ISSN No:-2456-2165

Soil Classification and Crop Recommendation System

Ashwin John, Denzil Davis, Athulya Merin C Tom, Dibin Davis, Jasmi Davis*
Asst. Professor* Computer Science and Engineering Department
Sahrdaya College of Engineering and Technology Thrissur, India

Abstract:- In this project we will be making a Soil Classification and Crop Recommendation System. This appplication will help the farmers to test the quality of the soil for the cultivation, so the farmers no need of going to the laboratories for testing the soil. By checking this we can find which crop can give more yield. With the help of a smartphone the farmers can test the soil by themselves. We are implementing this system by applying machine learning algorithm. The models are trained on the basis of a large dataset, so it will increase the accuracy of the model.

Keywords:- *Quality, Testing, Machine Leraning Algorithm.*

I. INTRODUCTION

Agriculture is that the major supply for living for the folks of Asian nation. Agriculture analysis is that the major supply of economy for the country. Soil is a vital key issue for agriculture[1]. There are many soil varieties in Asian nation. so as to predict the kind of crop which will be cultivated in this explicit soil kind we'd like to grasp the options and characteristics of the soil type. to explain and classify soils giving uniform system of classification with uniform language so as to correlate the soils of various space. to point out distribution of various soils within the field(soil mapping).To provide knowledge for creating interpretations on the ability of explicit soils for agricultural purpose and conjointly for several different functions (as in soil management).For proper crop yield, farmers ought to bear in mind of the right soil kind for a selected crop, that affects the accumulated demand for food. There are numerous laboratory and field strategies to classify soil, however these have limitations like time and labor-consuming. there's a demand of computer-based soil classification techniques which is able to facilitate farmers within the field and won't take tons of your time.

II. RELATED WORKS

In the Paper [1]" Prediction Of Land Suitability For Crop Cultivation Based On Soil And Environmental Characteristics Using Modified Recursive Feature Elimination Technique With Various Classifiers " [2] - Crop cultivation prediction is associate integral a part of agriculture and is based on factors like soil, environmental options like precipitation and temperature, and therefore the quantum of fertilizer used, significantly chemical element and phosphorus. These factors, however, vary from region to region: consequently, farmers area unit unable to cultivate similar crops in each region. this is often wherever machine learning techniques step in to assist realize the foremost appropriate crops for a selected region, so helping farmers a good deal in crop prediction. The feature choice side of metric capacity unit may be a major element within the choice of key options for a selected region and keeps the crop prediction method perpetually upgraded. This work proposes a unique feature choice approach known as changed algorithmic feature elimination to pick out acceptable options from an information set for crop prediction.The planned changed algorithmic feature elimination technique selects and ranks salient options employing a ranking method. The experimental results show that the changed algorithmic feature elimination methodology selects the most correct options, whereas the material technique helps accurately predict a suitable crop.

In the Paper " Smartphone-Based Spectrometric Analyzer for Accurate Estimation of pH Value in Soil " [3] - It demonstrates a cheap, compact, and hand-held smartphone-based sensing tool for correct estimation of pH scale values of agricultural farmlands. we tend to develop a qualitative analysis tool with a resolution ability of zero.22 nm/pixel by utilizing 3D printing technology, regular optical parts, a Digital Versatile Disc as a grating part,and the rear camera of the phone. The detector responses for normal pH scale samples within the pH scale vary four to ten ar ascertained to be linear however yield a sensitivity of 0.129 per pH scale unit. The resolution of the projected detector for the thought of samples is ascertained to be zero.09 pH scale units. The results obtained from the designed tool whereas mensuration the pH scale values of six field-collected soil samples are found to be correct. The designed sensor's performance has been evaluated by scrutiny the experimental knowledge with the commercial-grade pH scale sensing too.

In the Paper " Temporal-Spatial Soil Moisture Estimation from CYGNSS Using Machine Learning Regression With a Pre classification Approach " [4] - Global navigation satellite system-reflectometry (GNSS-R) will retrieve Earth's surface parameters, like soil wet (SM) victimization the mirrored signals from GNSS constellations with benefits of noncontact, unrestricted, realtime, and continuity, significantly the space-borne cyclone GNSS (CYGNSS) mission. However, the accuracy and potency of SM estimation from CYGNSS still have to be compelled to improve. during this article, the world SM is calculable victimization machine learning (ML) regression power-assisted by a preclassification strategy. the full observations are classified by land sorts and corresponding subsets are engineered for constructing mil regression submodels. Ten-fold cross-validation technique is adopted. the general performance of SM estimation with/without preclassification is compared, and therefore the results show that the SM estimations victimization totally different mil algorithms all have substantial improvement with the preclassification strategy. Then, the best XGBoost foreseen model with root-mean-square error (RMSE) of zero.052 cm3/cm3 is adopted. additionally, the

satisfactory daily Associate in Nursingd seasonal SM prediction outcomes with an overall correlation worth of zero.86 Associate in Nursingd an RMSE worth of zero.056 cm3/cm3 ar achieved at a worldwide scale, severally. moreover, the in depth temporal and abstraction variations of CYGNSS SM predictions ar evaluated.

In the Paper "Agricultural Soil Data Analysis Using Spatial Clustering Data Mining Techniques " [5] – Soil could be a crucial dynamic resource that supports vegetation. Soil data analysis can provide knowledge that is important for increasing nutrient use efficiency and agricultural productivity. it is a helpful gizmo for soil management and would possibly facilitate to cut back the onsite and offsite costs of erosion, improve water and nutrient use efficiencies, and confirm that the resource is sustained for future use. As degree unattended learning technique, spatial agglomeration has emerged to be one in each of the foremost important techniques at intervals the sphere of agriculture for soil data analysis. Soil properties (including physical, chemical, and biological properties) and thus the characteristics of the spatial soil data area unit first introduced. spatial agglomeration techniques area unit then summarized in five fully completely different categories.Soil data analysis practice spatial agglomeration is reviewed in four categories of agricultural applications: agricultural production management partitioning, comprehensive assessment of soil and land, soil and land classification, and correlation study for agro-ecosystem. the quality agglomeration algorithms usually work well, and prototype-based agglomeration ways that area unit further preferred in observe. Some machine learning models is any introduced into the spatial agglomeration algorithms for higher accommodation to various characteristics of soil dataset.

In the paper " Comparative Analysis of Soil Properties to Predict Fertility and Crop Yield using Machine Learning Algorithms "[6] - Agriculture is a vital a part of human lives. it's one in every of the most important supply of employment in India. More than 1/2 the population depend on agriculture. it's the backbone of our economy. Crop yield depends on several factors. one in every of the most important factors that have an effect on the yield of the crop is soil. Improvising the techniques to predict crop yield in several atmospheric condition will facilitate farmers and other stakeholders in higher higher cognitive process in terms of scientific agriculture and crop choice. Crop yield prediction includes foretelling the yield of the crop from previous historical knowledge that consists of things like temperature, humidity, pH, rain and crop name. It provides United States of America an inspiration for the best foreseen crop which can be cultivate within the field weather.In the planned work, a comparative analysis on soil properties to predict fertility and crop yield has been performed mistreatment machine learning algorithms. The analysis has been done on self –obtained dataset, for 3 crops - tomato, potato and chili. The crop yield prediction has been done mistreatment K Nearest Neighbour algorithmic program, Naïve Thomas Bayes algorithmic program and call Trees classifier.

III. PROPOSED SYSTEM

Soils area unit of assorted sorts and each soil kind will have totally different composition of minerals, humus, organic matter and may hold completely different characteristics supported that different crops area unit typically full-grown. an accurate soil take a look at can facilitate certify the applying of enough plant food to satisfy the requirements of the crop whereas taking advantage of the nutrients already gift at intervals the soil. Taking soil samples, Laboratory analysis of samples is incredibly long method for farmers. therefore we have got creating a system for soil analysis. The model has been tested by applying totally different forms of machine learning algorithms. SVM has given the best accuracy in soil classification. The planned model is even by a properly created dataset and machine learning algorithms. To estimate the wet content within the soil is one in all the foremost tough task for humans and robots, in packaging or segregation or choose and place operations.

Our objective is to help the farmers to know about fertility of the soil without testing the soil in laboratories. They can itself test the soil with the help of a smartphone . By just simply taking the picture of the soil they can get soil testing results in less time. From these results the farmer can know the fertility of the soil , pH value, and it will also recommend the crops which will be suitable in that soil. It will recommend what are the fertilizers are need to be used for the particular crop if we are cultivating in that soil. It shows the amount of fertilizers, pH value and other contents in the soil. It will recommend the crops which will give good yield in that soil and also recommend which all fertilizers are to be used for the soil. The proposed work is to develop a Machine learning based soil classification and crop recommendation system. A large data set of collected images in various categories is used to train the system. Collected data set is divided into training, validation and testing set for training and examining the framework. In the proposed system the images are acquired from the user. The images are received from the farmer via the Android Application developed exclusively for the service of the farmer and common men. The images are uploaded by the user by choosing the appropriate image of the soil or the piece of land picture from the Choose File option. The image uploaded by the farmer is processed by the model. Then image processing techniques are applied to extract useful features from the images, that are necessary for further analysis.

IV. METHODOLOGY

Soil Image Dataset and crop which is the main task of the project to collect the soil images .The dataset is consisting of different soil types and their features and different types of crops suitable for the soil. On this soil data we are training and testing the model for soil classification and crop Recommendation system. After collection the soil an crop data the next step is preprocessing. We can see it in the architecture [Fig.1]. Preprocessing, its main aim is to improve the quality of the images of the soils which we are taken using camera's etc.

ISSN No:-2456-2165

It is having different steps inside the preprocessing to format the image. Color correction, resizing etc . Then Data is spliting, To soil data and crop data. The soil data consist of the soil types and its properties, the crop data consist of which of the grow in that particular soil. Dataset Deviation Here the existing Data is taken for both Training and Testing of the data.

A. Architecture

In an large data set more number of data consisting of soil images and their features will undergo for Training the model. After the Training of the model only by using our we can predict the soil type and its features. And the remaining data will be used for testing the model which trained. This Data set of soil which will be divided for both the training and testing. In an large data set more number of data consisting of soil images and their features will undergo for Training the model. After the Training of the model only by using our we can predict the soil type and its features. And the remaining data will be used for testing the model which trained. The crop data set which will be also divided to both training and testing. In an large data set more number of data consisting of crop images and their details will undergo for Training the model. After the Training of the model only by using our we can predict the crop which can be cultivated in that soil. And the remaining data will be used for testing the model which trained.

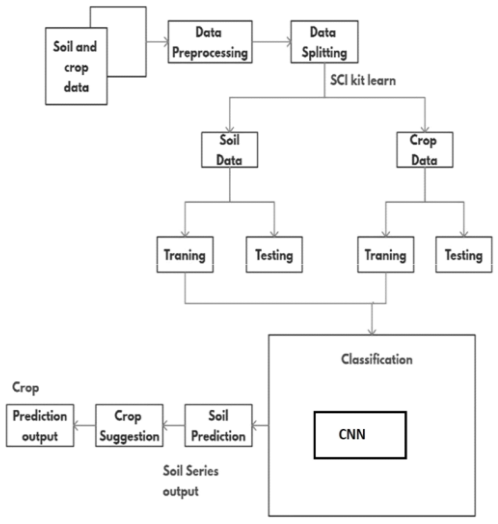

Fig. 1: Architecture of the application

B. Flowchart

The flowchart [Fig.2] which is able to show the flow of the method of our system. First it opens the applying and so image is taken and uploaded if the image isn't getting the standard the image are going to be retaken and again uploaded and processed. The soil image is processed so the soil type is predicted if not it'll be asked to retake the image of the soil. After predicting what form of soil it'll also predicts its features which can be usefull for the crop recommendation Then it'll predict the crop which can be suitable for that soil. Here both the predictions are done by different models. this can be the most flow of the system we had proposed.

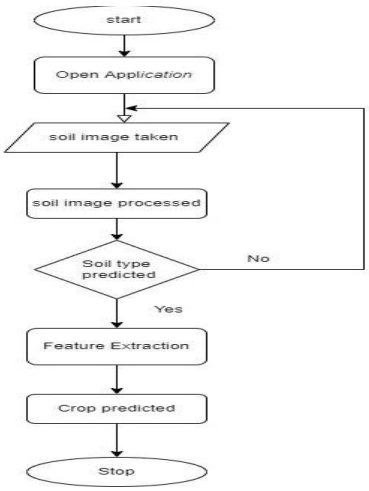

Fig. 2: Flowchart of the application

V. RESULT

Our product can give our farmers a better knowledge about the suitable crop for the land with ease of using of the product. It also gives better accuracy than existing systems. When we compared this product with another product it is proved that pH, nutrients predicted by the prodcut is more accurate than the that of another product. The temperature and humidity shown by the this product is alsmost same as the orginal temperature and humidity.

VI. CONCLUSION

Agriculture is that the major source for living for the people of India. Agriculture research is that the major source of economy for the country. To supply data for creating interpretations as to the adaptability of particular soils for agricultural purpose. For correct crop yield, farmers should bear in mind of the proper soil type for a specific crop, which affects the increased demand for food. There are different laboratory and field methods to classify soil, but they also have limitations. So There's a requirement of computer-based soil classification techniques which can help farmers and won't take plenty of time.

REFERENCES

[1.] Laishram, Joyalata Saxena, Krishna Maikhuri, Rakesh Rao, Kottapalli. (2012). Soil quality and soil health: A review.. International Journal of Ecology and Environmental Sciences. 38.

[2.] G. Mariammal , A. Suruliandi , S. P. Raja , and E. Poongothai, "Prediction of Land Suitability for Crop Cultivation Based on Soil and Environmental Characteristics Using Modified Recursive Feature Elimination Technique With Various Classifiers ", IEEE TRANSACTIONS ON COMPUTATIONAL SOCIAL SYSTEMS, VOL. 8, NO. 5, OCTOBER 2021.

[3.] Priyanka Das, Sarmistha Paul, Satya Sundar Bhattacharya, and Pabitra Nath ," Smartphone-Based Spectrometric Analyzer for Accurate Estimation of pH Value in Soil" ',IEEE SENSORS JOURNAL, VOL. 21, NO. 3, FEBRUARY 1, 2021.

[4.] Shuanggen Jin , Haolin Chen, Qingyun Yan , Patrizia Savi , Yan Jin , Yan Jia, and Yuan Yuan , "Temporal-Spatial Soil Moisture Estimation from CYGNSS Using Machine Learning RegressionWith a Preclassification Approach" ,*IEEE*. IEEE JOURNAL OF SELECTED TOPICS IN APPLIED EARTH OBSERVATIONS AND REMOTE SENSING, VOL. 14, 2021.
[5.] Hongju Gao ," Agricultural Soil Data Analysis Using Spatial Clustering Data Mining Techniques ", 2021 IEEE 13th International Conference on Computer Research and Development.
[6.] Pranay Malik, Sushmita Sengupta, Jitendra Singh Jadon, " Comparative Analysis of Soil Properties.
[7.] Predict Fertility and Crop Yield using Machine Learning Algorithms " , 2021 11th International Conference on Cloud Computing, Data Science & Engineering (Confluence).
[8.] Jie Ren , Jing Liang , and Yuanyuan Zhao " Soil PH Measurement Based on Compressive Sensing and Deep Image Prior " , IEEE TRANSACTIONS ON EMERGING TOPICS IN COMPUTATIONAL INTELLIGENCE, VOL. 4, NO. 1, FEBRUARY 2020.
[9.] Vitalik Buterin, Evgeniou, Theodoros Pontil, Massimiliano. (2001). Support Vector Machines: Theory and Applications. 2049. 249-257. 10.1007/3-540-44673-712.
[10.] M. Gopal P S and B. R, "Selection of important features for optimizing cropyield prediction," Int. J. Agricult. Environ. Inf. Syst., vol. 10, no. 3, pp. 54–71,Jul. 2019.
[11.] F. Balducci, D. Impedovo, and G. Pirlo, "Machine learning applications on agricultural datasets for smart farm enhancement," Machine, vol. 6, no. 3, pp. 38–59, 2018.