Recommender System in E-Commerce : Bringing Revolution in Marine Product Industry

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Abstract

E-commerce business world is evolving at a fast pace and to remain relevant in the business, the e-commerce world started introducing new tools for enhancing customer experience. Recommender System is one such tool. This paper discusses how Recommender system works and major types of Recommender systems which are currently in use. This paper also discusses some applications of the Recommender system in the marine product industry.

Keywords : Collaborative-filtering, content-based filtering, e-Commerce, recommender system

I. INTRODUCTION

Technology has taken huge leaps with time making business more and more competitive. New tools and techniques have come up which have changed the face of business and opened up new opportunities for individuals. 10 to 15 years back it was not possible of thinking of buy something without seeing the items physically in a shop, but technology-driven e-commerce has facilitated purchase of goods without seeing the articles physically. e-Commerce sites like Amazon, Snapdeal, Flipkart, and many more portals have revolutionized the way marketing is done in India and elsewhere. Several technological advancements along with assimilation of analytics in the purchase process have made the buying experience a real pleasure for users who can get first-hand information about related products in markets which he/she wants to purchase and also feedback about the products from thousands of users on the click of a button. Another technology which enhanced the online marketing experience of customers is the Recommender system. [1, 2] give deep understanding about the working of Recommender System. Recommender system uses analytical techniques to suggest most likely items which customers may be interested in buying based on their browsing patterns. Recommender system is a machine learning tool which has revolutionized the online marketing experience of customers in the last couple of years. The explosive growth in the amount of available digital information and number of internet users has led to internet overload which ultimately affects timely access to the items of interest on the internet. The recommender system is armed with sophisticated algorithms and has solved the problem of availability of too much information by providing specific choices which are of interest to prospective customers/users within a very short span of time.

[3, 4, 5] provide a clear picture on how Recommender system enhances user experience in the e-commerce business leading to more revenue. When someone sees a particular product (like Huawei NOVA 3i) in Amazon, the Amazon website automatically uses it to recommend some more mobile sets like Vivo V9 or OnePlus 6 etc. In case someone decides to buy the product, Huawei NOVA 3i mobile, and adds it to the shopping cart, automatically some new type of products like mobile screen-guard, mobile cover (which are not same, however, but are related) come up in the screen of the viewer. If somebody goes to Netflix and sees certain type of movie, the system automatically recommends certain other movies – the new recommended movies may have similar content or

related content. Most of the time, the users find the recommended content useful and opt for the content. This whole process of recommending products on the basis of customer choice or buying pattern has been facilitated by sophisticated machine learning algorithm which is termed as Recommender System or Recommendation System which is a sub-class of Information Filtering System.

Recommender systems have applications in many areas which include recommending movies, news items, search queries, social tags, books, research articles, music, songs, and along with it many other products that are available online. Recommender Systems are widely used in the social space also. In Facebook, when someone adds somebody else as a friend, the system recommends few other people who can be added as friends in the Facebook friend-list. In any dating website, the system automatically recommends individuals based on the preferences set by the user. In professional networking site like Linkedin, the site automatically recommends probable individuals with whom the users are able to connect and add them to the list of connections. The Recommender System has encroached all arenas of business in the last few years.

Recommender systems have helped both the sellers and users by reducing the transaction costs for searching different items in the online retail portal. It has also improved the decision making process and quality of delivery to a large extent. It has been found that the introduction of Recommender systems resulted in huge increase in revenue as it is an effective means of selling more products. Retailers have used a Recommender systems extensively which have enhanced customer experience to a large extent. This article is on different types of Recommender systems and it discusses how Recommender systems have been useful in the retail industry and how they can be useful in the marine product online marketing space.

II. TYPES OF RECOMMENDER SYSTEMS

There are different types of Recommender systems. We look into content-filtering based Recommender System and Collaborative-Filtering Based Recommender System in this article. Let us understand what these two types of Recommender Systems are and how they work.

A. Content-based Recommender System

Content-based filtering is a popular recommender system which has found usage in solving many business problems. It is a domain-dependent filtering technique for Recommender System and it uses the attributes or features of an object in order to make recommendations. It first extracts different features of a content/item and then matches it with the requirement of the user as per the user profile. The following example (Table I) about movies gives an overview about how content based filtering works. Suppose there are six movies in a database and the attributes of the movies are extracted as follows:

TABLE I.
ATTRIBUTE DATA FOR CONTENT BASED FILTERING

Movie Names						
Action	✓	✓	✓	✓	✓	
Comedy			✓	✓		✓
Romance		✓	✓	✓		
Animated Content	✓					✓
Sanjay Datta				✓		
Spy-Drama		✓	✓		✓	
Arnold Schwarzenegger	✓					
Sci-fi	✓					

We have considered whether the movies have attributes like action, comedy, romance, animated content, Sanjay Dutt starrer, spy-drama, Arnold Schwarzenegger-starrer or sci-fi or not. First, the system generates attributes like action, comedy, spy-drama, and Arnold Schwarzenegger from the movie Terminator, and from the all other movies. After that it checks the preferences a user has given. Then for a user who has given the preference as comedy, the recommender system proposes films like Spy, Sanju, and Bal Ganesh. Someone who has mentioned romance as preference is advised to see films Sky Fall, Spy, and Sanju. Suppose, someone is interested in spy-drama, he is advised to see the movies Bridge of Spies, Skyfall, and Spy. This is how content-based filtering works. Suppose, a user has seen the movie Skyfall. He can be advised to see movies like Spy which have similar attributes like spy-drama, romance, and action. In content-based filtering, first the features are extracted from each object and then the object is proposed to the users as per the preferences set by him or his earlier activities. This helps users to quickly

receive the content of their choice. Generally clustering and association techniques are used for proper arrangements of the content and for suggesting the content to the respective user based on the preferences set by him.

B. Collaborative Filtering

Collaborative filtering is a domain-independent process using which predictions are made based on a database of item preferences (or items accessed) by users. After the access matrix is created, the recommendation is made based on the similarity of the profiles of the users. The following example gives a clearer picture on how collaborative filtering technique works.

Suppose the six movies described in the content-based filtering example are rated by 10 users. The details of ratings (whether the user likes the movie or not) are presented in Table II.

TABLE II.
USER RATING DATA FOR COLLABORATIVE FILTERING

Movie Names						
User 1	✓	✓	✓		✓	
User 2	✓		✓	✓		✓
User 3		✓	✓	✓	✓	✓
User 4						✓
User 5			✓			
User 6			✓	✓		
User 7	✓	✓			✓	
User 8	✓				✓	
User 9					✓	
User 10		✓				✓

As per Table II, User 1 liked the movies Terminator, Skyfall, Spy, and Bridge of Spies. User 8 liked the movies Terminator and Bridge of Spies. The likings of all the users are mentioned in Table II. Now, a new user has come up and he mentions that he likes the movie Skyfall. In this case, the question is which other movies will be suggested to the new user. We have seen that people who have liked the movie Skyfall also liked some other movies. Let us see the matrix of those movies i.e. those who liked Skyfall, how many of them liked the other movies. The detailed response is presented in Table III.

So, we see that of the users who liked Skyfall, 3 users liked the movie Bridge of Spies, 2 users liked the movies Terminator, Spy, Bal Ganesh, and 1 user liked Sanju. As

TABLE III.
RAAZI-WATCHERS' OTHER MOVIE-LIKING RESPONSE DATA

Movie Names	Number of likings by users who have liked Raazi
	2
	2
	1
	3
	2

most users have liked Bridge of Spies, the system should automatically suggest that the new user should see the movie Bridge of Spies. This is how Collaborative filtering works.

Content-based filtering works in two ways:
1) Memory-based collaborative filtering
2) Model-based collaborative filtering

1) Memory-based Collaborative Filtering:
In memory-based Collaborative filtering, the ratings already given by the users provide the basis for the recommendations to new users. The example shown in Table II is an example of the Memory-based Collaborative filtering. The users have already given the ratings for all the 6 movies. A new user who comes to the system is recommended a new movie on the basis of the rating of another movie given by him. Hence, the basis of this type of filtering are the records already stored in memory.

2) Model-based Collaborative Filtering:
In this type of Collaborative Filtering technique, the previous ratings of different items are learnt in order to develop a model based on Machine Learning techniques. The developed model can quickly produce recommendation results. The model development includes techniques like Singular Value Decomposition (SVD), Matrix Completion Technique, Latent Semantic Methods, Regression, and Clustering.

III. USE OF RECOMMENDER SYSTEM IN ONLINE RETAIL INDUSTRY

Collaborative filtering based Recommender System is mainly used in the Online Retail Industry. When someone wants to buy anything, he is suggested many other items which are selected through the collaborative-filtering recommender system. When someone is searching the mobile set 'Huawei Nova 3i' in Amazon, the system proposes many similar searched items or related items (considered by the online portal based on the Collaborative Filtering Logic) as shown in Fig. 1.

Similar things happen in case of other e-Commerce stores also where someone can go for purchasing grocery items. In the Bigbasket website, if somebody sees cauliflower, he is shown related items (most cases content-based filtering approach is used or mixed approach) like cabbage etc. Fig. 2 depicts the Recommender System responses from a e-Grocery website.

This helps the user by giving ready-made information

Fig. 1. Amazon Website Page [6]

Fig. 2. Bigbasket Website Page [7]

about new set of products and the user does not need to separately look for cabbage if he wants to purchase. These are some of the instances of how different filtering techniques in Recommender system – Content-based or Collaborative have helped to revolutionize customer buying experience in the online retail space.

Recommender System in Online Marine Products Market

Many online e-commerce websites have come up in India which sell marine products online. These sites are selling marine products only. Fig. 3, Fig. 4, and Fig. 5 mention some of these websites.
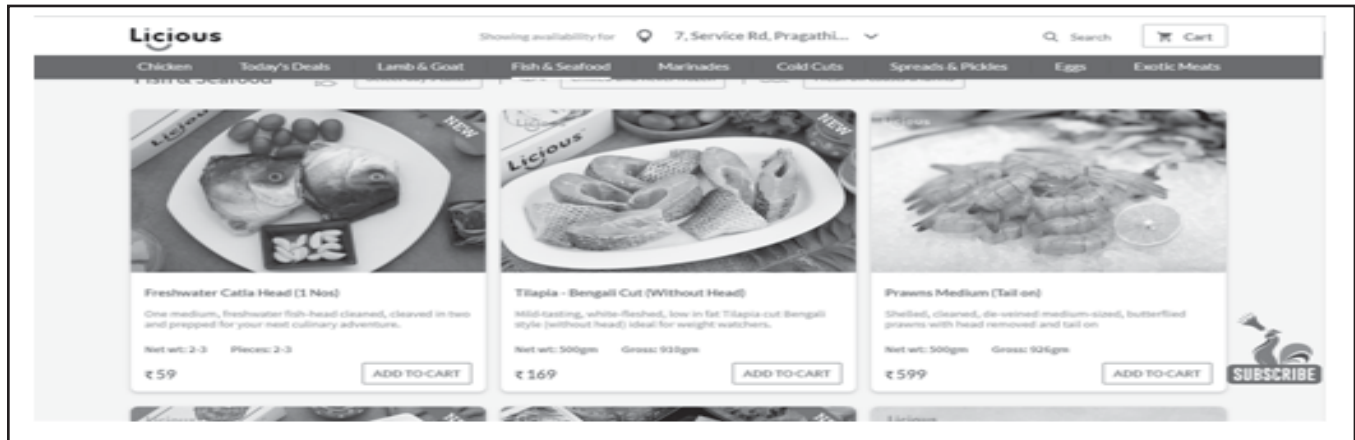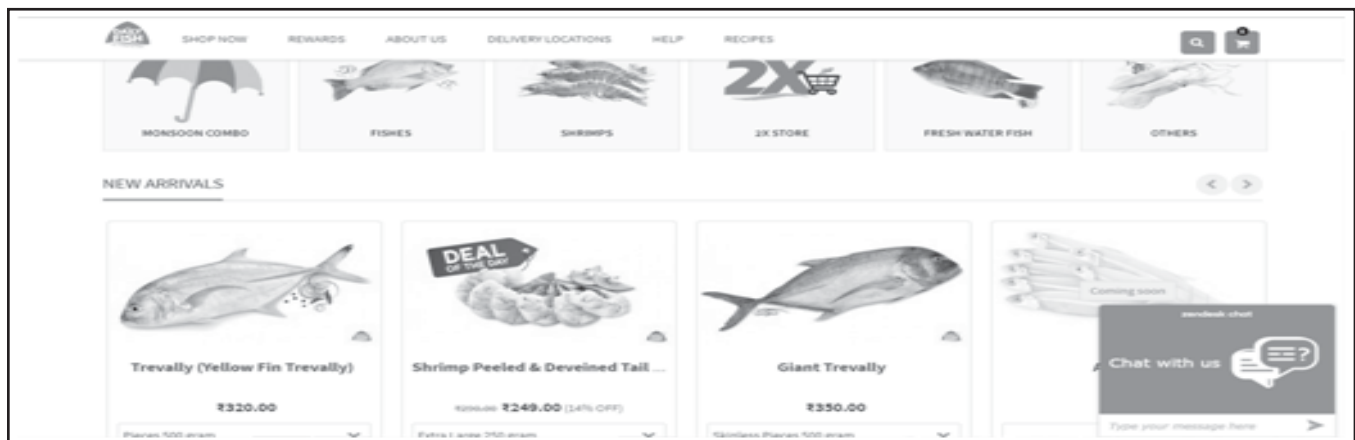

Fig. 3. Licious Website [8]
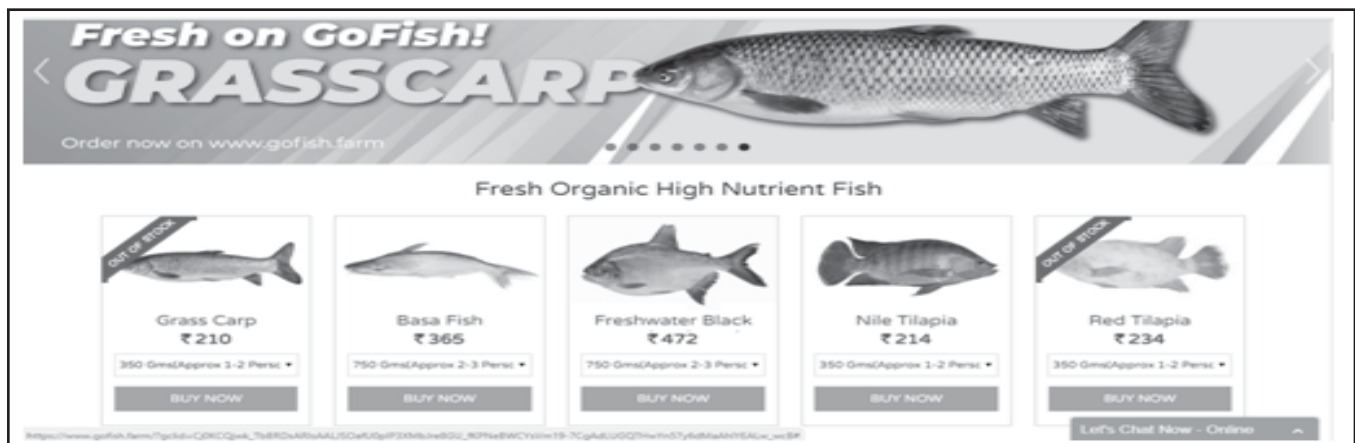

Fig. 4. Daily Fish Website [9]

Fig. 5. GoFish Website [10]

Using Recommender System filtering techniques enhances the shopping experience for the customers in these websites in the following ways:

1. Suggesting the user some marine product items which he has purchased before or those items are in the preference list of users.
2. Suggesting the user some marine items which others have purchased.

Some of the websites have already started using Recommender System for enhancing customer experience. Fig. 6 depicts the use of Recommender system by one such website.

independent process where the predictions are made based on a database of item preferences (or items accessed) by users. Most of the e-commerce sites use Recommender system for better customer experience. Marine products e-commerce sites have also started using mainly memory-based collaborative filtering techniques for delivering better customer experience.
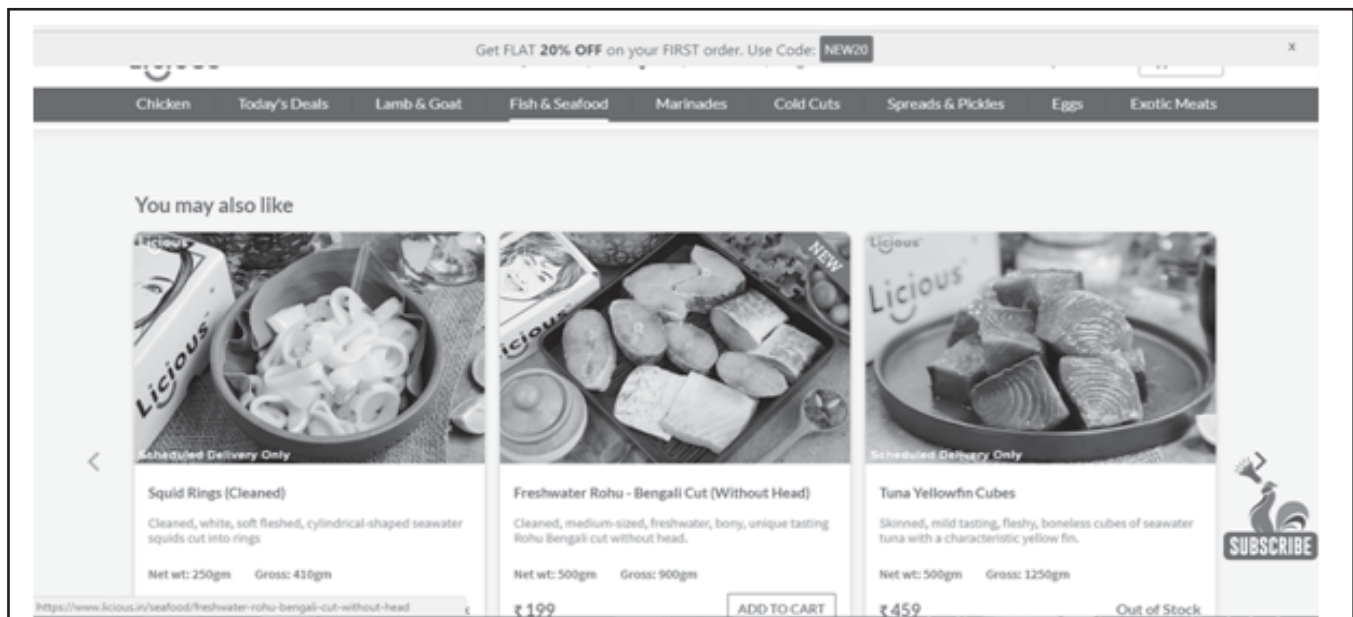

Fig. 6. Recommender System Use in Marine Products Website

Use of Recommender System has enhanced customer experience of marine products websites and it has induced sophisticated machine learning algorithm in a field of marine product business which was devoid of information technology use till five years back.

IV. CONCLUSION

Recommender systems have application in many areas which include recommending movies, news items, search queries, social tags, books research articles, music songs, and along with it many other products that are available online. Content-based Filtering Recommender System and Collaborative-Filtering Recommender System. Content-based Filtering is a domain-dependent filtering technique for Recommender System and it uses the attributes or features of an object in order to make recommendations. Collaborative filtering is a domain-

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Dr. Subhabaha Pal is a prominent academician and researcher in the field of Data Science and Machine Learning. His name figures in the list of 20 Most Prominent Data Science and Machine Learning Academicians in India – 2018 published by Analytics India Magazine. He is credited with publishing 3 books and 32 research papers on Data Science. He is currently working with Manipal Academy of Higher Education as Senior Faculty (Data Science).

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