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Cropsense: AI-Driven Predictions For Crop Patterns, Disease Management And Farming Solution

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Abstract: The cultivation of crops on land periodically throughout the year is a cropping pattern. This proposed work aims at prediction of major cropping patterns through only the cultivation-related factors like land, soil, and climate data using Machine Learning techniques. On a suitable land, farmers can grow many types of crops and there is a need of knowing the right cropping patterns to attain best profits. In the current agriculture sector, there are the changes of reduction in crop yield, crop damages if farmer choose the random method of cropping. This is because proper crop yield depends on many agriculture parameters like temperature, rainfall, soli type, season etc... Machine learning unsupervised learning algorithms applied to process the agriculture data and to predict the cropping patterns. Algorithms like Eclat algorithm used. The primary objective of this project work is to identify the best algorithm for predicting cropping pattern. Very less existing works on this pattern prediction, all existing works uses ready libraries for prediction and only model developed. Existing works uses static datasets for prediction. Existing works cannot be applied in real time. So, in our proposed system we collect datasets manually and we build an automation for cropping pattern prediction useful for farmers and agriculture departments. System developed using tools such as Visual Studio front end tool and SQL Server as back-end tool and we use more compatible and real time application supportive programming language C#. The cultivation of crops on land periodically throughout the year is a cropping pattern. This proposed work aims at prediction of major cropping patterns through only the cultivation-related factors like land, soil, and climate data using Machine Learning techniques. On a suitable land, farmers can grow many types of crops and there is a need of knowing the right cropping patterns to attain best profits. In the current agriculture sector, there are the changes of reduction in crop yield, crop damages if farmer choose the random method of cropping. This is because proper crop yield depends on many agriculture parameters like temperature, rainfall, soli type, season etc... Machine learning unsupervised learning algorithms applied to process the agriculture data and to predict the cropping patterns. Algorithms like Eclat algorithm used. The primary objective of this project work is to identify the best algorithm for predicting cropping pattern. Very less existing works on this pattern prediction, all existing works uses ready libraries for prediction and only model developed. Existing works uses static datasets for prediction. Existing works cannot be applied in real time. So, in our proposed system we collect datasets manually and we build an automation for cropping pattern prediction useful for farmers and agriculture departments. System developed using tools such as Visual Studio front end tool and SQL Server as back-end tool and we use more compatible and real time application supportive programming language C#.

Key words: Data science, Cropping Patterns, Naïve Bayes algorithm, ECLAT algorithm, GUI, Crop prediction, Data Mining

I. INTRODUCTION

Cropping pattern refers to the proportion of land under cultivation of different crops at different points of time. This indicates the time and arrangement of crops in a particular land area. India is a country where agriculture and agriculture related industries are the major source of living for the people. Agriculture is a major source of economy of the country. It is also one of the country which suffer from major natural calamities like drought or flood which damages the crop. This leads to huge financial loss for the farmers thus leading to the suicide. Predicting the suitable crops to cultivate and suggesting suitable cropping patterns to improvise crop yield well in advance prior to its harvest can help the farmers and Government organizations to make appropriate planning like storing, selling, fixing minimum support price, importing/exporting etc. Predicting a cropping pattern well in advance requires a systematic study of huge data coming from various variables like soil quality, pH, EC, N, P, K etc. As Prediction of cropping patterns deals with large set of databases thus making this prediction system a perfect candidate for application of data science. Through data science we extract the knowledge from the huge size of data. This system presents the study about the various machine learning techniques used for predicting the cropping patterns.

The success of any cropping patterns prediction system heavily relies on how accurately the features have been extracted and how unsupervised learning algorithms have been employed.

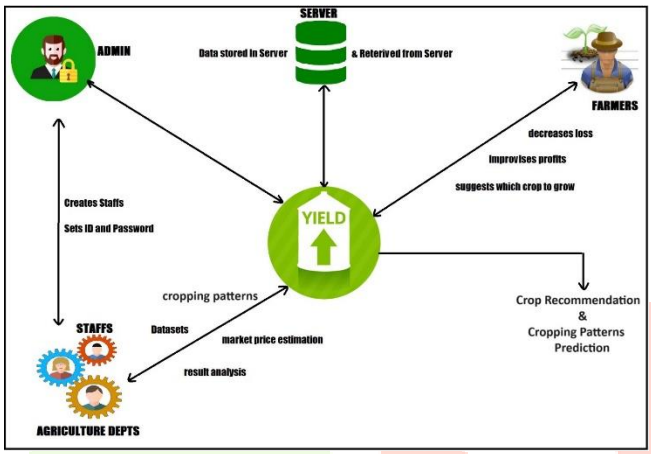

Fig: System Diagram

Machine learning algorithms applied to analyze data and to predict cropping patterns in advance for the good profits. Data-sets collected from agriculture departments. System developed as real time application which is useful for agriculture departments and farmers. We use suitable technology to work with real time application, that is "*visual studio*" as front-end technology and "*SQL server*" as back-end technology. These technologies are preferred because it supports more suitable libraries, tools and concepts required to work with real time application compared to other technologies. Proposed system helps farmers to cultivate right type of crops in right time and helps farmers to increase crop yield and crop quality.

II. METHODOLOGY

Association (or relation) is probably the better known and most familiar and straightforward data science technique. Here, we make a simple correlation between two or more items, often of the same type to identify patterns. *For example,* Market-basket analysis, where we track people's buying habits, we might identify that a customer always buys cream when they buy strawberries, and therefore suggest that the next time that they buy strawberries they might also want to buy cream.

System uses algorithms such as ECLAT algorithm to find the target customers for advertisements.

Step 1: Required data extracted from the server. In our project we extract agriculture data from the server.

Step 2: data preprocessing is done, where we remove the irrelevant data and extract the required data for processing. In our project irrelevant data means farmer id, name, mobile etc... All these are irrelevant data.

Step 3: once data preprocessing is done, desired data is inputted to the efficient unsupervised learning algorithms such as Eclat algorithm for processing.

Step 4: Algorithms process the data and finds the cropping patterns.

Step 5: Algorithm tested and results displayed.

Step 6: Text outputs displayed on GUI.

Eclat Algorithm Pseudo-code

Scan the data-set and determine the support count(s) of each item. Add the transaction ids instead of specifying the actual support.

Generate L1 (Frequent one item set) by comparing with minimum support count.

Use Lk-1, join Lk-1 to generate the set of candidate k - item set.

Scan the candidate k item set and generate the support of each candidate k – item set. When we find support count of candidate items, we compare with previous step, no need to again scan the data base and compare with original data-set.

Add to frequent item set, until C=Null Set.

For each item in the frequent item set generate all non-empty subsets. For each non empty subset determine the confidence. If confidence is greater than or equal to this specified confidence. Then add to Strong Association Rule.

Supervised Learning used to prognosticate Suitable Crop

Step 1: Raw data and Weather Statistics

This is the first step in the crop recommendation process where we collect husbandry data. Agriculture data collected from the region “nanjanagudu ” which contains husbandry parameters, crop details, growers details and yield details. Agriculture parameters include downfall, temperature, soil features similar as PH, nitrogen, potassium, iron etc.

Step 2: Extract and Segment Data (Data Preprocessing)

Then husbandry data anatomized and only applicable data uprooted. The data needed for processing uprooted and segmented according to the different regions. needed data birth is done because entire husbandry data not needed for processing and if we input all data, it requires too important of time for processing, so data processing is done.

Step 3: Train Data

Once needed data uprooted and segmented, we need to train the data, train means converting the data into the needed format similar as numerical values or double or string etc. conversion depends on the algorithm type.

Step 4: Supervised Learning

ML enterprises with construction and study of system that can learn from data. Supervised literacy is an approach to machine literacy that is grounded on training data that includes anticipated answers. Naive Bayes Algorithm " Naive Bayes Algorithm" is used for crop recommendation because of the following reasons; Effective classifier. Works fine for lower figures of parameters as well as further figures of parameters. Works fine for small data- set as well as big data- set. More accurate results.

Step 5: Crop Recommendation (Priority wise)

Then suitable crops recommended for the growers which may yield high gains. Naive Bayes algorithm generates labors (crop recommendations) grounded on the precedence wise.

Step 6: Results

Recommending suitable and high profit crops for the growers and recommendation is done grounded on the precedence wise. Then high probability crops are uprooted and sorted and crops are confided for growers.

Step 7 Visual Representation

Crops recommended for the growers on GUI. When druggies get login to the operation system recommends suitable and high profit crops for the growers on a GUI. Crops recommended for the farmers on GUI. When users get login to the application system recommends suitable and high profit crops for the farmers on a GUI.

RESULT

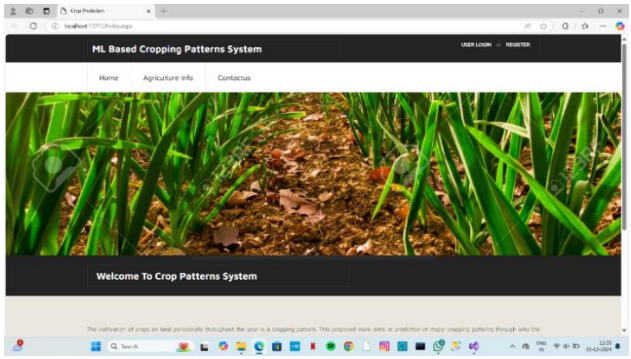

Fig: Home page for the cropping pattern Application

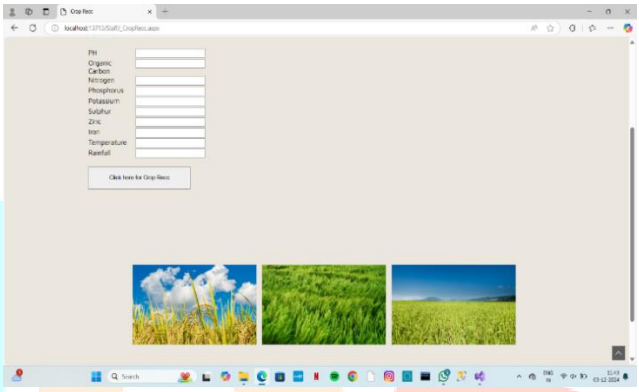

Fig: Single crop prediction

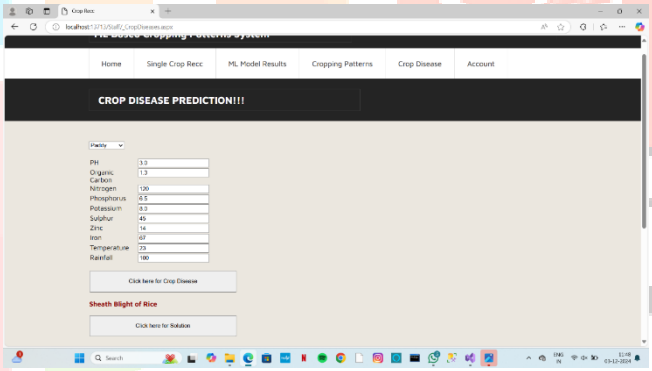

Fig: Disease Prediction

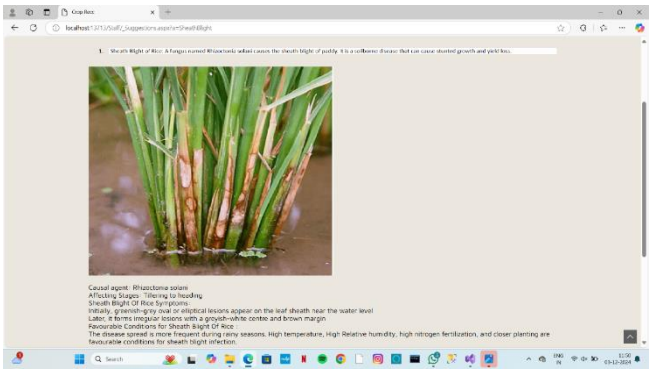

Fig: Solutions to overcome

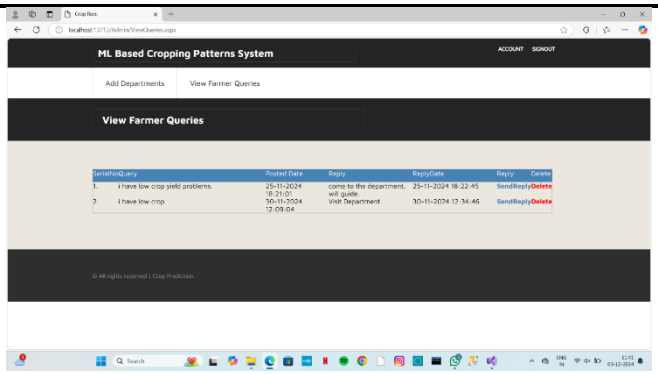

Fig: Farmer Queries and Admin Reply

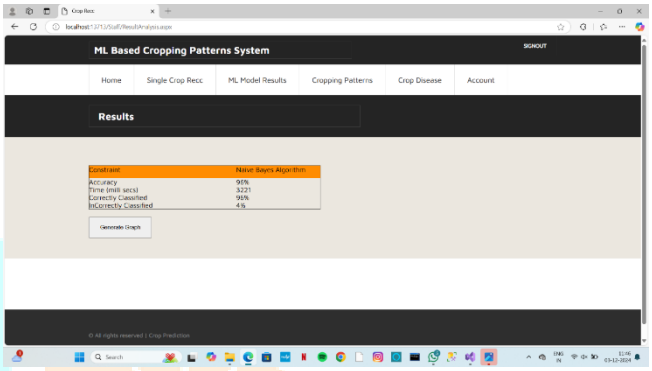

Fig: Result

CONCLUSION

Nowadays farmers facing lots of problems and they do not know the proper information regarding crops to grow and to cultivate. This proposed system helps farmers to know the right crop to grow. Proposed system predicts the crops using data science techniques based on the soil tested results. This system also useful to agriculture departments to predicts the right crop in right time. If we have such kind of automation, will be useful to farmers and agricultural field. The goals that have been achieved by the developed system are, simplified and reduced the manual work, large volumes of data can be stored and It provides Smooth work flow.

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