

## **EPRT- An Ingenious Approach for E-Commerce Website Ranking**

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### **Abstract**

The purpose of this paper is to discuss some of the earlier proposed E-Commerce website ranking algorithms, models and concept of webpage recommendation and propose a system that can help in efficient ranking of E-Commerce websites in accurate and in minimal time. This paper uses data mining and machine learning algorithms to rank the e-commerce website based on time spent by the previous customer on a particular website, no. of the recommended links clicked and feedback obtained from user. To perform the website ranking, E-Commerce Page Ranking Tool (EPRT) is implemented from proposed algorithm. The proposed system functioning is based on user action. It mines the data and gives the result. An extensive experimental and graphical evaluation shows that the website ranking precision of proposed E-Commerce Page Ranking Tool is more precise and accurate than IMSSE-tool [4].

**Keywords** – E-Commerce Page Ranking Tool (EPRT), website ranking, Feedback Mining, Data Mining and Query Mining, E Commerce

### **INTRODUCTION**

E-commerce is one of the sectors in some of the countries which is fastest growing over the past some years especially in a country like India which is densely populated due to which the number of internet users are increasing frequently day by day [6]. Therefore, with the doubling of internet usage, the craze and use of e-commerce

websites are rapidly increasing as now the people are using these sites for various purposes such as sales and purchase of various products like clothes, books, electronic components etc. and the list is endless. In today's world, people more rely on e-commerce websites because of large number of attracting features that they are providing [1]. Therefore, with the increasing popularity and demand of such websites among the people, there is a need to satisfy these demands efficiently. As a result of this, now companies are laying more and more emphasis to give customers, the best experience and are coming up with more and more new number of features in their websites and are putting more and more hard work to maintain a pace in today's market and also to maintain their reputation in the market which can in turn bring big revenues and a feeling of goodwill to their enterprise. Due to such a large number of e-commerce websites it has become difficult for the people to choose the best website among all the websites present which can give the best experience and also the one on which people can rely for their day to day basic needs. This can be done by ranking the web pages according to some of the features like time complexity, trust factor, number of citations and also on the basis of feedback. In order to meet the needs and taste of users, there is an urgent requirement to develop efficient algorithm which can operate on the results given by the different search engines like Google, Yahoo etc. [4]. The overall objective of this paper is to discuss some of the earlier proposed algorithms and models and to prepare a best one, which can improve the concept of ranking the web pages more efficiently, and which can produce more results that are accurate in less time. Thus, this paper is going to introduce a website ranking system called E-Commerce Page Ranking Tool, which will rank the websites based on citations recorded, time complexity, feedback/trust factor mining, etc. This will not do partiality between the e-commerce websites and will give the fair results because this system works on human dependent factors such as recording how much time the user spent on a website, getting feedback by doing survey's, by recording citations. The system will improve its results every time because of the machine learning algorithms are used. The rest portion of this paper is organized as follows. In section 2, the paper discusses the literature review of various papers based on recommendation system of e-commerce website or ranking of e-commerce website. Section 3 discusses that why we need this system for ranking and gives its model of working. Section 4, 5, 6 discusses the working of system, gives the algorithm of time recording its use for ranking and gives the graphical analysis of the experiment's results respectively. Section 7 discusses the conclusion of paper and the future work and is followed by important references used in the paper.

## **LITERATURE REVIEW**

**Neha Verma, Dheeraj Malhotra, Monica Malhotra, Jatinder Singh[1]** have proposed an algorithm named 'SNEC page rank algorithm' which stands for Semantic

and Neural Based E-commerce page ranking algorithm. With the help of the above-proposed algorithm, web page ranking has been done with the help of various features for the online customers so that they can pick the best product among large number of products available.

**Gurkiran Kaur, Rekha Bhatia [2]** proposed a product ranking solution with a versatile approach using accessibility and reliability factors. In this paper, the author tries to evaluate the reliability factors in a web page, which consists of trust factor with help of online security evaluation programs. This paper focuses on the two factors associated with time complexity and the trust factor for ranking of a product.

**Hua Jiang, Yong-Xing Ge, Dan Zuo, Bing Han [3]** discussed an effective approach for improvement in the precision of ranking of web pages after analysing the original rank of the page and its new versions. In this paper, the authors proposed a model for ranking of their web pages based on the assumption that the user clicks the pages orderly.

**Dheeraj Malhotra, O.P. Rishi [4]** have proposed the design of a tool named 'IMSS-E tool' which is known as Intelligent Meta Search System for E-commerce which is used for the ranking of web pages. The IMSS-E tool uses the concept of back propagation neural network and semantic web mining to upgrade or improve the web page rank. The tool basically extract the information from the web to rank the different web page.

**Ganesh Venkataraman, Arunkumar Ravichandran [5]** proposed a method for re-ranking of the search results which are ranked using either conventional algorithms or semantic algorithms.

**Dheeraj Malhotra, Neha Verma [6]** developed a mathematical approach for ranking of web pages. The approach deals with various kinds of problems related to time complexity and space complexity. The authors discussed that web mining optimizes two things i.e. use of web dictionary and the time-spent statistic by the user on the previous visit to the same web page, which are used to improve the ranking process of the web pages. **Ch.**

**Vanipriya, Thammi Reddy, Pallavi. R [7]** discussed an efficient approach of providing positive, negative as well as neutral review from user's review of a product in less time. The approach aims to view the strength and weakness of the products in a more detailed way.

**Dheeraj Malhotra [8]** proposed a neural based approach for improving web page ranking process. The approach uses the concept of back propagation neural network which can well adapt to the new patterns of supervised learning. The proposed system with the help of data mining can also be used for improvement as well as development in E-Commerce optimization system.

## **RESEARCH METHODOLOGY**

E-commerce has become a part of life of most of the people in this technical world and has grown rapidly in past some years. According to e-Marketer, Asia-Pacific will remain the world's largest retail e-commerce market throughout the forecast period, with sales expected to top \$1 trillion in 2016 and more than double to \$2.725 trillion by 2020. The region will also see the fastest rise in retail ecommerce sales, climbing 31.5% this year [10]. However, this has resulted in increase in the no. of e-commerce websites, with which the customers are having problem in comparing the e-commerce websites. Thus, this paper is proposing an E Commerce Page Ranking Tool.

This section is going to discuss the necessary facts on proposed model and algorithms that are being used in this paper for e-commerce website ranking. The proposed system also challenges the cold start by the other search engines for the first time users. The system discussed in this paper can tackle this problem of cold start with the help of machine learning and data mining techniques with which the system give the results to new users by mining the data of old users having same inputs/query and by giving them semantic results in the form of ranked e-commerce websites.

This system is best from user point of view because it is implicitly dependent on the user action and improves itself by using data mining algorithms based on user actions.

### **E-Commerce Page Ranking Tool**

E-Commerce Page Ranking Tool is a powerful system, which can rank the websites more accurately and precisely as compared to some of the earlier proposed systems for website ranking. Therefore, it is a prerequisite to have an user account on the system through which the above proposed system will maintain a database record for each user such as number of clicks on a particular link, time spent by the user on that particular link or website etc. which in turn will provide better results by data mining with the help of machine learning algorithms used in the above proposed system. Therefore, through E-Commerce Page Ranking Tool, objective is to provide much accurate results to the users.

#### **A. Accepting search query from users**

Firstly in this step, the user is asked to enter his/her search query for a particular product. For example, if the user enters “**apple iPhone**” to search. The system will take the input as it is from the user and will send it to database. From here the keywords are further processed to the Data Cleaning step which has been discussed as below.

## B. Data Cleaning

From the above step the system has accepted the key words from the user in form of search query. Now, in this step there are two processes which will take place:-

### 1. Query Mining

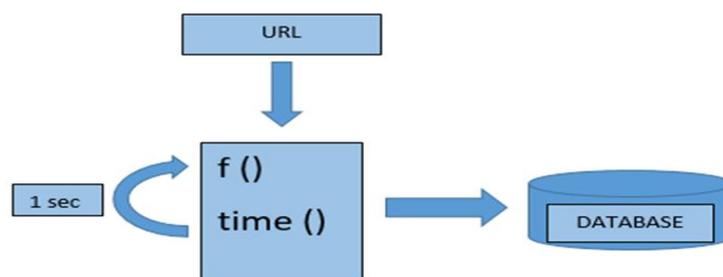
Query mining refers to the removal of stem words or unwanted words from the search query entered by the user in the first step. Now, the results from the database are obtained on basis of mined query and earlier ratings done by the system of websites on mining the record of clicks on the links.

### 2. Semantic keywords extraction

After the process of Query Mining, we move to the next step in which the user will also be given the choice of search for hypernym or hyponym which refers to the technical meaning of the search query entered by the user and hyponym which refers to some specific meaning of the search query if no hypernym exists for the search query and finally it will look for synonym which refers to general meaning of that particular query in case if both hypernym and hyponym does not exists. This extra feature is very helpful for the users when the user don't know that, 'For what he/she is exactly looking for'. After the completion of this step the system further moves to the time spent mining process.

## C. Time Spent

Time spent refers to the recording of time spent per second by the user on a particular e-commerce website after clicking on the link of websites by the user. Greater the time spent on website greater the priority in ranking system. In the given below diagram the time function is called recursively and dispatches the data of time recorded to database every second until the user closes the browser.



**Figure 1.** Time spent calculation model.

**D. Feedback Mining**

Now, in the fourth step, a FMT is being used which stands for Feedback Mining Tool in which the tool will accept the feedback from users and then process them to arrange those feedbacks accordingly. The E-commerce websites with good feedbacks will be rated on the top and websites having worst feedbacks will be rated in the last. In addition, this tool will be used for conducting regular surveys and will ask the users to give feedback of the websites for the ranking purpose. The tool will be calculating an average rating and after calculating the average rating from the feedbacks performed by the above mentioned tool it will rank the websites accordingly. Finally, from here the results are forwarded to the last step.

**E. Recommended webpage and their rating**

In the final step, the ranking of recommended e-commerce websites is shown as output. Whenever the ranked links are clicked, the unique name of particular website having some integer value is increased by 1.

For example:

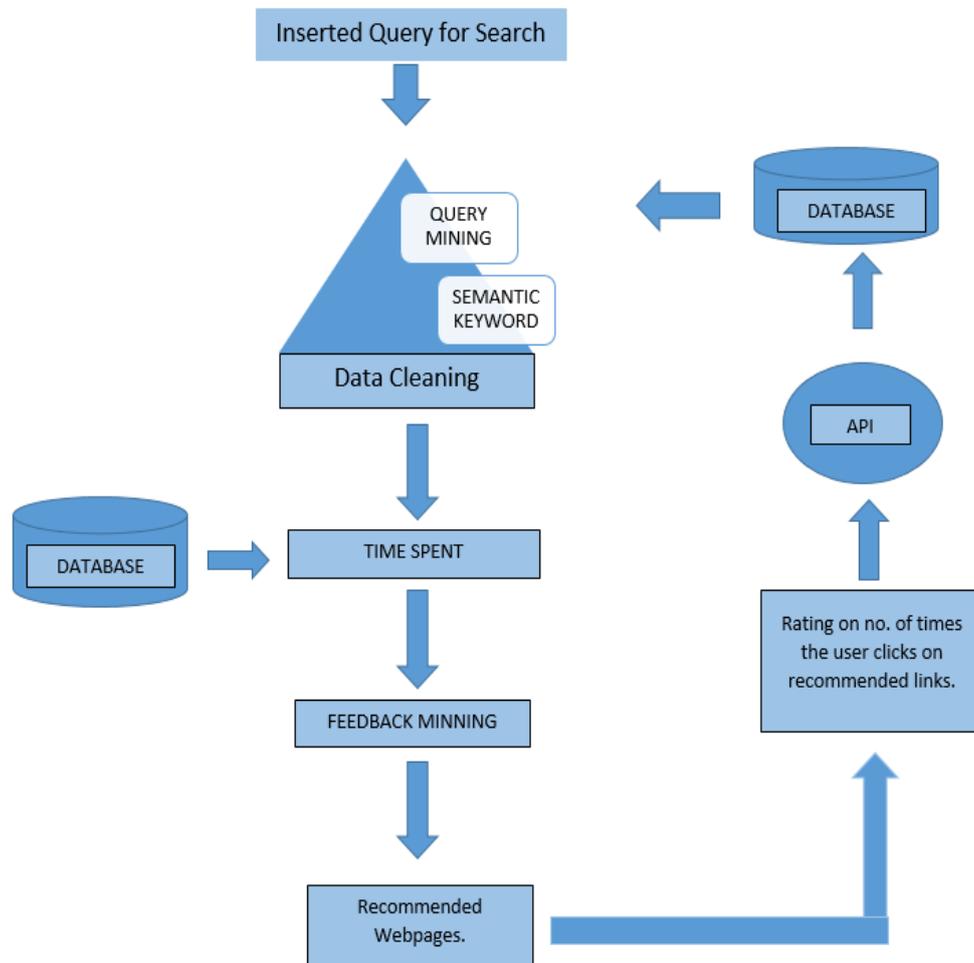
The amazon is represented as 'a' and no. of clicks on amazon is 200.

Then,  $a=200$

Amazon clicked,  $a=a+1$ .

Now,  $a=201$ .

In addition, the value gets stored in database and helps in ranking in Data cleaning process.



**Figure 2.** E-Commerce Page Ranking Tool model

### Algorithm used in E-Commerce Page Ranking Tool

**Step 1:** Accept query string from user.

**Step 2:** Remove stem words from string.

**Step 3:** Determine minimum and maximum length.

**Step 4:** Check for hypernym, hyponym and synonym if available in database.

**Step 5:** Create web document.

**Step 6:** Retrieve time spent by the user on each website from database.

TIME ( )

IF database -> username, sitename

Time = Time+1

Else

Create tuple -> username, sitename

Set, Time = 1

**Step 7:** Arrange web document according to time in descending order.

**Step 8:** Retrieve feedback rating from database.

Feedback ( )

Get feedback string from user

Remove stem words

Compare ( )

If words in favor

Counter ( )

Feedback = Feedback + 1

Else

Return zero

**Step 9:** Arrange web document according to feedback rating in descending order.

**Step 10:** Display ranked webpages.

**Step 11:** Record no. of clicks on the recommended links.

Link (username, sitename)

Click = True,

A= A+1.

Store A in database.

### **Experiment and Graphical Analysis**

In order to test the overall efficiency and the effectiveness of our proposed system, we took 15 volunteers out of which 8 were males and 7 were females. All the volunteers were experienced who do transaction on e-commerce websites regularly. They were asked to install our system on their laptops or personal computers and first complete the signing up process. The volunteers were asked to compare the

performance of our proposed system with respect to IMSSE-tool [4], repeating the following steps for at least 3-4 trials on each of E-Commerce Page Ranking Tool and IMSSE-Tool [4].

1. Firstly, the volunteers were asked to search a product query for example Reebok purchase instead of Reebok shoes purchase.
2. Secondly, the system will itself remove stem words like a, an, etc., if any in the search query and will search for hypernym, hyponym and synonym for same search query.
3. Thirdly, we calculate the time spent by each of volunteers on a particular website. Greater time spent will give higher priority in our system.
4. In the fourth step we asked the user to give feedback to website.
5. In this step the ranking of different websites are produced as output and also the top rated links are provided by our system. If any of those links are clicked then their values increased by 1.

<b>E-Commerce Page Ranking Tool</b>			
Sign-Up		Sign-In	
User Id- axyz1982@.....			
Password- *****			
Enter search Query :-			
Search		Reset	
Hypernym	Hyponym		Synonym
Rank	Web Links	Feedback (ratings)	Time Spent (in seconds)
1.	www.reebokshoes.in	201	1107
2.	www.puworldfootwear.com	169	1690

**Figure 3.** Interface of E-commerce Page Ranking Tool

The webpage's relevancy for a given search query depends mainly upon its position among the search results. Here, we have compared our proposed E-Commerce Page Ranking Tool with the IMSSE-tool [4] where we have considered precision at A metric, denoted by  $P(A)$ .  $P(A)$  reports the fraction of labeled results as relevant which are reported in top A results. In addition, it is considered that a webpage ranked higher is more relevant. The comparison of precision between the proposed E-Commerce Page Ranking Tool and IMSSE-tool has been shown by the graph below. The plotted graph shown in figure 4 compares the precision on vertical axis & number of trial runs, which is on the horizontal axis for the same search query. The results produced are much better as shown by the graph so the above-proposed tool can be used for improvement in the web page ranking process.



**Figure 4.** Comparison of E-Commerce Page Ranking Tool and IMSSE-tool [5]

## CONCLUSION/FUTURE WORK

In this research paper work, we have introduced a system of ranking of websites called E-Commerce page ranking tool. The system works and give results based on various factors such as feedback mining, time spent mining, query mining entered by user for searching, etc. The proposed ranking system includes 3-stage ranking, which is combined at the end to give the rankings based on feedback ratings. This research work also discussed the papers based on ranking of e-commerce websites. The paper also discussed the algorithm of Time ( ) used for recording the time spent by the user on a particular website. The system worked accurately as shown by the experimental evaluation in the form of graphical analysis. The result of experiment shows that the algorithm worked properly and gave accurate results. The machine learning and data mining algorithms are also adopted so that the system gives better results to each user every time. The system can be further improved for product ranking, and also can have

additional parameters like RTPC (Run Time Price Comparison) and response time calculation.

## REFERENCES

- [1] Neha Verma, Dheeraj Malhotra, Monica Malhotra & Jatinder Singh, "E-commerce website ranking using semantic webmining and neural computing", "International Conference on Advance Computing Technology and Applications (ICACTA-2015)".
- [2] Gurkiran Kaur & Rekha Bhatia, "Semantic Product Ranking Model (SePRaM) using PNN over the Heuristic Product Data", "International Journal of Computer Applications (0975 – 8887) Volume 146 – No.7, July 2016".
- [3] Hua Jiang<sup>1</sup>, Yong-Xing GE<sup>1, 2</sup>, Dan Zuo<sup>1</sup>, Bing Han<sup>1</sup>, "Timerank: A Method Of Improving Ranking Scores by Visited Time", "Proceedings of the Seventh International Conference on Machine Learning and Cybernetics, Kunming, 12-15 July 2007".
- [4] Dheeraj Malhotra & O.P. Rishi, "IMSS-E: An Intelligent Approach to Design of Adaptive Meta Search System for E Commerce Website Ranking", "AICTC'16, August 12-13, 2016, Bikaner, India".
- [5] Ganesh Venkataraman and Arunkumar Ravichandran, "Adaptive Semantic Search: Re-Ranking of search results based on Webpage feature extraction and implicitly learned knowledge of User Interests", "".
- [6] Dheeraj Malhotra and Neha Verma, "An Ingenious Pattern Matching Approach to Ameliorate Web Page Rank", "International Journal of Computer Applications (0975 – 8887) Volume 65– No.24, March 2013".
- [7] Ch. Vanipriya, Thammi Reddy, Pallavi. R, "Sentiment Analysis-An opinion mining tool", "International Journal on Advanced Computer Theory and Engineering (IJACTE)".
- [8] Dheeraj Malhotra, "Intelligent Web Mining to Ameliorate Web PageRank using Back- Propagation Neural Network", "2014 5th International Conference- Confluence The Next Generation Information Technology Summit (Confluence)".
- [9] Yang Liu, Jian-Wu Bi, Zhi-Ping Fan, "Ranking products through online reviews: A method based on sentiment analysis technique and intuitionistic fuzzy set theory".
- [10] <https://www.emarketer.com/Article/Worldwide-Retail-Ecommerce-Sales-Will-Reach-1915-Trillion-This-Year/1014369>
- [11] Dheeraj Malhotra, Rishi O.P., "IMSS: A Novel Approach to Design of Adaptive Search System Using Second Generation Big Data Analytics", "International Conference on Communication and Networks. Advances in Intelligent Systems and Computing, vol 508. Springer, Singapore".
- [12] Dheeraj Malhotra, Op Rishi, Neha Verma, Jitender Singh, "Intelligent Big

Data Analytics: Adaptive E-Commerce Website Ranking Using Apriori-Hadoop – BDAS Based Cloud Framework”, “Maximizing Business Performance and Efficiency through Intelligent Systems, IGI Global - International academic publisher, USA, ISBN13: 9781522522348, February 2017 [IGI – GLOBAL, USA]”.

- [13] Neha Verma and Jatinder Singh, “Improved web mining for e-commerce website restructuring”, “Computational Intelligence & Communication Technology (CICT), 2015 IEEE International Conference on. IEEE, 2015”.