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Crop Recommendation System for Precision Agriculture Using ML.

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ABSTRACT - India is agricultural country in India there are many farmers. but still it has very less productivity .crop recommendation or prediction system used to predict suitable crop on the basis of input provided by user such as moisture ,PH level ,NPK values ,Temperature , rainfall.to build model we use supervised ML algorithms such as Logistics regression ,Random Forest , decision trees etc.

KEY WORDS: Machine Learning, SVM Algorithm, RandomForest, Logistic regression, Anaconda, Decision Tree.

INTRODUCTION

India is agricultural country in ,India there are many farmers but they have low productivity. we overcome that problem we a ML that can recommend crop on the basis of soil constraint such as(NPK values ,rainfall ,PH level).Precision agriculture is the technology which can recommend crops using various ML algorithms random forest , decison tree, Logistic regression. Precision agriculture is the technology of "site-specific" farming. it provide output on the basis of input provide user. Although precision agriculture has delivered better improvements it is still facing certain issues.

In order to resolve issues regarding crop selection. The "site-specific" technique has improved the results yet there is a need to supervise the results of such systems. Not all precision agriculture systems provide accurate results. But in agriculture it is important that the recommendations made are accurate and precise because in case of errors it may lead to heavy material and capital loss.

LITERATURE SURVEY

A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews use secondary sources, and do not report new or original experimental work.

1.Paper name: Crop Recommendation System for Precision Agriculture
Author: Ying Zhu, MS, Geoffrey S. Young, MD, Zhong Xue, PhD, Raymond Y. HuanS.Pudumalar*, E.Ramanujam*, R.Harine Rajashree´n, C.Kavya´n, T.Kiruthika´n, J.Nisha´n.

Data mining is the practice of examining and deriving purposeful information from the data. Data mining finds its application in various fields like finance, retail, medicine, agriculture etc. Data mining in agriculture is used for analyzing the various biotic and abiotic factors. Agriculture in India plays a predominant role in economy and employment. The common problem existing among the Indian farmers are they don't choose the right crop based on their soil requirements. Due to this they face a serious setback in productivity. This problem of the farmers has been addressed through precision agriculture. Precision agriculture is a modern farming technique that uses research data of soil characteristics, soil types, crop yield data collection and suggests the farmers the right crop based on their site 6 "Crop Recommendation System For Precision Agriculture In ML.."

2.Paper name: Crop Recommendation System to Maximize Crop Yield using Machine Learning Technique
Author: : Rohit Kumar Rajak1, Ankit Pawar2, Mitalee Pendke3 , Pooja Shinde4, Suresh Rathod5, Avinash Devare
Agriculture in India plays a major role in economy and employment. The common difficulty present among the Indian farmers are they don't opt for the proper crop based on their soil necessities. Because of this productivity is affected. This problem of the farmers has been solved through precision agriculture. This method is characterized by a soil database collected from the farm, crop provided by agricultural experts, achievement of parameters such as soil through soil testing lab dataset. The data from soil testing lab given to recommendation system it will use the collect data and do ensemble model with majority voting technique using support vector machine (SVM) and ANN as learners to recommend a crop for site specific parameter with high accuracy and efficiency.

3.Paper name: Machine Learning based Crop Recommendation System for Local Farmers of Pakistan.
Author: Sayed Mazhar Ali1 ; Bhagwan Das2*; Dileep Kumar3,1Department of Electronic Engineering, Quaid-e-Awam University of Engineering, Science and Technology, Nawabshah, Sindh,
Pakistan Farming is one of the most fundamental and generally rehearsed work in Pakistan and it plays an imperative part in fostering the country. In Pakistan, the most part of the land is used for agriculture cultivation to meet the desires of nearby people and export want as properly. Therefore, the need of increasing crop production is the significant challenge for farmers. Crop cultivation anywhere in the world depends on the climate so called seasons and soil properties, however, the enhancing the production of crops depend on various factors like mainly on temperature.

METHODOLOGY

The Used Crop data set was taken and data processing has done to filter the data and to remove some unnecessary data. The model was trained with the processed data using the linear regression algorithm to predict the crops with higher accuracy. Fig 1 shows the structured outline for proposed Methodology.

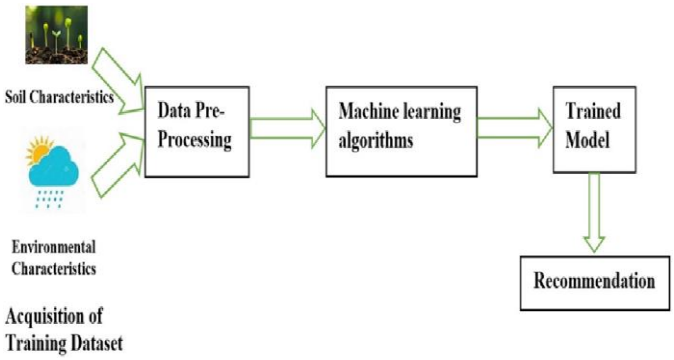


Fig 1: Structured outline of Proposed system

A) Dataset Collection

It is the process of gathering the information from the source for the evaluation. The crop data set is collected from a website Kaggle which is in a CSV format.

B) Data Preprocessing

Data preprocessing plays a crucial in developing a crop recommendation system for precision agriculture in machine learning. The goal of data preprocessing is to prepare and transform the raw data into a suitable format for machine learning algorithms. Here are some key steps involved in data preprocessing for a crop recommendation system.

Data Cleaning : Clean the collected data to handle missing values, outliers, and inconsistencies. Missing values can be imputed using techniques like mean imputation, median imputation, or using advanced imputation algorithms.

Feature Selection : Analyze the collected data to identify the most relevant features that contribute to crop recommendations. This step helps reduce the dimensionality of the dataset and improve model performance.

The preprocessed data set except the target variable is assigned to the variable 'X'.

After all preprocessing steps have done, the data was shown as in figure Fig

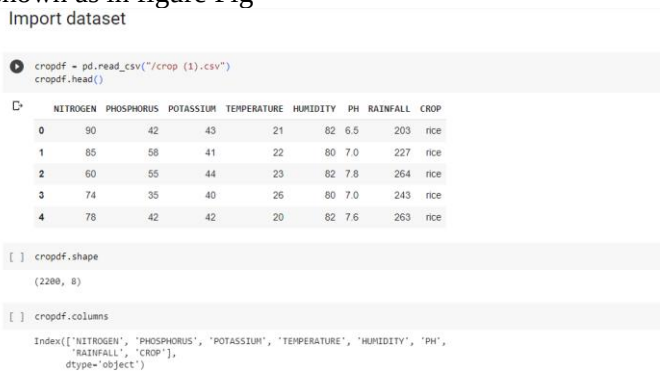


Fig 1:Data preprocessing

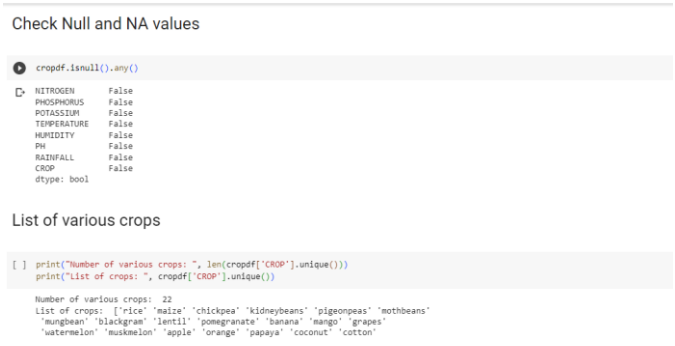


Fig 2:Data preprocessing

1) SVM Algorithm:

In machine learning, support-vector machines (SVMs, also support vector networks[1]) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. The Support Vector Machine (SVM) algorithm is a popular machine learning tool that offers solutions for both classification and regression problems. Developed at AT&T Bell Laboratories by Vapnik with colleagues (Boser et al., 1992, Guyon et al., 1993, Vapnik et al., 1997), it presents one of the most robust prediction methods, based on the statistical learning framework or VC theory proposed by Vapnik and Chervonekis (1974) and Vapnik (1982, 1995). Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a

model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier (although methods such as Platt scaling exist to use SVM in a probabilistic classification setting). An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on the side of the gap on which they fall.

2) KNN Algorithm:

K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories .K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm .K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems .K-NN is a **non-parametric algorithm**, which means it does not make any assumption on underlying data.it is also called a **lazy learner algorithm** because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset .KNN algorithm at the training phase just stores the dataset and when it gets new data, then it classifies that data into a category that is much similar to the new data.

3) Logistic Regression:

Logistic Regression was used in the biological sciences in early twentieth century. It was then used in many social science applications. Logistic Regression is used when the dependent variable(target) is categorical .For example ,To predict whether an email is spam (1) or (0) .Whether the tumor is malignant (1) or not (0)Consider a scenario where we need to classify whether an email is spam or not. If we use linear regression for this problem, there is a need for setting up a threshold based on which classification can be done. Say if the actual class is malignant, predicted continuous value 0.4 and the threshold value is 0.5, the data point will be classified as not malignant which can lead to serious consequence in real time .From this example, it can be inferred that linear regression is not suitable for classification problem. Linear regression is unbounded, and this brings logistic regression into picture. Their value strictly ranges from 0 to 1.

4) Decision Tree

Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

In a Decision tree, there are two nodes, which are the Decision Node and Leaf Node. Decision nodes are used to make any decision and have multiple branches, whereas Leaf nodes are the output of those decisions and do not contain any further branches.

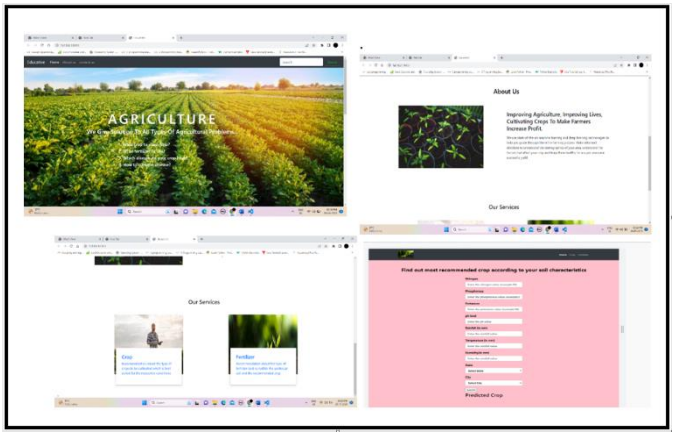
The decisions or the test are performed on the basis of features of the given dataset.

It is called a decision tree because, similar to a tree, it starts with the root node, which expands on further branches and constructs a tree-like structure.

In order to build a tree, we use the CART algorithm, which stands for Classification and Regression Tree algorithm.

A decision tree simply asks a question, and based on the answer (Yes/No), it further split the tree into subtrees.

RESULTS



CONCLUSION

Our work would help farmers to increase productivity in agriculture, prevent soil degradation in cultivated land, and reduce chemical use in crop production and efficient use of water resources.

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