

An intelligent approach to design big data on e-commerce in cloud computing environment

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ABSTRACT

Web resources extract useful knowledge by the process of web mining. Web server maintains the log files for analyzing them from behavior of customer and improves business as the challenging task for e-commerce companies. The processing and computing of big data was increased day by day by the demand of computer system's ability. The emphasis on data was increased gradually by the rapid development of information technology. Various businesses are exploring effective data analysis methods, and this system proposes an intelligent approach to designing big data for e-commerce in a cloud computing environment. This paper aims to develop and implement the relevancy vector (RV) algorithm, an innovative page ranking algorithm based on Hadoop distributed file system (HDFS) MapReduce. The research provides customers with a robust meta search tool that makes it easy for them to understand personalized search requirements and make purchases based on their preferences. The intelligent meta search system adverse events (IMSS-AE) tool and the RV page ranking algorithm were shown to be efficient and effective by a thorough experimental evaluation in terms of reduced response time, enhanced page freshness, high personalized relevance, and high hit rates.

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1. INTRODUCTION

The modern big data modifies a lot of shopping activity by enormous E-Tailers growth in websites of online shopping, in countries like India there are various attractions preferred by new age customers through online portals because the Internet availability is cheap and easy [1]. Although in recent years the continuous development form the industry of emerging e-commerce and the innovation of technology undergoes to new changes bounded by the field development [2]. Information gathering and technological capabilities analysis using big data, the high new technologies significantly help to the promotion of this content and cloud computing and this brings the e-commerce's operation by real-time and experience of dynamic service conducts better related businesses over the e-commerce and this information have a favorable control [3].

eBay, Amazon, Alibaba, Flipcart, Wal-Mart, and other e-commerce providers are affected by the web and e-commerce communities. These platforms are very scalable and innovative, and they schedule recommender systems [4]. The shared file system can be processed and accessed by the technique of big data involves in data distribution that works on parallelization and implements in Hadoop MapReduce API by a cluster of machines [5]. Amazon elastic MapReduce (Amazon EMR) is used by Amazon to process the business of e-commerce and Hadoop framework Fastly manages the large amount of distributed data analysis and demands the cost-effectiveness that suits for purchasing [6].

The traditional business model deficiency requires an e-commerce emergence. The information network construction is focused under the data or information age. There is lot of security issues and data management issues in traditional business model. From cloud computing perspective, cloud platform and big data have makes strengthen the traditional business. The most powerful platform for marketing is created by integrating a number of technological benefits that highlight the benefits of today's Internet, and the screening analysis is where the benefits of all the data are found [7]. It is taken into consideration to ensure optimal application effect, rationality, and perfect cognition by integrating the features of big data technology and cloud computing [8].

Through various resources of the hypertext transfer protocol (HTTP) protocol used by web browser and web server interaction, the server, client, and proxy levels collect web usage data. There is an increase in online customers with the increase of current scenario [9]. In typical website log file, the order of hundred bytes data is created by the clicking of each web page. The web user sends the request information to the web server, and the server records the user's activity through a protocol. These types of records are known as web access logs, and they include information such as computer IP address requests, visitor information, hit lines, request method, location, HTTP status code, file size, and requested name [10].

The e-commerce traditional operation mode was changed by the Platformization rise in cloud computing and big data [11]. Using a large number of small and medium-sized enterprises that rent different cloud services and data center providers, e-commerce platforms are rapidly developed. All kinds of e-commerce's user customized needs are shared among the enterprises, better collaborated and met by promoting the powerful cloud computing capacity [12]. The RV MapReduce framework is used by big data analytics of market basket analysis easily accomplishes the website ranking of e-commerce as it is a robust and scalable to process big data efficiently by an open-source platform. An advanced e-commerce website ranking system based on big data can be implemented efficiently with the help of a cloud computing architecture based on Hadoop and MapReduce. The IMSS-AE tool uses big data mining and Hadoop-RV (relevancy vector)-MapReduce framework-based analytics to perform the ranking process. This makes e-commerce website personalized search easier. The study intends to help e-trailers optimize their website structure for competitiveness and to help consumers identify authentic products at fair rates by evaluating and assessing e-commerce websites.

This work is organized as follows. A survey of the literature is provided in section 2, section 3 describes an intelligent approach to designing big data for e-commerce in the cloud computing environment, in section 4, results and discussions are described, and in section 5 concludes the paper.

2. LITERATURE SURVEY

In [13], the platform structure of cross-border e-commerce's commercial value of big data analysis. The big data features of 4V distribute the data process analysis of business intelligence capabilities. They are capable in many ways for marketing promotion, improve customer's relational management, this research examines that big data can be used to increase operational effectiveness in cross-border logistics for e-commerce on a number of platforms. The enterprises are provided for co-relation and mobile+social network marketing.

In [14], firstly expounded the e-commerce system's actual use by the situation and secondly focused on analyzing problems that exists in e-commerce system is used by big data technology. Finally, they offered feasible solutions based on practical problems. The commodities of big data in mining marketing association, it is found that the model is applied reasonably in field of e-commerce the correlation commodities are not enhanced between them as they ensure more scope of the big data mining extensive. Aoki *et al.* [15] discusses about (WIX) Web index architecture system generate hyperlink for replacing the keywords. The links can be inserted into web pages by customer's choice and this turn reduces load of his/her by all the results of search engine produced by web. However, if a keyword associates multiple web links, then the described system's major limitation time is taken by the relevance computation.

In [16], semantic and neural based e commerce (SNEC) algorithm developed by the basis of various web semantics and artificial neural networks of intelligent technology. In this paper, the website priority tool is discussed for obtaining easy relevant ranking evaluation of the search queries in e-commerce. E-commerce

websites to assist the customers by finding relevant web sites on the top during their search for buying a specific product as well as businesses to compare their strengths and weaknesses with competitors and hence to improve their profits by providing relevant product at competitive price with consumer-friendly services to the customers by better structuring their e-commerce websites.

Aujla [17] using software-defined networks (SDN), in a multiedge-cloud context, for managing data-intensive applications, an effective workload slicing method is recommended. Using a multileader multi-follower Stackelberg game for cost-efficient implementation, the study suggests an energy-aware SDN control strategy for handling inter-DC migrations. Using a number of measurements, google workload traces are used to evaluate the effectiveness of the suggested strategy. The results demonstrate how successful the proposed strategy

In [18], the experience of summarized marketing discussed and its actual activity of some brands were adopted from the precision marketing strategies. we develop a research model based on the innovation characteristics from the diffusion of innovation (DOI) theory and the technology-organization-environment (TOE) framework. Data collected from 369 firms in Portugal are used to test the related hypotheses. The study also investigates the determinants of cloud-computing adoption in the manufacturing and services sectors.

In [19], the effectiveness of using the normal distribution (ND) approach, which can produce representative information in the split data sets, to split and handle large amounts of medical data in a cloud setting. The proposed method's significant efficiency advantages over conventional methods without dividing data into small partitions are demonstrated by the results of experiments. The ND-based approach can provide representative data sets, making it a possible and efficient way to handle large amounts of data. The cloud computing environment allows for the parallel processing of the divided data sets.

In [20], new model presented for web service e-commerce of trust authenticating services are comprised by considering additional service object of trust degree and their customer evaluation is computed by service business. The services of normal and malicious are distinguished in between the new trust model for showing the results by simulation experiment. The small business identifies the upgrades of trust value and big sum business identifies the group cheat of effective action.

Candeia *et al.* [21] examined are the significance of capacity planning in this setting and the impact on SaaS providers' profits of using simple business-driven heuristics for long-term capacity planning in this study. Synthetic e-commerce workloads were used in simulation research. According to our data, the average yearly improvement in SaaS provider profit due to the suggested heuristics is 9.6501%. By examining these results, we can show that capacity planning is still a crucial task that helps SaaS firms make larger profits. A good capacity planning can also prevent a negative reputation that might occur from unacceptable performance a benefit that is difficult to measure.

In [22], this study looks into the advantages of e-commerce big data analysis (BDA) adoption for both customers and sellers, taking into consideration the importance of BDA and its advantages for e-commerce operations. In order to give e-vendors a competitive advantage, improve consumer loyalty, and increase profits, the study examines the effects of big data analysis on e-commerce. Additionally, BDA-derived recommendation algorithms give clients a more personalized searching and shopping experience. There may be significant disadvantages when using BDA in e-commerce, such shopping addiction. Although BDA enhances e-commerce experiences, e-vendors experience difficulties in managing costly BDA tools and professionals due to the rapid growth of data.

In [23], cross-platform recommendation for social e-commerce is the problem we addressed. Using standard e-commerce apps and social media, we first look into the varied shopping behaviors of users. Based from these data-driven results, we provide cross-platform recommendation for online shopping in social media (CROSS), an approach for cross-platform recommendation for online shopping in social media. It utilizes social relation data from social media in addition to user-item interaction data from both platforms. Our two proposed variations, CROSS-MF and CROSS-NCF, are modifications of the main structure. They show through extensive tests on two real-world social e-commerce datasets that our suggested CROSS performs much better than the current state-of-the-art techniques.

In [24], images used in e-commerce are categorized using content-based techniques. The proposed solutions address the issues of inadequate classification accuracy and prolonged training times in e-commerce image classification. The LBP-DBN training algorithm, AML-LBP-DBN, is based on the adaptive momentum learning rate, and the commodity image classification method utilizes multi-level clustering of image local features and the image-class nearest neighbor classifier. Regarding the accuracy of e-commerce images and the training time for classification, the provided method has clear advantages, as demonstrated by the results obtained from simulating the commodities identification dataset RPC.

In [25], a sentiment-driven fuzzy cloud multicriteria model is a novel approach that uses sentiment analysis for purchase recommendations and has been created for online product ranking and performance, bidirectional long short-term memory network-conditional random fields and k-means clustering are used to mine product features and calculate sentiment evaluations based on reviews from numerous platforms. They

present real examples of attribute performance evaluation and online mobile phone ranking. The results demonstrate that our suggested approach has a great lot to offer when handling customer decisions about online product purchases and issues with performance direction identification. Implications for management are examined.

3. INTELLIGENT APPROACH TO DESIGN BIG DATA ON E-COMMERCE

Figure 1 represents the block diagram of an intelligent approach to designing big data for e-commerce in a cloud computing environment. The customer preferences are easily tracked by the website ranking system of e-commerce to closely monitor the browsing history of customer and the short- and long-term preferences are built for updating the profile of customer automatically with the changes in browsing patterns of his/her websites does not require any additional effort of the customer. Their past browsing history and registered preferences are retrieved by long-term preferences. The last two days browsing history is only retrieved by short-term preferences. In this phase, Meta keywords are fetched to extract search queries and visits browsing history of web links from selected ideas the search query is used to disambiguate the query of simple keyword for expanding personalized query to meaningful query of customer for improving the search engines results of backend. Hence the customer's contextual database is established further by using profile of developing customer.

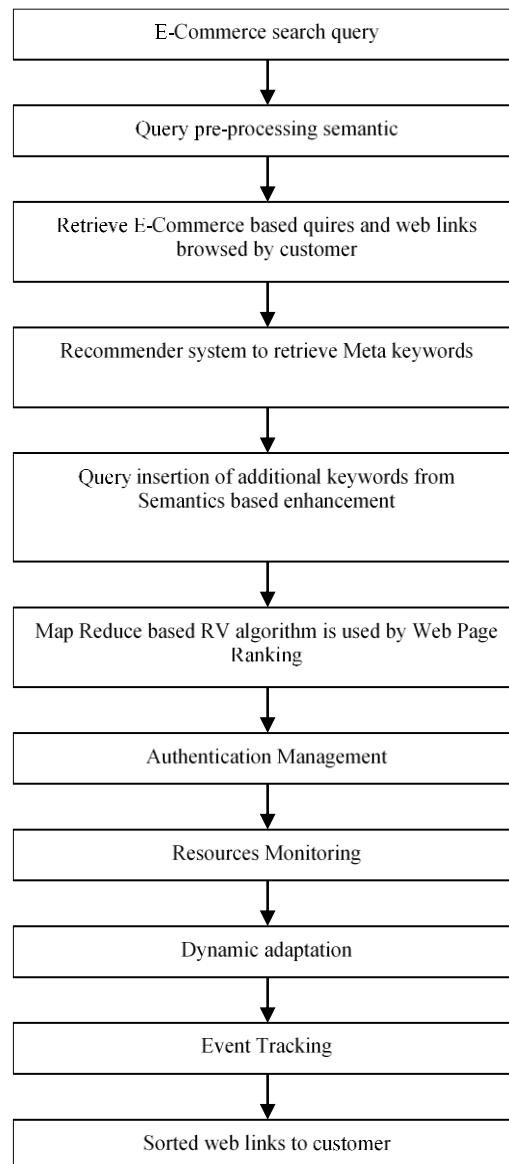


Figure 1. Block diagram of intelligent approach of e-commerce big data

Hadoop-RV (relevancy vector)-The IMSS-AE tool's ranking system is implemented using big data mining and analytics based on the MapReduce architecture, which simplifies e-commerce website personalized search. This work provides the public cloud at the middle layer for service level agreements. The user-specified query is the first search of this step on search engines of each back end and a unique id is assigned from 1 to n for web pages of each retrieved clusters are compared with the privacy/security, response time and accessibility ease of user specifications for processing the ranking purpose by finding relevant cluster's list L.

The network exists massive data through analyzing the e-commerce platform or enterprise management and improves competitiveness by providing basis of decision-making. The administrator's access is controlled at all levels by using module of the authentication management system's background and the security of the system is directly affected by and e-designs modules. The data resources optimization and unified resource management uses cloud computing for optimizing marketing services used by connecting internet and massive high-quality data. The multiple channels obtain various network resources for integrating cloud computing-based precision marketing to achieve the cloud platforms wider range.

Map method accepts an ID key of search engine to retrieve its various background by each web link clusters and the weblog tokenizes second argument for frequency count of each keyword entry link in the weblog of e-commerce search query. However, the occurrence of each keyword is cumulated over all by the implementation of Reduce method. The web document frequency of each keyword is determined by this accomplished numerical insertion of 1 (one) and hence the various search engines are concluded by web documents of retrieved relevancy vector content.

The RV algorithm determines e-commerce website's relevancy used by a specific customer for calculating content relevancy vectors (CRV), semantic relevancy vector (SRV), reply time, privacy, feedback and also calculates each search string keyword's minimum and maximum lengths. The longest common subsequence is used for determining SRV and the MapReduce functions are used for determining CRV. The reply time, accessibility or privacy vector's final output is equal to 0 and it removes all e-commerce websites by using the algorithm the feedback relevancy vector's calculation following the previous stage, the website rank is calculated in the final step based on the customer's past experience and the relevancy vectors of weighted summation.

The performance of RV algorithm is determined by using intelligent meta search system adverse events (IMSS-AE) tool and the browsing history is used by personalized, expanded search string are suggested by this tool. The preferred search criteria are used from selected statistics details of customers for ranking the various links on output provides the feedback of web links about ranked order of the customer. Hence the customer preferred changes are matched with capabilities of personalized ranking for better improvement.

4. RESULTS AND DISCUSSION

The e-commerce website of personalized relevancy gives the output of search results depending upon the position of product query of a specific customer and evaluates the proposed RV algorithm, IMSS-AE tool gives efficiency and effectiveness. From the various age groups of 15-45 years, the 20 human volunteers were employed by us with 3 years of minimum experience in carrying out numerous transactions of e-commerce. Among them there are nine male and eleven female volunteers and to follow the process of sign up/registration they used installed IMSS-AE tool in their personal laptops. The following steps must be repeated by volunteers for a minimum of four trial runs on both the suggested IMSS-AE Tool and Dogpile. A metasearch engine called Dogpile collects data from popular search engines including Google, Yahoo!, Yandex, and Bing. Initially, we requested that volunteers look for intentionally incomplete e-commerce queries. For example, they could search for "Samsung online purchase" rather than "Samsung mobile online purchase 2." The following phase was asking volunteers to rate each output connection for the Dogpile engine and the suggested IMSS-AE tool individually, from 1 (worst) to 5 (best). Calculate numerous accuracy factors such as personalized relevancy, page freshness, and response time after obtaining ranking data from each volunteer.

Figure 2 demonstrates a comparative examination of an intelligent approach to designing big data on e-commerce utilizing. When creating big data for e-commerce, the IMSS-AE tool performs better in terms of response time than Dogpile, demonstrating its efficiency in the metasearch engine. In this graph x-axis denotes the number of runs and Y-axis denotes the response time in seconds. The comparative analysis of an intelligent approach to design big data on e-commerce using described IMSS-AE tool and Dogpile in terms of page freshness (as precision count) is represented in Figure 3. At initial stage these parameter values are low compared to Dogpile, after some trail runs initial precision values of IMSS-AE tool are high. X-axis presents the number of runs and y-axis represents the page freshness.

Figure 4 shows the comparative analysis of personalized relevancy (as precision count) parameter for an intelligent approach to design big data on e-commerce using described IMSS-AE tool and Dogpile metasearch engine. Improved performance of IMSS-AE tool is because of capabilities of semantic based learning. This calculates the various important vectors of relevancy for the database of customers profile with some trial runs it monitors his/her personalized browsing preferences. In this comparative graphical representation, number of runs is denoted on X-axis and Personalized relevancy is denoted on Y-axis. The term Hit is defined as when the requested document is in cache and request is satisfied immediately. Otherwise, the document is retrieved from the original server which is nothing but request is miss. Figure 5 show performance of RV page ranking algorithm for various prefetching threshold values of 0.25 and 0.5 by the analysis of hit rate. Threshold value is expressed on X-axis and hit rate is expressed on Y-axis. For both threshold values Hit rate of IMSS-AE tool with RV algorithm is high compared to without RV algorithm.

Therefore, from results it is observed that, an intelligent approach to design big data on e-commerce in cloud computing environment is very efficient in terms of all parameters. As the RV algorithm scans a wide range of web logs from the e-commerce industry in order to do predictive prefetching, this analysis results in a good response time and accuracy. The extensive experimental evaluation shows that the enhancing page freshness and personalized relevancy, the proposed IMSS-AE enhances personalized search.

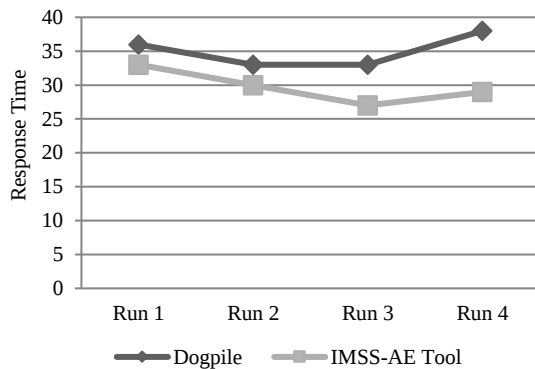


Figure 2. Comparative analysis of response time

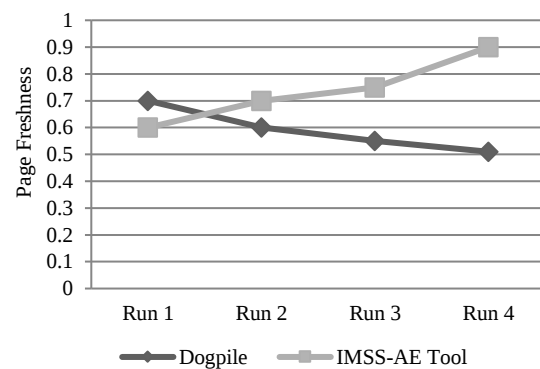


Figure 3. Comparative analysis of page freshness

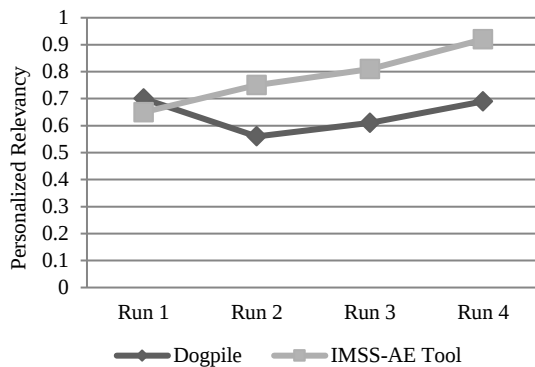


Figure 4. Comparative analysis of personalized relevancy

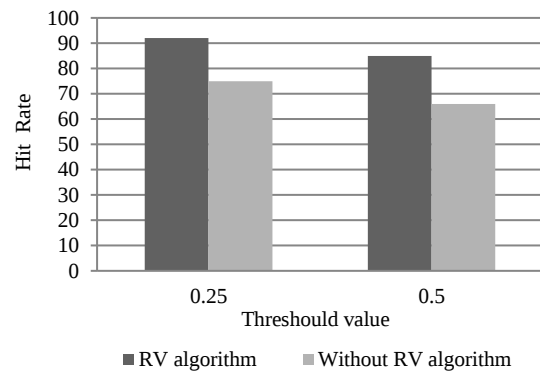


Figure 5. Analysis of cache hit rate

5. CONCLUSION

In this paper an intelligent approach to design big data on e-commerce in cloud computing environment is described. Big data processing technology can assist e-commerce businesses in gathering and analyzing vast amounts of data; therefore, they should take advantage of this development opportunity. With the help of a unique RV page rating algorithm, IMSS-AE is an e-commerce website ranking tool that helps current consumers choose e-commerce websites that are appropriate for online purchases. IMSS-AE semantic-based learning capabilities are demonstrated by the improved precision parameters. The experimental analysis justifies the described ranking approach. The IMSS-AE tool, which helps clients select

suitable e-commerce websites for specific product purchases, is a representation of the results. Page freshness and personalized relevancy of described IMSS-AE tool model are high compared to Dogpile. Response time of intelligent approach to design big data on e-commerce using described IMSS-AE tool is less compare to Dogpile metasearch engine which explains the efficiency of described model. The Hit rate of described IMSS-AE tool with RV algorithm is better than without RV algorithm. Hence, personalized website ranking output benefits end user in selecting the appropriate website for online purchase. Neural networks can be used to integrate client decisions for a more personalized experience, further improving the suggested IMSS-AE tool.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

- The data that support the findings of this study are openly available in C. Xuecong at <http://doi.org/10.1109/IPEC51340.2021.9421260>, reference number [3].
- The data that support the findings of this study will be available in X. Zhao <http://doi.org/10.1109/ICEBE.2018.00053> following a 6-month embargo from the date of publication to allow for the commercialization of research findings.
- The data that support the findings of this study are available on request from the corresponding author, SS. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

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