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Soil Classification using Machine Learning and Crop Suggestions

Dr. Sulochana Sonkamble[1], Punit Jadhav[2], Vaishnavi Jadhav[3], Akanksha Kavitake[4], Rohan Kohalli[5]
[1, 2, 3, 4, 5]*Department of Computer Engineering, JSPM Narhe Technical Campus, Pune, Maharastra , India*

Abstract: India is a predominantly agricultural nation. Agriculture is currently the most significant emerging sector in the actual world and the key industry and economic pillar of our nation. The discipline of agricultural information technology has recently undergone significant changes that have made crop yield prediction an intriguing study topic. Crop yield prediction is a technique for estimating crop production using many characteristics, including temperature, rainfall, fertilisers, pesticides, and other climatic variables and parameters. The use of data mining tools is quite common in agriculture. Agriculture uses data mining tools to forecast agricultural production for next years and evaluates these strategies. This method provides a succinct study of K-Nearest Neighbour (KNN) and Support Vector Machine-based agricultural yield prediction.
Keywords: Data Mining, RBAC, Multi cloud data security, Proxy Key generation.

I. INTRODUCTION

India is described by little homesteads. Over 75percent of complete land capitals inside the nation are under 5 sections of land. Most harvests are downpour fed, with pretty much 45percent of the land inundated. According to certain assessments, around 55percent of complete populace of India relies upon cultivating. In the US, in light of weighty automation of farming, it is around 5percent. India is one of the greatest makers of agrarian items regardless has extremely less ranch efficiency. Efficiency should be expanded so ranchers can get additional compensation from a similar land parcel with less work. Accuracy horticulture gives a method for getting it done.

Accuracy cultivating , as the name suggests, alludes to the applying of exact and legitimate all out of remark like pee , composts, soil and so on at the appropriate opportunity to the stomach for expanding its efficiency and expanding its yields. Not all accuracy horticulture frameworks offer best outcomes. Yet, in farming it is vital that the suggestions made are exact and exact in light of the fact that in the event of mistakes it might prompt weighty material and capital misfortune. Many explores are being completed, to accomplish a precise and proficient model for crop expectation. Ensembling is one such method that is remembered for such examination works. Among these different AI procedures that are being utilized in this field; this paper proposes .

II. LITERATURE SURVEY

Ashwani kumar Kushwaha, Depicts crop yield forecast techniques and a propose reasonable harvest with the goal that it will work on the benefit for the rancher and nature of the agribusiness area. In this paper for crop yield expectation they acquire huge volume information, it's been called as large information (soil and climate information) utilizing Hadoop stage and agro calculation. Subsequently based store information will foresee the appropriateness crop for specific condition what's more improvement crop quality. Girish L, portray the harvest yield and downpour fall expectation utilizing an AI strategy. In this paper they gone through an alternate AI approaches for the expectation of precipitation and harvest yield and furthermore notice the effectiveness of an alternate AI calculation like liner relapse, SVM, KNN strategy and choice tree. In that calculation they presume that SVM have the most elevated productivity for precipitation expectation. Rahul katarya ,Portrays the distinctive AI strategies utilized for speeding up crop yield. In this paper they gone through various man-made brainpower methods such as AI calculation, enormous information investigation for accuracy agribusiness. They clarify about crop recommender framework utilizing KNN, Ensemble-based Models, Neural organizations,and so forth.

The planned framework will suggest the most reasonable yield for specific land. In light of climate boundary and soil content like Rainfall, Temperature, Humidity and pH. They are gathered from V C Farm Mandya, Government site furthermore climate office. The framework takes the necessary info from the ranchers or sensors like Temperature, Humidity what's more pH. This all sources of info information applies to AI prescient calculations like Support Vector Machine (SVM) also Decision tree to recognize the example among information andthen, at that point, process it according to include conditions.

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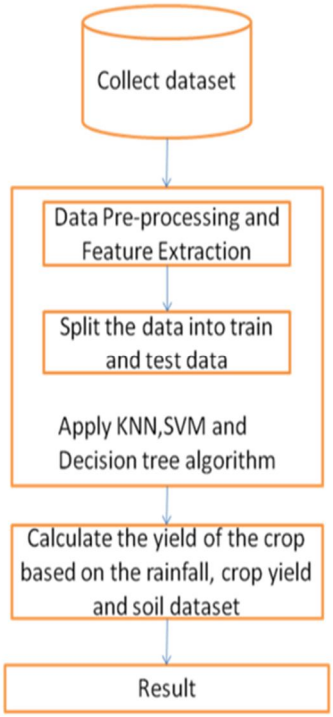
III. SYSTEM ARCHITECTURE



IV. MODULAR EXPLANATION

1) *Data Collection:* The first step is to collect data related to soil characteristics and crop performance. This data can include various features such as soil pH, organic matter content, soil texture, nutrient levels, moisture content, and historical crop yield data. The data can be collected from different farms or agricultural research institutions
2) *Dataset Preprocessing:* Once the data is collected, it needs to be preprocessed to ensure its quality and prepare it for machine learning algorithms. This step involves data cleaning, where any missing or erroneous values are handled. It may also involve data normalization or scaling to bring all the features to a similar range, which helps in the training process.
3) *Feature Selection/Extraction:* In this step, relevant features for soil classification and crop suggestion are selected. Depending on the dataset, certain features may have more importance in determining soil types and crop suitability. Feature extraction techniques like principal component analysis (PCA) can also be applied to reduce the dimensionality of the data and capture the most important information.
4) *Model Training:* Machine learning models are trained using the preprocessed data. Various algorithms can be used for this purpose, such as decision trees, random forests, support vector machines (SVM), or neural networks. The choice of the algorithm depends on the complexity of the problem and the nature of the dataset. During training, the model learns patterns and relationships between the soil characteristics and crop performance.
5) *Model Evaluation:*The trained model is evaluated to assess its performance and accuracy. This step involves splitting the dataset into training and testing subsets. The model is then tested on the testing subset to measure its predictive capability. Evaluation metrics such as accuracy, precision, recall, or F1 score can be used to assess the model's performance.
6) *Soil Classification:* Once the model is trained and evaluated, it can be used to classify soil types based on the given soil characteristics. Given a set of soil features as input, the model predicts the most probable soil type. This classification can provide valuable information about the soil properties, which can be utilized for agricultural purposes.
7) *Crop Suggestions:* After soil classification, crop suggestions can be generated based on the predicted soil type. This step involves linking the soil types to known crop suitability information. Historical crop yield data can be used to identify the crops that have performed well in similar soil conditions. This information can be stored in a knowledge base or database. The model can then recommend the most suitable crops for a given soil type, considering factors such as nutrient requirements, moisture levels, and pH preferences.

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V. MOTIVATION

Machine learning enables us to create precise soil maps by analyzing various soil parameters such as pH levels, organic matter content, nutrient composition, and texture. These maps help farmers understand the spatial distribution of soil properties within their fields, allowing them to tailor their agricultural practices accordingly. By optimizing fertilizer application, irrigation schedules, and seed selection based on specific soil conditions, farmers can enhance productivity while minimizing resource wastage.

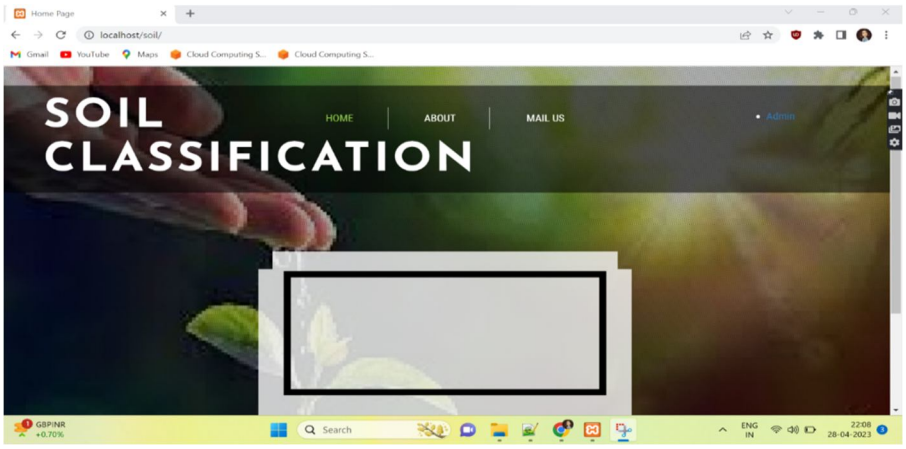
VI. OBJECTIVE OF THE SYSTEM

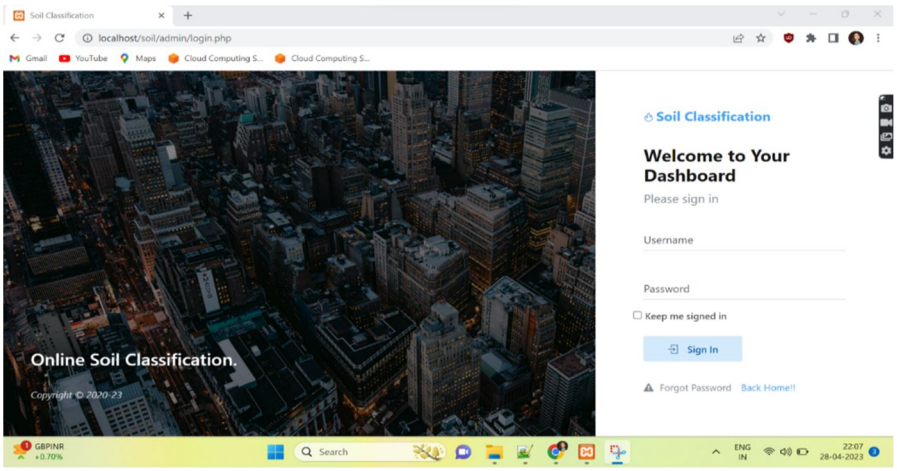
1) To detect the soil Classification Using Machine Learning Methods Based on NTP values.
2) To Predict crop based on soil and weather .
3) To train dataset using Support Vector Machine , Random Forest Technique.

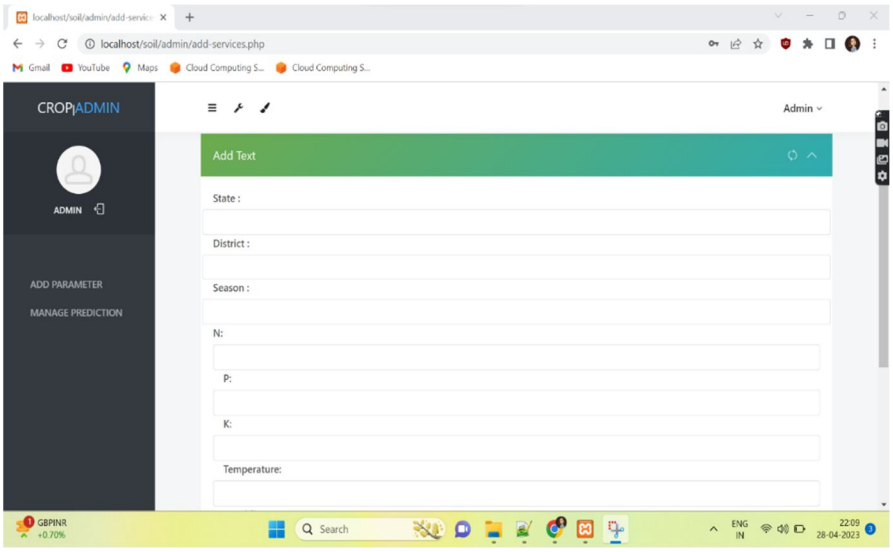
VII. METHODOLOGY

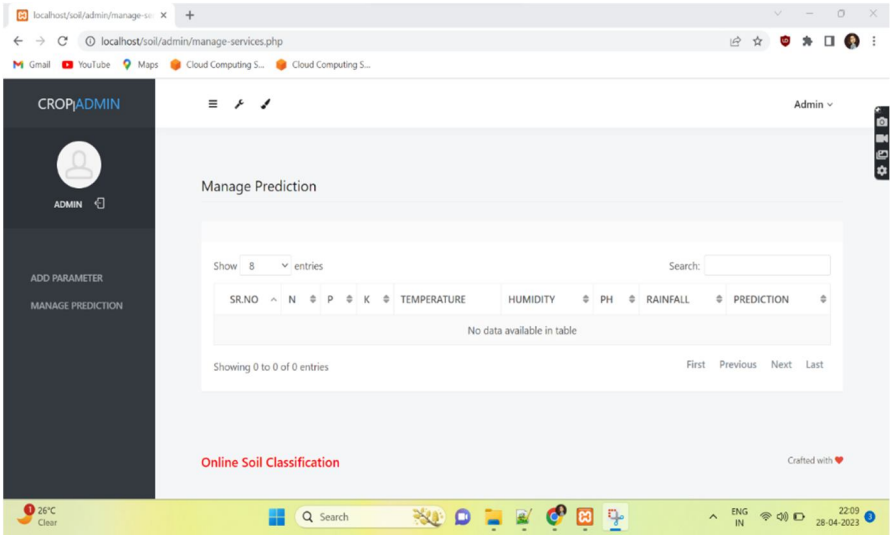
1) *Dataset Collection:* Data is collected from a variety of sources and prepared for data sets. And this data is used for descriptive analysis.
2) *Preprocessing step:* This step is a very important step in machine learning. Preprocessing consists of inserting the missing values, the appropriate data range, and extracting the functionality.
3) *Feature Selection:* Feature extraction should simplify the amount of data involved to represent a large data set. The soil and crop characteristics extracted from the pre-treatment phase constitute the final set of training.
4) *Data Prediction:* In Advance to this step there need to split the data into train dataset and test dataset. By applying the KNN , SVM and decision tree algorithm the data is trained with available input and output data. Then the new data is predicted by machine learning module.

VIII. RESULTS









IX. ADVANTAGES

1) Accurate soil classification
2) Efficient and cost-effective
3) Improved crop suitability assessment
4) Cost Effectiveness, Scalability, Environmental Sustainability.

X. LIMITATIONS

1) Limited Training data.
2) Complex Soil variablity
3) Data quality and inconsistencies.
4) Dynamic nature of soil and crops

XI. APPLICATIONS

1) Forecast for Palm Oil Yield System.
2) Soil and crop yield Prediction System.
3) Helped the crops to achieve a successful growth.
4) Weather forecast Applications.
5) Market Basket Analysis

XII. CONCLUSION

Agriculture has always been the most important sector for survival. There are a lot of difficulties faced by our farmers these days due to various unpredictable reasons. Hence, as engineers, we need to collaborate with farmers and provide them a solution to improve the quality and quantity of crops. Our project is the first step towards it. Prediction can help us make strategic decisions in crop production. With machine learning, we get insights about the crop life which can be very beneficial. This work can be enhancing to the next level.

XIII. FUTURE SCOPE

1) Machine learning algorithms can analyze large datasets containing various soil attributes such as texture, pH level, organic matter content, nutrient composition, and moisture content.
2) By combining soil classification data with crop-specific information such as growth requirements, disease susceptibility, and yield potential, machine learning algorithms can provide personalized crop recommendations for specific soil types.
3) Machine learning models can also assist in determining the optimal allocation of resources such as water, fertilizers, and pesticides based on soil characteristics.

XIV. ACKNOWLEGMENT

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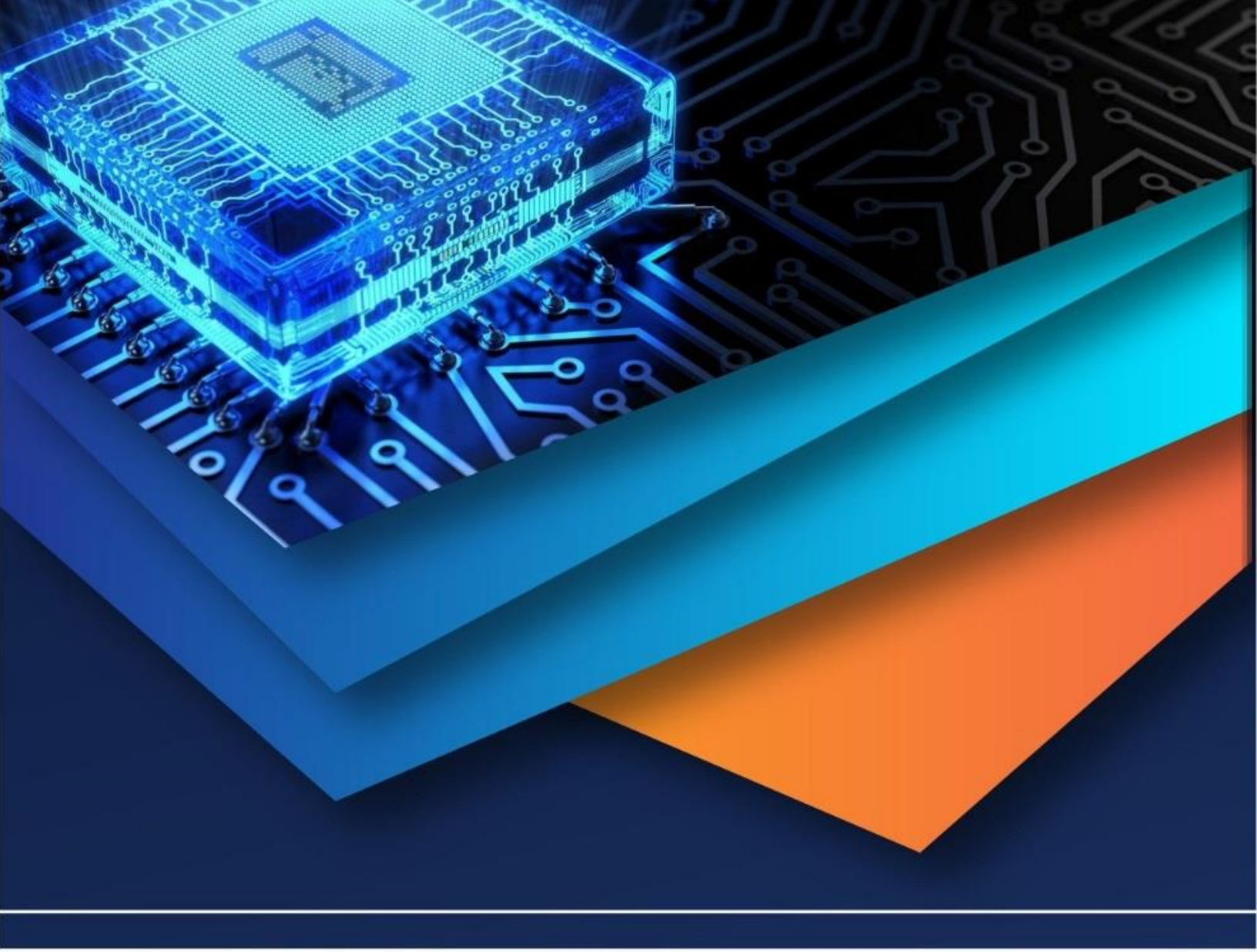

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