Intelligent Crop Recommendation System using Machine Learning

Tejal Survase[1], Siddhi Velapure[2], Mayuri Swami[3], Ratan Kore[4], Prapti Atkale[5].

[1]SVERI's College of Engineering, Pandharpur, Punyashlok Ahilyadevi Holkar, Solapur University

Solapur, Maharashtra, India

Abstract : India is the second-largest agricultural producer and 7th largest exporter of agricultural goods. India is a global agricultural powerhouse. Around 70% of people in India directly or indirectly depend on agriculture. Due to a lack of knowledge about better crop yielding in different technology, the farmers gain less profit. Because of less knowledge about technologies, farmers are not getting the expected profit. Because of choosing the incorrect or wrong crop, the crop may get a failure. The problems like soil erosion and choosing the wrong crops without knowing the soil requirements for the crop, climatic conditions, soil properties, and rainfall all cause serious setbacks in productivity, and because of this, a farmer commits to suicide. This paper introduces a technology called machine learning which plays a vital role in agriculture. By using machine learning algorithms farmers can solve lots of problems related to farming. Knowledge-based agriculture can improve the sustainable productivity and quality of the crop.

1. Introduction :

India is one among the oldest countries which is still practicing agriculture-is one of the most significant sources of income, employing around 58 percent of our country's population. Sometimes decision of farmers about selecting crop to cultivation is generally clouded by his instinc and further peripheral component like making immediate profits, lack of acknowledgement about market stipulation, overestimating a soil's capability to hold up a particular crop, and so on. The main purpose of this research paper is to deliver the solution in terms of technology which helps us to reach the right way for predicting the crop. The objective of this research paper would to be motive the algorithm that gives recapitulation of superior ways of machine learning.

2. Literature Survey :

[1] S.Pudumalar*, E.Ramanujam*, R.Harine Rajashreeń, C.Kavyań, T.Kiruthikań, J.Nishań. :: In a country like India in which agriculture plays a dominant role. The prosperity of the farmers prospers the nation. Thus our work would help farmers in sowing the right seed based on soil requirements to increase productivity and acquire profit out of such a technique. Thus the farmers can plant the right crop improving their income and also increasing the gross productivity of the state. Our future work is focused on an upgraded data set with a large number of attributes and also implements yield prediction.

[2] Shikha Ujjainia, Pratima Gautam, S. Veenadhari :: From the above analysis, it has been concluded that technology has achieved that level of competency by which agriculture can easily predict crop-yielding production. Machine learning technology proposed the model integrated form of a concept called as ensemble method that eliminated the loopholes existing in the prediction process for crops. By estimating the different parameters of biosystems has been recognized that the technology used for making the crop yielding prediction device is very much variegated. The parameters of biosystems vary concerning changing location and a single concept of algorithm is not sufficient to fulfill the requirement of crop prediction. Therefore, ensemble algorithm was found to be the best technique for crop prediction if consider the device to be used in the Universal context.

[3] Mahendra Choudhary, Rohit Sartandel, Anish Arun, LeenaLadge SIES Graduate School of Technology, Maharashtra, India Corresponding author: Rohit Sartandel, Email: rohit.sartandel18@siesgst.ac.i :: At present, our farmers are not using technology and analytics productively, so there is a probability of fallacious crop selection for cultivation, which will reduce their income. To fend off such dropping, we have developed a farmer-friendly system with a graphical user interface (GUI) that will predict which crop would be the best fit for a specific plot of land. This system will also furnish details on the essential nutrients to add to the soil and help them to pick out crop diseases. As a result, farmers are more likely to make the proper decisions for crop selection, and farmers will benefit from earning more profits. With the help of more composite algorithms, the efficiency of the model can be increased. To boost the efficiency of crop selection and yield, incorporate the crop recommendation system with yield prediction. By increasing the dataset's size and by including more crop information and pictures of infected plants, the efficiency of the model can be increased.

3. Comparatively study :

Sr.no.	Name of researcher, year of publication	Paper titles	Methodology Adopted / Modules Used	Observation Noted
1.	Prof. Rakesh Shirsath, 2017	Agriculture decision support system using data mining	1.Subscription based system 2.ANN	1.Android app with a login module 2.Previously planted crops.
2	Miftahul Jannat Mokarrama, 2017	RSF:A Recommendation System for Farmers	1.Location Detection 2.Data analysis and Storage 3.similar location detection 4. Recommendation generation module	1.Physiographic, thermal, crop growing periods, crop production rate 2.Seasonal crop database 3.Generating the set of crops 4.similarity between the crops planted in a region.

3	S.Pudmalar, E.Ramanujam,2016	Crop Recommendation system for precision Agriculture	1.Random tree 2.CHAID 3.KNN 4.Naive Bayes 5.WEKA tool	1.Pre-processing of data 2.Handling missing and out-of-range values 3.Feature extraction 4.Ensemble model to get higher accuracy 5.Rule generation.
4	ShrutiMishra Priyanka Paygude, 2018	Use of Data Mining in Crop Yield Prediction	1.J48 2.LAD tree 3.LWL 4.IBK algorithm	1.WEKA tool 2.LAD tree showed the lowest accuracy 3.Errors can be minimized by pruning the tree 4.IBK was observed to achieve higher accuracy.
5	Ji-chun Zhao, Jian-xin Guo,2018	Big Data Analysis Technology Application in Agricultural Intelligence Decision System	1.Inference engine 2.Domain expertise 3.Knowledge engineering 4.Knowledge acquisition module 5.Knowledge base for recommendation system	1.Large database of crops 2.Processed using Hadoop 3.Professional knowledge 4.Past experiences 5.Feature selection using Hadoop with Artificial Neural Networks.

4. Methodology :

To terminate the aforementioned drawbacks, we propose an Intelligent Crop Recommendation system which takes into consideration all the appropriate parameters Including temperature, rainfall, location, and soil condition, to predict crop suitability. This system is fundamentally concerned with performing the primary function of an Agro Consultant, which is, providing crop recommendations to farmer's algorithms. We also provide the profit analysis on crops grown in different states which gives the user an easy and reliable insight to decide and plan the crops.

SVM :

Support Vector Machine i.e. SVM is one of the prominent Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, mostly it is used for Classification problems in Machine Learning. The target of the SVM algorithm is to produce the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily set down the new data point in the right category in the future. This decision boundary is called a hyperplane.

SVMs are used in applications like intrusion detection, email classification, gene classification, handwriting recognition, face detection, and in web pages. This is one of the cause we use SVMs in machine learning. It can pick up both classification and regression on linear and non-linear data.

Random Forest :

Random Forest is a supervised ensemble machine learning algorithm used in both classifications as well as regression problems. It contains various decision trees and an average of them is taken so as to give the output. It is based on the concept of bagging wherein multiple decision trees are created and an average of them is taken so as to give the output. As decision trees are prone to overfitting, random forest is useful in reducing the effect of overfitting and hence giving a more accurate output.

Decision Tree :

Decision Tree is one of the most popular machine learning algorithms used mostly in classification problems but can also be used for regression types of problems. The working of it is based on a simple technique, wherein a yes/no question is asked and according to the answer the tree is split into smaller nodes. The split of the nodes can either occur by calculating Gini impurity (calculates the measure of impurity) or information gain (calculates the change in the entropy). Decision Trees are prone to overfit and hence The next step is building the machine learning model. While building the machine learning model, first we need to split our dataset into 2 parts i.e.: training data and test data. We have split the data in the ratio of 70-30. Taking the training data, we apply our machine learning algorithms to the features of the dataset. We have used 4 machine learning algorithms on our training dataset and the algorithms that give us the highest accuracy will be selected on the test dataset.

Logistic Regression :

Logistic Regression is one of the simplest algorithms in machine learning. It is used for solving classification problems. It uses a sigmoid function to mathematically calculate the probability of an observation and accordingly, the observation is then put into its respective class. While calculating, the probability of an observation is 0 or 1, a threshold value is decided upon and classes having probabilities above the threshold value are given the value 1 and classes having values below the threshold are given the value 0.
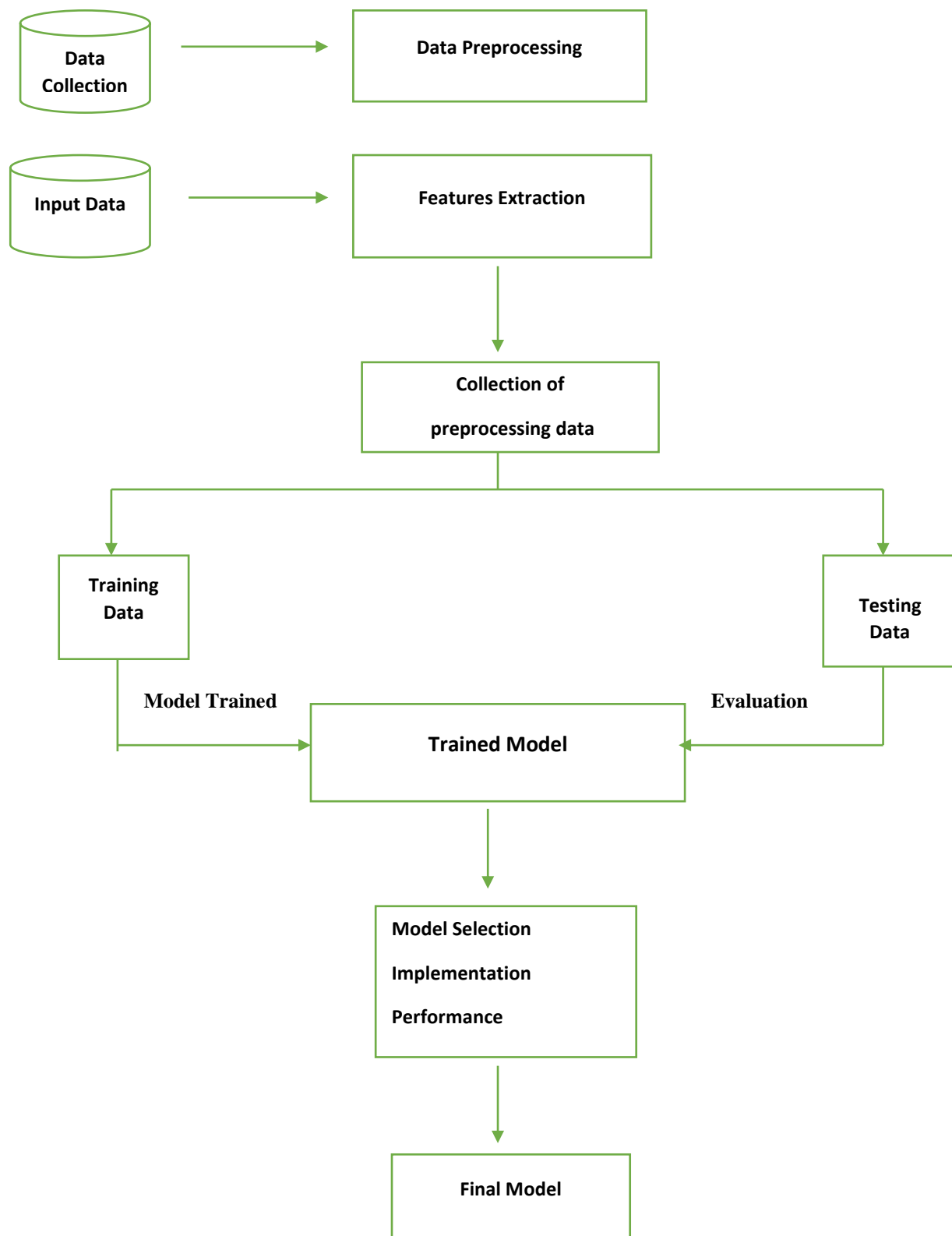
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Fig : System Architecture

5. conclusion :

The intelligent crop recommendation system using machine learning helps the farmer to choose the right crop and to earn the expected benefit. This system is user-friendly with the help of this system the farmers will get lots of farming knowledge to yield a good crop and this will lead to development in agriculture and fewer suicides of farmers. The technology used in agriculture is the best real-world application of machine learning to provide better farming results. Further development of crop would also provide farmer an estimate of production if he plants the recommended crop.

6. References:

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[3]https://www.publications.scrs.in/uploads/final_menuscript/7e6d4680313ad60e32d6e3f82d981a8e.pdf

[4]https://www.researchgate.net/publication/335799151_Crop_Recommendation_System_for_Precision_Agriculture

[5]https://www.researchgate.net/publication/343730263_Crop_yield_prediction_using_machine_learning_A_systematic_literature_review

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