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Recommendations using Linked Taxonomies of Subjective Assessments

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Abstract - Subjective assessments like 'beautiful' and 'breathtaking' are assigned to items by users and are commonly found in reviews on many online sites. Analyzing the links between these SAs and items can help improve the recommendation accuracy. We propose a different method which links taxonomy of items to a taxonomy of SAs to capture user's interests in detail.

Keywords **- Recommendation System, Collaborative Filtering, Subjective Assessments.**

1. Introduction

Different online retail sites like Amazon employ user generated reviews or tags of items as well as ratings. These reviews or tags consist of Subjective Assessments. These SAs provide information about the user's preferences. The ratings as well as these SAs can be used for recommendations in recommendation systems. Subjective assessments show what the user perceives about an item. This data is very useful in understanding the needs of the user. The recommendations provided by systems employing these methods can match the desires of the users. Most commercial recommendation systems use methods based on collaborative filtering (CF). CF makes use of intuition in such a way that the user who gets the recommendation tends to have similar interests as the active user.

The user generated tags can be classified into the following categories. Context tags contain contextual information about the item. Subjective tags are descriptive judgments about the items. Organizational tags are about self references and personal tasks. The content information of these items is useful in improving the recommendation accuracy. The results of the previous studies showed that the recommendation accuracy did not improve by using subjective tags. We assume that the poor accuracy of recommendations was due to sparsity, i.e. datasets used to measure the similarity of users were not adequate. This problem is called as the sparsity problem. The sparsity problem has two causes when using SAs. Different users do not assign SAs using the same items and the ratings dataset contains few items with the same SAs. The sparsity problem due to the reasons mentioned above can be resolved by using the concept of taxonomies though not simultaneously. The previous method based on taxonomies could not resolve the two sparsity problems simultaneously. This was because the taxonomies of items and SAs were based on different types of item classifications. We could construct a single taxonomy by merging the taxonomies of items with taxonomies of SAs.

To solve the sparsity problem while retaining the semantics of user's item transactions, we propose a different method using the concept of linked taxonomies which links separate taxonomies of items and SAs. Our method groups the SAs assigned by users to items in SCs. Then our method matches the SAs/SCs assigned to an item in its classes. Our method is based on the observation that users who assign high rating to an item and also provide an SA may also like the items from the same class and similar SAs.

For example, if user u gives a high rating to pasta restaurant Figlio and assigns it with the SA 'light' ,this user is expected to prefer pasta restaurants assigned with the SA 'non-fatty' by other users. This is because 'light' and 'non-fatty' share the same SC. Hence, our method treats user v who likes restaurant Laria as similar to u. And it treats user w who likes pasta restaurant Fratelli as dissimilar to u.

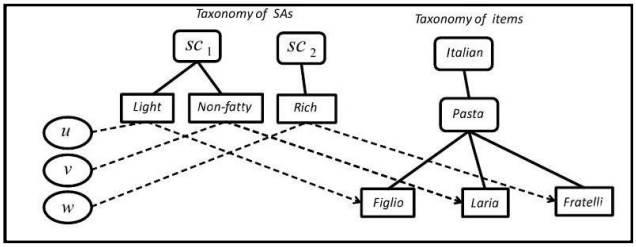

Fig 1: Linked taxonomies for modeling user's interests

This method can provide information about why items are recommended to user's based on the relationship identified in the taxonomies of SAs and items as well as information related to users who assign SAs in their reviews.

This paper is organized as follows:

We describe the previous work in the next section. We describe linked taxonomies in detail in section 3. We conclude the paper in section 4.

2. Previous Work

Commercial recommendation systems use methods based on collaborative filtering (CF). CF based systems work in the following manner. A user expresses his or her preferences by rating the items of the system. These ratings can be viewed as an approximate representation of the user's interest in the corresponding domain. The system matches this user's ratings against other user's ratings and finds the people with most "similar" tastes. The system recommends items that the similar users have rated highly but not yet rated by this user.

CF based methods suffer from sparsity problem. These methods treat different words having similar meanings as different SAs example "excellent" and "marvelous" were treated as two different SAs even though they mean the same thing actually. Our method which creates subjective classes for the SAs does not suffer from this problem because SAs meaning similar things are a part of the same class. Hence our method provides accurate recommendations as compared to previous methods.

3. Computing Recommendations by Linking Taxonomies of SA's and Items

3.1 Extracting SA's

For the extraction of SAs given by users to different items, we use natural language processing. We determine the phrases and compare them with patterns defined for classifying SA's. The different patterns are |<adverb><adjective>|, |<adjective><noun>|,|<adjective>|,|<adverb>|,|<pronoun><adjective>|.

We can use sentiment analysis methods to extract the SAs from item reviews. In the reviews, the subject of the review is an item that has been reviewed, i.e. if we consider restaurant reviews, the subject is the restaurant. We need to use syntactic analysis to extract SAs to analyze the relationships between the SA candidates and reviewed items according to the following procedures.

(1)We model the properties of the items that are assigned SAs by the users.

(2) We analyze the relationships between these properties and the SA candidates using a syntactic analysis tool.

3.2 Creating Taxonomy of SAs

If an existing taxonomy cannot be used a new one must be created.

A new taxonomy can be created by using Wordnet as we will be doing or we can create one manually. We will be creating subjective classes of SAs which will hold the related SAs or SAs having similar meanings.

For assigning words having ambiguous meanings to SCs we will use synonym nets provided on WordNet. WordNet provides polysemous count of any word i.e. the number of synonym sets a word has. If the target SA belongs to more than two synsets we extract the most frequent synset and assign the corresponding sense of the chosen synset in the SC for the target SA.

For SAs that correspond to the pattern |<adverb><adjective>| we classify them according to the adjective in the pattern.

3.3 Recommendation of Items

Using subjective classes of SAs and taxonomies of items users will be given accurate recommendations.

The dataset which we use contains user information, ratings from 0-5 and SAs.

Our approach is based on the observation that users who assign high ratings to an item and also provide SA may also like items from the same class and similar SAs.

For example, suppose user 'a' gives high rating to movie 'Mission Impossible 4' and assigns it with SA 'incredible' the user is expected to prefer action movies assigned similar SAs because the SAs share the same subjective classes. Hence , our method treats user 'b' who likes the action movie 'Salt' and gives it the SA 'thrilling' as similar to' a'.

3.4 Proposed Architecture

The architecture of our system will be as follows.

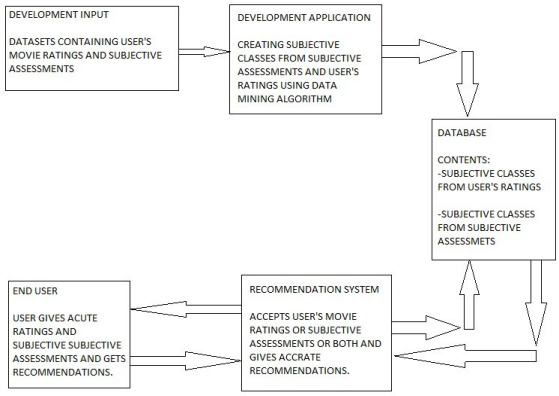

Fig 2: Proposed architecture

The input to our system is the user information, the ratings provided by the user and the SAs provided by the users.
The output of the system will be desired accurate recommendations to the users. The first step in the processing of the input information will include extraction of the SAs given by the users. This will be done using WordNet wherein we will analyze the synonym nets for each word and choose the relevant meaning word to be stored in our taxonomy.

The next step would be to form the classifications of items for which SAs have been provided. Then depending upon the relationships between the users, SAs and items the recommendation system will give desired recommendations to different users.

Consider an example, suppose user u rates the movie 'Princess diaries' and assigns it the SA 'nice' and user v rates the movie 'High school musical' and assigns it the SA 'enjoyable' then our system will add the movies to the taxonomy of items. Then a link to SC containing the SAs provide will be formed. The items linked to the SC of these SAs will be recommended to the users u and v, i.e. user u may be recommended movies which have been given high ratings and similar SAs by user v and vice versa. So user u may be recommended the movie 'High school musical ' and user v may be recommended the movie 'Princess Diaries'.

4. Conclusion

In this study we have explored a novel method that links taxonomy of items to taxonomy of SAs to improve measurement of the similarity of user's interests. Our method groups the SAs assigned by the users to items in SC and the SAs/SCs reflect the classes in which they are included. Our method computes the similarities of users based on the SAs/SCs assigned to items and those assigned to item classes.

5. Future Work

Linked taxonomies could be applied to tags other than SAs like content tags or context tags because different types of semantic relationships exist for different types of tags.

References

[1] Makoto Nakatsuji and Yasuhiro Fujiwara," Linked taxonomies to capture users' subjective assessments of items to facilitate accurate collaborative filtering", ScienceDirect, Artificial Intelligence 207 (2014) 52–68.

[2] I.Cantador, I.Konstas, J.M.Jose, Categorizing social tags to improve folksonomy-based recommendations, J.WebSemant.9 (2011)1–15.

[3] Y.Zhen, W.-J.Li, D.-Y.Yeung, TagiCoFi,"tag informed collaborative filtering", Proc. Rec Sys' 09 , pp.69–76.

[4] J.L. Herlocker, J.A. Konstan, L.G. Terveen, J.T. Riedl "Evaluating collaborative filtering recommender systems", in ACM Trans. Inf. Syst., 22 (2004), pp. 5–53.

[5] V. Schickel-Zuber, B. Faltings, "A semantic similarity function based on hierarchical ontologies", in Proc. IJCAI'07, pp. 551–556.

[6] Y. Koren, "Collaborative filtering with temporal dynamics", in Proc. KDD'09, pp. 447–456.

[7] A. Meena, T.V. Prabhakar, "Sentence level sentiment analysis in the presence of conjuncts using linguistic analysis", in Proc. ECIR'07, pp. 573–580.

[8] H. Kanayama, T. Nasukawa, "Fully automatic lexicon expansion for domain-oriented sentiment analysis", in Proc. EMNLP'06, pp. 355–363.

[9] R. Valitutti, "WordNet-Affect: an affective extension of Wordnet" ,in Proc. International Conference on Language Resources and Evaluation, pp. 1083–1086.

[10] B. Sarwar, G. Karypis, J. Konstan, J. Reidl," Item-based collaborative filtering recommendation algorithms", in Proc. WWW'01, pp. 285–295.