Automating the Indian transportation system through intelligent searching and retrieving with Amazon Elastic Compute Cloud

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Abstract  
This article focusses on the problems associated with or unavailability of service in the Indian transportation system. Nowadays, web portal pages and Internet require most frequent search capability. In applying queries for data searches, this work procedure expressly demonstrates intriguing aspects of the query that utilize gathering terms. These gatherings are semantically correlated but separate from search results. The query is fired for the best travel route to make the travel system more intelligent. Such gatherings can be applied to real-time applications such as those for airlines, trains, buses, and diverse and distinct flight travel classes to determine the lowest cost and shortest route. In this work, the gatherings are called query aspects. This work investigates a method for web applications that searches for data from a user search and generates a list of the shortest and lowest cost travel routes. A proposed intelligent algorithm is developed and analysed for searching data effectively. The user selects from a list of the low-cost, shortest routes by the preferred mode of travel (flight/train/bus). The proposed method reduces customer dependency on solely vehicle (cab/bus/train) services, where prices may be too high and travel time too long. The proposed method demonstrates suitable performance by visualization of data against considered peer methods.

1 | INTRODUCTION

E-business and online services are important aspects of present-day lifestyles. They provide great support to promote business in various sectors such as travel, tourism, hotels and other service-oriented applications [1–3]. Though each of these sectors introduces a variety of recommended services, viz. product and promotion recommendations as well as other methods for better performance. However, with increasing personalized information service conditions, the traditional recommendation system of a class of products for all cannot satisfy all customers [4–7]. With piles of data in databases and warehouses, investigating the most significant user-friendly data is not always an easy task. A number of previous studies have developed tools or investigated systems for retrieving significant user-friendly data that could provide more effective recommendations. With the amount of diversified data increasing daily, there is a continuous need for new systems to improve recommendation quality [6, 8, 9]. In the literature, some researchers have focussed on such systems, but there is still a scope to enhance such a system, so this article proposes a web-application system that discovers user travel requirements and needs to automate transportation options (via flight/train/bus) using a customer’s own choices [4, 5, 10–12]. It incorporates user search preferences, most travelled destinations and search queries to populate a list of travel routes that are lowest in cost and shortest in distance [6, 13–15].

Data of such a nature are vast, uncertain and multi-faceted. To refine such data, we use the document retrieval algorithm and weight calculation algorithm (WCA) on a graphical model because accurate deductive results are difficult. The assessment consolidates the review and accuracy of feature terms with gathering quality [16, 17]. The query feature can be gathered/ separated from a vast range of assets that could include, for example, a social folksonomy, taxonomy, anchor text or query log. In the literature, various algorithms have been suggested for the retrieval of keywords, text, or documents etc. [18–20], and then classification of the extracted informative data.

Here we use two algorithms to refine our data search and analysis:
• **Document retrieval algorithm:** It provides a query as input, and the output represents an array of object relevancy to be calculated.
• **Weight calculation algorithm:** The input is again a user query, whose weight is calculated and assigned.

This application provides the most economical method of commutation with minimum time, unlike the case with other cab service applications. Using the latter method, the final price may differ from the price displayed prior to booking; the application described here ensures that the price does not change. Also, it provides a local bus commuting method using public transport. In addition, it provides a banking module that reduces dependency on third-party payment and can add suggested cards and money to the book.

Apart from the above, with the help of wireless or ad hoc networks, data/information (textual, transaction, keyword etc.) from real-time domains can be saved on the cloud/servers or retrieved from servers/the cloud. Often, it can be extracted as a meaningful information through the analysis. Such a system performs the following functions [15, 17, 21]:

- Generate or transmit captured data through the wireless network.
- Store the information on a server or cloud network.
- Preprocess the information.
- Manipulate the acquired data.
- Process the data according to requirements.
- Analyse the data.
- Visualize the analyse data for graphical representation.

The wireless network is applied to store or transmit data on the cloud and is then used for processing and analysing purposes [15, 16, 21]. Such a network model is illustrated in Figure 1.

In a real-time environment, the initial step is to collect the data and store it in an appropriate database or server or cloudserver over wireless Internet networks or the Internet [16, 21]. The collected data is preprocessed for experimental work. Nowadays, this preprocessed data can be processed to create meaningful information using techniques such as machine learning, artificial intelligence, neural networks, statistics-based methods etc. The meaningful information is analysed and depicts visualization results that can be displayed in a required format to report the overall data through visualization (Figure 2).

## 2 | LITERATURE REVIEW

In this section, some available methods from the literature are presented and suggested through various methods to deliver the best results for a travel system. Shafqat et al. (2019) introduced, alongside top-positioned places, places that were frequently disregarded by voyagers that could be inferred by the absence of advance or viable promotion and alluded to as under-underlined areas. Nowadays, every single pertinent datum, for example, sightseeing blogs, evaluations, and surveys, is utilised to acquire ideal suggestions [1]. Such work plans evaluate inactive variables that should be tended to, for example, food options, cleanliness, and opening times, and suggest vacation destinations dependent on client history. Its main task is to propose a cross-mapping table methodology depending on an area’s noticeability, evaluations, dormant themes, and suppositions. A target work for proposal enhancement is planned dependent on these mappings. The standard algorithm is the idle Dirichlet allotment bolster support vector machine (SVM) [1]. Gomati et al. propose a restaurant suggestion in which the client first picks indicated lodging preferences; focussed on these preferences, relating lodgings are presented and client remarks analysed to recognize the lodging with the best positioning [2]. In the end, the most highly evaluated lodging is prescribed to the client by the restaurant’s suggested framework. The proposed nostalgic score to measure a natural language processing (NLP) calculation is utilized to discover the perspectives and assumptions of client remarks. The assessment results uncover the proposed NLP calculation to improve the presentation when contrasted against the existing algorithm. The focal point of the research work is to offer a rundown of prescribed eateries that is progressively exact and available. This recommended approach yields high accuracy [2]. Dietz et al. present two applications that use mined outings. The first is a methodology for grouping explorers in two contextual analyses, one on Twitter and the other on Foursquare, where unadulterated versatility measurements are advanced with social viewpoints, that is, the sorts of scenarios for which clients have checked in. Grouping 133,614 excursions from Twitter, we obtain three particular bunches. In the Foursquare informational collection, six groups can be resolved. The second application zone is the spatial bunching of global goals. These found areas are exclusively shaped by the versatility examples of the excursions and are in this manner autonomous regulatory districts, for example, nations. This work recognizes 942 locales as goals that can be legitimately utilized as district models of a goal-recommender system [3]. Hu et al. acquaint a chart-based technique with recognized vacationer development designs from Twitter information. First, tweets gathered with geo tags are cleansed to channel those not distributed by travellers. Second, a DBSCAN-based bunching technique is adjusted to build traveller diagrams comprising vacation spot vertices and edges. Third, organized explanatory strategies (e.g. centrality, Markov bunching calculation) are applied to recognize vacationer development designs, including famous attractions, driven attractions, and well-known visit courses. New York City in the United States is chosen to exhibit the utility of the proposed methodology. The identified traveller development designs help business and government exercises for crucial visit item arranging, transportation, and the advancement of both shopping and convenience centres [4]. Liu et al. (2011) suggested a method and assessment of virtual screening using SHAFT, a hybrid approach for 3D molecular similarity calculation [5]. Xiong et al. (2015) proposed recommendations for hotel booking based on a collaborative filtering and rank boost algorithm [6], personalized intelligent information [7], and user
preference analysis [8], respectively. Xiang et al. (2010), recommended a role for social media in online travel information searches [9]. Adishesha et al. [22] suggested a method to overcome challenges and monitor some health parameters of aircraft that also enhance the safety of passengers, crew and operators. Vasudev et al. [23] proposed an efficient method that focusses on warning messages to minimize road transportation issues. This method was developed to reduce traffic and transportation issues along with accident rates. Zhou et al. [24] investigated a concept to automate device-to-device, vehicle-to-vehicle, and Internet-to-vehicle-based networks. Papadimitratos et al. [25] explored numerous challenges and solutions through technologies for vehicular communication systems. Li [26] proposed an algorithm that extracts features in terms of words from a variety of legal texts. This algorithm focusses on the classification of these words into corresponding legal terms through parameter calculation.

3 | PROPOSED MODEL

With technological improvements nowadays, wireless Internet networks can be used in transfer data from various nodes to the destination/server. It can be used in numerous real-time domains. This data can also be stored in a distributed environment to provide greater system efficiency. Nowadays in transportation systems, cabs, buses, and metro trains can store various kinds of data (text, audio, video, HTML, XML, recordings etc.) captured by numerous devices (sensors) or data generated by clients/individuals related to ticketing, booking etc. All this data is available on its own server or on a cloud server. Similarly, with the effective use of wireless networks, this data can be fetched from these servers for various purposes and in different forms for such things as report generation, visualization, analysis, and future prediction of various aspects using existing APIs and artificial intelligence (AI)- and machine learning (ML)-based
techniques. Here, queries are applied using a data retrieval algorithm using a weight calculation method to fetch data. Thus, this method attempts to retrieve data from storage and analyse it to demonstrate accuracy and false ratios. The work proposed here plans and executes a framework focussed on functionality through query events to arrange and rerank travelling types. Here, the Google API provides power as a third-party interface to communicate with the search method. It then combines all information utilizing ML and reranks it by page rank like a navigation algorithm. This method gathers the information from the Google API and ranks all recommendations based on recent client queries.

This article focuses on the problems associated with or unavailability of service in the Indian transportation system. This work also studies and depicts various peer methods available in the literature. The proposed work attempts to deliver better outcomes and implementation to automate the Indian travel system. The entire work is implemented under a wireless system. The planning and execution of the proposed work uses natural query aspects to separate and gather regular records from textual documents, labels, HTML documents and correlated areas inside top search results with high security in a cloud system. When clients send a query to the framework, it first checks for accessibility in existing peer frameworks and then allows the searching of recent available lists. On the other side, the current query is accessible in an existing search over the wirelessly connected server or database and will restore all the URLs from the server or database. The framework’s query is sent to the framework on the Amazon EC2 console for processing, where the Amazon EC2 is an open cloud service provider. It emphasizes database security through SQL infusion utilizing an MVC design-based model that enhances the boosting capability of the framework to minimize the load on the database or server side and perform smooth execution. The MVC-based architecture helps develop this work through Module, View and Controller-based logic. The whole logic executed from the user end, that is, presentation logic to business logic, is handled through the controller logic. Database security is delivered using the Aho-Corasick method for SQL infusion at the server side. It stores history records of every client in the server database.

### 3.1 System implementation

This section depicts the modules used for solutions in such a system to investigate and present the new framework to address the problem of achieving relevant results. The aim of this work is to enhance the algorithm performance when working with the Amazon EC2 cloud service over a wireless Internet network. The results demonstrate the current state of work done for practical implementation of the proposed algorithm. It has been completed for the user and bank modules of the proposed method. The implementation of proposed modules is briefly depicted in Table 1. In Table 1, the first column briefly depicts the user module for handling the customer end, and the second column briefly presents the bank module for handling bank/financial transactional data. User registration, authentication, recommendation, one-time password and ticket booking, history and related data are handled through the user module.

#### 3.2 Module description

In this system, the whole task is categorised using a specific module. Each module has a separate stepwise task procedure that is accomplished by the following steps.

- **User authentication and query submission module:**

  This module can process the user authentication in which any client can submit a search query through the form.

- **Document retrieval:**

  This second module applies the document retrieval method from different web pages and extracts the required data.

- **List extraction:**

  This phase extracts the matched keyword of a fired query from each page and simultaneously stores it to server.

- **List-weighting module:**

  This step applies a list-weighting approach that uses the similarity algorithm and assigns a specific weight to each list.

- **Clustering module:**

  This module applies a list-clustering approach that creates clusters of available lists from the previous step.

### Table 1 User and bank modules

| User module | Bank module |
|-------------|-------------|
| The user module is completed by the following steps: | The bank module is applied for transactional purposes. |
| - user registration and user authentication modules | This module is completed by the following steps: |
| - data gathering and retrieval from user history, Google API data, and user rating on social sites | - add account |
| - list weighting of page rank and algorithms | - credit amount |
| - clustering of top K recommendation | - debit amount |
| - one-time password generation | - view balance |
| - book ticket and send ticket confirmation by mail | |
Facet-ranking and analysis module:

This step emphasises the ranking, analysis and visualization of results in the system.

Figure 3 demonstrates the framework of the proposed method and depicts the factual step-by-step procedure used for implementing the suggested work. Crucial steps, viz. crawling top results, list extraction, computation of score weighting, clustering, and item facet ranking are intelligibly visible in Figure 3.

4 | PROPOSED ALGORITHMS

The study of the algorithms from the literature shows the great importance of analysis of the survey data in the practical world because algorithms are tremendously useful in statistical programs. The proposed algorithm is shown below: Here, this is a document retrieval algorithm where users provide a query, say Q, as an input, and this work considers network connections as N, and the output is the result of relevancy calculations of the top K pages based on Q. The user provides Q to the system.

**Figure 3** Proposed system architecture

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**Algorithm 1** Document Retrieval Algorithm

**Input:** We consider Q no of initial queries \( q_1(n), q_2(n) \ldots q_j(n) \), where \( K= \) page rank; and \( N= \) network connection of the network framework and compare the pages in between the array list \( a(a1, a2, a3 \ldots) \) and list \( b= (b1, b2, b3 \ldots) \).

**Output:** Relevancy result of top K Pages in query Q.

1. If
2. First it will check whether the Input queries in the network is provided by user or not.
3. The algorithm will read attributes A within the Ith row in webpage.
4. Result will be displayed in the form of array with function \( q(n) \).
5. Else
6. Connection cannot be made with the network by calling with query function \( q(n) \).
7. For each \( K \) in Network
8. Array list will bind all the relevant result of top pages with query \( Q(n) \) to \( k \)
9. Return the object as an array.
10. Calculate the weight of every page \( K \) so as to rank them in the array list using weight calculation algorithm.
   
   \[ W(x) = W(x) - A (d(\text{Error})/d (w(x))) \]  \( //w(x) = \text{new weight}, W(x) = \text{old weight} \)
   
   \[ W(x) = \text{Calculation} (Q, A) \]  \( // \text{old weight} \)
   
   \[ A= \text{array List function } // A(W(x)) \]
Weight-calculation algorithm

With the WC4, user input is passed through a query Q, and each retrieved list L from a web portal page. In this procedure, the system evaluates similarities between the lists—\( \vec{a} = (a_1, a_2, a_3, \ldots) \) and \( \vec{b} = (b_1, b_2, b_3, \ldots) \)—where \( a_n \) and \( b_n \) are the vector components (feature of the doc or values for each word of the comment), and \( N \) is represented as the dimension of the vectors:

- **Procedure begin**
  - For each row \( R \) from the data list, choose \( L \).
  - For each column \( C \) in row \( R \):
    - Apply formula (1) on column \( C \) and query \( Q \).
    - Compute the ScoreCalculate \((C, Q)\).
    - The relevancy score for the attribute list, say \( A \), is calculated.
    - A current weight is then assigned to each row.
- Then categorize all instances.
- **Procedure end**

This work uses Q as the input in a Web portal page and lists the number of web sources (such as websites/servers) visited so that we can calculate weights using scores. Here, this work approaches ranking the web data of the most visited sites by the user and thus is efficient for the user in deciding which travel system in the Indian transportation system is most appropriate. All the activities in this study have been performed using a wireless Internet system to transmit, store, and retrieve the data in/from the server or cloud server database. Here, Amazon EC2 services are applied for the storing and fetching of data. Then, the Amazon EC2-enabled sensor network is applied to quickly build, train and deploy the models (ML/AI-based). Here, we connect the wireless sensor network with EC2 from a bucket list and deploy the SPN network. The bucket list maintains a secure sensor network and does not allow third-party networks to access it.

Depending on resource availability, this work experiments using Amazon EC2. EC2 delivers easy-to-scale computing capability to considered instances for its services. It furnishes the actual demand for all hardware resources demanded to run its services and reduces the cost of purchasing such hardware for running the application. The significant role of using EC2 is to develop and deploy an application by minimizing the cost and improving the performance. Here, an EC2 instance is associated with a group for security to the instance at any level that is at the port or protocol level. The main benefit of using amazon EC2 is that it stores data efficiently and allows for scaling (up or down) of resources depending on requirements.

Using the proposed application, distributed credentials can be achieved through Amazon EC2. The main Amazon EC2 provides secure and resizable computing capability in the cloud. The instances may be scaled up/down along with resource requirements. The main credential is to integrate with other services such as S3 or RDS. These services can be run on two different operating systems; here, we have experimented on Windows 8.1. The main goal is to deliver a secure network for resource communication through a virtual private cloud.

5 | EXPERIMENTAL SETUP AND DISCUSSION

This work is demonstrated through the depicted graph. It is applied to perform a comparison of performance accuracy among considered algorithms such as the document retrieval algorithm and weight calculation algorithm. It also compares other peer methods, as shown in Table 2. Figure 4 shows the accuracy of the proposed system relative to the existing systems. Shafqat et al. propose LDA and SVM algorithms for a recommendation system having 85% accuracy and a 15% fault rate. Decorsiere Rami et al. propose involving extraction methods and discarding any fast phase/fluctuation of signal, giving 82% accuracy and an 18% fault rate. Gomati et al. proposed the NLP algorithm to improve the performance; this algorithm compared with an existing algorithm having 91% accuracy and a 9% fault rate. The SVM-based method works with 85% accuracy and a 15% fault rate. The proposed method has been completed through document-retrieval, weight-calculation, and web-crawling algorithms. Here, the performance of the proposed method is better than the considered peer methods in terms of accuracy and false ratio. It demonstrates better accuracy and the lowest false ratio compared with those of the considered peer methods.

This work used flow of the distance-retrieval algorithm and all the keyboard values inserted in the query so that the document with the most ranked value is depicted at the top of the search bar.

User query generation, processing and retrieval of results can be better understood through Figure 5. The rank-based keyword search method is adopted to finalize the final document for the retrieval system.

Such data has been captured through sensory devices and transmitted to the server or cloud using a wireless sensor network. This article focuses on data and analysis available on a web server.

According to the analysis shown in Table 2, the document-retrieval and weight-calculation algorithms depict maximum accuracy against peer methods and demonstrate a lower false ratio than that of peer methods. According to the proposed method, the document-retrieval and weight-calculation algorithms depict the lowest false ratio and maximum accuracy ratio compared with those of peer methods.

In metro/smart cities, such applications are highly necessary, yet such applications can be applied to automate any transportation system in India. In real-time applications such as airlines, trains, buses, distinctive flight and diverse travel classes for the lowest cost and shortest routes can be achieved through this work. It can thus be explored in the future based on demand and the requirements of society.
6 | CONCLUSION

This work provides a list of cheapest routes and shortest travel times. Such applications are implemented in local bus transportation in India that emphasise economical and environmentally friendly usability of the public transportation system. It also provides another mode of commuting to customers by minimizing sole dependency on travel agents or private cab services, which tend to be very costly. This work can be used to automate various transportation systems such as airlines, trains, buses, and distinctive flight-diverse travel classes for lowest costs and shortest routes. This manuscript proposes a method that uses algorithms for document retrieval and weight calculation. It computes the best route results for the commuting mode chosen by the user for suggested destinations. This web-based application is one solution for passengers that also delivers user travel history and preferences. The proposed application works in WSN through Amazon EC2 services. The application can be fully customized using different APIs and can be made even more user-friendly with greater use of resources. The proposed method is experimentally verified, and its computed performance demonstrates better accuracy and the lowest false ratio against considered peer methods. The effectiveness of the proposed method is illustrated through achieved outcomes.

7 | FUTURE SCOPE

The application has such a vast future scope, as it can be extended and implemented in hotel booking, international tour and travel booking, best places to visit in a city, food booking, and local route recommendations, and it can be implemented in cab, auto, carpool, and bike booking etc. With suggested enhancements, it will help users in both day-to-day commuting
and while travelling within a country or to other countries and remove the intermediate agents, as users can choose the best deal from recommendations provided by the app itself. Future enhancement work will develop a GUI-based application for this work through real-time data in a cloud environment.

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