Rating Based Mechanism for Effective Ecommerce Product Recommendation in Social Networks

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Abstract – Social Networks (SNs) provide platform to users to sell and buy different products and set up online business called ecommerce. It is very difficult to buy a new product of different brands from different sources at a time. To solve this kind of problem, it is necessary to create a recommendation mechanism to recommend products to user according to user requirements. In this paper, a product recommendation system has been proposed to recommend products to new users. A product is recommended on the basis of some rating calculated through user's existing reviews and total number of visits on that product. The proposed mechanism is analyzed using Weka, and to classify ratings, Naïve Baye's Classifier is used.

Index Terms – Social Networks (SNs), Product Recommendation, Collbarative Filtering (CF), Rating and Weka.

1. INTRODUCTION

Online social network is pulling in an ever increasing number of individuals in today's Internet, where the clients can utilize the social network utilizing different social networking destinations. Buyers are permits straightforwardly to purchase products or administrations from dealer over the web utilizing a web program. Customers discover a product of enthusiasm by going to the site of the retailer straightforwardly or via seeking among option merchants utilizing a shopping web index, which shows a similar product's accessibility and estimating at various e-retailers. A commonplace on-line store empowers the shopper to see the company's scope of merchandise and administrations, see pictures or footage of the merchandise, aboard knowledge concerning the merchandise determinations, parts and prices. Recommendation is foreseen to be a standout amongst the foremost imperative administrations that may provide such tailored net primarily based business to shoppers. In any case, social media recommendation is not quite the same as customary substance recommendation in that social media recommendation needs to take the substance data as well as clients social relationship and conduct into record. Users were allowed to give rating to the goods and services using various rating techniques. Using this rating techniques some Online Social Rating Networks (SRNs) were built such as Epinions.com and Flixster.com. These networks enable clients to shape a few verifiable social networks, through their every day cooperation's like co-remarking on similar products, or likewise co-rating products.

2. PRODUCT RECOMMENDATION SYSTEM

In days of yore individuals use to suggest some product verbally, yet now a businessperson can offer their products anyplace on the planet through social media and web based business sites while sitting at their places. These shrewd showcasing should be possible utilizing internet business site e.g. Amazon, Flipkart, Quicker, and so on. These sites are worked with some recommendation framework at the backend [7]. The recommendation is anticipated to be a standout amongst the most essential administrations that can give such customized sight and sound substance to clients. In any case, the social media recommendation is not quite the same as the customary substance recommendation in that social media recommendation needs to take the substance data as well as client's social relationship and conduct into record [8]. Recommendation System is best known for their utilization of web based business and Web destinations, where they utilize contribution about a client's enthusiasm to create a rundown of prescribed things. Numerous applications utilize just the things that clients buy and unequivocally rate to speak to their interests, yet they can likewise utilize different traits, including things saw, statistic information, subject interests, and most loved craftsmen. At Amazon.com, we utilize recommendation calculations to customize the online store for every client. The store fundamentally changes in light of client interests,

indicating programming titles to a product specialist and child toys to another mother [9]. There are three normal ways to deal with taking care of the recommendation issue: customary shared separating, group models, and pursuit based techniques. Here, we contrast these techniques and our calculation, which we call thing to-thing communitarian separating. Not at all like customary synergistic separating, our calculation's online calculation scales freely of the quantity of clients and number of things in the product list. Our calculation produces recommendations progressively, scales to gigantic informational collections, and creates top notch recommendations [10].

3. RELATED WORK

Yu *et al.* [7] developed a probabilistic framework for memory-based CF (PMCF). While these frame works have clear links with classical memory-based CF, it allowed to find the principle solutions to known problems of CF-based recommender systems. Dhawan *et al.* [8] designed a high rating preference system based on item to item collaborative filtering technique. A new heuristic similarity measure called PIP for collaborative filtering has been presented by Hyung Jun Ahn [9] that is widely used for automated product recommendation in Internet stores. The PIP measure was developed utilizing domain specific interpretation of user ratings on products in order to overcome the weakness of traditional similarity and distance measures in new user cold-start conditions. Correspondingly Dong *et al.* [10] proposed a personalized hybrid recommendation system which can support massive data set is designed and implemented. In addition to this Je *et al.* [11] proposed a new hybrid collaborative filtering model combined with item-based CF algorithm and user-based CF algorithm. Hybrid CF model integrates item oriented CF algorithm and user-oriented CF algorithm into a unified framework. Both item similarity matrix and user similarity matrix are utilized in hybrid CF model. An approach for the use of a recommender system was introduced by Afsarmanesh *et al.* [12] introduced to assist designers of sub-products with reusing the existing specifications, as well as for recommending business services that can enhance the defined sub-products. From the above study, it is observed that these systems often require a large amount of existing data on a user in order to make accurate recommendations.

In many of the environments in which these systems make recommendations, there are millions of users and products. Thus, a large amount of computation power is often necessary to calculate recommendations. The number of items sold on major e-commerce sites is extremely large. The most active users will only have rated a small subset of the overall database. Thus, even the most popular items have very few ratings. So, there is an urgent need to build a new product recommendation system. The techniques which can be used to improve the present recommendation system are discussed in section 4.

4. PROPOSED WORK

In proposed mechanism real dataset is collected from website https://www.data.world.com that contains amazon products details including product id, customer id, urls of product and reviews on products which was given by user after using that product. Now apply collaborative filtering technique to filter above mentioned attributes of dataset separately. After attributes filtering, compute rating of a product. The rating is calculated on the basis of reviews of products and total number of visits of users on a particular product. Users are allowed to give their own opinion on a product.

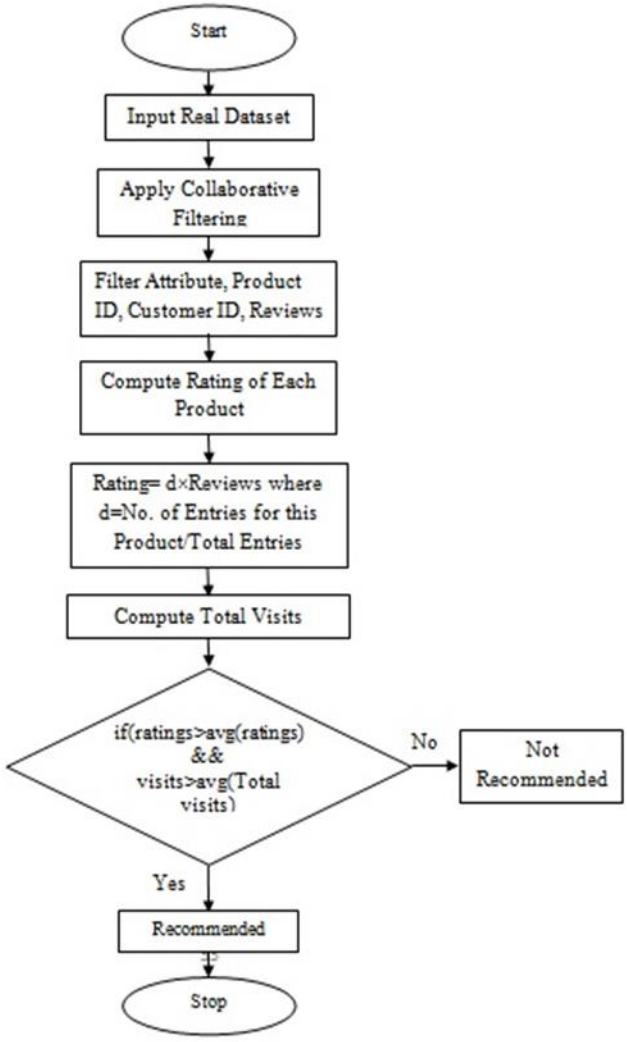

Figure 1 Flow Chart of Proposed Product Recommendation Algorithm

This may be either positive or negative. The opinion is called review of product. Positive review indicates the likeness of product by the user and negative review indicates that the user does not like that product. Rating is also depends upon the

visits on any product. The number of users visits a product then that is called total visits of a product. So on the basis of these parameters a product is recommended or not if the rating of products and visits of a product is greater hen some average value then that product will be recommended otherwise it is not recommended. The average value used in proposed product recommendation mechanism is 0.09 for ratings and 30 for total visits.

Here, d is called Total Visits. This is the fraction of number of entries for any product and total number of Entries in a dataset. Rating is calculated as d times the review (positive or negative) of that product.

$$\text{Rating} = d \times \text{Reviews}$$

$$\text{Where, } d = \frac{\text{No.of Entries for any Product}}{\text{Total Entries}}$$

5. RESULTS AND DISCUSSION

Weka: Weka tool is used to analyze proposed mechanism. It is open source software can be used for data mining and analyzing large amount of data.

Naïve Bayes Classifier: It is classification technique based on Baye's Theorem. It is commonly used in spam filters, this basic model assumes that for a given label, the individual features of URLs are distributed independently of the values of other features.

Eclipse: Eclipse is Associate in Nursing integrated development atmosphere (IDE) for Java and different programming languages like C, C++, PHP, and Ruby etc. Development atmosphere provided by Eclipse includes the Eclipse Java development tools (JDT) for Java, Eclipse CDT for C/C++ and Eclipse PDT for PHP, among others. within the context of computing, Eclipse is Associate in Nursing integrated development atmosphere (IDE) for developing applications victimization the Java programming language and different programming languages like C/C++, Python, PERL, Ruby etc. The Eclipse platform that provides the muse for the Eclipse IDE consists of plug-ins and is intended to be protractible victimization further plug-ins. Developed victimization Java, the Eclipse platform may be accustomed develop wealthy consumer applications, integrated development environments and different tools. Eclipse may be used as Associate in Nursing IDE for any programming language that a plug-in is obtainable.

Metrics Used:

- **Confusion matrix:** A confusion matrix of binary classification may be a 2x2 table fashioned by numeration of the amount of the four outcomes of a binary classifier. We usually denote them as True Positive (TP), False Positive (FP), True Negative (TN), and False Negative (FN).
- **Recall:** Recall is that the TP rate additionally named as sensitivity what fraction of these that are literally positive were expected positive.

$$\text{Recall} = \frac{\text{TP}}{\text{Actual Positive}}$$

- **Precision (Positive predictive value):** Precision (PREC) is calculated as the number of correct positive predictions divided by the total number of positive predictions.

$$\text{Precision} = \frac{\text{TP}}{\text{Predicted Positive}}$$

- **F-measure:** F-measure is calculated as the sum of the harmonic mean of precision and recall.

$$\text{F} - \text{measure} = \text{Precision} + \text{Recall}$$

A	**B**	A= Recommended B= Not Recommended
697	33	
25	214	

Table 1 Confusion Matrix

Table 1 shows confusion matrix in which variable '*A*' shows recommended products while variable *'B'* shows not recommended products. In this table total numbers of recommended products and not recommended products are represented. In proposed work 697 products are recommended out of 969 whereas 68 products are these products which are neither recommended nor not recommended category and 214 products are not recommended.

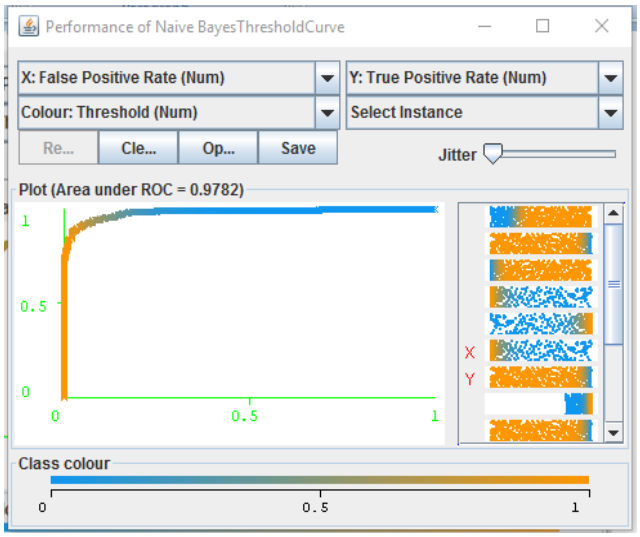

Figure 2 Threshold Curve with False Positive Rate

Figure 2 and Figure 3 shows ROC (Receiver Operating Characteristic) curves of Naïve Baye's classifier in perspective of false positive rate and true positive rate. These curves created by plotting the false positive rate (FPR) along x-axis against the true positive rate (TPR) along y-axis at various thresholds cut points.

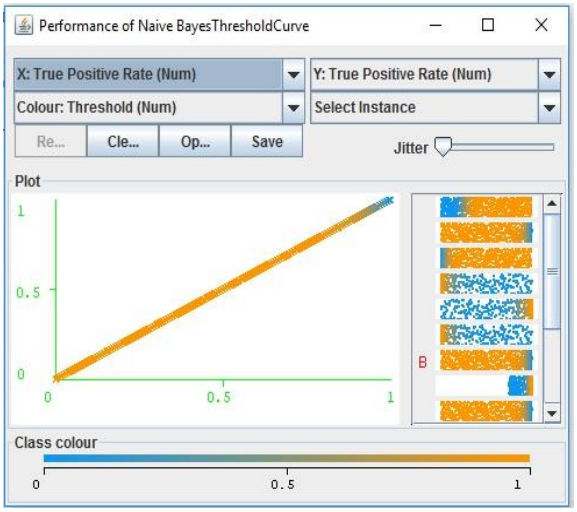

Figure 3 Threshold Curve with True Positive Rate

Precision	:	0.866396761133603
Recall	:	0.895397489539749
F-measure	:	0.880658436213992
Correct	:	94.01444788441692
In Correct	:	5.985552115583076

Table 2 Results with Weka Performance Metrics

Table 2 shows that proposed work is 94.01% correct as compare to existing Naïve Baye's classifier. This shows that the proposed product recommendation system is very much better than the existing product recommendation system in terms of accuracy in recommending product to the end users.

6. CONCLUSION

Online product recommendation is a critical problem for online retailers, as demand of user increases and number of brands of same product increases then it is difficult for user to choose a product out of them according to its requirements. A rating based product recommendation system is proposed in this paper. To classify product ratings Naïve Baye's classifier is used. It uses Baye's theorem to classify different instances. The proposed mechanism is implemented in eclipse and Weka is configured in eclipse through Weka library files to analyze results with confusion matrix and ROC curves. Results shows that proposed mechanism can recommend products in correct manner. This proposed recommendation system can also be implemented on a large data set with the achieved accuracy. In future, try to apply proposed mechanism in different real product recommendation fields also try to use other classification techniques for recommending products.

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