

# SURVEY ON WEB SERVICE RECOMMENDATION BASED ON USER HISTORY

N.Arunachalam  
Assistant Professor

Department of Information Technology  
Sri ManakulaVinayagar Engineering  
College  
Puducherry, India.  
narunachalam85@gmail.com

Dr.A.Amuthan  
Professor

Department of Computer Science  
and Engineering  
Pondicherry Engineering College  
Puducherry, India.  
amuthan@pec.edu

M.Sharmilla, K.Ushanandhini  
UG Students,

Department of Information Technology  
Sri ManakulaVinayagar Engineering College  
Puducherry, India.  
sharmivarshia@gmail.com,  
nandy.169@gmail.com,

***Abstract**—Today in world of web and services, new service has been widely used in various domains for building various applications across several industries and scholastic areas latterly. The web service which has been facing with the agile development of technology has been witnessed that large number of web services are available is durably increasing through the online network. This procreation results in increased complexity to select an applicable web service among the available services for the user. Lots of problem may occur due to an improper service selection (e.g., ill-suited performance) to the resulting applications. Helping users in designing and developing service oriented software systems is the aim of web service recommendation system. The objective of this paper is to investigate the various approaches used for web service recommendation systems available in the world. A survey is performed rated to methods and algorithms which are used for web service recommendation by different researchers.*

***Keywords**—web service recommendation, content based filtering, collaborative filtering, hybrid filtering*

## I. INTRODUCTION

A web service can be defined as the method that is used to communicate between two devices over network. It is used as a software system for interoperable machine to machine communication. It can also be said as the collection of standards or protocols for exchanging information between two devices or applications [1] [12]. Web service are the applications that can be accessed via internet for performing the business needs as it is considered as platform independent and loosely couples. Over a network, any applications can interact with any other application via web services. For example, .Net application can communicate with Java, .Net and PHP applications. So web service is a language independent way of communication. The main advantage of web service is the cross platform and cross language characteristics. With these advantages, web services

meets many benefits and hence they have been widely made used by both single developers and enterprises for constructing applications that are service oriented.

A web service has three members. The members are a provider who provides a service, a consumer who consumes a service and a service broker. A web service description language (WSDL) is send to Universal, Description, Discovery, Interface (UDDI) with the help of service provider. By using SOAP protocol, the data needed by the provider is found by enabling a channel to UDDI with the help of the service requester. A contact is made to the service provider after the above steps. Again by applying SOAP protocol, the structured data is returned by authorizing the service request by the service provider in the format of XML file. Using an XSD file, the XML file obtained would be again verified by the service requester. The web service are majorly divided into two categories-Functional part and nonfunctional part. Aspects such as operation and behavior are dealt by functional part. The non-functional part includes the QoS (Quality of service) parameters like performance, cost, security, usability etc.[2]

QoS are used as a parameter for selecting web services. Differentiating the services which are similar is the most crucial task that are provided by various service providers is Quality of Service (QoS) of a web service. There are many web services over internet so to select an optimal web service among these services is the biggest challenge for the user. Thus, to suggest the user about optimal web services, a recommendation system is required. Several techniques such as content based recommendation, collaborative recommendation, knowledge based recommendation, and memory based recommendation are available and are used to provide prediction about web services [3]. Hence, the Quality of Service (QoS) of a web service is an important factor

from which the services offered by different service provider are differentiated.

The rest of the paper is organized as follows: the 2<sup>nd</sup> section deals with the detailed study of web service recommendation approaches. Section 3 deals with the general discussion with the works of various articles. Section 4 is to summarize the approaches that are discussed in section 3. Section 5 is the conclusion and followed by reference which is section 6.

## II. RECOMMENDATION APPROACHES

The system which comes under the choice of information filtration system are called recommendation systems. To find the rate or the desire of the previous users on the system, such systems are used. They have been used in various applications such as news, music, movies, shopping portals etc., because of their dynamic behavior. Generally recommendation systems are widely classified in three groups

1. Content based filtering
2. Collaborative filtering
3. Hybrid recommendation systems

### A. COLLABORATIVE FILTERING:

The procedure of distinguishing the web services that are identical and also which has identical users and recommending what the similar users like is called Collaborative filtering [10] [12]. The web service history is used as the basis for web service suggestion to the user in the collaborative filtering. The QoS values of the services are said to be unknown when the services are not invoked by the user. Hence all the services are not called by the user. Therefore, a very crucial task for the service users is to provide prediction to the web service accurately. By predicting the QoS value selection can be made for the expected service. This was proposed by rich and during web service recommendation this has been used widely [4]. In service recommendation system, building user-service matrix upon the user used services, finding the group of related users and a group of similar services are the capital issue of CF. The collaborative filtering applies two process. The first process is recommending web services that are optimal to the users those who are active. The optimal service is selected by finding the QoS data from the similar users history to predict the missing QoS values. The importance of CF methods is: the usefulness of a precise item for a particular user is guessed depending upon the history of other users that are got previously. There are two types of collaborative filtering algorithms:

- Model based collaborative filtering
- Memory based collaborative filtering

### 1. MODEL BASED COLLABORATIVE FILTERING:

In Model based algorithm the predicted QoS is collected and used [10]. It includes Bayesian models and clustering models. A trained model is used for the prediction of QoS values which are unknown and QoS data that are observed are fitted by using a predefined model. Latent factor models, Clustering models, latent semantic models, and etc. are some of the examples that can be included. Good online performance can be achieved by these algorithms and also for quickly generating recommendations. Whenever there is a need to add a new user or items to a system the models must be rebuilt.

### 2. MEMORY BASED COLLABORATIVE FILTERING:

User based approach, item based approach and their combination user based approach all come under Memory based collaborative filtering [10]. User based approach does rating prediction basis the rating of other similar users. It recommends items to the user which is preferred by highly correlated users. Item based approach does rating prediction basis the similarity of items. Item to item correlation is calculated using user item rating matrix. Items which are highly correlated are recommended to the user. Implementation of Memory based algorithms are effortless. The training cost is less or it does not require any training cost. This approach can easily take rating of new users into account. But when coming to a huge count of users and items scaling cannot be done well due to the high computation complexity [13].

**Advantage:** the features information of items does not require for users.

**Disadvantages:** items having few ratings are not easily recommended to the user. When a new user enters the system then a cold start problem occurs. When items in large number to recommend data sparsity problem may occur and which degrades the performance of recommendation.

### B. CONTENT BASED FILTERING:

Content based algorithms base recommendations on the features extracted from the items content [4]. The establishment to this method is done by looking into the information of web services description and the history of service usage by the user. Recommendation to the end users are done by viewing the relevancy of usage history of user's service. Content base filtering approach basis the user usage history focused on both QoS preference and user interest into the recommendation of web service [5].

**Advantages:** it does not depend on other users ratings. It can recommend non popular and new items. It

overcomes the problems occur in collaborative filtering that is a cold start and sparsity

**Disadvantages:** it requires data in structure format.

### C. HYBIRD METHOD:

There are many limitations over both collaborative filtering and content based filtering system of their own. To overcome the limitation of both techniques, Hybrid filtering technique combine collaborative filtering and content based filtering and hence the recommendation performance is increased. Semantic content based recommendation system is one of the hybrids filtering technique. This technique provides similar web services which are of user's interest. This approach identifies the relating neighbor of the active user by computing the similarity between different users by looking at their personal profile information. Recommendation are made to the top k web services depending upon the rank given to the semantic services used by active users.

## III. RELATED WORKS

Guosheng Kang presented an approach to find user's desired web services using a diverse Web service recommendation approach. Top-k web service with diversity is recommended by incorporating functional interest, diversity feature and QoS preference. And a diversified Web service ranking algorithm to find the ranked top-k diversified web service list is proposed. This is proposed based on their non-functional relevance and functional relevance and the interest of user. QoS utility, and diversity feature are considered as the non functional relevance and historical user interest relevance are included as the functional relevance[5].

Apurwa Atre Proposed a recommendation system for web service by combining preferences of users regarding quality and diversities amongst web services. From the user's history that has been used the users' requirements are considered and mined. Using clustering techniques, we find functional similarities. This is followed by listing top-k services by applying a ranking algorithm. Specifying the user's interest and QoS requirements can be done explicitly, and the submission can be done to the service discovery system. For the user's interest and QoS requirements, matches are made by the service discovery system with corresponding attributes of Web services. Then the service with best matching degrees to the user is returned [6]. And also an approach for QoS-driven service selection discover high quality Web services has been proposed, in the service computing field.

V. Kiruthiga and et al, Proposed an approach of novel web service recommendation system by pooling

potential QoS preferences of users and user's interest of diversity feature on web service. Service usage factors is evaluated by for achieving this. From the user's history that has been used the users' requirements are considered and mined. Using clustering techniques, we find functional similarities. This is followed by listing top-k services by applying a ranking algorithm. To discover high quality web services, a number of QoS models for Web services and QoS-driven service selection approaches has been proposed in this field. In this system, user's his/her interests and QoS requirements are specified explicitly, and they are submitted to the service discovery system. Corresponding to the attributes of web services, matches are made by the service discovery system for the QoS requirements and user's interest. The services that are with best matching degrees are returned to the user [7].

Nikita R. Gurjar and et al, proposed a system for a location-aware Web service recommender system. This system is helpful for selecting services with optimal Quality of service (QoS) performance. Based on the clustering system by which this recommender system employs the location information, the clustering is done on users and services based on the QoS values, and recommendation is made by personalized service recommendation for users [8]. Based on the predicted QoS values of web services the optimal service among the functionally equivalent ones is selected for the users using the production of Personalized QoS-aware Web service recommendations. QoS value is collected from a large number of real-world service which are from different location, strong correlation with the location of users for web service QoS performance which was observed by the users were found.

A location aware collaborative filtering technique is proposed by Jianxun Liu and et al,. This technique takes both user's location and web service to select similar results for the target user, also enhance the similarity measurement by using personalize influence for web service and user location. There are techniques like content based, link prediction based and some others are also used for web service recommendation but collaborating filtering provides simple and effective solutions. This technique uses QoS values for the prediction purpose. By the use of QoS values a similarity for user location and web services are presented. This technique does not provide solution which based over time factors for prediction [9].

## IV. SUMMARY OF THE REVIEWS

This session is used to give the summary of the review of different authors which we have been discussed above.

<i>S.NO</i>	<i>AUTHOR</i>	<i>CONTRIBUTION</i>	<i>MERITS</i>	<i>DEMERITS</i>
1.	Guosheng Kang, Mingdong Tang, Jianxun Liu, Xiaoqing(Frank) Liu, and Buqing Cao [5]	Proposed an approach of novel web service recommendation system by pooling potential QoS preferences of users and user's interest of diversity feature on web services.	This web service recommendation approach promotes the attributes of the recommendation results significantly when compared to existing methods	This system can be enhanced by improving the similarity computation to avoid redundancy of services.
2.	Ms. Apurwa Atre, Ms. Nayan Kamble <sup>1</sup> , Ms. Vineeta Bisht <sup>1</sup> , Mr. Tejas Mamarde [6]	Proposed a recommendation system by integrating users' preferences regarding quality and diversities amongst web service for effective web services.	The system matches the user's interest and the best matching degree is returned to the user	The clustering method is to be improved to the similarity computations
3.	V.Kiruthiga, R.Seethalakshmi [7]	Proposed an approach of novel web service recommendation system by pooling potential QoS preferences of users and user's interest of diversity feature on web services. It is achieved by the evaluation of service usage factors.	This approach is effective since the recommendation approach promotes the attributes of the recommendation results significantly when compared with existing methods	To increase and effectively compute the similarity among the services and more test must be performed to improve the system
4.	Nikita R. Gurjar, Dr. Sandeep V. Rode [8]	Proposed a system which helps selection of services with QoS performance to the users with the help of location-aware Web service recommender system.	No additional web service invocations are needed in this approach and selecting the optimal service is achieved for helping users among the functionally equivalent ones	This approach need more improvement to give the service selection more efficiently
5.	Jianxun Liu, Mingdong Tang, Zibin Zheng, Xiaoqing Liu, Saixialyu [9]	Proposed a method for the recommendation of web service using location-aware personalized CF method. The proposed method has its benefits by two attributes when selectin similar neighbors for the target user or service such as locations of users and Web services	When comparing to the previous CF-based recommendation methods, there is significant improvement in the computational efficiency and the QoS prediction accuracy	Consideration is needed to take more location information for QoS prediction details, such as the topology like Internet's AS topology

## V. CONCLUSION

The article presents a brief review over the technique which used for web service recommendation system. A good recommendation system should be dynamic. Collaborative filtering, content-based filtering, and hybrid based filtering are the three main recommendation approaches. It should be able to consider profiles updates in real time to have a positive recommendation. Further recommendation system should be able to do web ranking by studying customer usage history effectively. The primitive idea is to exhort the best one for progressive users based on chronicled web service QoS records by Predicting Web service QoS values. Literature survey is performed of different parameters considered in web service recommendation here. In future we will proposed the recommendation system that can produce the recommendation result by applying data mining on history data and text mining on comments. And for clustering and classification techniques will be used.

## VI. REFERENCES:

- [1] V.Kiruthiga , R.Seethalakshmi, "Diversity Aware Web Service Recommendation Using WS-QoS and Service Usage Factors " in International Journal of Innovative Research in Computer and Communication Engineering, Vol. 4, Issue 5, May 2016
- [2] Sumit Thakur, Prof Rahul Sahu, Dr.VineetRichhariya, "A Survey: Over Different Technique for Web Service Recommendation Based On Location Aware and Personalized Collaborative Filtering " in International Journal of Scientific & Engineering Research, Volume 7, Issue 2, February-2016
- [3] AshwiniPuri, MansiBhonsle, "A Survey of Web Service Recommendation Techniques based on QoS values" in International Journal of Advanced Research in Computer and Communication Engineering, volume 4, Issue 12, December 2015
- [4] AshwiniChavhan, M. A. Kulkarni, R. R. Badre, "Recommendation Survey paper on web services approaches" in International Journal of Advanced Research in Computer and Communication Engineering, volume 5, Issue 4, December 2016
- [5] Guosheng Kang, Mingdong Tang, Jianxun Liu, Xiaoqing(Frank) Liu, and Buqing Cao, "Diversifying Web Service Recommendation Results via Exploring Service Usage History", IEEE TRANSACTIONS ON SERVICES COMPUTING,2015, DOI 10.1109/TSC.2015.2415807.
- [6] Ms. Apurwa Atre1, Ms. Nayan Kamble1, Ms. Vineeta Bisht1, Mr. Tejas Mamarde1, " A Clustering based system for diversified WSRec Results", International Journal of Advanced Research in Computer and Communication Engineering, volume 5, Issue 4, April 2016
- [7] Nikita R. Gurjar, Dr. Sandeep V. Rode, "Web Service Recommendation Based On User History", International Journal of Advanced Research in Computer and Communication Engineering, volume 4, Issue 6, June 2015
- [8] Jianxun Liu, Mingdong Tang, ZibinZheng, Xiaoqing Liu, Saixialyu "Location Aware And Personalize Collaborative filtering for web service recommendation" IEEE, 2015.
- [9] AtishaSachan, VineetRichariya, " A Survey on Recommender Systems based on Collaborative Filtering Techniques", International Journal of Innovations in Engineering and Technology, volume 2, Issue 2, April 2013
- [10] ReshmaGulhane, Dr.S.M.Chaware," A Survey on Recommendation System on Web Services", International Journal of Innovative Research in Computer and Communication Engineering, Volume 4, Issue 4, April 2016
- [11] V.Kiruthiga, R.Seethalakshmi, "Diversity aware Web Service Recommendation using WS-QoS and service usage Factors", International Journal of Advanced Research in Computer and Communication Engineering, volume 4, Issue 5, May 2016
- [12] PriyanshiBarod, M.S.Bhamare, " A Survey of Web Service Recommendation Methods", International Journal of Advance Engineering and Research Development, Volume 2, Issue 12, December 2015
- [13] N.K. Patil, PriyankaPawar, Shankar More, BhausahebTupe, " Web Service Recommendation Using QoS Parameters and Users Location", International Journal of Advanced Research in Computer and Communication Engineering, Volume 4, Issue 3, March 2015
- [14] Lina Yao, Quan Z. Sheng, Anne. H.H. O'Ngu, Jian Yu, and Aviv Segev, "Unified Collaborative and Content-Based Web Service Recommendation", IEEE TRANSACTIONS ON SERVICES COMPUTING, VOL. 8, NO. 3,2015, 10.1109/TSC.2014.2355842.
- [15] Yan Hu, QiminPeng, Xiaohui Hu, and Rong Yang," Time Aware and Data Sparsity Tolerant Web Service Recommendation Based on Improved Collaborative Filtering", IEEE TRANSACTIONS ON SERVICES COMPUTING, VOL. 8, NO. 5,2015, doi: 10.1109/TSC.2014.2381611.