iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** V **Month of publication:** May 2022

DOI: https://doi.org/10.22214/ijraset.2022.43524

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue V May 2022- Available at www.ijraset.com

Soil Classification and Crop Suggestion using Machine Learning Techniques

Saurabh Gaikwad[1], Ajay Aiwale[2], Vishwanath Rekade[3], Vishwas Kalunge[4]
[1, 2, 3, 4]*Dept of Information Technology Engineering, JSCOE, Savitribai Phule Pune University, Pune, Maharashtra, India*

Abstract: ***Soil is important to humans and all living things on earth because it acts as the root source for agriculture, food and medicine. Soils are of different types and each soil type can have different composition of minerals, humus, organic matter and can hold different characteristics based on which different crops can be grown. So we need to know the features and characteristics of various kinds of soils of different places to understand which crops grow better in certain soil types in different climatic conditions and what kind of fertilizers/ pesticides can be added to make the crop grow healthily. So we've proposed a system which can be a great use to the farmers and common public to predict what kind of crops can be grown for different types of soil series based on agricultural data analysis using machine learning techniques and image processing***
Keywords: Soil, Crop, Agriculture, crop recommendation, soil classification, machine learning

I. INTRODUCTION

Agriculture is a source of livelihood in most parts of the world. Agricultural produce is of great importance. But in recent years, the agricultural produce is gradually decreasing. Soil plays a crucial role in agriculture. Soil consists of nutrients, that are used by the plants to grow. There are different types of soils available and each having different properties. Crop's productivity is mainly based on the type of soil. The possible way to improve productivity is that we choose a right crop for the right land type. This can be done by first analysing the soil then classifying it into different soil groups. Based on these soil groups and the geographical conditions, one can decide which crop is best suited and is beneficial. The traditional methods are Costly, long process and also time consuming. Hence, there is a need for new technologies and methods to enhance the existing system in order to get faster and better results. Machine learning is one of the budding technologies in the field of agriculture. Machine Learning can be used to improve the productivity and quality of the crops in the agricultural sector. It can be used to find patterns among
the agricultural data and classify it into a more meaningful data. This data can be used for further processes. Machine learning techniques usually follows the following procedure: collecting data, processing the data, training Testing of data samples. The algorithm such as SVM can be used for classification of soil and crop prediction based on previous patterns followed and the type of the soil. The project requires the following datasets: soil dataset with several chemical properties has its features and crop dataset with geographical attributes as its features. The project aims at creating a model that efficiently classifies the soil instances and map the soil type to the crop data to get better prediction with higher accuracies. Soil prediction involves types of crop classifications and geographical attributes. It also aims at creating a system that processes the real-time soil data to predict the crops with higher accuracy. The model involves two phases: training phase and testing phase. Two datasets are used: Soil dataset and crop dataset. The predicted and actual classes are compared and the list with correct classes is obtained.

II. BODY OF PAPER

The system uses the soil series data obtained by Soil Resources Development Institute (SRDI) of Bangladesh. The group of soils which is formed from the same kind of parent materials and remains under the similar
conditions of drainage, vegetation time and climate forms the soil series. It also has the same patterns of soil horizons with differentiating properties. Each soil series were named based on its locality. The main purpose of this system is to create a suitable model for classifying various kinds of soil series data along with suitable crops suggestion for certain regions of Bangladesh. In this paper, they have worked on 9 soil series datasets obtained from six upazillas of Khulna district, Bangladesh. The dataset considered had 383 samples with 11 classes. The crop database was created by considering the Upazilla codes, map units and class labels. The method involved two phases: training phase and testing phase. Two datasets were used: Soil dataset and crop dataset. Soil dataset contains class labelled chemical features of soil. The system follows an architecture as seen in Fig2.1.1. The machine learning methods were used to find the soil class.

Three different methods used were: weighted K-NN, Gaussian Kernel based SVM, and Bagged Tree. Weighted KNN: KNN uses all training data, since weighting is used. The nearest neighbours are given more weightage than the farther ones. The distance is calculated and the majority of such classification is taken as the final classification. The obtained accuracy of the classification using KNN was 92.93 % Gaussian Kernel based SVM: SVM separates the objects of classes into different decision planes. A decision boundary separates the objects of one class from the object of another class. Support vectors are the data points which are nearest to the hyper-plane. Kernel function separates the non linear data by transforming the inputs to higher dimensional space. In this project they have used gaussian kernel function. The accuracy obtained using SVM was 94.95%

After classifying the soil series, the crops, that are suitable for that series for the given map unit of corresponding upazilla were suggested. The results inferred that K-NN and Bagged tree showed comparative accuracy, but SVM outperforms the other two algorithms and produces an accuracy of 94.95%. The system was able to achieve an average accuracy of 92.93%.

III. PROPOSED METHODOLOGY AND DISCUSSION

Proposed Algorithm of SVM_GWO . The objective of this study is to increase the accuracy of prediction model by using different parameters for future precision agriculture. The data set has been taken from Food agriculture organization and applied to the processing model through map reduce. To process the big data, map reduce is used to minimize the time of execution and further classification is done. Feature selection and extraction are important steps in classification systems. This paper presents a hybrid model i.e. SVM_GWO that uses a combinational approach for improving the classification accuracy, recall, precision, f-measure by selecting the optimal parameters settings in SVM. In this classification we have extract the feature vector with minimum error and converge and then SVM_GWO is developed for selecting the optimal SVM parameters. Result show that the proposed approach is better than the typical SVM classification algorithm with classification accuracy 77.09%, precision 75.38%, recall 74.189% and f measure 73.15%.

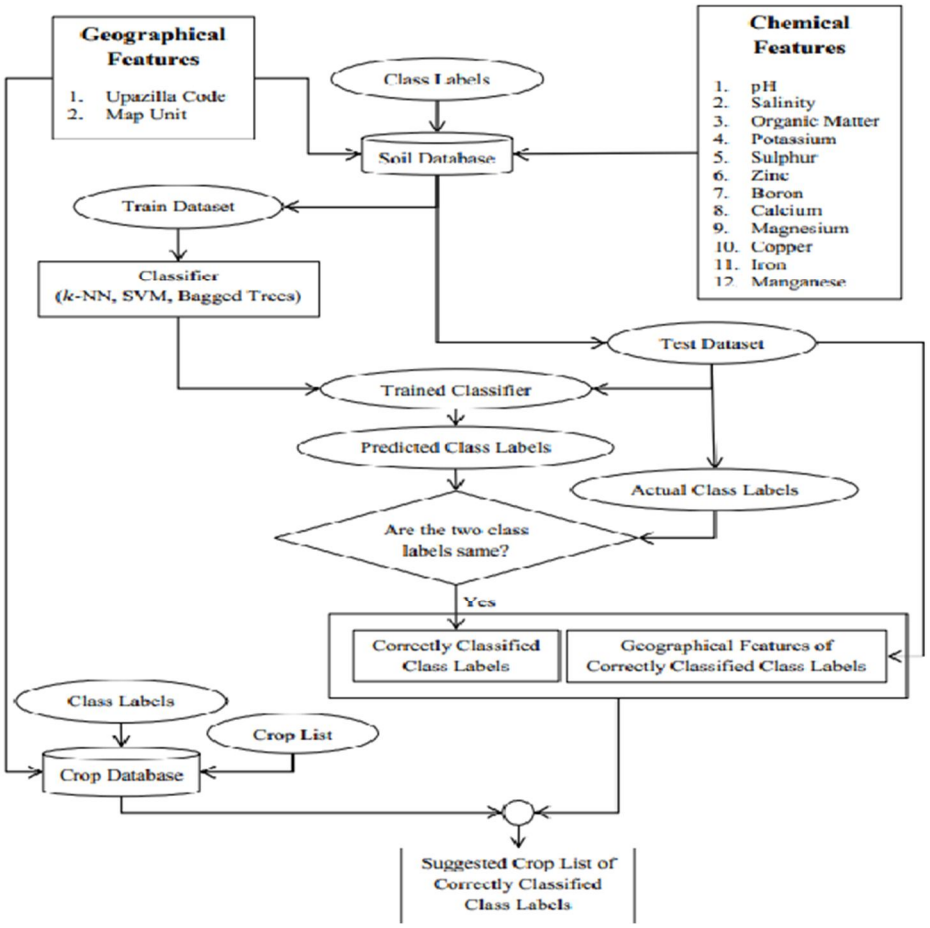


Fig -1: Figure

IV. SMART FARMING PREDICTION USING MACHINE LEARNING

Agriculture is one of the major game changer and a major revenue producing sector in India. Different seasons, market and Biological Patterns influence the crop production ,but because of changes in these patterns result in an excellent loss to farmers .This factors can be minimized by using a suitable approach related to the knowledge of soil types ,pressure ,suitable weather, crop type. whereas, weather and crop types and be predicated using useful dataset that can aid to farmers by predicting the maximized profitable crops to grow. These paper mainly focus on the algorithms used to predict crop yield ,crop cost prediction. With the help of all these features smart farming can be achieved.

V. SOIL DATA ANALYSIS USING CLASSIFICATION TECHNIQUES AND SOIL ATTRIBUTE PREDICTION

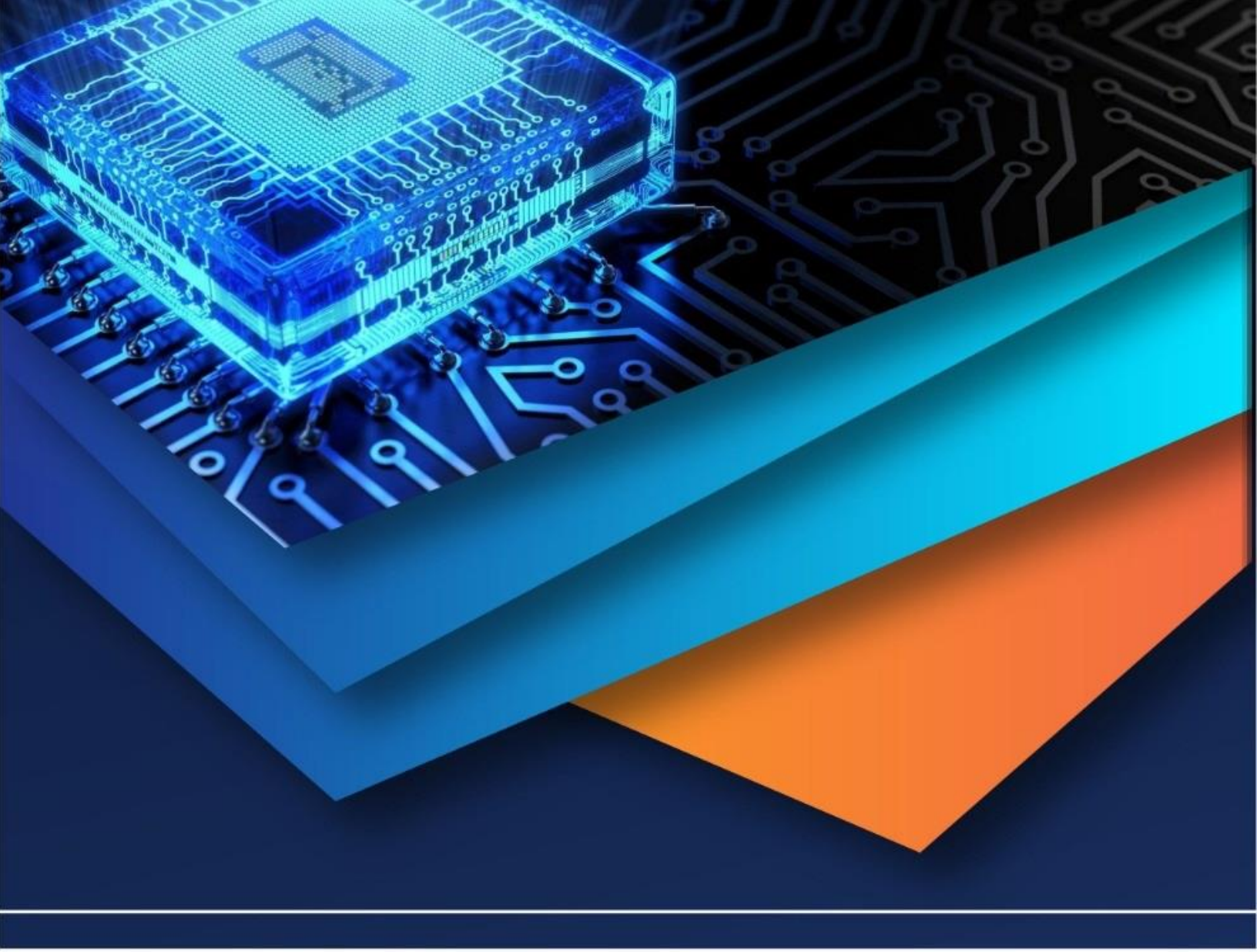
Agricultural research has been profited by technical advances such as automation, data mining. Today ,data mining is used in a vast areas and many off-the-shelf data mining system products and domain specific data mining application soft wares are available, but data mining in agricultural soil datasets is a relatively a young research field. The large amounts of data that are nowadays virtually harvested along with the crops have to be analysed and should be used to their full extent. This research aims at analysis of soil dataset using data mining techniques. It focuses on classification of soil using various algorithms available. Another important purpose is to predict untested attributes using regression technique, and implementation of automated soil sample classification.

VI. CONCLUSIONS

An application of classifying the soil types and providing the necessary crop suggestions for the classified soil series. The proposed work will benefit farmers to maximize productivity in agriculture, reduce soil degradation in cultivated fields, and reduce fertilizer use in crop production by recommending the right crop considering various attributes. The proposed work
aids framers to accurately select the crop for cultivation and attain sustainability

REFERENCES

[1] Gholap, J., Ingole, A., Gohil, J., Gargade, S. and Attar, V., 2012. Soil data analysis using classification techniques and soil attribute prediction. arXiv preprint arXiv:1206.1557.
[2] James O. Hortle, 2018. Alzheimer's Disease and Support Vector Machines: An Introduction to Machine Learning.
[3] Heejong Suh, Daehyon Kim* and Changsoo Jang, 2018, Heejong Suh, Daehyon Kim* and Changsoo Jang. [4] Amos Baranes, Rimona Palas , 2019, Earning Movement Prediction Using Machine Learning-Support Vector Machines (svm).



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY