

Prediction of Crop Yield Using LS-SVM

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Abstract— Agriculture sector is the backbone of Indian economy. Yield prediction of crop is very important problem in agriculture field. Predicting the yield is very popular among farmer nowadays, which especially contributes to the correct choice of crop for growing. Earlier, crop production was implemented by considering the farmer's experience on an appropriate field as well as crop. Information technology has an important area to predict the crop production because it includes the latest advancement. In this paper, our aim is to develop the system to achieve high accuracy and resolve the problem of yielding in agriculture. We use the LS-SVM and deep neural network learning technique to predict the yield of crop based physical and chemical feature of plant and soil. This system helps the farmer to take the right decision about sowing particular crop in available land.

Keywords-crop yield, LS-SVM, Deep Neural Network learning

I. INTRODUCTION

In India, Agriculture is the most important history. It is the backbone of Indian economy and gives the 10-15% gross product development to it. Yield prediction is the major problem in agriculture. Most of the farmers are not getting the expectable yield of crop for various reasons. Every farmer is excited with knowing, how much yield he is going to anticipate. Earlier, predict the yielding of crop was implemented through the farmer's experience on particular crop and field. Examine that information are accessible for frequently to the back, where the comparing yield expectation have been recorded. Data mining technique that training the information is to be gathered from some time back to the past and accumulated information is utilized as a part of terms of preparing which must be exploited to figure out how to arrange future yield forecasts. Various techniques were suggested for mining the information or data throughout the years. The real problem in agriculture field is the information obtaining and efficient learning exploitation. Agriculture is a rare crop production is dependent on various economy and weather factor. The agriculture yield of the crop is mainly based on climate situation and soil properties. Salinity is the most significant climate issues. Aggregation of extensive measure of salt can decrease the productivity of yielding of crop, effectiveness of water system, demolish soil system and other soil properties. The dominant salts which aggregate in soils are magnesium, ph range, potassium, carbonate, phosphorus and so on. For example:- assume farming on cotton, we could focus the farmer having less water and human assets. Subsequently the farmer having constant supply of water and mean temperature is applicable for paddy and also rainfall situation additionally impact on rice cultivation and. The amount of data is available in agriculture field and it is used for various purposes. In this paper, the farmer's needs a timely instruction to predict the future yield of crop and an analysis is to be done as to support the farmer's to increase the yield of crop in the agriculture field. In recent year, various development applications have offer new requirement and technique for information technology. Information technology

has turned out to be increasingly a part of our everyday life, particularly for agriculture.

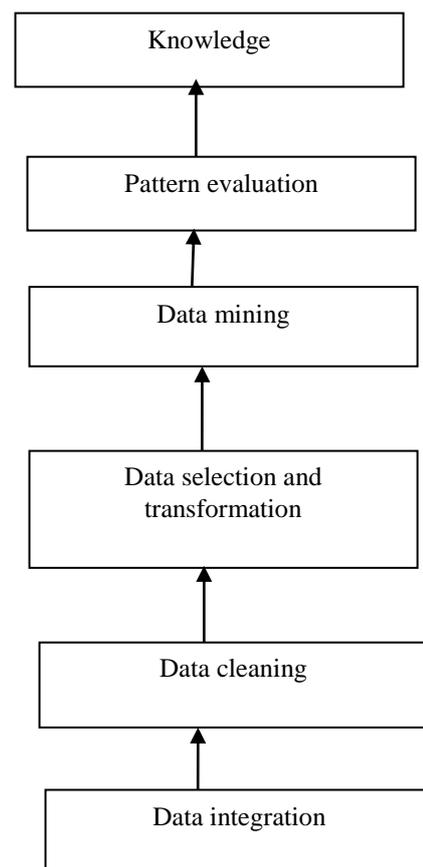


Figure:- Knowledge Discovery in Database Process

In agriculture, data mining is moderately research field. Data mining is useful for analyse the large database and provide valuable classification and pattern in the data set. The overall purpose of the data mining technique is used to extract

the data from a large database and transfer it into reasonable framework for further utilize.

In this paper our main focus is to develop system that helps the farmer to take the right decision for sowing the particular crop on available land. This work use two techniques such as LS-SVM and deep neural network learning to predict the yield of crop based on available data set and resolve the problem of yielding in agriculture.

II. METHODOLOGY

In this paper, develop the system using MATLAB Software. It is the programming language implement by MathWorks and is simple and easy way to make learning fast and efficient. Data is collected from various resources. Data mining classification techniques is used to predict the crop yield in agriculture field. Second step is implemented to extract the feature from database. Next step, apply the classifier used to train and test the input data of crop and soil. The model then classifies all the crop parameter and soil characteristics from input value. Then it finds the type of crop, time duration and name of pesticide based on physical and chemical feature of soil and crops and show the result.

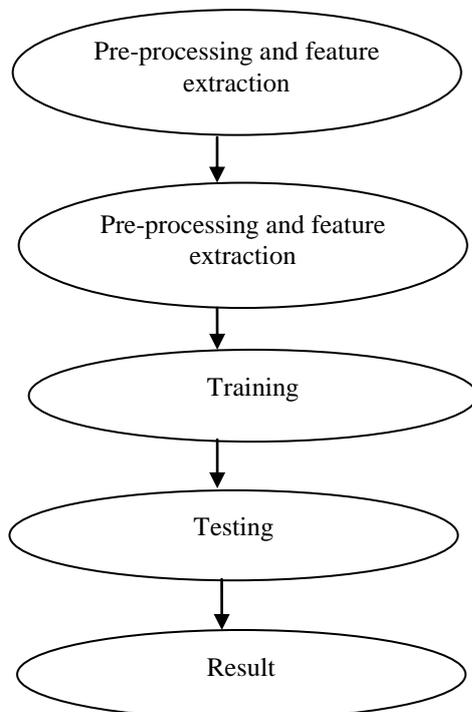


Figure:-Flow diagram of different steps for yield problem

A. Least Square Support Vector Machine (LS-SVM)

LS-SVM are least square form of SVM (Support Vector Machine), which are an arrangement of supervised learning techniques that analysis information and perceive pattern, and that are used as classification and regression analysis. LS-SVM technique is suggested for large scale problem. LS-SVM method is applied and it included various step. First step is to initiation and the tune the data. Then this method is used to train and test the input data. This algorithm is help to predict the category of crop based on physical and chemical characteristics of crop and soil.

B. Deep Neural Network Learning

Deep Learning (also called organization learning) is part of large extensive class of machine learning strategies depends on learning data or information representation rather than particular task algorithm. Learning can be either supervised or unsupervised. Deep learning structure for example deep belief networks, recurrent neural network and deep neural network have been employ to field consists of computer version, social network separating where they delivered result equivalent to and in some case again better than human specialists. Deep neural network learning technique use to automatic feature extract without human interference. In this method, these systems learn to perceive relationship between significant features and produce excellent results.

1. *Data collection:-* Soil data and rainfall of crop is collected from Punjab Agriculture university of Ludhiana and another feature of crop is collected from online sites of agriculture. Input data is compared to original data which classifier has been conducted. Data includes the physical and chemical feature of plant and soil.
2. *Pre-Processing Phase:-* Pre-processing is very important step in data mining. In pre-processing phase includes insert the missing value, proper range of data and then extract the feature. The quality of data set is very important process for analysis.
3. *Feature extract:-* Feature extraction requires the simplifying the number of data that contains to represent a huge data set. The feature of soil and crop are extracted in pre-processing phase is the final training set. These features include the physical and chemical characteristics of crop and soil.
4. *Processing Phase:-* Processing Phase, The final data set are formed in pre-processing are processed by LS-SVM and deep neural network learning techniques. This phase includes the training and testing input data.

(A) *Training:-* Classifier is used to train the available input data. In this phase, train the support data and preconception terms of a classifier for function approximation and classification.

(B) *Testing:-* In this phase, test the trained data and then to give the corresponding name of crop, pesticide name and time taken.

III. RESULT

The system is work on the different datasets. These datasets include physical and chemical feature of plant and soil such as temperature, rainfall, humidity, ph range, 5 type of soil such as black soil, alluvial soil, red soil, laterite soil and desert soil, soil moisture, iron, aluminium, magnesium, nitrogen, potash and phosphorus. The datasets used in this system consists of 100 categories of crops. Chemical feature of dataset thus define the availability of nutrients and micronutrients in soil. Availability of these nutrients and micronutrients can be divided into different categories which can be used to decide its effects on the yielding capability of crops. First in pre-processing, which all features are extract from input data. Then apply the classify techniques such as LS-SVM and deep neural network learning to classified the feature of plant and soil. Classifiers are used to analyse and recognise pattern used for classification methods.

The accuracy of the system is change using different data set. Techniques have been run to train and accuracy is obtained according the different data set along prediction done to test the input data and give the name of crop, time duration and pesticide name that effect the yield of crop.

A system contains two processes. The first process is used for generating a trained model. The algorithms are applied on the training dataset to train the model. The second process is used to test the already trained model, thus making predictions and also measure the performance with respect to given feature of crop and soil.

TABLE I. PHYSICAL AND CHEMICAL FEATURE OF CROP AND SOIL

Physical feature of crop	Chemical feature of soil
Temperature, Rainfall, Humidity	PH range, 5types of soil such as black soil, alluvial soil, red soil, laterite soil and desert soil, soil moisture, iron, aluminium, magnesium, nitrogen, potash and phosphorous

TABLE II. COMPASION OF ACCURACY

Sr. No.	Classification Techniques	Accuracy
1.	LS-SVM	98.8%
2.	Deep neural network learning	95.53%

I. CONCLUSION

Yield prediction is very complex problem in agriculture field and also effect the economic growth of the farmer. In this paper, we developed the system to achieve high accuracy and increase the production of crop. We use the two techniques such as LS-SVM and deep neural network learning to predict the yield of crop based on available physical and chemical feature of plant and soil and solves the yielding problem in agriculture area. This research determines the name of crop, time duration and pesticide name used in particular crop. This system helps the farmer to take the right for sowing the crop in available land.

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