LITERATURE SURVEY ON A FERTILIZER RECOMMENDATION SYSTEM FOR DISEASE PREDICTION

ABSTRACT:

Agriculture is the most important sector in today's life. Most plants are affected by a wide variety of bacterial and fungal diseases. Diseases on plants placed a major constraint on the production and a major threat to food security. Hence, early and accurate identification of plant diseases is essential to ensure high quantity and best quality. In recent years, the number of diseases on plants and the degree of harm caused has increased due to the variation in pathogen varieties, changes in cultivation methods, and inadequate plant protection techniques.

An automated system is introduced to identify different diseases on plants by checking the symptoms shown on the leaves of the plant. Deep learning techniques are used to identify the diseases and suggest the precautions that can be taken for those diseases.

I. INTRODUCTION

Agriculture plays an essential part in an economy's life. They are the backbone of our country's economy system. One of the key problems confronting farmers is selecting the right crop for cultivation. Selection of crops is determined by several factors such as temperature, soil composition, market prices etc.

Machine Learning is a technique that uses complex algorithms and a collection of predefined rules to operate intelligently. It uses past data to read the patterns and then perform the intended task

according to the defined rules and algorithms based on the analysis it produces.

In this project a system is developed in which Voting Based Ensemble Classifier is applied to recommend the appropriate crops This system also proposes the required fertilizer to boost the nutrients contained in the soil and thus enhance the yield of the crop. Thus, there arises a need for suggesting suitable crops and fertilizers using machine learning algorithm.

II. RELATED WORK

V. Sellam et al [2], Evaluated environmental parameters such as Cultivation Area, Annual Rainfall and Food Price Index which affects the crop yield. The crop yield is a dependent variable that depends on all of these environmental factors. From the results produced factors like Weather Conditions, Soil Parameters etc have great effect on the crop production when compared to Cultivation Area and Food Price Index

Supriya D M et al [9], Developed a system where data mining techniques were used to predict class of the analyzed soil datasets. Thus, the predicted class will indicate high profitable crop yield. Classification algorithms were designed to label the unknown samples using the information provided by a sequence of classified samples.

III. METHODOLOGY

A. Voting Based Ensemble Classifier An ensemble classifier is a cluster of classifiers, where each classifier's distinct decisions are integrated to classify new examples. This technique provides a better predictive output in comparison to the prediction result of a single

classifier model. The basic idea is to learn a set of classifiers, letting them vote.

a) Naïve Bayes Classifier Naïve Bayes is a probabilistic classifier, which could be used for a wide range of classification tasks. The purpose of the probabilistic classifier is to evaluate the likelihood of the features occurring in each class, with features x1 to xn and classes c1 to ck and to return the most probable class. Probability P (c | x1… xn) for each class is calculated.

b) Random Forest Classifier Random forest algorithm is a supervised algorithm for classification. Random forest is an ensemble method used for classification and other tasks. This works by constructing a multitude of decision trees at a time of training and by generating the class mode of individual trees classes. The higher the number of trees in the forest gives the higher precision results in random forest classifier.

c) CHAID Classifier Chi square Automatic Interaction Detection (CHAID) is a tree classification method. CHAID partitions the data into mutually exclusive subsets which best describe the categorical dependent variable. CHAID is similar to decision tree but instead of information gain it uses gain ratio

IV. SYSTEM ARCHITECHTURE

A. Data Collection Agriculture (crop soil) data set is collected and checked for the presence of missing values. The data set is further analysed for thorough understanding and data clarity and the dataset is loaded to the crop recommendation system.

B. Checking for Skewness Histogram chart is plotted for the data present in the crop soil dataset, to identify if the data is skewed. By analysing the histogram plot it is inferred that the data is normally distributed.

C. Pre - processing Very few missing values were found in the agricultural dataset. The missing values were replaced with the mean of the corresponding attribute in the dataset

D. Voting Based Ensemble Classifier Naive Bayes Classifier, Random Forest Classifier and CHAID Classifier automatically gets executed internally once the user input is accepted by the Ensemble Classifier module and it suggests the suitable crop. Finally, the voting will be performed for each unique crop suggested by all the three classifiers of the Ensemble classifier module

E. Crop Recommendation and Fertilizer Suggestion Naive Bayes Classifier, Random Forest Classifier and CHAID Classifier runs internally and as an output each classifier suggests crops separately for the user given input. Finally the crops with the highest vote are recommended to the user. The crops are suggested by considering the factors like nutrients that are already present in the soil (N,P,K) and the other soil parameters along with the temperature and hence the yield will be high for the forecasted crop. Additionally, suggesting the fertilizer suitable for the recommended crop will tend to boost up the yield.

F. Yield Calculation As the final step the yield calculation for the crop suggested by the Ensemble Classifier model can be determined by simply providing the area of the cultivation land in acres. As a result, the yield prediction module returns the crop production in tonnes for the requested acres of land by the end user

V. CROP ROTATION

Crop rotation module plays a vital role in crop recommendation system. Crop rotation must be considered as the important factor in order to maintain the soil fertility and to prevent from soil degradation. In this module crop cultivation season is provided as the input and the alternate crops other than the predicted crop that can also be grown in that season is provided as output by this

module. Distance metric is used for the given NPK values in order to provide top three alternate crop suggestions

VI. EXPERIMENTAL RESULT

A. Response Time Metric

Response time is used to calculate the processing time of the Voting based ensemble classifier and providing the crop suggestion to the user. Stopwatch is used to determine the elapsed time. It is used to calculate the execution time of the complete voting-based ensemble classifier.

B. Accuracy Metric

Accuracy is used to measure the degree to which our forecast result is precise. Accuracy is computed by the formula,

$Accuracy = Number\ of\ correct\ predictions / Total\ number\ of\ predictions\ made$

VII. CONCLUSION

By classifying the soil based on the soil type, land type and macro nutrients Nitrogen (N), Phosphorus (P) and Potassium (K) present in the soil, along with Temperature, pH and Electrical Conductivity of the soil the highly appropriate crop along with the suitable fertilizer to enrich the soil and boost up the productivity is suggested to the agricultural stakeholder. The yield prediction is also provided for the crop requested by the farmer. Alternate crops that can be grown for that particular cropping season and also suitable for the NPK ratio contained in the soil is taken into account for providing suggestion to the farmer. Alternate crop rotation module provides the additional three different crops that can be grown for that soil conditions. The proposed crop recommendation system provides 92% of accuracy.

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