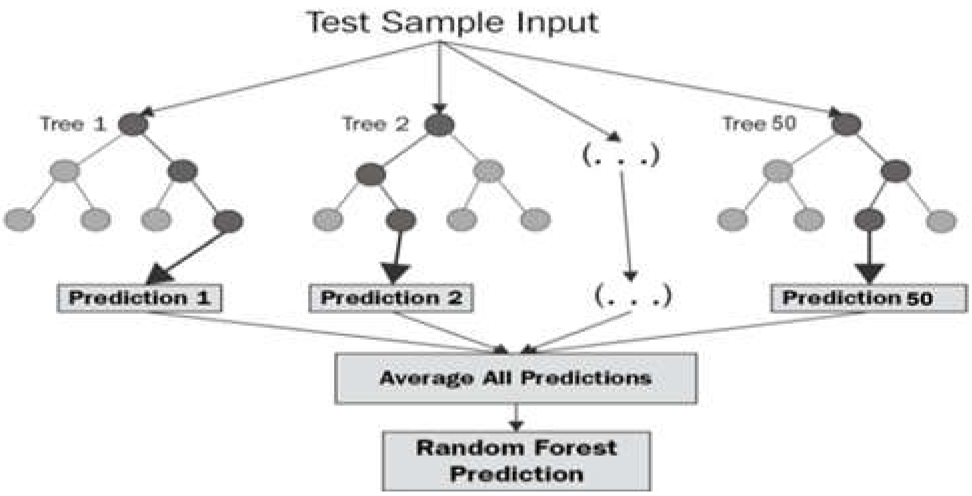
PROPOSED SYSTEM



A. Pre-processing-

The given data has a lot of NA values that are filtered in Python. Data with numbers make up the datset. The inquartile range is used instead of values between 0 and 1 in robust scaling. Normalization expands the range to 0 to 1. From 0 to 1, robust decreases.

B. Random Forest Regression-



Decision trees in a random forest are those that have been trained using different subsets of data. Crop and location are the inputs we are using in this project. We'll forecast the values of N, P, and K based on the input values. Training and testing data sets will be divided up. Only 20% of the data are in the testing dataset, while 80% are in the training dataset. Separate decision trees that represent the average of the classes for each N, P, and K will be seen.

C. Random Forest Algorithm-

BEGIN:

Step-1: The dataset n=2200 with 80% training and 20% testing, i.e. training =1, testing = 240.

Step-2: Apply random forest to each N,P, and K while using n=50 as your estimator.

Step-3: Train the labels N, P, and K using a dependent and training dataset (Where the dependent variable is

N for N Label, P for P Label and K for K Label).

Step-4: Based on the training dataset, each N, P, and K label creates 50 decision trees as an output.

END:

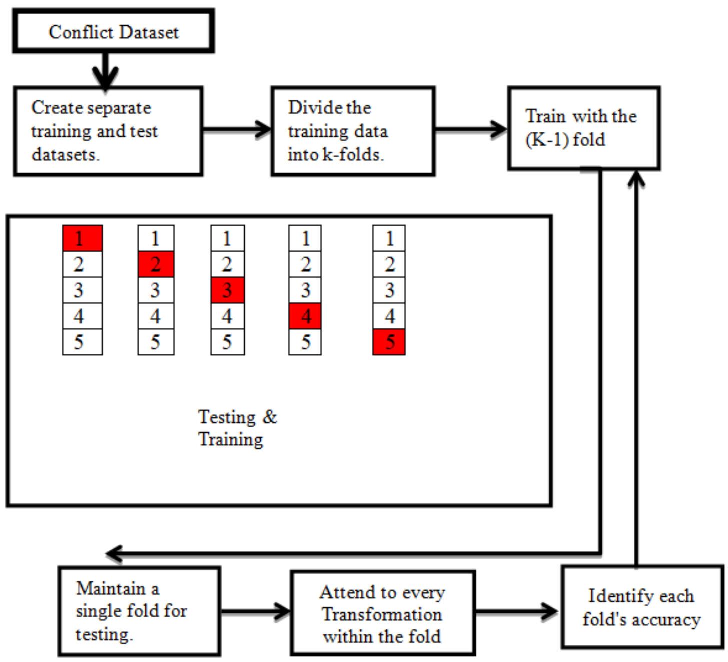
We have tested for different n_estimator values, but the upmost accuracy achieved for N_Label is 0.87 for two decimal digit precision

D. Cross Validation-

Cross validation is a resampling method used to assess a machine learning system using a little amount of data. The number of groups to be formed from a specific data sample can be decided by the algorithm by utilising the single parameter k. This results in the procedure being referred to as K -fold cross validation. If a precise k value is provided, it can be used in place of k in the model, for instance, if k=5 for cross-validation is then performed five times.

It is a well-known strategy because it is simple to understand and, when compared to other techniques, such as a plain train/test split, often produces a less biassed or excessively optimistic estimate of the model's capability.

It is crucial that all data preparation be completed prior to fitting the model, and that it be done on the loops CV-assigned training dataset rather than the larger dataset. This holds true regardless of the hyper parameter modification. If these steps are not followed within the loop, data leakage and an inflated assessment of the model's skill may result.



E. Data Set

The eight main features of the dataset are crop, temperature, humidity, rainfall, weather, nitrogen, potassium, and phosphorous. The suggested model does not benefit from any of the features provided. As a result, a dimension reduction technique known as feature selection is used, and finally seven features are chosen for evaluation.

The input features of our system are given below:

Crop: rice, cotton, mango, orange, lentil, etc.
Temperature: temperature measured in Celsius
Humidity: measured relatively in percentages
Rainfall: rainfall in mm

The output features for our system are given below:

Label_N: Ratio of Nitrogen content in the soil.
Label_P: Ratio of Phosphorus content in the soil.
Label_K: Ratio of Potassium content in the soil.

CONCLUSION

The suggested sytem is quite good for any predictive models because it achieves 92% accuracy.It provides the necessary information regarding the quantity of nutrients needed by crops for proper growth and production dependent on weather conditions.It sends out messages and weather alerts. In the event of inclement weather, the alerts will be shown in the output. Technology advancements may increase accuracy.

FUTURE SCOPE

The Farmers can benefit greatly from the suggested system.It gives details on the kind and amount of nutrients that are necessary for crops. For the system's improvement ,there is a user interface in the user's native language. If a user is inexperienced with the language or finds it difficult to grasp, they can still use the system with ease by using this.Futhermore,speech recognition can be included to help users who are illiterate or ignorant.

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