A Farm-to-Consumer Trading Portal

A. J. Kadam[1] Aparna Mane[2] Arpita Lokhande[3] Gouri Karape[4] Madhura Kulkarni[5]
[1,2,3,4,5]Department of Computer Engineering
[1,2,3,4,5]All India Shri Shivaji Memorial Society's College of Engineering, Pune, India

Abstract— In this modern era, the traditional way is still used by farmers to sell the products. For farmers, the product sales and its marketing is less profitable due to the interference of agents and middlemen. Also, they are unaware of the other buyers like caterers, hotels, exporters, retail supermarkets, etc. We aim to design a location-based F2C (Farm to Customer) trading portal for agricultural produce. Our platform takes up the opportunity to revolutionize life for farmers through a mobile app and web app substantially designed for farmers residing in rural areas of India. It's a single step platform for farmers where the information about crop prices and selling their produce are all included in one application. Using the platform, farmer can analyze current market situation and pictorial representation of daily sale evaluating his profit. This platform will provide transparent farmer to customer communication. This application will maximize farmer's profit who often sell their produce to local traders. Also, customers will be provided with variety of choices for his desired product and will be recommended related products based on customer behavior using KNN (K-Nearest Neighbor) algorithm.

Keywords: component, formatting, style, styling, insert

I. INTRODUCTION

India's poor storage infrastructure in agricultural areas encourages the middlemen to trick farmers as to the actual cost of the produce. Farmers have no options rather than sending their produce to urban markets as there are no warehouses close to their fields. In traditional marketing scheme, farmers have limited options for selling their product due to which they cannot optimize their crop profit at optimum level. Thus, it becomes necessary to establish such system which will help to resolve farmer's problem time to time using digital platform and technologies in order to remain updated with changing requirements.

Collaborative filtering algorithms such as KNN (K-Nearest Neighbour) algorithm consists of efficient ways to recommend useful contents to buyers by assuming that a user will likely prefer the preferred items of similar buyers. More specifically, when a user requests a recommendation, the collaborative filtering scheme predicts the user's preferences for all of the unseen items based on similar users' preferences for those items. In a similar way, the item-based collaborative filtering scheme predicts the preferences of the user for all unseen items based on the preference levels of their similar items.

II. LITERATURE SURVEY

This [1] paper proposed that Proposing an interface between farmers and buyers with help of KNN Algorithm for better decision making and for the purpose of latitude, longitude check using GPS system to sell or purchase. analysis of Market location, stock details and its demand can be done within less time and with less effort. Crop profit can be optimized to maximum level due to multiple options, modern marketing methods and market analysis details that is available for the study.

Main purpose of this [2] paper is to provide a scalable and robust recommendation system that can provide good accuracy. In our work, proposing a personalized recommendation by considering user's past behavior. In this paper, they present a model that combines RS method such as CF with big data technique such as association rule mining. they have proposed to conduct a personalized movie recommendation by considering user's past behavior.

In this [3] paper, they explain a Collaborative Filtering algorithm using a KNN (K-Nearest Neighbor) graph. This algorithm provides the prediction of preferences of only KNN items and it also decreases the performance time by calculating a KNN item in minimum time based on greedy filtering. This experiments results show that their recommendation algorithm is much faster than traditional Collaborative Filtering algorithms.

III. PROPOSE MODELLING

After successful registration on application, Farmer upload relevant information of crop (quality, quantity, type, price) farm location details and contact. For an end user, it gives a listed view of available product with the product information.

It also provides rating option to buyer so that they rate any product available on app according to their experience. System provide comment box where end buyer, farmer can exchange opinion, experience about any crop or e-agriculture ideas.

It's easy to contact farmers, as his phone number is available on the app. On the basis of user's history, rating to any product nearest location of farmers app uses collaborative filtering to recommend similar product to users.

A. Recommendation Systems

Recommendation systems can be found today in most of the modern applications that introduces the buyer to a large collection of items. These systems provide the buyer with a list of recommended items they might prefer to buy in future, or predict how much a buyer might prefer every item. These systems help buyers to decide on items, and can ease the task of finding relevant and preferred items in the collection of items. Recommendation system provides the facility to understand a buyers' choice and find new options, desirable and relevant content for them automatically. In spite of buyers' choices may vary, they follow patterns. Buyer tend to like items which are similar to other items they like as well as other similar behavioral buyer likes.

Sometimes such types of patterns also can be related with the relevancy of products. On the other side of coin, we can figure out which products or items are similar to what user already liked, again by having a look into other

buyer's apparent preferences. Technically these are the two major categories of recommender engine algorithms i.e. user-based and item-based recommenders.

These recommendations are based on filtering techniques namely collaborative and content-based filtering techniques. Collaborative filtering derives recommendations based on the knowledge of buyer's relationship with products, items and services. This technique does not require any knowledge of properties of product and its characteristics. Content-based filtering is based on attributes and characteristics of products. We can compare this with our application as follows. Collaborative filtering will check for the similarity between buyers of the farm produce. If buyer A has bought wheat and rice and buyer B has bought wheat, rice and jowar. Hence the system will recommend jowar to the buyer A as both buyer A and B has bought wheat and rice which describes user behavior independent of item characteristics. However content-based filtering will check for one buyer A. If buyer A has bought moth beans before then system will recommend user to buy mung beans as both product items fall under category pulses. In this characteristics of items are checked. Hence here the suggestions are based on the content or characteristics and properties related to the items and their aspects. One more filtering approach has now become popular where collaborative and content-based filtering techniques can be applied on various levels of recommendation system, which is called as hybrid filtering technique.

1) Collaborative Filtering

Collaborative filtering approach builds a model from a buyer's past behavior as well as similar preferences made by other buyers. Then the model is used to predict items that the buyers may be interested in buying. While Content-based filtering approach makes use of a series of discrete characteristics of items in order to recommend additional items with similar properties. A particular type of collaborative filtering algorithm uses matrix factorization i.e. low-rank matrix approximation technique. Collaborative filtering approach might suffer from three problems: cold start, scalability, and sparsity.

a) Cold Start:

These systems usually require a huge amount of existing dataset on a buyer in order to make relevant and accurate recommendations.

b) Scalability:

There are millions of buyers and items in which these systems produce recommendations in many of the environments. Thus, a huge amount of computation power is often required for calculating recommendations.

c) Sparsity:

The amount of items sold on most of the e-commerce sites is extremely huge. The most active buyers will only have rated a small subset of the overall database. Thus, even the most popular products may have very few ratings.

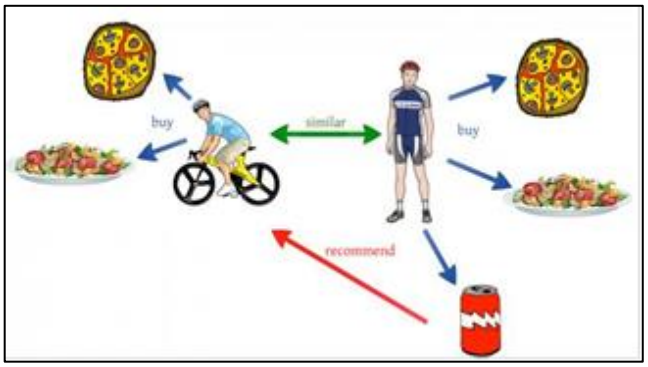

Fig. 1: Collaborative Filtering Approach.

2) Content-based filtering

Content-based filtering is another approach for building a recommender system. These methods are based on description and properties of the product and buyer preferences. The keywords are used to describe the product to describe their characteristics that can be used for generating recommendations. Basically these algorithms are implemented to recommend items or products that are similar to those that a buyer liked in the past. For example, If buyer A has bought moth beans before then system will recommend user to buy mung beans as both product items fall under category pulses. Particularly, different candidate items are compared with products previously rated by the buyer and the best-matching items are recommended to the buyer. This approach is mostly used in information retrieval and information filtering.

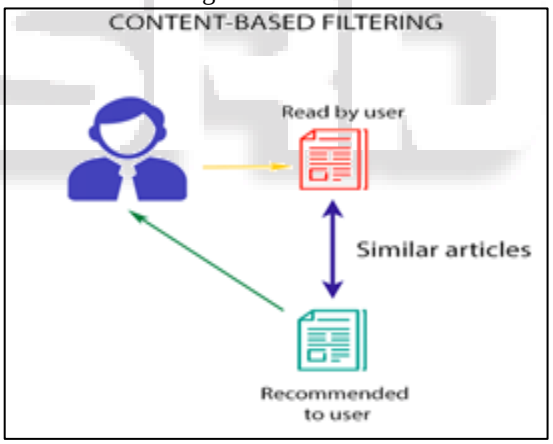

Fig. 2: Content-Based Filtering Approach.

3) Hybrid filtering

Hybrid filtering is an approach for recommendation system is a combination of Collaborative filtering and Content-based filtering approaches. In this approach, first step is to apply collaborative filtering approach based on user behavior and then to apply Content-based filtering based on item properties hence to achieve better recommendation system. This approach is becoming more popular nowadays. Netflix is a good example of a hybrid recommendation.

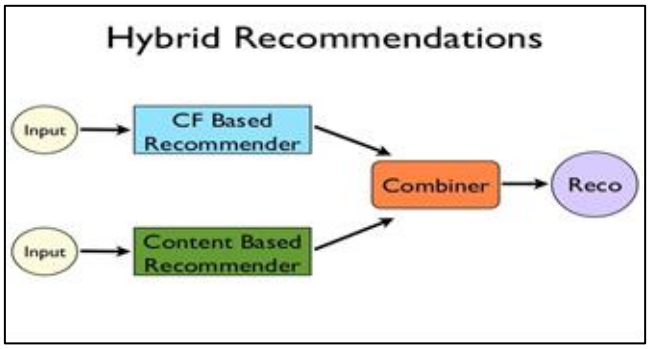

Fig. 3: Content-Based Filtering Approach.

Collaborative filtering generally can be implemented in the following three steps.

1) In the first step, constructing a user-item matrix where rows of the matrix represent number of users and the columns of the matrix represent number of items represent the columns each entry in the matrix represent the corresponding rating value.
2) Calculate the similarity between the pair of items and the users and find their nearest neighbor.
3) Predict the unknown ratings for the items.

B. UML Diagrams

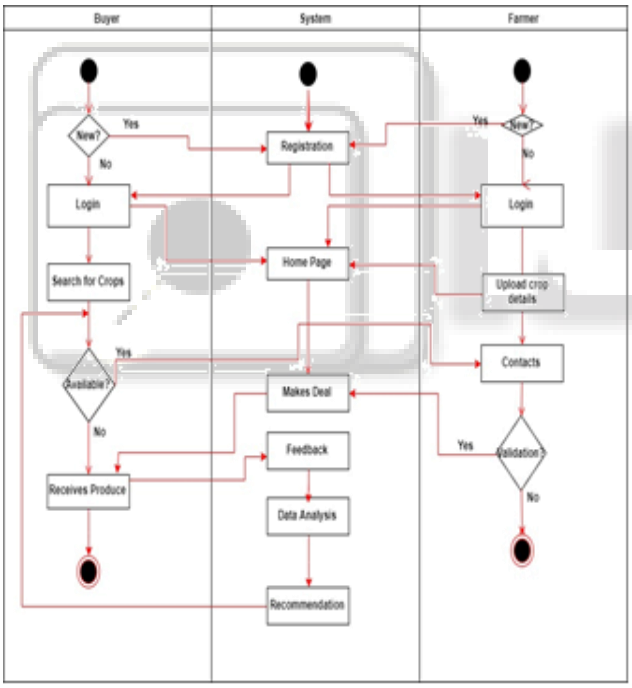

Fig. 4: State Diagram

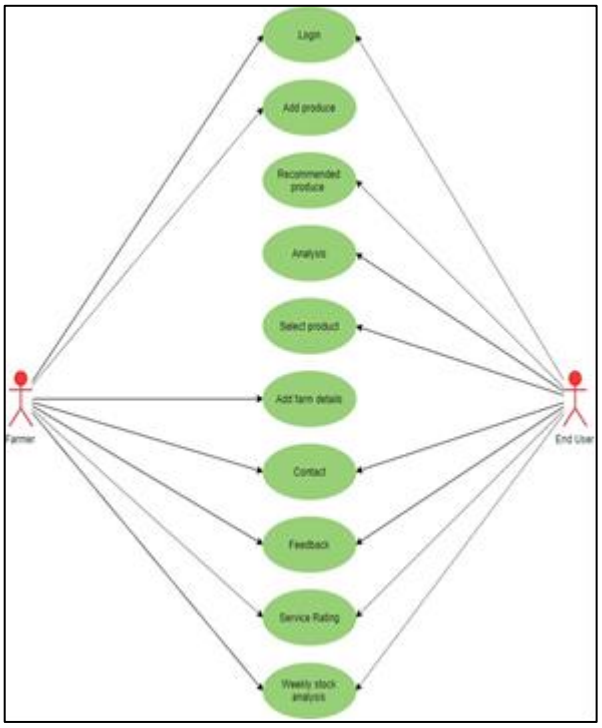

Fig. 5: Use Case Diagram

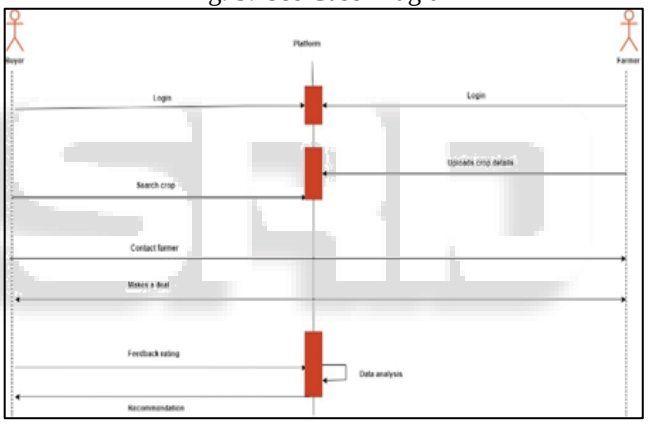

Fig. 6: Activity Diagram

C. System Architecture

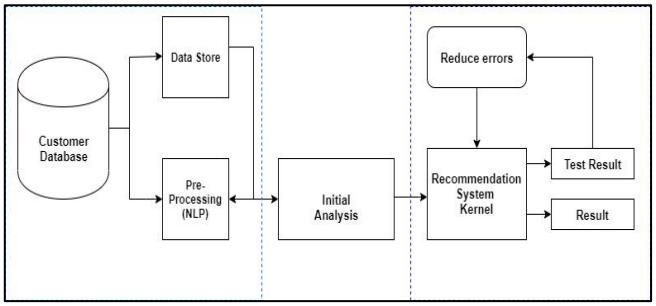

Fig. 7: System Architecture

When a user registers into the application, he can sign in the application using his registered username and password provided so that each user should be unique and authenticated. When a farmer registers on application, it takes information of his crop along with location details and contact. For an end user, system gives a map-based view of available product with the product information. System also provides rating option to buyer so that they rate any product available on app according to their experience. This further

implement a recommendation system so that buyer considers buying other items related to his purchase. It's as easy as a breeze to contact farmers, as his phone number is available on the app. On the basis of buyer's behavior of farmers app uses collaborative filtering to recommend similar product to users. It is important for a recommendation system to be precise with algorithm used so as to provide the user variety of recommendations which are similar to his preferences.

Customer behavior is stored in the data store. This behavior can be in different format. Such as comments, feedback, ratings and search. Hence this unstructured data is needed to convert in structured data hence to gain knowledge from this data. Thus Pre-processing of this data takes place using Natural Language Processing (NLP). There are various type of data which is needed to be preprocessed such as Regional and SMS type's language data, Positive and negative reviews and opinions, Review that may not express any meaning, Sarcastic reviews, Internet slang words and emoticons, Conditional sentences or opinions, Spam (Spit) reviews. This data undergoes preprocessing to gain knowledge. Some of the reviews look like positive but actually they are negative. SentiWordNet is a lexical resource which can be used for the same to identify such type of words from data. It is a lexical resource in which all the sentences can be categorized into three categories like positive, negative, and its objective. This resource is freely available for research purposes. SentiWordNet generates three numerical scores for each sentence Obj(s), Pos(s), Neg(s). Here Obj(s) represents the objective of sentence, Pos(s) represents positivity and Neg(s) represents negativity.

D. Mathematical Model

Let the proposed system be defined by set theory as:
S= {DC, TRAN, SI, REC, S, F, O, I, Q, q_0, q_f, NDD, D, ALGO}
Where,
I = input : {Farmers produce data}
O = output : {successful transaction}
q_0 = initial state:{system starts and displays login screen}
q_f = final state :{system displays the expected output to user}
S = success: {If the system works accurately without any halt or error}
F = failure: {System halts due to some error or doesn't predict accurately}
Q = set of states: {q_0, q_1, q_2, q_3, q_4,q_f}
D = deterministic data : {Null}
NDD = non deterministic data:{ All states resulting output is non deterministic}
DC = data collection :{q_1 : results in data stored in NOSQL}
TRAN = communication within users: {q_2: results in transaction.}
SI = similarity identification: {q_3: results in similarities within users}
REC = recommendation: {q_4: results in expected output.}

E. Big O of K-Nearest Neighbor:

For the brute-force neighbor search of the KNN algorithm, we have a time complexity of O(n×m), where n is the number of training examples taken and m is the number of dimensions in our training set. For simplicity, assuming n m, the complexity of the brute-force nearest neighbor search is O(n).

F. Advantages of the proposed system

- More buyers, better prices for farmers and less wastage. Search and locate farmers and aggregators easily using internet/mobile.
- Direct dealing and visiting farms prior to purchase enables better backward integration and quality.
- Platform also uses big data analysis tool on customer behavior and provide recommendations to customer's need.
- This platform will provide transparent farmer to customer communication.

G. Benefits of Recommendation System

1) Recommendation systems are based on objective reality. It becomes the biggest advantage of recommender systems.
2) Recommendation systems are very useful in discovering patterns. For example, Netflix discovering various patterns of user behavior.
3) Recommendation systems are effective and efficient tools for personalization.
4) Recommendation systems are always up-to-date.
5) As the system is always on, bubbling up activities in real time is the main and huge advantage of recommender systems.
6) Recommender systems are database driven and intensive.

IV. CONCLUSION

We provide platform where farmers and end users directly get connected without interference of middle man or local traders. platform used big data analysis tool on customer behavior and provide recommendations to customer's need. Analysis of Market location, stock details and its demand can be done within less time and with less effort.

The system consists of phases such as data collection, initial analysis, pattern identification, recommendation and visualization. Hence to ensure that farmers can get more profit and also the buyers get more choices. The final output of this system is in the form of visuals. And also the real time database can be used for the further analysis such as graph plots describing information about weekly sale of the farmer.

REFERENCES

[1] Mrs. Manisha Bhende, Ms. Mohini S. Avatade, Mrs. Suvarna Patil, Mrs. Pooja Mishra, Ms. Pooja Prasad, Mr. Shubham Shewalkar," Digital Market : E-Commerce Application For Farmers", IEEE 2018.
[2] Sonali R. Gandhi, Prof. Jaydeep Gheewala, "A Survey on Recommendation System with Collaborative Filtering using Big Data" ,IEEE 2017.
[3] Sayali D. Kadam, Prof. Dilip Motwani, Siddhesh A. Vaidya, "Big Data Analytics- Recommendation System with Hadoop Framework", IEEE 2016.

[4] Youngki Park, Sungchan Park, Sang-goo Lee, Woosung Jung," Fast Collaborative Filtering with a k-Nearest Neighbor Graph", IEEE 2014.
[5] Sneha Gumaste, Anilkumar Kadam,"A Smart Farming Approach: Using Cloud and FFT Technology",IJCAT,2015.
[6] http://recommender-systems.org/collaborative-filtering/
[7] https://towardsdatascience.com/intro-to-recommender-system-collaborative-filtering-64a238194a26
[8] http://www.manditrades.com
[9] http://www.kisanabhimaan.com/
[10] https://play.google.com/store/apps/details?id=com.creatorscorp.krushidhan&hl=en_IN

