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# A Survey on Structural Balance Theory-Based E-Commerce Recommendation over Big Rating Data

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**ABSTRACT:** Collaborative Filtering is a method usually used to fabricate customized suggestions on the Web. It is based on the idea that people who agreed in their evaluation of certain items in the past are likely to agree again in the future. Be that as it may, commonplace CF techniques likewise treat every client and article and are not ready to recognize the variety of client interests in various areas. This violates the way that client interests dependably concentrate on particular areas and clients who have comparative tastes in a space may have different tastes in another area. In this paper, we propose a new structural balance theory-based recommendation algorithm (SBT-Rec) to perform user-based recommendation: let's watch for the "enemy" of the target user. We determine the target user possible friends, according to the rule of "enemy's enemy is a friend" of the structural balance theory, and recommend the product favorite articles from "possible friends" of the target user to the target user and in the same way, for products purchased and preferred by the target user, we determine your "possibly similar product articles" based on the structural balance theory and recommend them to the destination user.

**KEYWORDS:** E-commerce, Product recommendation, similar friend, dissimilar enemy, big rating data, Structural Balance Theory

### I. INTRODUCTION

Recommendation systems are currently essential that support users with potentially different opinions and opinions in their search for information, taking into account the diversity of preferences and the relativity of the value of the information. Collaborative filtering (CF) is an effective and widely accepted recommendation approach. Unlike content-based recommendation systems that rely on user profiles and forecasting elements, CF approaches make predictions using only information about the interaction of the user's object, such as transaction history or content satisfaction in ratings, etc. As more personal attention is paid, CF systems become more and more popular, as they do not explicitly require users to provide their personal information.

However, there are still some issues that can limit the performance of typical CF methods. On the one hand, user interests always focus on specific domains, but not on all domains. However, typical FC approaches do not address these domains distinctly. On the other hand, the key assumption for typical CF approaches is that users get similar scores on partial articles and, therefore, they will get a score on all other articles in a similar way. However, it is noted that this hypothesis is not always so defensible. In general, the effect of collaboration between users varies depending on the different domains.

In other words, two users with similar tastes in a domain cannot infer that they have a similar taste in another domain. By taking an intuitive example, two users who love romantic movies are likely to have totally different preferences in action movies. Therefore, it is more reasonable and it is necessary to automatically extrapolate different domains and perform domain-sensitive CF for the recommendation systems.

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## II. LITERATURE SURVEY

Sr.No	Author/Paper Name	Proposed System	Refer Points
1	Lianyong Qi, Xiaolong Xu, Xuyun Zhang, Wanchun Dou, Chunhua Hu, Yuming Zhou, Jiguo Yu, "Structural Balance Theory-based E-commerce Recommendation over Big Rating Data" 2016, pp. 219–200	In this paper, proposed a novel structural balance theory-based recommendation algorithm (SBT-Rec) algorithm, to make the rating prediction by exploring the user-item subgroup analysis simultaneously, in which a user-item subgroup is deemed as a domain consisting of a subset of items with similar attributes and a subset of users who have interests in these items.	Structural balance theory-based recommendation algorithm (SBT-Rec), to make the rating prediction by exploring the user-item Subgroup analysis.
2	A. Bellogin and J. Parapar, "Using graph partitioning techniques for neighbour selection in user-based collaborative filtering," in Proc. 6th ACM Conf. Recommender Syst., 2012, pp. 213–216.	In this paper, we use one of these techniques, Normalized Cut, to derive a cluster-based collaborative filtering algorithm that goes beyond other state-of-the-art techniques in terms of classification accuracy. Let's look at this technique as a method for selecting neighbors and showing its effectiveness compared to other cluster-based methods.	Cluster-based collaborative filtering algorithm which outperforms other standard techniques in the state-of-the-art in terms of ranking precision.
3	B. Xu, J. Bu, C. Chen, and D. Cai, "An exploration of improving collaborative recommender systems via user-item subgroups," in Proc. 21st Int. Conf. World Wide Web, 2012, pp. 21–30.	In this document, to find significant subgroups, we formulate the Multiclass Co-Clustering (MCoC) problem and propose an effective solution. Subsequently, we propose a unified framework to extend traditional CF algorithms by using subgroup information to improve their N recommendation superior performance.	CF algorithms by utilizing the subgroups information for improving their top-N recommendation performance.
4	J. Liu, Y. Jiang, Z. Li, Z. Zhou, and H. Lu, "Partially shared latent factor learning with multiview data," IEEE Trans. Neural Netw. Learn. Syst., vol. 26, no. 6, pp. 1233–1246, Jun. 2015.	This article proposes a new supervised multivision learning algorithm, called learning a partially shared latent factor (PSLF), which jointly uses consistent and complementary information across multiple perspectives. In PSLF, a non-negative (Factoring) (MFN) based formulation is adopted to learn a partially shared, compact and complete latent representation consisting of common latent factors shared by multiple views and some latent factors specific to each view. With the representations learned from multiview data, we present a robust scattered regression model to predict label labels labeled. By integrating the MFN-based model and the regression model, we get a unified formulation and propose an alternative algorithm based on multiplication for optimization.	A robust sparse regression model to predict the cluster labels of labeled data.
5	Z. Li, J. Liu, J. Tang, and H. Lu, "Robust structured subspace learning for data representation," IEEE Trans. Pattern Anal. Mach. Intell., vol. 37, no. 10, pp. 2085–2098, Oct. 2015.	In this article, we propose a new Robust Substructural Structural Learning (RSSL) algorithm that integrates image understanding and learning of features into a joint learning framework. The learned space is adopted as an intermediate space to reduce	The proposed a supervised feature selection algorithm to improve the image tagging performance.

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		the semantic gap between low-level visuals and high-level semantics. To ensure that subspace is compact and discriminative, the intrinsic data geometry and local and global structural consistency on labels are simultaneously exploited in the proposed algorithm.	
6	M. Huang, L. Sun, and W. Du, "Collaborative filtering recommendation algorithm based on item attributes," in Proc. IEEE/ACIS Int. Conf. Softw. Eng., Artif. Intell., Netw. Parallel/Distrib. Comput., 2014, pp. 1–6.	In the case of scattered data set, to improve the accuracy of the calculation of similarity is to improve the quality of the recommendation. In this work, an improved likeness. A calculation method is proposed that is combined with the relevant theoretical knowledge of the theory of attributes and of the current research.	Finally, the experimental results show that compared with traditional algorithm the proposed algorithm can effectively alleviate the user rating data sparsity problem and improve the quality of recommendation system.
7	S. C. Madeira and A. L. Oliveira, "Biclustering algorithms for biological data analysis: A survey," IEEE/ACM Trans. Comput. Biol. Bioinform., vol. 1, no. 1, pp. 24–45, Jan. 2004.	We have presented a comprehensive review of the models, methods and applications developed in the field of biclustering algorithms. The list of applications submitted is not exhaustive and a full list of possible applications would be too long.	In this comprehensive survey, we analyze a large number of existing approaches to biclustering and classification according to the type of biclusters they can find, biclusters models that are being discovered, methods used to search and target applications.
8	T. George and S. Merugu, "A scalable collaborative filtering framework based on co-clustering," in Proc. 5th IEEE Int. Conf. Data Mining, 2005, pp. 625–628.	In this article, let's consider a novel CF approach based on a newly proposed weighted pooling algorithm which implies the simultaneous grouping of users and articles. We design incremental and Parallel versions of the co-clustering and use algorithm build an efficient FC frame in real time.	In this document, we consider that a new approach to CF is based in a weighted Bregman pool recently proposed algorithm.

### III. EXISTING SYSTEM

- Existing recommendation systems are now indispensable for days, which supports users with possibly different opinions and opinions in searching for information, taking into account the diversity of preferences and relative value of information.
- Content-based recommendation systems that are based on user profiles and forecasting elements.
- CF approaches make predictions using only user interaction information such as transaction history or article satisfaction in evaluations, etc.
- In addition, most of these clustered FC approaches are executed in a two-step sequential process: domain detection by clustering and rating using CF within the groups.

#### Disadvantages of Existing System

1. The existing system has some problems which might limit the performance of typical CF methods.
2. However, it is observed that this assumption is not always so tenable. Usually, the collaborative effect among users varies across different domains.

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3. However, such divide-and-conquer style being a new problem i.e. the algorithm cannot take full advantage of the observed rating data which is limited and precious.

## IV. PROPOSED SYSTEM

In this work, propose a new structural balance theory-based recommendation algorithm (SBT-Rec) to perform classifications prediction by simultaneously analyzing the subset of user elements, in which a subset of user elements is considered as a domain consisting of a subset of elements with similar attributes and a subset of users who have interests in these elements. Enemy's enemy is a friend" rule of Structural Balance Theory Algorithm. The proposed framework of SBT-Rec includes three components: a matrix factorization factor model for observed rating reconstruction, a bioreactor model for the analysis of subgroups of user elements, and two regular terms to link the two before components into a unified formulation.

### Advantages of Proposed System

1. Develop a structural theory based E-commerce recommendation algorithm, which makes rating prediction assisted with the user-item subgroup analysis
2. SBT-Rec is a unified formulation integrating a matrix factorization model for rating prediction and a bi-clustering model for domain detection.

## V. PROPOSED SYSTEM ARCHITECTURE

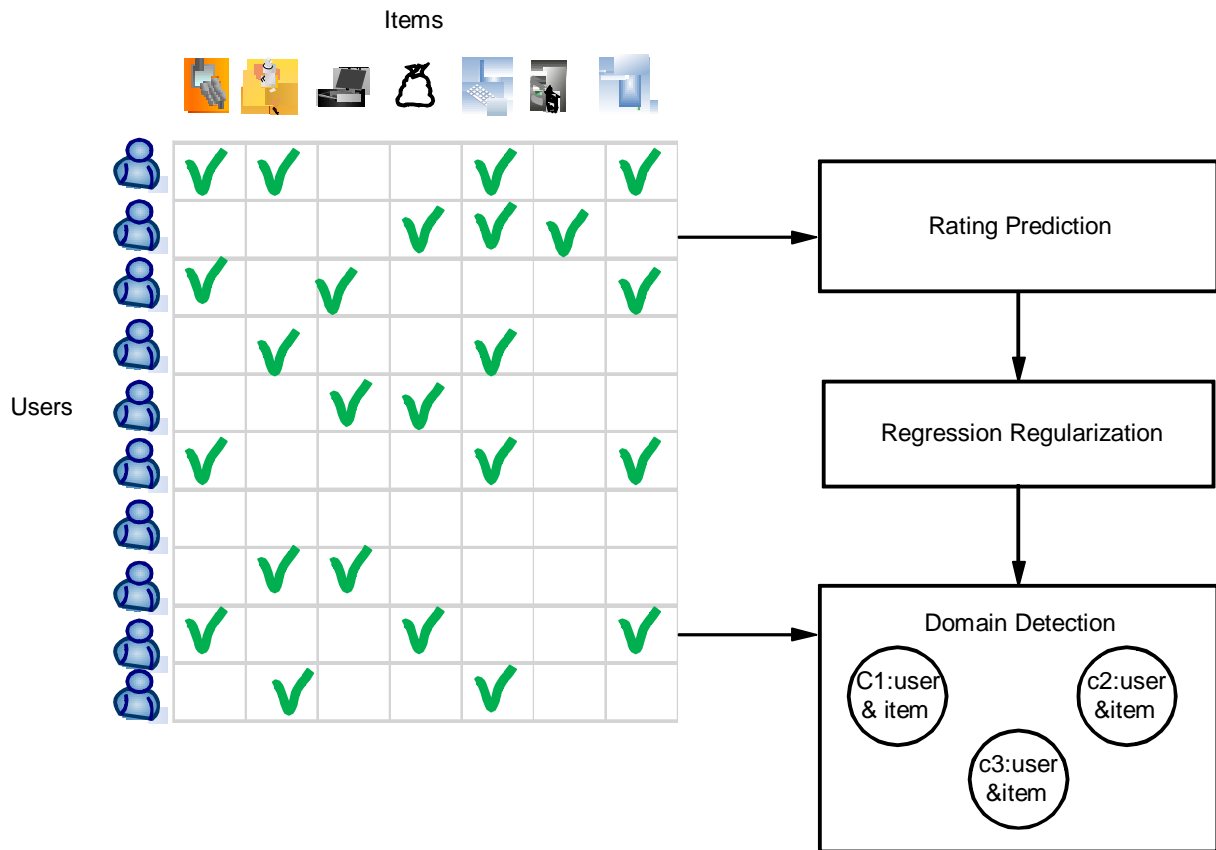


Fig. System Architecture

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## VI. CONCLUSIONS

In this paper, to handle specific recommendation situations when the target user does not have Friends and similar product items preferred by the target user do not have similar products. On the one hand, SBT - fully exploits the valuable information on the structural balance hidden in the network of purchase of the user's products precise recommendation, considering that the rule "the enemy's enemy is a friend" and the rule of "friend of the enemy is an enemy" in Theory of structural theory; On the other hand, SBT-Rec integrates both the user-based CF recommendation and the CF recommendation of imputation, in order to improve recovery of the recommendation.

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