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A Survey On: Web Service Recommendation Using Location-Aware and Personalized Collaborative Filtering

Smita R.Patil[1], Prof. Vikas P. Mapari[2]
Department of Computer Engineering
DYPCOE, Ambi, Maharashtra, India

Abstract:
A Web service is a method of communication between two electronic devices over a network. Web services have been widely employed for building service-oriented applications. Recommendation techniques are very important in Web-based services. Collaborative filtering is one of widely used Web service recommendation techniques. In QoS-based Web service recommendation, predicting missing QoS values of services is often required. There have been several methods of Web service recommendation based on collaborative filtering, but have they considered locations of both users and services in predicting QoS values of Web services. Actually, locations of users or services do have remarkable impacts on values of QoS factors, such as response time, throughput, and reliability.

Keywords: Web Services Recommendation, Quality of service (QoS), Collaborative Filtering, Location Aware

I. INTRODUCTION

Web service is a software system designed to support interoperable machine-to-machine interaction over a network. With the prevalence of Service- Oriented Architecture (SOA), more and more Internet applications are constructed by composing Web services. As a consequence, number of Web services has increased rapidly over the last decade. Web service discovery has become a crucial and challenging task for users. In addition to functional requirements, users also want to find Web services that satisfy their personal non-functional requirements. Under this circumstance, service discovery that incorporates non-functional performance of Web services has aroused a great deal of interests in the services computing field. QoS of Web services is mainly comprised of performance factors that include availability, response time, reliability, throughput, and etc. Values of these QoS factors are usually highly dependent on the network distance between services and service users, i.e. the locations of services and users, which are not fully incorporated in the existing CF recommendation algorithms. CF has been widely used in commercial recommendation systems. CF algorithms can be divided into two categories: memory-based and model-based. Depending on characterizing relationships between users or product items, memory-based CF has two kinds of approaches: user-based approaches and item-based approaches. The user-based approach recommends to a user product items collected by other users sharing similar tastes; while the item-based approach recommends to a user those items similar to the ones the user preferred in the past.

II. METHODS USED IN WEB SERVICE RECOMMENDATION

CF methods, content-based methods and hybrid methods are three kinds of methods that are widely used in Web service recommendation.

A. CF Methods

The memory-based and model-based methods are two kinds of CF techniques that are widely used in recommendation systems. Well-known memory-based methods include user-based approaches and item-based approaches. Memory-based CF techniques have been recently adopted to provide QoS-aware recommendations. Shao et al. [9] propose a typical user-based CF method to predict QoS values which supposes that similar users tend to receive similar QoS from similar services, and they use Pearson Correlation Coefficient (PCC) to compute similarity between users. Zheng et al. develop a model which enhances the user-based CF by fusing item-based CF [10]. The model-based method allows the system to make intelligent predictions for the collaborative filtering tasks based on some learned models [5, 6]. Matrix factorization (MF) is one of the representative works. In MF is used to construct a global model for predicting Qos data, which can achieve higher prediction accuracy. Yu et al. [13] propose a matrix completing approach using an effective iterative algorithm. The method takes into account both the low-rank structure and the clustered representation of QoS data.

B. ontent Based Methods

The content based methods mainly focused on providing a mechanism to formalize users' preference, resource, and the description of Web services, and recommendations are generated based on the predefined semantic models. Zhao et al. provide a way to model services and their linkages by semantic algorithm. Based on the input keywords, users can get a set of recommendations with linkages to the query. Blake and Nowlan compute a recommendation score by matching strings collected from the user's operational sessions and the description of the Web services. Based on this score, they judge whether a user is interested in the service. Mehta et al. [5] add quality and usage

pattern to the service description to provide more information to discover a service that meets user requirements. Maamar et al. [6] propose a model for the context of Web service interactions and highlighted the resource on which the Web service performed.

C. **Hybrid Method**

Since hybrid methods which often combine CF with other techniques can provide more accurate predictions, they are widely used. Numerous hybrid models have been presented that involve other related factors to improve service recommendation quality, such as users' locations social network information and temporal effects. Chen et al. propose a CF algorithm which takes into account of users' physical locations and design a region model for large-scale Web service recommendation. Tang et al. demonstrate a location aware CF model by incorporating locations of both users and services. Tang et al. propose a trust-aware recommendation method with social network which integrates some social relation.

III. LITERATURE SURVEY

It introduces the related work on Collaborative Filtering, Web Service Recommendation, and Self Organizing Map.

A. **Collaborative Filtering**

Z. Zheng, H. Ma, M.R. Lyu, and I. King[1] have worked on a user-contribution mechanism for Web service QoS information gathering. Web service QoS value prediction is generated by novel hybrid collaborative filtering algorithm. They have proven that WSRec get the well expectation accuracy as compare to other methods. There are some service user-perspective has the following difficulties:
1. It needs service calls; it executed the prices of the service users. Also, it consumes properties of the service providers.

2. It may estimate too many service applicants. It may not expose some suitable Web services to the service users.

3. The estimation of web service is not specialist for service user. It used method which is hybrid Collaborative filtering method with the help of this method they can reduce the above difficulties.
It uses the novel hybrid collaborative filtering algorithm for Web service recommendation; it recovers the recommendation value associating with other outdated collaborative filtering methods.
This method divided into two parts:
1] In user-based collaborative filtering for Web services, PCC is working to describe the relation between two service users built on the Web service items.
2] In Item-based collaborative filtering methods using PCC is working to describe the relation between Web service items in its place of the service users. The difficult of this work is to incomplete the collaborative filtering methods for Web service recommendation, so there is no extensive Web service QoS datasets, which is obtaining from the review of QoS value expectation outcomes, without considerable and adequate Web services.

J.S. Breese, D. Heckerman, and C. Kadie[2] have worked on Collaborative filtering or recommender systems usage a database about user preferences to calculate subjects or goods a new user might similar. They have described another task which is depends on correlation coefficients, vector-based same calculations, and arithmetical Bayesian methods. Collaborative filtering algorithm is used two classes:

A] In Memory-based algorithms, work is to create expectation over the whole user database. Normally, this task is to predict the votes of a specific user from a database of user elections from a section by using the Collaborative Filtering.
Advantage:
1. It is easy to implement.
2. It requires little or no training cost.
3. It can easily take new users' ratings into account.
Disadvantage:
1. It cannot cope well with large number of users and items, since their online performance is often slow.

B] In Model-based collaborative filtering, it used to evaluate the user record, which is then used for calculations. From a probabilistic viewpoint, this task can be observed as finding the predictable value of a vote, assumed what they know about the user. They request to expect votes on unnoticed items for the active user.
Advantage:
1. It can quickly generate recommendations.
2. It can achieve good online performance.
3. It must be performed a new when new users or items are added to the matrix.
The difficulties of these networks are following:
1. It has lesser memory requirements.
2. It permits for quicker predictions than a memory-based technique such as correlation availability of votes with which to create calculations.

R. McLaughlin and J.L. Herlocker[3]have proven that two of the greatest commended CF recommendation algorithms have faults that outcome in an intensely undesirable user experience. Nearest-Neighbor algorithms work to make movie recommendations with the all Picture establish that many of the topmost movies recommended were incorrect, highly doubtful, or unverifiable. This algorithm implements poorly because it difficult to find out the best movie from recommendations. Nearest-neighbor algorithm was dividing into two parts: User Nearest Neighbor or User-User algorithm is calculating the similarities between each couple of users.
Advantages are as follows:-
1. It is easy to implement
2. It proves high correctness when measured with mean absolute error.
Item Nearest Neighbor or Item-Item algorithm is to discoveries the users having different item with ranking. It has interests related to the active user and it finds items ranked by the active user that are related to the item being expected.
But this algorithm contains two errors
1. The active user taking too little neighbors who had ranked an item.

2. The neighbors with very little connection to the active user ranked the picture and this fault demonstrated quantitatively by the little modified Precision scores

Belief Distribution Algorithm is to solve the above problems. This algorithm delivers a well user experiences. The limitation idea is to execute a user study in which a whole group of rankings is composed. It is allowing us to estimate just how exactly modified precision dealings the user experiences.

SongJieGong [4] Adapted recommendation systems is support users to discover exciting things. They have used the change of electronic exchange. Several recommendation methods are work with the collaborative filtering technology; it has been showing to be one of the greatest important methods in recommended systems. With the rise of customers and products in electronic exchange systems, the time taking nearest neighbor collaborative filtering examine the objective of customer in the whole customer space. It goes from it is bad quality. When several accounts is in the user database, it grows the sparsely of data set. The main causes of the bad quality have?

The previous methods have contained some drawbacks are as following:

1. Scalability in the collaborative filtering.
2. Sparsely in the collaborative filtering.

The recommendation method is to combines the user clustering technology and item clustering technology. Users group are depending on users' ranking on objects. Each users has a one group center. Depends on the comparison between objective user and group centers, the NNs of objective user can be establish and plan where essential the expectation. The suggested method can operates the item clustering collaborative filtering to create the recommendations.

Advantages are following:

1. This method is a more accessible.
2. This method is a more correct than the old one.
3. This method is scalable and sparsely in filtering.

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