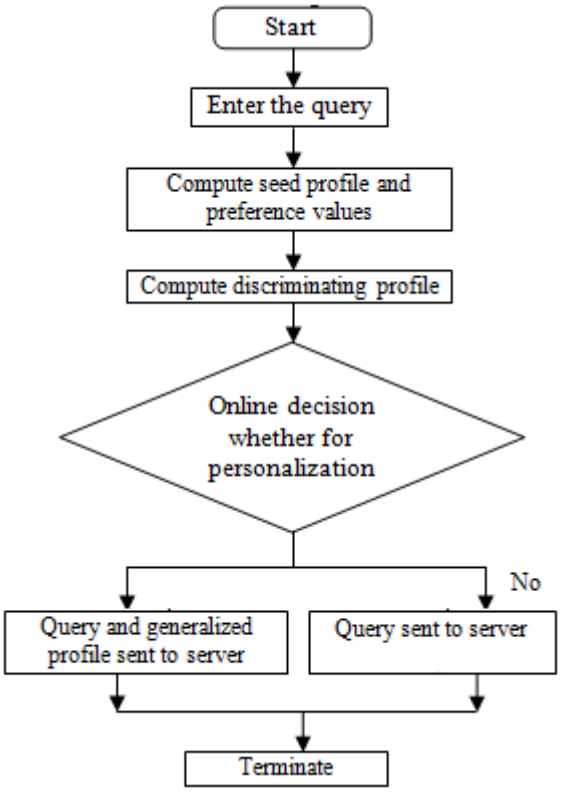

Figure 2: Query Topic Mapping and Profile Generalization

Heuristic 2:

$$IL(t) = \begin{cases} pr(t \mid q,G)(IC(t) - IC(part(t,G))), case1 \\ dp(t) + dp(shadow) - dp(shadow), case2 \end{cases} \quad \textbf{(16)}$$

$$dp(t) = pr(t \mid q,G) \log \frac{pr(t \mid q,G)}{pr(t)} \quad (17)$$

The final step of the work is to prune-leaf nodes topics based on solitary topic 't' that belongs to case . While in case, reducing the topics 't' acquire recomputation of the first choice values of its sibling nodes.

Heuristic 3: In the hierarchical tree structure once a leaf node topic't' is reduced, if and only if the candidate operators reduce t's sibling topics should toward be updated in 'Q'.

4. Results and Discussion

In this section, present the experimental results of UCOPS. In the primary experimentation, learning the complete results of the metrics in every iteration of the UCOPS and existing methods .Second, examine the results of the proposed and existing schemas under query-topic mapping. Third, examine the results of scalability between proposed and existing schemas in terms of response time. In the final stage of the experimentation analysis, learn the efficiency of clarity calculation and the hunt quality of UPS and UCOPSK. For experimentation work refer a topic repository make use of the ODP web Directory. To focal point on the pure English categories, remove taxonomies "Top/World" and "Top/Adult/ World." The log files of the each user are downloaded from online AOL query log. This log consists of more than 20 million queries and 30 million clicks of 650k users during the period of 3 months. The log file format of each user is described as follows: <uid; query; time [rank; url]>

Search Quality is defined as the relevant search results relying on the user query and the constructed user profile as per user's interests.

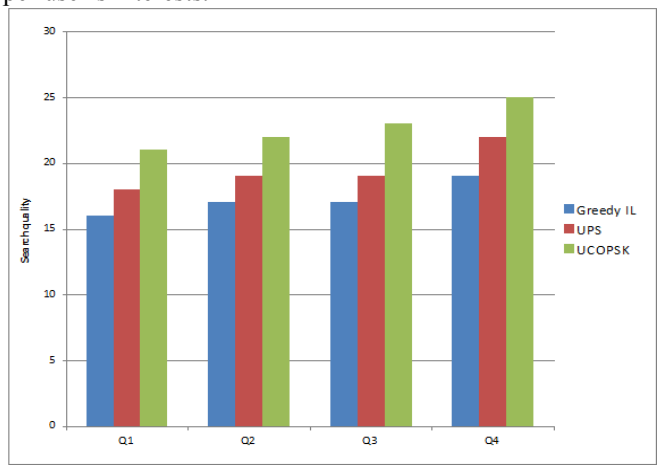

Figure 3: Performance Comparison based on Search Quality

Figure.3 gives the comparison of the existing system of GreedyIL relying on Quality of search, UPS framework and proposed UCOPSK. The number of query sets in the dataset is represented as Q1-Distinct Q2- Medium, Q3- Ambiguous Q4-Very ambiguous is denoted in X-axis and searching quality results are plotted in Y-axis. When compare to other methods UCOPS achieves 13% of improvement in search quality than the GreedyIL. The results are tabulated in Table 1.

Table 1: Evaluation Results for Search Quality

Query Set	Greedy DP Relevant URLs	UPS	UCOPSK
Q1	16.0	18	21
Q2	17.0	19	22
Q3	17.0	19	23
Q4	19.0	22	25

Figure. 4 shows the performance comparison results of the various schemas by varying the privacy threshold. Figure 4 gives the comparison of the existing system of GreedyIL, UPS and proposed UCOPSK based on the effectiveness of personalization. The Privacy threshold is plotted in X-axis and the average precision is plotted in Y-axis. Based on the privacy threshold value, the AVP varies through admiration to generalization. The UCOPSK achieves 15% of improvement in personalization than the GreedyIL

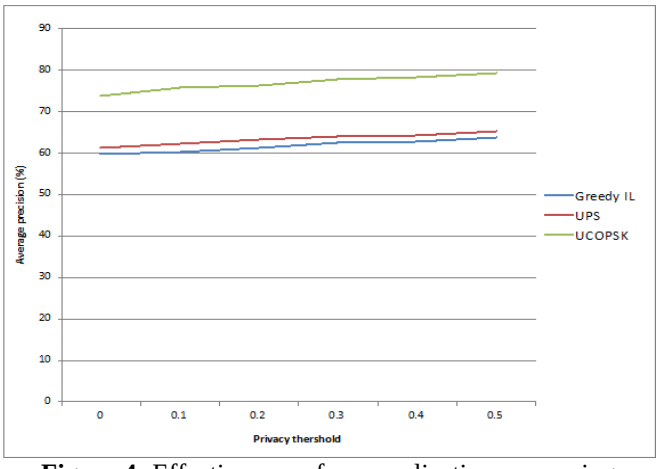

Figure 4: Effectiveness of personalization on varying

Response time : Response time is defined as the time required for generalization of profile following issuing the query relying on the privacy requirements of the user.

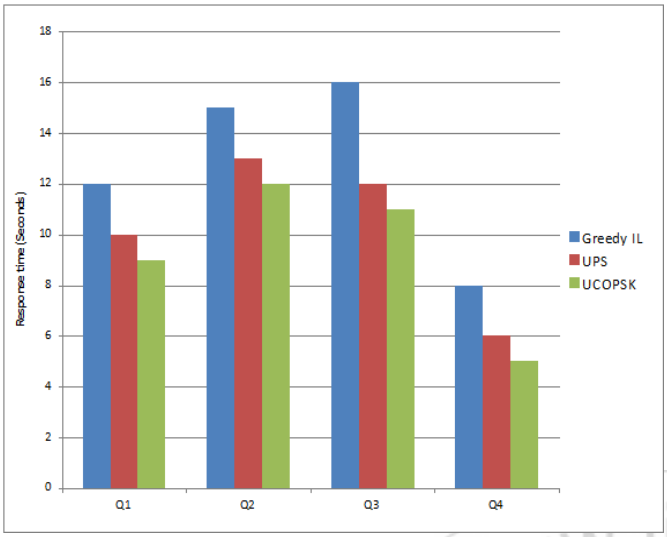

Figure 5: Performance Comparison based on Response time

Figure. 5 gives the comparison of the existing system of GreedyIL, UPS and proposed based on the response time taken by the query sets. The number of query sets in the dataset is represented as Q1-Distinct Q2- Medium, Q3-Ambiguous Q4-Very ambiguous is denoted in X-axis and average time results are plotted in Y-axis. The UCOPS achieves 12% of improvement in response time than the GreedyIL. The results are tabulated in Table 2.

Table 2: Evaluation Results for Response Time

Query Set	Response Time (sec)		
	Greedy IL	UPS	UCOPSK
Q1	12	10	9
Q2	15	13	12
Q3	16	12	11
Q4	8	6	5

Scalability: Scalability is defined as the system's capability to hold the rising profile size in a proficient manner or its capability to be distended to accommodate that growth.

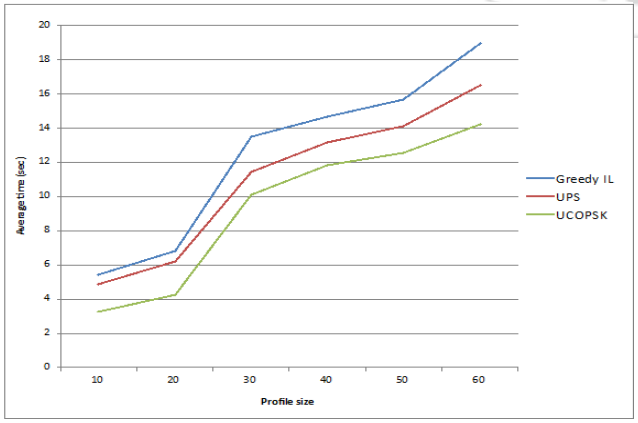

Figure 6: Performance Comparison based on Profile Size

Figure.6 gives the comparison of the existing system, GreedyIL, UPS and proposed UCOPSK based on the scalability of varying profile size. The Profile Size is plotted in X-axis and the average time is plotted in Y-axis. The UCOPSK achieves 11% of improvement in scalability than the GreedyIL; the results are tabulated in Table 3.

Table 3: Evaluation Results for Scalability of varying profile size

Profile Size (No of nodes)	Average Time (sec)		
	Greedy IL	UPS	UCOPSK
10	5.4	4.85	3.25
20	6.83	6.23	4.26
30	13.5	11.45	10.11
40	14.65	13.14	11.85
50	15.68	14.12	12.58
60	18.94	16.48	14.21

5. Conclusion and Future Work

In this work proposes a novel PWS framework named as User Customizable Online Privacy-preserving Search with K-anonymity (UCOPSK) with the intention of be able to adaptively simplify profiles with queries while regarding user specified privacy achievement in both online and offline searching. In this paper to preserve privacy of the user, proposed UCOPSK framework makes an assumption that queries might not contain some perceptive information, and aspire on protective the confidentiality in single user profiles at the same time as retaining their effectiveness designed for Personalized Web Search (PWS). The protect privacy for user the k anonymity is applied to each user and their topics, simultaneously assign sensitive value to each topic. A client-side confidentiality security UCOPSK is applied for personalized web search. The UCOPSK method allowed users in the direction of identify personalized privacy requirements by means of the hierarchical profiles. The privacy result of the proposed UCOPSK is compared to existing GreedyIL and UPS methods for the online generalization. The UCOPSK might attain high searching quality search results and preserve privacy requirements of user when compare to existing GreedyIL and UPS methods. The future work effort in the direction of defends against adversaries through broader background information, such as richer association in the middle of topics.

References

[1] J. Pitkow, H. Sch¨utze, T. Cass, et al, " Personalized search" , Communications of the ACM, 45(9):50–55, 2002.
[2] C.-M. Karat, C. Brodie, and J. Karat, " Usable privacy and security for personal information management", Communications of the ACM, 49(1), pp.56–57, 2006.
[3] S. Sackmann, J. Strker, and R. Accorsi , "Personalization in privacy-aware highly dynamic systems", Communications of the ACM, 49(9), pp. 32–38, 2006.
[4] M. Spertta and S. Gach, "Personalizing Search Based on User Search Histories", Proc. IEEE/WIC/ACM Int'l Conf. Web Intelligence (WI), 2005.
[5] B. Tan, X. Shen, and C. Zhai, "Mining Long-Term Search History to Improve Search Accuracy", Proc. ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining (KDD), 2006.

[6] X. Shen, B. Tan, and C. Zhai, "Implicit User Modeling for Personalized Search", Proc. 14th ACM Int'l Conf. Information and Knowledge Management (CIKM), 2005.
[7] X. Shen, B. Tan, and C. Zhai, "Context-Sensitive Information Retrieval Using Implicit Feedback," Proc. 28th Ann. Int'l ACM SIGIR Conf. Research and Development Information Retrieval (SIGIR), 2005.
[8] Z. Dou, R. Song, and J.-R. Wen, "A Large-Scale Evaluation and Analysis of Personalized Search Strategies", Proc. Int'l Conf. World Wide Web (WWW), pp. 581-590, 2007.
[9] Y. Xu, K. Wang, B. Zhang, and Z. Chen, "Privacy-Enhancing Personalized Web Search", Proc. 16th Int'l Conf. World Wide Web (WWW), pp. 591-600, 2007.
[10] K. Hafner, Researchers Yearn to Use AOL Logs, but They Hesitate, New York Times, Aug. 2006.
[11] Chirita P.A., Nejdl W., Paiu R., and Kohlschu¨tter C, "Using ODP metadata to personalize search", In Proc. 31st Annual Int. ACM SIGIR Conf. on Research and Development in InformationRetrieval, 2005, pp. 178–185
[12] Teevan J., Dumais S.T., and Horvitz E , "Personalizing search via automated analysis of interests and activities", In Proc. 31st Annual Int. ACM SIGIR Conf. on Research and Development in Information Retrieval, 2005, pp. 449–456.
[13] Sugiyama K., Hatano K., and Yoshikawa M , "Adaptive web search based on user profile constructed without any effort from users", In Proc. 12th Int. World Wide Web Conference, 2004, pp. 675–684.
[14] Sun J.-T., Zeng H.-J., Liu H., Lu Y., and Chen Z , "CubeSVD: a novel approach to personalized web search", In Proc. 14th Int. World Wide Web Conference, 2005, pp. 382–390.
[15] Smyth B., Coyle M., Boydell O., Briggs P., Balfe E., Freyne J., and Bradley K , "A live-user evaluation of collaborative web search", In Proc. 19th Int. Joint Conf. on AI, 2005.
[16] K. Ramanathan, J. Giraudi, and A. Gupta, "Creating Hierarchical User Profiles Using Wikipedia", HP Labs, 2008.
[17] Y. Xu, K. Wang, G. Yang, and A.W.-C. Fu, "Online Anonymity for Personalized Web Services", Proc. 18th ACM Conf. Information and Knowledge Management (CIKM), pp. 1497-1500, 2009.
[18] Y. Zhu, L. Xiong, and C. Verdery, "Anonymizing User Profiles for Personalized Web Search", Proc. 19th Int'l Conf. World Wide Web (WWW), pp. 1225-1226, 2010.
[19] J. Castellı´-Roca, A. Viejo, and J. Herrera-Joancomartı´, "Preserving User's Privacy in Web Search Engines", Computer Comm., 32(13/14), pp. 1541-1551, 2009.
[20] A. Viejo and J. Castell_a-Roca, "Using Social Networks to Distort Users' Profiles Generated by Web Search Engines", Computer Networks, 54(9), pp. 1343-1357, 2010.
[21] A. Krause and E. Horvitz, "A Utility-Theoretic Approach to Privacy in Online Services", J. Artificial Intelligence Research, vol. 39, pp. 633-662, 2010.