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CROP RECOMMENDATION SYSTEM USING SVM AND USER-BASED COLLABORATIVE FILTERING

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Abstract - — India being a nation where agriculture is still a dominant occupation and traditional farming methods are still in

practice, thereby giving limited crop yields to the farmer which ultimately is less beneficial to the farmers compared to the inputs given by them. Hence, in order to maximize the yields of a crop for the given input, we are showcasing different methods which will be useful to develop a recommendation system for smart

farming. Agriculture accounts for 18% of India's Gross Domestic Product (GDP) and fulfills the need of 1.2 billion people. Hence it is very much important to have a good yield of crops. Natural calamities cause huge loss of crops for farmers leading to increased suicide rates. Even pest attacks can cause a significant amount of crops to be affected. Traditional farming techniques involve farmers past experience with a large risk of harvest being

not as per the demands. Hence, apart from conventional approaches, use of various data mining techniques to predict the crop to be planted and its yield is required. The algorithms used for the same are SVM and ItemItem Collaborative Filtering. Use of techniques which use ensemble model for smart recommendation generation is also considered which help to get better accuracy for the system.

Key Words— Climate, RGF (Regularized Greedy Forest), Soil composition, CSM (Crop Selection Method), GBDT (GradientBoosted Decision Tree), regularization, regression problem.

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1. INTRODUCTION *(Size 11, Times New roman)*

Diversity in India is unique which represents varieties of physical features and cultural features. Almost all families in India are dependent on agriculture and professions related to agriculture. IoT is playing the major role in agriculture which is helping farmers from many problems and to focus on other related professions. Precision agriculture is one of the best inventions. It is educating farmers in many ways like predicting disease in advanced so that farmer can take actions and get prevented from loss and recommending crop suitable for his field, weather information is also provided as well as it also provides information about marketing and he can export his products and helping to maintain the field. Sensors and actuators automate his tasks such as irrigation and use of pesticides in proportionate. With all these techniques he is able to maximize profit and can continuously monitor his field. In India, precision agriculture is not much evaluated. Now a day we found thatevery day the environment is changing continuously which is harmful to the crops and leading farmers towards debt and suicide. In many cases like this and with growing population to maximize yield farmers are using more pesticides and fertilizers which are leading to the soil infertility as well as decreasing the holding capacity of soil and increasing toxicity of soil. Farming land is used by growing industrialization, so again increasing the rate of soil pollution which affects the quality of plants.

We provide a solution to this problem in the form of a web application which will act as a bridge between farmers and factories/companies. This web application is a type of ecommerce platform where the business (buying and selling of stubble) will be carried out between the farmers and companies. This application is built using Django framework. Django is a high-level Python Web framework that encourages rapid development and clean, pragmatic design. This is an opensource tool used for web development in Python programming language.

In this application, we have designed separate dashboards for farmers and companies each. This application is connected to our PostgreSQL database where the data is regularly updated. We have created modules in this project like login and signup which carry out authentication successfully. Farmers can register their products on this site for selling purposes. Companies/Factories have to create their account and are able to view farmers and their products. We have also created a recommendation system which will recommend the best rated products to the consumers.

2. PROPOSED APPROACH

2.1 BASIC CONCEPTS/ DEFINITIONS:

- Development of a smart system which can recommend various ways to a farmer for making the

right decisions to improve the farming methodologies by analyzing environmental, topographical & economic factors using data mining techniques. The proposed crop recommendation system will help the farmers for increasing the crop productivity. By using the historical data, the system can suggest the right crop to farmers based on particular parameters like state, district, investment cost and season.

2.2 LITERATURE SURVEY:

This section of Literature Survey explains the extracted relevant content from various research papers and websites and analysis of many author's work as follows:

1. Aakunuri Manjula ,Dr.G .Narsimha stated in the paper titled "XCYPF: A Flexible and Extensible Framework for Agricultural Crop Yield Prediction.

2. Rakesh Kumar,M.P. Singh, Prabhat Kumar and J.P. Singh stated in the paper titled "Crop Selection Method to Maximize Crop Yield Rate using Machine Learning Technique", [2] that it give the method Crop Selection Method (CSM) to answer the crop selection problem, and maximize net productivity rate for crop over season and consequently achieves highest financial growth of the country.

3. A.T.M Shakil Ahamed, Navid Tanzeem Mahmood, Nazmul Hossain, Mohammad Tanzir Kabir, Kallal Das, Faridur Rahman, Rashedur M Rahman proposed system in paper titled "Applying Data Mining Techniques to Predict Annual Yield of Major Crops and Recommend Planting Different Crops in Different Districts in Bangladesh".

4. author Mrs.K.R.Sri Preethaa stated in the paper titled "Crop Yield Prediction" [4] that the system has the characteristic of better expansibility than before, and it is significantly simple and practical to reduce crop production cost and increase agricultural production efficiency..

5. authors Hao ZhangLi ZhangYanna RenJuan ZhangXin XuXinming MaZhongmin Lu stated in the paper titled "Design and Implementation of Crop Recommendation Fertilization Decision System Based on WEBGIS" that the common difficulty present among the Indian farmers is 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 in paper https://getbootstrap.com/docs/4.6/gettingstarted/introduction/

This is the official link to the documentation of bootstrap version 4.6 which is a framework used to develop the frontend of the web application.

6. Ji-chun Zhao; Jian-xin Guo stated about use of Big data analysis and knowledge engineering in paper titled "Big Data Analysis Technology Application in Agricultural Intelligence Decision System".This paper considers history based knowledge of the farmers and experts and uses them to build a recommendation engine which predicts based on knowledge engineering.

2.3 RELEVANT MATHEMATICAL MODEL:

Collaborative filtering is best suited to problem with known data on users but lack of data for items or difficult to do feature extraction for items of interest.

Unlike content-based approach, collaborative recommender systems try to predict a user's utility for an item based on other users' previous utility with the item.

A. Memory-base Example:

Reusing the rating system example, memory-based methods essentially are heuristics that predicts a user's rating for an item based on the collection of rating for the item from other users,
i.e.,

$$r_{i,c} = agg_{c' \in C}\, r_{i,c'}$$

where C is the user set excluding the user c of interest. Several realization of the aggregation function are

$$r_{i,c} = \frac{1}{N}\sum_{c' \in C} r_{i,c'} \quad (1)$$

$$r_{i,c} = \frac{\sum_{c' \in C} sim(\omega_c, \omega_{c'}) \cdot r_{i,c'}}{\sum_{c' \in C} sim(\omega_c, \omega_{c'})} \quad (2)$$

$$r_{i,c} = \bar{r}_c + \frac{\sum_{c' \in C} sim(\omega_c, \omega_{c'}) \cdot (r_{i,c'} - \bar{r}_{c'})}{\sum_{c' \in C} sim(\omega_c, \omega_{c'})} \quad (3)$$

(1) is simply an average rating for the item from all other users. (2) is trying to weight other users' ratings by how close they are close to user c, and one way to measure that is the similarity function between two users' feature vector. (3) is to address the issue that users may have different rating scale for what they mean "like", for example, some users may be more generous to give a top rating for the item they like.

B. Model-base Example:

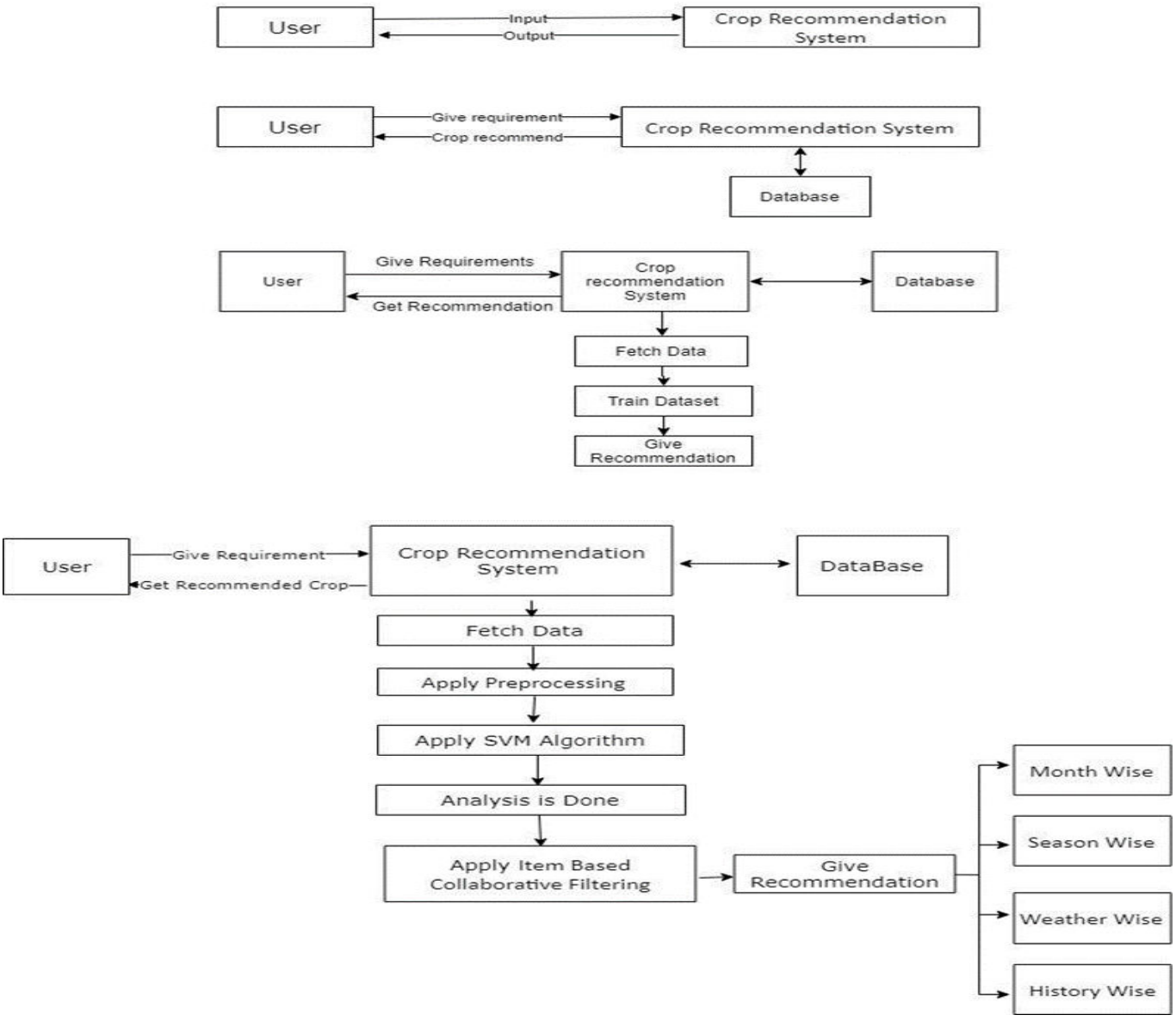
Similar to model-based content-based filtering, model-based collaborative filtering use historical data (from other users) to learn a model. For the rating example, a model-based way is to build a linear regression model with user profile as features and rating as target for each item separately.

Limitation:

- The existing models are based on prediction system while as we are implementing additional features in the project
- The Voice Based Feature will help farmers to get information in local language using NLP we can implement this as it is missing in many modules we discovered.

New item, which is an extreme case of less popular items, and hence, make collaborative filtering approach not applicable.

2.4 SYSTEM FLOW::



2.5 ADVANTAGES:

1.The system can help farmers in deciding which crops to be planted so that can get maximum profit at minimum cost.

2.The whole system can be implemented in very low cost and provides better accuracy.

3. CONCLUSIONS

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. Our future work is aimed at an improved data set with large number of attributes and also implements yield prediction

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