

Analysis on Existing Methodologies of User Service Rating Prediction Systems

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ABSTRACT:- Recent advancements in the field of mobile and social networking lead to the increase in users opinion sharing by providing reviews, ratings, photos, check INS etc. These user data can be analyzed to get ideas about their personal behavior there by helping to predict their required future service patterns. The use of mobile phones with network connectivity helps us to geographically locate the smart phones thus bridges the gap between physical and digital world. These location based data acts as a connection between user's physical and virtual behaviors. These social networks involving geographical information are called as Location based social networks (LBSNs)

Key Words: service rating Prediction, user rating, Recommendation systems, and social networks

1. INTRODUCTION

Now a days due to wide spread availability of internet access and use of different mobile devices, social media such as face book, twitter, LinkedIn are used commonly. These smart phone users produce large volumes of data. The internet revolution has brought about a new way of expressing an individual's opinion. It has become a medium through which people openly express their views on various subjects. These opinions contain useful information which can be utilized in many sectors which require constant customer feedback. The proposed method compares about existing methodologies available for user service rating prediction and their problems.

2. RECOMMENDER SYSTEMS

Recommender systems are the main methods that helps users to make decision about what products to buy, which hotels are good, which movies to watch etc. These systems helps the business by increasing sales and also helps the users by saving time and money by recommending the best personalized results.

Three categories of recommender systems have been identified which are collaborative filtering, content based

Filtering and the hybrid version which is the combination of two mentioned categories. Social recommender systems are actually the improved version of collaborative filtering. These collaborative filtering is based on social networks. Social networks are made of a finite group of users

And their relationships (figure1) that they establish among them through the social links so one key insight is that Social-based recommender systems should account for a Number of dimensions within a user's social network, Including social relationship strength, expertise, and user similarity.[1].

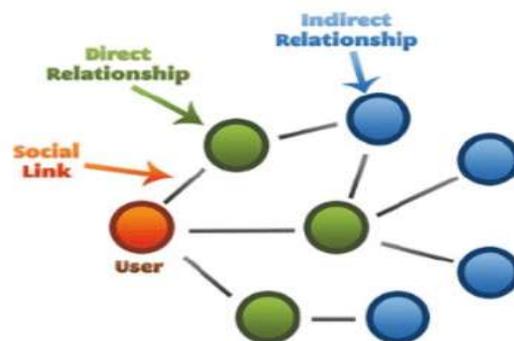


Figure 1: the pattern of social relationship in social Networks [2].

3. COLLABORATIVE FILTERING

Collaborative filtering is the technique used by Recommender systems to filter the user's behavioral patterns and extract new patterns. This extraction is done by collecting users Preferences or interest from many users. The collaborative filtering method works under the assumption that if a user 1 has the same opinion of user 2 in a issue then they are more likely to have same opinion on a different issue. So by analyzing the opinion of user 1 we can predict the opinion of user 2. The main pillars of this approach are that a) many peoples must participate) there must be a method for people to express their interest c) an algorithm must be there to match the user's interest.

Collaborative filtering has found its applications on the web. Electronic commerce sites such as Amazon.com and Flipkart feature recommendation centers, where, in addition to expert reviews, users can rate items and then receive personalized recommendations computed by a collaborative filtering engine. User preference can also infer from site usage: for example, purchasing a book may be taken as evidence of interest not just in that book, but also in the book's author [3].

There exist Different collaborative filtering systems in both industry and academia. Tapestry [4], a manual collaborative filtering system presented by Goldberg *et al.* Relied on each user to identify like-minded users manually. It was designed to recommend documents drawn from newsgroups to a group of users. GroupLens [5,6], Video Recommender [7], and Ringo [8] were the first automated collaborative filtering system.

According to Breese *et al* [9], algorithms for collaborative recommendations can be grouped into two general classes: model-based and memory-based Memory based algorithms are heuristics that use previously rated items by the users to make rating predictions. In contrast to memory based methods, model-based algorithms first uses a set of ratings to learn a model, then using this model make rating predictions.

A. Problems

Collaborative filtering suffers from problems such as Cold start, Scalability, Sparsity [10] [11].

- **Cold Start:** For a new user or item, there isn't enough data to make accurate recommendations.
- **Scalability:** In areas where these systems make recommendations, there are millions of users and products. Thus, a large amount of computation power is often necessary to calculate recommendations.
- **Sparsity:** 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.

4. CONTENT-BASED RECOMMENDATION

Content based Recommendation is based on Description of the products and a Profile of user's interest and preferences. These methods are suitable to apply when details about an item like name, location, description, rate etc are known. In content based Recommendation Systems the user specific recommendations are made based on user's likes and dislikes. These methods try to recommend items that are similar to items that users liked in the past.

This method sets up a user Profile and item profile. User Profile for every user based on information's of users like a pattern of user's preference and history of users which we derive from the interaction of users with recommender Systems. Item profile contains the features, ratings and details about the item.

Content based system also makes use of user opinions which will be got from analyzing the feedback collected from users by leaving a space for users to enter feedback while purchasing the item. So in turn this system makes use of opinion mining method.

The existing Content based recommendation systems are G. Salton, in book "Automatic Text Processing" [12] has shown that the content-based recommendation has its roots in information retrieval and information filtering. It is due to the early advancements made by the information retrieval and filtering communities that many content-based recommenders focus on recommending items containing textual information such as URLs and documents.

NewsDude [13] presented by Billsus & Pazzani (1999), a content-based filtering system suggests new stories the user might like to read. To accomplish this two user models are built. The first user model measure similarity between the new story and the stories that the user has read before by counting the co occurrences of words appearing in these stories. The second user model assigns a probability of interest to a new story by comparing how frequently its words occur in those stories the user regards as interesting to those the user regards as of no interest. Comparing how frequently its words occur in those stories the user regards as interesting to those the user regards as of no interest.

5. Hybrid recommendation

One way to implement Hybrid recommender systems are implemented by combining the results of collaborative filtering and content based recommender systems. Initially the data is processed separately by the two methods and then the results are combined. The other methods include

There is no reason why several different techniques of the same type could not be hybridized. Hybrid approaches can be implemented in several ways: by making content-based and collaborative-based predictions separately and then combining them; by adding content-based capabilities to a collaborative-based approach or by unifying the approaches into one model. Several studies that empirically compare the performance of the hybrid with the pure collaborative and content-based methods and demonstrated that the hybrid methods can provide more accurate recommendations than pure approaches. These methods can also be used to overcome some of the common problems in recommender systems such as cold start and the sparsity problem, as well as the knowledge engineering bottleneck in Knowledge based approaches.

The hybrid recommender systems also have some issues like they need a database of user ratings as well as user profiles. Without this database recommender systems cannot predict accurate results

6. CONCLUSION

In our opinion, the rating behavior in recommender system could be analyzed in these aspects: 1) when user rated the item, what the rating is, 2) what the item is, 3) what the user interest that we could dig from his/her rating records is, and 4) how the user's rating behavior diffuses among his/her social friends.

7. REFERENCES

1. Maryam Nayebzadeh Akbar Moazzam, Amir Mohammad Saba, Hadi Abdolrahimpour, Elham Shahab, "An Investigation on Social Network Recommender Systems and Collaborative Filtering Techniques".
https://www.researchgate.net/publication/318849587_An_Investigation_on_Social_Network_Recommender_Systems_and_Collaborative_Filtering_Techniques
2. W.-K. Chen, Al Falahi, Kanna, Nikolaos Mavridis, and Yacine
3. Atif. "Social networks and recommender systems: a world of current and future synergies." In *Computational Social Networks*, pp. 445-465.
4. Springer London, 2012
5. *Beyond Recommender Systems: Helping People Help Each Other*. B. Smith, Loren Terveen and Will Hill AT&T Labs – Research in HCI in the New Millennium, Jack Carroll, ed., Addison-Wesley, 2001 p. 1 of 21
6. Hofmann, T. Collaborative Filtering via Gaussian Probabilistic Latent Semantic Analysis. In *Proc. of the 26th Annual International ACM SIGIR Conference*, pp.259-266, ACM press, New York, NY, USA, 2003.
7. Konstan, J. A., B. N. Miller, D. Maltz, J. L. Herlocker, L.R. Gordon, and J. Riedl. GroupLens: Applying collaborative filtering to Usenet news. *Communications of the ACM*, vol. 40, no. 3, pp. 77-87, 1997
8. Resnick, P., N. Iakovou, M. Sushak, P. Bergstrom, and J. Riedl. GroupLens: An open architecture for collaborative filtering of netnews. In *Proceedings of the ACM conference on Computer Supported Cooperative Work*, pp. 175- 186, New York, NY, USA, 1994.
9. Hill, W., L. Stead, M. Rosenstein, and G. Furnas. Recommending and evaluating choices in a virtual community of use. In *Proceedings of CHI'95 SIGCHI Conference on Human Factors in Computing Systems*, pp. 194-201, ACM press, New York, NY, USA, 1995.
10. Shardanand and P. Maes. Social information filtering: Algorithms for automating 'word of mouth'. In *Proceedings of SIGCHI Conference on Human Factors in Computing Systems*, pp. 210-217, ACM press, NY, USA, 1995.
11. Breese, J. S., D. Heckerman, and C. Kadie. Empirical analysis of predictive algorithms for collaborative filtering. In *Proceedings of the Fourteenth Conference on Uncertainty in Artificial Intelligence*, pp. 43- 52, Morgan Kaufmann Publishers, San Francisco, CA, USA, 1998
12. Rubens, Neil; Elahi, Mehdi; Sugiyama, Masashi; Kaplan, Dain (2016). "Active Learning in Recommender Systems". In Ricci, Francesco; Rokach, Lior; Shapira, Bracha (eds.). *Recommender Systems Handbook (2 ed.)*. Springer US. doi:10.1007/978-1-4899-7637-6_24. ISBN 978-1-4899-7637-6
13. Elahi, Mehdi; Ricci, Francesco; Rubens, Neil (2016). "A survey of active learning in collaborative filtering recommender systems". *Computer Science Review*. **20**: 29–50. doi:10.1016/j.cosrev.2016.05.002
14. Salton, G. *Automatic Text Processing*. Addison-Wesley Longman Publishing co., Boston, MA, USA, 1989.
15. Billsus, D. and M. Pazzani. User modeling for adaptive news access. *User Modeling and User-Adapted Interaction*, vol. 10, no. 2-3, pp. 147-180, Kluwer Academic Publishers Hingham, MA, USA, 2000.