



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 7, July 2022

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.118

 9940 572 462

 6381 907 438

 [ijirset@gmail.com](mailto:ijirset@gmail.com)

 [www.ijirset.com](http://www.ijirset.com)



# Collaborative Filtering Based Web Service Prediction & Recommendation

Ms. Sonal R. Navpute<sup>1</sup>, Ms. Dipa D. Dharmadhikari<sup>2</sup>

Research Scholar, Computer Science and Engineering Department, Marathwada Institute of Technology,  
Aurangabad, India<sup>1</sup>

Asst. Prof. Computer Science and Engineering Department, Marathwada Institute of Technology,  
Aurangabad, India<sup>2</sup>

**ABSTRACT:** Web services have developed in popularity among application developers as an interoperable machine-to-machine interface mechanism based on XML messaging. When using web services, the user does not have access to a graphical user interface (GUI). Web services, on the other hand, employ a programmatic interface to communicate business logic, data, and processes via a network. This project comprises collecting Quality-of-Service (QoS) data from online services and service users in an obfuscated manner in order to protect users' identities. After real-world data is collected, collaborative filtering is applied to user data depending on their location and the web services they utilize. To forecast QoS values among users who are similar, item-based filtering is utilized.

**KEYWORDS:** Web Service, Graphical User Interface (GUI), QoS, Item based filtering.

## I. INTRODUCTION

Web services are components of software that are distributed over the Internet to allow users to build composite Web applications [1]. Recent advances in cloud computing enable on-demand service delivery, accelerating the rapid growth of service marketplaces, where an increasing number of Web services are predicted to become available. While the vast number of Web services fits the needs of varied customers, it also poses significant obstacles in picking among a big number of identical web services [2]. Web service recommendation [3-6] is a prominent research topic in the area of service computing in recent years, with the goal of assisting users in fast finding desirable services. Users' functional and non-functional requirements must be met for a web service recommendation to be effective. Nonfunctional requirements, such as round-trip time (RTT), reaction time, throughput, and failure probability, are related to the quality of service (QoS) and are based on what a service does. QoS plays an essential part in Web service recommendation, as it allows consumers to rate and select related services.

## II. RELATED WORK

Based on the knowledge sources they employ to produce suggestions, the current generation of recommendation systems can be divided into five types [7]:

1 Content-based Recommendation: Content-based systems suggested products to the user that were comparable to those that he or she had previously favored. Content-based systems are mostly used to suggest text-based items.

2 Collaborative Recommendation: Almost every recommendation system employs collaborative filtering. Based on the same set of online services offered by numerous other users, collaborative filtering assesses the usefulness of a certain item or collection of web services for a specific user.

3 Context-Aware Recommendation: Context is a multidimensional notion that has been researched in a variety of fields, including computer science (particularly in artificial intelligence and ubiquitous computing), cognitive science, linguistics, and philosophy.

4 Knowledge-based Recommendation: Knowledge-based recommendation makes use of existing information about users and products to determine which products best match the user's needs. Some of the current systems efficiently guide the user through a discriminating tree of product attributes, while others use a quantitative decision support tool to accomplish this.

5 Demographic-based Recommendation: This feature categorizes users based on personal characteristics and generates suggestions based on demographic groups, such as college students, teenagers, women, and men. This system's benefits and drawbacks are comparable to those of Knowledge-based Recommendation Systems.

Web service users are now more concerned with QoS than functionality because to the rapid growth in the number of Web services available online. It has been widely used in web service selection [12], [13], service composition, service recommendation and other popular topics in the field of Services Computing. In this section, we present the related work of efficient QoS-aware Web service [14] recommendation.

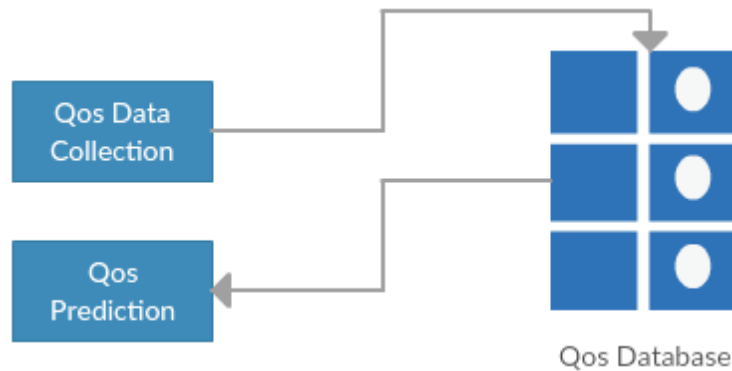


Figure 1 Web Service QoS Prediction

They recommended using the conventional user-based combination and item-based collaborative filtering method to anticipate the QoS value of Web services. Their method avoids the need for Web service calls and works by examining QoS data from users with comparable usage patterns. Users of the service find relevant Web services. In their Web service [14] evaluations in paper reports, they chose just one operation from a web service to do for evaluations and used the power of this operation to the performance by presenting the Web service. This reduced the impact of Web service calls to the real web services.

### III. SYSTEM ARCHITECTURE

The development of online services on the internet has created new problems for finding and selecting services. The demand for effective quality of service evaluation, in particular, is growing urgently. To solve this problem, we create a formal privacy-preserving formal location-based prediction framework that allows for a fast global optimization approach, and then we use alternative baseline estimate components to improve prediction performance.

Neighborhood-based collaborative filtering and matrix factorization are two extensively used approaches for collaborative QoS prediction. Location-based CF has the advantages of being simple, justifiable, and efficient. Users of cloud services, on the other hand, are likely to expect a reasonable explanation for the QoS estimates offered by a service recommendation system. The suggested system's architecture is depicted in Figure 2. Users who use web services log in to the system and share the Web Service QoS values they've noticed with other users. Training users are recordings of web service QoS. When a training user requests Web Service Recommendation, the user is

considered an active user. As a result, the user becomes a more active user. The training users' QoS values are stored in an encrypted fashion to protect their personal information. The training users' QoS levels will be used to produce customised recommendations for the active user. According to their physical locations and previous online service usage experiences, the system divides training users into distinct areas. It also groups online services that are functionally similar based on their QoS similarity. The active user is then assigned to a user region based on previous QoS and the user's current location.

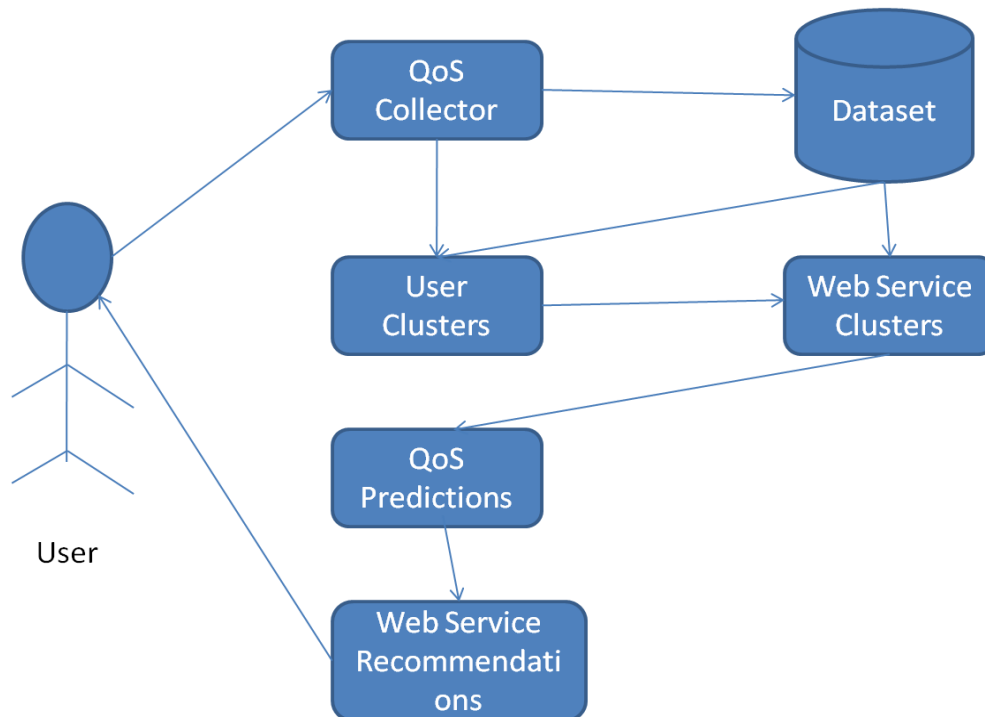


Figure 2 Architecture of proposed System

#### IV. PERFORMANCE ANALYSIS

In this experiment, the prediction time of web service recommendation is compared to earlier methods such as IPCC, UPCC, WSRec, LORec, and Region-KNN. The result is retrieved from a dataset containing top-k web service recommendations, for which the time necessary has been calculated and delivered as a result.

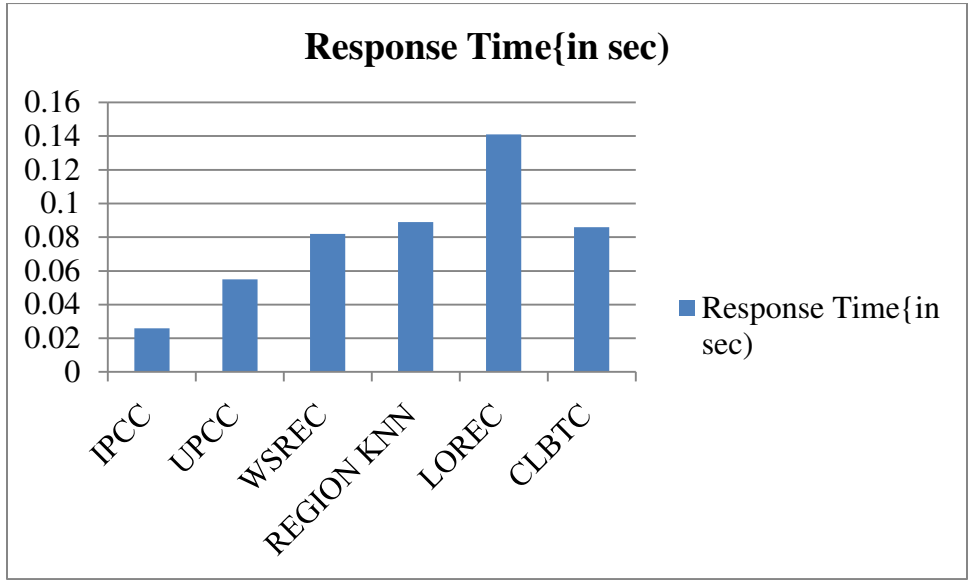


Figure 3 Response Time Comparison of Various Algorithms

Figure 3 is a graphical representation of the response time required comparison. As indicated in the diagram above, the suggested system's reaction time is compared to that of previous algorithms such as IPCC (which used only item-based similarity computation), UPCC (which used just user-based comparisons), and other approaches such as WSRec, Region-KNN, and LoREC. Our solution outperforms earlier methods by incorporating both user and item-based computations with user locations in the dataset.

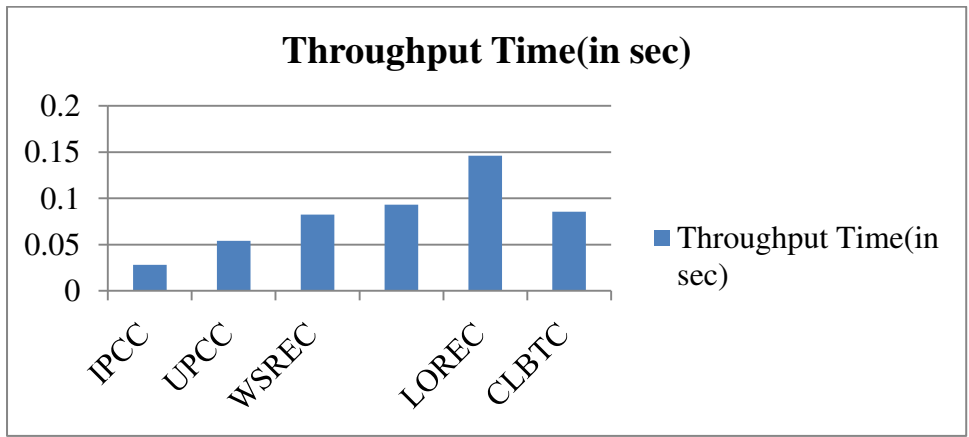


Figure 4 Throughput Time Comparisons of Various Algorithms

We evaluated alternative methods for predicting throughput time with our suggested strategies [8], as shown in figure 4. Based on the throughput from the file that contains the estimated similarity coefficients of all pairs of services, it takes roughly 0.0855 sec to fetch the most similar items. In addition, as compared to earlier techniques, this method gives improved accuracy in service suggestion by combining service QoS and user locations.





Table 1 Prediction Time Comparison of Various Algorithms

Method	Response Time (in sec)	Throughput Time(in sec)
IPCC	0.026	0.0279
UPCC	0.055	0.054
WSREC	0.082	0.0825
REGION KNN	0.089	0.093
LOREC	0.141	0.146
CLBTC	0.086	0.0855

Table 1 illustrates the response time and throughput for all of the web service recommendation approaches being compared. This is the predicted time in seconds for getting web services from the computed files in the dataset. The Custom Location Based Tanimoto Coefficient (CLBTC) is the name of the approach we suggest.

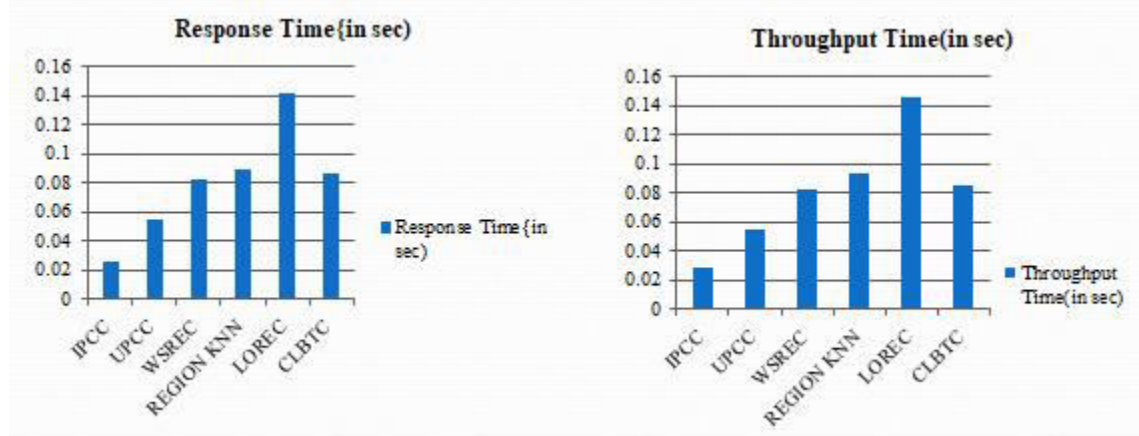


Figure 5 Custom Location Based Tanimoto Coefficient Method for Web Service Recommendation

As shown in the figure 5, we combine prediction results generated from service regions and user regions, which achieves better results than existing approaches. We also find that the combination result is much better than the result from any single method, either the prediction generated from user regions or the one generated from Web service regions. This is because these two methods analyze the problem from different aspects and the combination of them counteracts the error of individual methods.

## V. CONCLUSION

This project entails gathering QoS information from web services and service users in an obfuscated format in order to avoid users' identities from being revealed for security reasons. Following the acquisition of real-world data, collaborative filtering is applied to the data of users based on their location and the web services they utilize. Item-based filtering is used to forecast QoS values among users who are similar. This project is excellent for service-based business developers who want to focus on establishing a business process rather than developing a web service, so they may focus on the business logic rather than the web service. It also makes it simple for customers to choose a web service that is best for them depending on their location and QoS levels.



## REFERENCES

- [1] L.J. Zhang, J. Zhang, and H. Cai, *Services Computing: Core Enabling Technology of the Modern Services Industry*. Tsinghua University Press, 2007.
- [2] Klein, F. Ishikawa, and S. Honiden, "Towards network-aware service composition in the cloud," in *Proc. of the 21st ACM World Wide Web Conference (WWW)*, 2012, pp. 959–968.
- [3] Z. Zheng, H. Ma, M. R. Lyu, and I. King, "Wsrec: A collaborative filtering based web service recommender system," in *Proc. of the IEEE International Conference on Web Services (ICWS)*, 2009, pp. 437–444.
- [4] W. Zhang, H. Sun, X. Liu, and X. Guo, "Temporal qosaware web service recommendation via nonnegative tensor factorization," in *Proc. of the 23<sup>rd</sup> International World Wide Web Conference (WWW)*, 2014, pp. 585–596.
- [5] Zheng, Q. Yu, and M. R. Lyu, "Web service recommendation via exploiting location and qos information," *IEEE Trans. Parallel Distrib. Syst.*, vol. 25, no. 7, pp. 1913–1924, 2014.
- [6] R.M. Sreenath and M.P. Singh, "Agent-Based Service Selection," *J. Web Semantics*, vol. 1, No. 3, pp. 261–279, 2003.
- [7] Sabanaz S. Peerzade, "Web Service Recommendation using Collaborative Filtering", *International Research Journal of Engineering and Technology (IRJET)*, Volume: 04, Issue: 06, June -2017.
- [8] Mingdong Tang, Yechun Jiang, Jianxun Liu, "Location-Aware Collaborative Filtering for QoS-Based Service Recommendation", *IEEE 19th International Conference on Web Services*, July 2012.
- [9] Sabanaz S. Peerzade, Vanita D. Jadhav, "A Review on Web Service Recommendation System Using Collaborative Filtering", *IPASJ International Journal of Computer Science (IJCS)*, Volume 3, Issue 3, March 2015.
- [10] Jianxun Liu, Mingdong Tang, ZibinZheng, Xiaoqing (Frank) Liu, SaixiaLyu, "Location-Aware and Personalized Collaborative Filtering for Web Service Recommendation", *IEEE Transactions for Service Computing*, October 2015.
- [11] Jieming Zhu, Pinjia He, ZibinZheng, Michael R. Lyu, "A Privacy-Preserving QoS Prediction Framework for Web Service Recommendation", *IEEE Transactions on Web Services*, May 2015.
- [12] Jianxun Liu, Mingdong Tang, ZibinZheng, Xiaoqing (Frank) Liu, SaixiaLyu, "Location-Aware and Personalized Collaborative Filtering for Web Service Recommendation", *IEEE Transactions for Service Computing*, October 2015.
- [13] Jieming Zhu, Pinjia He, ZibinZheng, Michael R. Lyu, "A Privacy-Preserving QoS Prediction Framework for Web Service Recommendation", *IEEE Transactions on Web Services*, May 2015.
- [14] Xi Chen, ZibinZheng, Qi Yu, Michael R. Lyu, "Location Aware and Personalized Collaborative Filtering for Web Service Recommendation" *IEEE Transactions on Service Computing*, Vol. 9, No. 5, September/October 2016



**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.118**



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details