RESEARCH ARTICLE OPEN ACCESS

Weighted Hybrid Approach in Recommendation Method

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ABSTRACT
Recommendation systems, as efficient measures to handle unstructured, raw and complex data in the big data environment. Big Data has the potential to ascertain valued insights for enhanced decision-making process. A recommender system automatically suggests an item to a user interested in. Consequently, traditional recommender systems often suffer from Cold start and Data Sparsity problems when processing or analyzing such big data. Here, we propose a weighted hybrid Novel Approach in recommendation Method, to address the above challenges. It aims at presenting a personalized service recommendation list and provides the most appropriate services to the users. Specifically, keywords are used to indicate user's preferences and a Content-based and Knowledge-based Filtering algorithm is adapted to generate correct recommendations. To improve its scalability and efficiency in the big data environment. Finally, extensive experiments are conducted on realworld Datasets, and results demonstrate that weighted hybrid significantly improves the accuracy and scalability of service recommender systems over existing approaches.

Keywords :- Recommendation System, Preferences, Content based filtering; Knowledge based filtering, Collaborative Filtering.

I. INTRODUCTION

The main thing of supporting a new stream of capability improvement, betterment, and client flood is a Big Data. [1]. Knowledge discovery and decision making from such rapidly growing bulk data is a difficult in terms of organization and processing, which is an emerging trend known as Big Data Computing. Big Data organizes and extracts the valued information from the fastly growing, large volumes, various forms, and frequently changing data sets collected from multiple, and autonomous sources in the minimal possible time, using several statistical, and machine learning techniques [2]. Big data also brings new opportunities and critical challenges to and academia [3], [4]. The recommender system is about to identify the knowledge about the similar user or the event and derive the convenient aspect based on it. It is the criteria of individualized and interesting and useful that separates the recommender system from information retrieval systems or search engines. [5] Recommender systems are an extensively studied and well-established field of research [6]. Recommender systems are the systems which analyses taste and interest of users and recommend services, products, brands or persons as best suited. Users may find it tough to select the best service that meets their individual interest and prerequisite [7]. Most of algorithms and techniques are developed to improve the recommender systems. Recommender systems usually rely on collaborative filtering, content-based filtering, knowledge-based filtering, and hybrid recommendation algorithms. Recommender systems encounter two main challenges for big data application:

1) To make a decision within an acceptable time.

2) To generate ideal recommendations from so many services. In Content-based recommendations, the user will be recommended items similar to the ones preferred in the past. In Collaborative recommendations user will be recommended things that people with similar tastes and preferences liked before. In Hybrid Approaches these methods combine collaborative and content-based methods. [8]. Examples of such practical applications include CDs, books, web pages and various other products now use recommender systems [9], [10], [11].

In many traditional service recommender systems available the ranking and recommendation list provided is the same. Recommender systems have become an important research area. The interest in this area is high because it constitutes a problem- big research area and because of the plenty of practical applications that help users to deal with information. Recommender systems have their relevance to information retrieval in different areas [12].

II. REVIEW OF LITERATURE

In Khushboo, [13] KASR gives a personalized recommendation. Both active user's preferences and passive user's reviews and sentiments in the text are considered for score calculation. Sentiment Analysis is applied to these reviews to provide more accuracy. In Iman, [14] propose an algorithmic framework Based on matrix factorization that simultaneously exploits the similarity information among users and items to alleviate the cold-start problem. In [15] this paper addresses the difficulty of retrieving relevant, pertinent, and novel information for a large system that involves fusion of data in different formats such as, text, barcode, and pictures. We come up with a schema to combine an intelligent image retrieval and intelligent information retrieval (IIR)

along with the user profile learning to develop a recommender system. In [16] Sherla1 It aims at presenting a customized service recommendation list and recommending the foremost applicable services to the users effectively. Specifically, keywords area unit won't indicate users' preferences, and a user-based cooperative Filtering algorithm is adopted to get applicable recommendations. In [17] here summarizes the various aspects of RS, problems /challenges. It also discusses certain issues specific to context aware systems and the long tail problem of RS. In [18] Chiranjeevi it provides a personalized service recommendation list to the users and recommends the most useful services to the users which will increase the accuracy and efficiency in searching better services. In [19] authors explore the different characteristics and potentials of different prediction techniques in recommendation systems in order to serve as a compass for research and practice in the field of recommendation systems. In [20] the system can recommend interesting document files to users by collaborative filtering. In the system, we employ regional similarity between users and general similarity between groups. Using this system, users can find out necessary knowledge and reuse knowledge effectively. In [21] author proposes text indexing system based on the assignment of an appropriate weighted single term which produces superior retrieval result as evidence accumulated over the past 20 years. This result depends crucially on the choice of effective term weighted system. In [22] author proposes weighted least square method is utilized to obtain the weights. This method has the advantage that it involves the solution of a set of simultaneous linear.

III. SYSTEM OVERVIEW

The Internet provides more ways for people to interact but also a place here they could find information about almost everything and anything. Recommendation systems can be considered a way of multiplexing these two features in order to help people find the information they need or something they would be interested in. Recommendation systems are used in various online applications from e-Commerce to search engines. There are lots of techniques used to implement recommendation systems, each with its advantages and disadvantages. Hybrid systems intend to combine two or more of these techniques in order to obtain better results. Recommendation systems development was driven by e-Commerce but there are also other applications for them such as search results and news portals customization. Hybrid techniques were implemented to overcome some of the deficiencies in the traditional techniques. The deficiencies include performance aspects, but also trust security and privacy issues. The most commonly used technique in recommendation systems is collaborative filtering. We propose a weighted hybrid recommendation [23] method. In this method Hybrid, recommender systems combine two or more recommendation techniques in order to increase the overall performance. The weighted hybrid recommendation is adopted to generate appropriate recommendations. Its aims are calculating a personalized rating for each candidate service for a user and then presenting a personalized service recommendation list and recommending the most appropriate services to him/her. Weighted Hybrid Recommendation Systems:

- Weighted Hybrid recommendation systems combine two or more recommendation techniques in order to increase the whole performance.
- The main idea is using multiple recommendation techniques to suppress the drawbacks of an individual technique in a combined model.
- The taxonomy is based on the hierarchy and input/output relations of recommender. A weighted hybridization strategy combines the recommendations of two or more recommendation systems by computing weighted sums of their scores. These scores are hybridized by using a uniform weighting scheme. Thus, given n various recommendation functions reck with associated conditional weights βk.

$$rec_{weighted}(u,i) = \sum_{k=1}^{n} \beta_k * rec_k(u,i)$$

A. System requirement and specification

There are some functional and non-functional requirements of systems are as follows,

I. Functional Requirement

User authentication: Proposed system should authenticate end users and collect the user interest while creating profiles. Product Listing / Searching and Recommendation: Proposed system should be able to list the services by category also user can search into that list as per his need. Also proposed system should recommend the services to use as per his need.

Customer management: It's a common scenario that a new user registers using the e-commerce front-end to be able to perform a commercial transaction later. it should be possible to:

a. Check if a customer already exists in system.

b. Create new customers in system.

Product catalog: A product catalog contains all the products that a user can view.

General considerations:

a. System supports multiple languages for the product name.

b. All the information about the products in the catalog is stored in system.

It should be possible for a user to perform the following actions:

a. Browse the product catalog hierarchically sorted by alphabetically by product name.

b. Browse the product catalog hierarchically by product category.

c. Search the product catalog.

d. Get all the details of a product.

e. Users can rate the product as per their experience. [Poor, Good, Best Excellent]

f. Users can pass comments on products.

Every product object can contain at least the following details:

Product name, Product description, Product category, Product attributes or key features (weight, color, size, etc.), Product price Tax.

II. Non-functional Requirement

Less time required for predicting the required result from big data: The Proposed system requires less time to generate similarity cluster of big data collected from site, It could be users rating, comments and description of products. Also it will take less time for predicting required result from clustered data.

System should be reliable: The proposed system should be reliable means it should be work continuously.

System should be providing good accuracy: The accuracy of the predicted model should be good as compared to previous models.

IV. MATHEMATICAL MODEL

Let S be a highly accurate and advance Recommendation System.

$S= \{I, S, S_{clust}, F_{CBPred}, F_{KBPred}, P_d, U_f, P_r, U_{in}, U_p, R_{obj}, O\}$

Where,

I =Input – big data-Service Clusters

S=User session= {S1, S2... Sn}

Sclust - List of semantic clusters

List< S_{clust} >= AHC (Bigdata)

F_{CBPred} = Content based recommendations on U_f and U_p

F_{CBPred} = (S_{clust} -< U_F >, S_{clust} - < U_p >)

F_{KBPred} = Knowledge based recommendations on Uf, Uin and Pd.

F_{KBPred} = (Sclust -< UF >, Sclust -< UIN >, Sclust -< PD >)

P_d - Product with its key features or description

U_f - User profile

P_r - Product rating's given by individual users

U_{in} - User's attributes and area of interest.

U_p - User preferences

R_{obj} - Recommended product

O= Output= Weighted hybrid Recommended list R.

R1 = F_{CBPred} , R2 = F_{KBPred}

R =Σ (R1 + R2)

Return R.

A. Proposed Algorithm

Weighted Hybrid Recommendation System Algorithm:
Start Algorithm

Let S = A user session *{S1, S2…Sn}*

Where each Si has its own Pair of

< *Product, Attribute, Interest, Hobbies, Views, Product, Purchase history, Product likes* >

List< $REC_{Products}$ >R_{obj} - Return list of recommended products to respective user's session Si.

P_d - Product with its key features or description

U_f - User profile

P_r - Product rating's given by individual users

U_{in} - Users attributes and area of interest.

U_p - User preferences

S_{clust} - List of semantic clusters

For each SCi in List< S_{clust} >

R_{obj}- > *Add* (F_{CBPred} (SCi- > U_f; SCi- > U_p));

- A content based recommendation on preferences U_p, with users U_f.

R_{obj} - > *Add* (F_{KBPred} (SCi- > U_f; SCi- > U_{in}; SCi- > P_d));

- A Knowledge based recommendation on user's interest or requirement Uin, with product key features P_d.

Next;

Return R_{obj};

Stop Algorithm.

V. SYSTEM ARCHITECTURE

Following architectural diagram, recommendations are provided to the user by using clustering based weighted hybrid recommendation system for semantic clusters. At first, the entire user interacts with data processing unit. In the form of big data, it is collected from users; data will be in the form of users purchase information, rating information, according to user's area of interest, product key features, purchase history. After the data collection, data processing step takes place where semantic clustering techniques are applied to collected data. Complete data is divided into the number of clusters. For this purpose, Agglomerative Hierarchical Cluster (AHC) algorithm is used. These clusters are passed to the

content and knowledge filtering techniques. Weighted Hybrid recommendation system is used to provide final recommendations to the users.

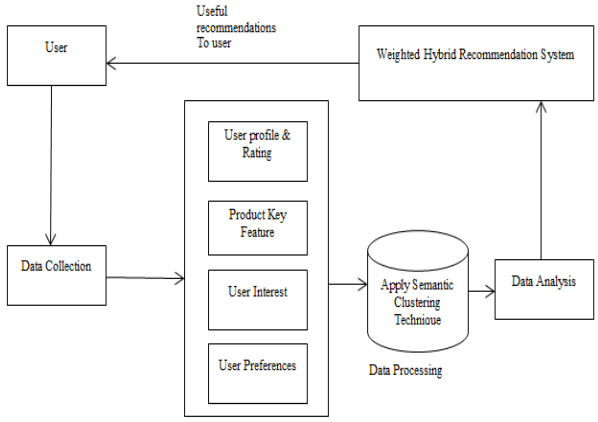

Fig. System Architecture

A. *Efficiency and Performance Measure*

The performance of proposed system is measured in terms of accuracy. In order to calculate accuracy Mean Absolute Error (MAE) is calculated as shown in the, Following equation,

$$MAE = \frac{\sum_1^n |r_{a,t} - P(u_a, s_t)|}{n}$$

In this formula, n is the number of rating-prediction pairs, $r_{a,t}$ is the rating that an active user u_a gives to a service s_t, P (u_a, s_t) denotes the predicted rating of s_t for u_a. Efficiency of the system is also analyzed form this method. Accurate recommendations will surely implement efficient system.

B. *Comparative Analysis*

To design and experiment a weighted hybrid approach to overcome the problems that occur in individual recommendation systems. Existing system used individual recommendation systems such as user-based Collaborative Filtering in that two main problem have been occurred first, Cold-start problem, It's difficult to give recommendations to new users because his profile is almost empty and he has not rated any items so the taste of user remains unknown to the system. Another problem is when user has not rated before when new to the system and Second, Data Sparsity problem, Sparsity is the problem of lack of information. Suppose you have a huge amount of users and items but user have rated only few items. If a user has evaluated only few items then its difficult to determine the taste of the user. As compare to exiting recommendation systems this proposed system is strongly provide accurate recommendations to the user. Above mentioned exiting system problems degrade the performance of recommendation system. Based on accuracy the comparative analysis and performance is measured.

C. *Outcome and Success Definition*

Success of recommendation system is depending on user satisfaction. Service recommendations according to the user needs will define the success rate of this system. This proposed system definitely provides accurate response to the user and it will be the best outcome of this system.

VI. CONCLUSION

The Weighted Hybrid Recommendation System approach for big data applications is proposed to create significant proposals to a gathering of users for items or products that might interest them. Before applying filtering system, administrations are combined into a few clusters through an AHC calculation. Then the rating similarities between services within the same cluster are computed. As the whole system services more than the number of services in a cluster, it costs less online computation time.

ACKNOWLEDGMENT

We might want to thank the researchers and in addition publishers for making their assets accessible and instructors for their direction. We are grateful to the powers of the contributors for developing and maintaining such type of material and concern individuals for their consistent rules and support. We are likewise appreciative to the analyst for their important recommendations furthermore, thank the school powers for giving the needed foundation and help.

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