International Research Journal of Advanced Engineering and Science
ISSN: 2455-9024

A Survey on Different Types of Recommendation Systems

Gigimol S[1], Sincy John[2]
[1]PG Scholar, Computer Science and Engineering, Mar Baselios Christian College of Engineering & Technology, India
[2]Assistant Professor, Computer Science and Engineering, Mar Baselios Christian College of Engineering & Technology, India

Abstract— *Recommendation system is used for filtering of information that provide users with information that he/she is interested in. It also helps in addressing the information overload problem by retrieving information that is required by the user according to their preferences. Recommendation system also add value to the customer by increasing trust and customer loyalty. The rating or preference that the user give to an item, can be predicted using recommendation systems. It can be used in many applications such as movies, news, books, e-commerce etc. This paper focuses on different types of recommendation systems for various applications.*

Keywords— *Collaborative filtering, context, hybrid, recommendation, typicality.*

I. INTRODUCTION

Recommendation systems are software tools that provides suggestions about items for user. This system provides suggestions for user in decision making such as where to plan a tour, what items can be brought, what exciting news are there to read etc. It has the ability to cope with the information overload problem. There are many methods to handle challenges of recommendation system like data sparsity [1], scalability [2], long tail problem [3], cold start problem [4] etc.

Recommendation systems are useful for both users and providers.

Value for the users

- Recommend items that are interesting to them.
- Lessen the number of choices
- Explore the option space
- Find new items
- Entertainment**…**

Value for the providers

- Ensure unique personalized service for the users
- Increase user trust and loyalty
- Increase sales of items
- Chances for promotion
- Gain knowledge about users

II. CLASSIFICATION OF RECOMMENDATION SYSTEM

Based on how the systems analyze and filter the information according to the user requirements, there are many recommendation systems.

A. Content Based Recommendation System (CBR)

CBR system is based on item description and the profile of the user that is build according to their preferences [5]. The items are described using keywords and user profile contains all the items that the user likes. This recommendation system recommend items to the user according to his profile. The user profiles are updated automatically based on their feedback. It uses filtering techniques for information retrieval, in which some candidate items are matched with those items that the user had previously rated and the recommends the best item to the user. The output is a performance score based on degree of matching.

Advantage

- Give recommendation based on user preferences.
- No sparsity problem.
- No cold start problem
- Automatic updation

Disadvantage

- It depends on the preexisting knowledge of the user to give recommendation [6].

B. Collaborative Filtering Recommendation System

Recommendation system based on collaborative filtering, depends on gathering and analyzing the data based on the user preferences and make a prediction of items that they would like based on their similarity with other users, this similarity is calculated by comparing their ratings with the ratings of other users for the same item [7]. There are two types of collaborative filtering approaches – item based and user based.

a) Item based collaborative filtering system

In this system, item relationships are identified using user-item matrix and use this to calculate recommendation for users indirectly [8]. It provides users, an item as a recommendation, depending on other items with high correlations. A set of similar items for each item is first found i.e. the set of their neighbours. This system predicts the ratings of the user for a particular item depending on the rating given to the similar item by the same user.

Advantage

- High performance
- Good prediction quality

b) User based collaborative filtering system

User based collaborative system [9] recommends an item to the user based on other similar minded users opinion for that item. It finds the users with common interests and considers them as the nearest neighbours. Then the prediction of that user for the item will be made based on the rating that the neighbours of the user give for that item.

Advantage

- Simple
- Efficient

Gigimol S and Sincy John, "A Survey on different types of recommendation systems," *International Research Journal of Advanced Engineering and Science*, Volume 1, Issue 4, pp. 111-113, 2016.

- Accurate

Disadvantages

- Cold start problem
- Scalability problem
- Data sparsity problem

C. Hybrid Recommendation System

In order to increase the efficiency of recommendation systems, hybrid recommendation system is demonstrated that combines the above two recommendation systems. It can be implemented in three ways – (a) by separately making predictions and then combining them [10], (b) adding functions of content based system to collaborative system and (c) combining the models into one model. One good example of this system is Netflix [11] which provides recommendations by comparing the similar users as in collaborative system and recommends the one that is highly rated by the users as in content based systems.

Advantage

- Avoids scalability problem
- Minimize data sparsity

Disadvantage

- Cannot adopt to increasing number of users or items.

D. Context Aware Recommendation System

Tourism is one area that has been improved by the use of context in mobile applications. Context is any information that characterizes the situation of an entity such as person, place or object [12]. Tour guides heavily rely on location and ignore other context types. As a result information overload problem [13] arises. This can be avoided by using appropriate personalization and content filtering method such as VISIT (Virtual Intelligent System for Informing Tourist) system [14]. This system considers five main types of contextual data such as location, time, weather, personalization and social media entertainment [15].

Advantage

- It detects the level or variance between data.
- Reduces the dimensionality of data.
- More accurate

Disadvantage

- High prediction errors.

E. Typicality Based Recommendation System

Typicality degree of user in user groups is used to identify the neighbours of the users [16]. It first group the items into several clusters. Based on each cluster, user group is formed with users having same typicality degree in one group. Then a user typicality matrix is constructed to measure similarity of users and then select neighbours for the users. According to the ratings for an item by the neighbor, the rating given by the user for that item can be predicted.

Advantage

- Improves the prediction accuracy
- Reduces error
- High efficiency

F. Object Typicality Recommendation System

In order to process large number of items on the web, traditional recommendation systems are not efficient as it decreases the user trust. To address this problem, a novel object typicality is used [17]. This system deals with perceptions made by the human for an object. It exploits similarities of user and item to make recommendations. It recommends "Typical items" in which the group is more interested to the "typical user" of that group. It ensures data generalization [18].

Advantage

- High computational complexity
- Less error
- Handles sparse data

G. Knowledge Based Recommendation System

This system recommends products based on the requirements of the user and their preferences [19]. It requires a functional knowledge about the user for satisfying them by recommending a particular item. So, there is a large use of domain knowledge. Its decision is independent of individual, so there is no need to collect information about a particular user. Constraint based knowledge recommendation system is capable of recommending complex items [20].

Advantage

- Avoids early rater problem.
- Avoids sparse rating problem.
- More efficient

Disadvantage

- High cost
- Less accuracy
- Asymmetric model

III. CONCLUSION

Nowadays, recommendation systems are gaining high popularity due to their large number of applications. These systems are persuasive system that makes users susceptible to decision biases. . Recommendation systems are useful for both customers and providers in many ways. In order to manage the information on web, some kind of recommendation is needed to recommend the items to the user according to their preferences and requirements and to increase the purchases. Different personality characteristic requires different types of recommendation systems. They are important to reduce the information overhead.

REFERENCES

[1] J. Borrs, A. Moreno, and A. Valls, "Intelligent tourism recommender systems: A survey," *Expert Systems with Applications*, vol. 41, no. 16, pp. 370 -389, 2014.

[2] J. Bobadilla, F. Ortega, A. Hernando, and J. Alcal. "Improving collaborative filtering recommender system results and performance using genetic algorithms," *Knowledge-Based Systems*, vol. 24, issue 8, pp. 1310-1316, 2011.

[3] Y. Cai, R. Y. Lau, S. S. Liao, C. Li, H.-F. Leung, and L. C. Ma, "Object typicality for effective web of things recommendations," *Decision Support Systems*, vol. 63, pp. 52-63, 2014.

[4] S. Tyagi and K. K. Bharadwaj, "Enhancing collaborative filtering recommendations by utilizing multi-objective particle swarm optimization embedded association rule mining," *Swarm and Evolutionary Computation*, vol. 13, pp. 1-12, 2013

[5] M. J. Pazzani and D. billsus, "Content based recommendation system," ASBIII, New Brunswick.
[6] S. Bakshi, A. Kumar Jagadev, S. Dehuri, and G.-N. Wang, "Enhancing scalability and accuracy of recommendation systems using unsupervised learning and particle swarm optimization," *Applied Soft Computing*, vol. 15, pp. 21-29, 2014.
[7] P. K. Tiwaria and D. P. Vidyarthib, "Evolutionary computation and its applications: A survey," *Information Engineering Letters*, vol. 2, no. 1, 2012.
[8] B. Sarwar, G. Karypis, and J. Riedl, "Item based collaborative filtering recommendation algorithms," 2001.
[9] M. S. Prasad, B. R. Sarath Kumar, "An implementation of user based collaborative filtering algorithm," *International Journal of Computer Science and Information Technology*, vol. 2, issue 3, pp. 1283-1286, 2011.
[10] D. Gavalas and M. Kenteris, "A web-based pervasive recommendation system for mobile tourist guides," Personal and Ubiquituous Computing, vol. 15, pp. 759–770, 2011.
[11] A. Gupta and A. Mohapatra, "Towards a hybrid approach to Netflix challenge," 2009.
[12] Y. Cai, H. F. Leung, Q. Li, H. Min, J. Tang, and J. Li, "Typicality based collaborative filtering recommendation," *IEEE Transactions on Knowledge and Data Engineering*, vol. 26, pp. 766-779, 2014.
[13] A. K. Dey and G. D Abowd, "Towards a better understanding of context and context awareness," *in Proc. CH1*, pp. 217-253, 2001.
[14] R. Barta, B. Proll, and H.Grun, "Covering the semantic space of tourism," NewYork, 2009.
[15] K. Meehan, T. Lunney, K. Curran, and A. McCaughey, "VISIT: Virtual intelligent system for informing tourists," PGNET, Liverpool, 2012.
[16] A. Crediminas and A. Tuzhilan, *Context-Aware Recommender Systems*, in recommender system handbook, springler, 2011
[17] P. Patel and V. Kohle, "An approach for travel package recommendation using clustering and typicality based approach," *International Journal of Innovative Research in Computer and Communication Engineering*, vol. 3, 2015
[18] X. Yan, Y. K. Lau, and Jian Ma, "Towards a semantic granularity model for domain specific information retrieval," *ACM Transactions on information system*, 2011
[19] B. Towle and C. Quinn, "Knowledge based recommendation system using explicit user models," *AAAI*, 2000
[20] A. Felfernig and R. Burke, "Constraint based recommendation system: Technology and research issues," Austria, 2000.