

TRAVEL AND TOURISM MANAGEMENT SYSTEM USING CHATBOT RECOMMENDER

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ABSTRACT

Chatbots have gained increasing importance for research and practice with a lot of applications available today including Amazon's Alexa or Apple's Siri. In this paper, we present the underlying methods and technologies behind a Chatbot for e-tourism that allows people textually communicate with the purpose of booking hotels, planning trips, and asking for interesting sights worth being visit. In particular, we show how model-based reasoning can be used for enhancing user experience during a chat, e.g., in cases where too many possible selections are available or where user preferences are too restricted causing inconsistencies and as a consequence not possible answers to be provided. Besides the underlying foundations, we provide a use case from the intended tourism domain to show how such a model-based chatbot effectively can be used in practice.

Key Words: travel recommendation, time sensitivity, recency effect, personalization, social media

1.INTRODUCTION

The people around the world are fascinated to know about the cultures of different countries, lifestyles, food verities, monuments and historical places etc. creating the allure for global tourism [1]. Recent past decades have shown a major inclination for the foreign travel as there has been a significant increase in foreign travel frequency by Indians. This increase in number of travelers is from 4.42 million in 2000 to 26.9 million in 2019 though there has been a decrement to 7.29 million in 2020 due to pandemic [2]. This is due to increase in per capita income (from \$443 per annum in 2000 to \$2101 in 2020) there by significant rise in the size of middle and upper class of the country [3]. Since this market has grown up like anything,

many facilitators such as MakeMyTrip [4], TripAdvisor [5], ease_my_trip [6] and yatra [7] have come up to capture the business opportunities in this growing market. Conventional mechanism to select a tourism destination involves reading and analysis of reviews available on various websites such as MakeMyTrip [4], TripAdvisor [5] etc. and the social media platforms like twitter [8], Facebook (meta)[9], Instagram [10] and YouTube[11] etc. Lots of travelers' bloggers post their videos having detailed information in terms of the best hotels, weather, famous sites to visit, transport-related reviews etc. for the information of prospective travelers. Most of the countries whose economy is dependent upon the tourism also provide the tourism related information on their respective websites. A person willing to travel abroad can refer to all these information for making the travel for his/her family convenient. However, referring to all the above-mentioned information involves many problems: Posted text reviews are lengthy and their number is quite huge. Reading all these reviews and analyzing them is quite a herculean task. Compared to the volume of the text, the information content is quite low. The information is spread over multiple websites and exploring it in totality is not feasible. Thus, there is a need for an automated mechanism that can provide gist of these text reviews which are continuously growing and updating. If the analysis mechanism can also provide the information on the desired features (as per user requirement) then it will be an added advantage. The proposed work is an effort in this direction. The work proposes a Big Data based framework that revolutionizes the process of selection of destination by extracting and analyzing the reviews posted in the form of natural language on different sources like TripAdvisor, YouTube and Twitter etc. The analysis of results is presented as a score for the place. The five common factors have been

used to calculate the score of a place based on the reviews which are: availability of vegetarian food, facilities in hotel rooms, comfort, sightseeing & attractions and family friendliness. These factors are of most common concern for an individual person or family at the time of the selection of a destination to visit. The proposed framework is based on the data extracted from Top 10 destinations [12] where the Indian tourist have visited most in recent years. These places are Bali, Bangkok, Dubai, London, Mauritius, New York, Paris, Singapore, Sri Lanka, Switzerland. In the proposed framework, text data is retrieved from the trusted sources and filtered using Selenium [13][14] and BeautifulSoup [15][16]. Filtering is performed to obtain reviews of the restaurants containing veg food, hotels which are suitable for family, places having common facilities, attractions and sightseeing at a place and comfort at the place. The data so obtained is quite voluminous, has variety/heterogeneity, high incoming velocity etc. making it a big data centric problem. The Apache Spark [17] (Big Data framework) is used to handle the huge amount of input data. The data obtained from Apache spark is fed to Natural Language Toolkit (NLTK) [18] for the purpose of data cleansing and pre-processing. The pre-processed data is provided to pre-trained BERT [19] for the purpose of sentiment analysis. The proposed framework converts the results into an elegant user-friendly visual representation. The user can see a visually attractive globe having all the information related to the destination with scores of different factors in dynamic format. The proposed framework helps the user not only in searching destination(s) according to his/her preferences but also as per the appropriateness for his/her family.

2. LITERATURE REVIEW

Current tourism recommendation techniques have several innovative aspects and can be classified in different ways, depending on how they analyze the user's information and filter the list of items [14].

2.1 Collaborative filtering

This approach aims to offer visitors destinations they have not yet been to, but which they might like, based on the habits and tastes of similar users' profiles [15]; the similarity of taste between two users is calculated based on the similarity of their rating history. The VISIT system [11], for example, applies sentiment analysis techniques (using the Alchemy Application Programming Interface

(API)) to analyze news about a given attraction on Twitter and Facebook and determine whether users make positive or negative comments about it. This information is displayed in green and red by the system in its interface so that the user can easily identify the places that visitors enjoy most today and those are not. However, this approach is more difficult to meet the needs of tourists, when it is almost impossible to match users' travel history (see rating), it is very difficult to find two people on the same trip, with the same duration, the same places of interest, and the same experience.

2.2 Content-based recommender system

For making recommendations to potential visitors, content-based systems are based on the analysis of content similarities between items previously consulted by users (or examined in the present) and those have not yet been consulted [16, 17]. Content-based filtering is the most popular and widely used technique in tourism recommendation systems [14, 18]. The system proposed in Ref. [19] defines a content-based recommendation method for cultural heritage (tangible and intangible). This method selects resources based on user preferences and item metadata, orders items using multi-criteria user feedback, and enriches the set of suggestions using semantic relationships between items. A natural limitation of content-based filtering is the need to have a generic and rich representation of the content of the items, which is not the case for tourist items characterized by their great extent and variety. Moreover, this type of system generally suffers from the problem of overspecialization; for example, when a tourist enjoys an event or a show during a trip, it does not mean that he will want to see it again. However, using a content-based approach, the system will suggest him to come back a second time to the same place with the same type of event (even if it is not organized!!), when he might be more interested in events, he did not discover on the last trip.

2.3 Context-aware filtering

Recommender systems are called context-sensitive when they use context in their calculations to predict what is likely to be of interest to the user [11]. The most commonly used context elements in tourism recommendation systems are geolocation, weather, visit history, and weather. Today, many mobile devices connected to the Internet, also known as "connected objects", are widely available and used to capture and provide a wealth of information that can enrich the

current context and its variations. Reference [20] proposed a context-sensitive recommender system and presented a definition of the concept of context through a meta-model. An applied case study was conducted in the city of Tangier. The system developed is composed of three main modules: Context, composed of the user's profile, Spatio-temporal and environmental information (i.e., location, characteristics of the device used to access the application, external physical environment (e.g., weather conditions) and information collected about the community (from Facebook, Twitter, and other social network applications)); the tourism content repository, which contains tourism service data; and the recommender system.

2.4 Hybrid recommender system using Chatbot

The hybridization of these approaches, to overcome the shortcomings of each technique used alone and take advantage of their strengths, has been the subject of several research studies [21]. Reference [22] proposed a new architecture for a recommender system for individuals and groups, based on the characteristics of the works of art, the context of all users, and the social affinity between these users. The system is a hybridization of three approaches: the content-based approach, the social approach, and the context-based approach.

2.5 Discussion

It should be noted that 90% of the current solutions are generally concentrated on a single category of items (hotels, museums, tourist sites, . . .) [14], providing only tourist services information (inserted in the system by the administrator or by experts) to make the trip more pleasant; besides, most of these works use a single approach, with a clear predominance for content-based approaches [14, 18] .

For all these reasons, there is a need for a conceptual framework not only to gather the recommendation approaches but also to present the different tourism resources in a single architecture.

3. REFERENCE ARCHITECTURE FOR TOURISM RECOMMENDER SYSTEM

Our research work consists of proposing a new architecture for tourist recommendation systems. This architecture is based on a hybrid recommendation approach, which aims to improve user access to tourism

resources in information retrieval systems, such as tourism portals and service providers' documentary Extranets. Another innovative aspect of this architecture is that the proposed system goes beyond a list of recommended tourist attractions and can be seen as a planner that aims to build a complex and detailed program of a multiday visit. The client will thus be offered a diversified list of tourist resources (monuments, activities, hotels, shows) that exactly meet their specific needs and preferences.

We propose to decompose the proposed system architecture into five main modules (Fig. 1):

- (1) **Visitor profiles** contain in particular information that can be used to determine user preferences in terms of items (ratings, social information, etc.).
- (2) **Services repository** contains information on tourist services (such as accommodation, restaurants, tourist sites, transport) as well as associated multimedia content.
- (3) **A contextual meta-model** takes into account multiple factors involved in manipulating context, such as time, space, location, the distance between two places, routes, tourist travel history, etc., to make a specific recommendation.
- (4) **The hybrid filtering process** returns a list of items with the degrees of appreciation that the target user can give to each item.
- (5) **A trip planner** selects items considered relevant to the user, and uses operational research techniques to correlate these choices in the form of a trip.

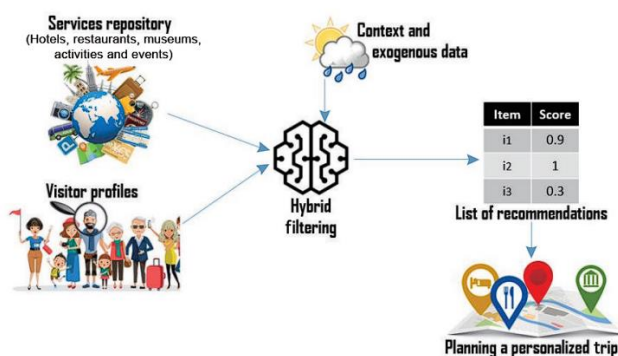


Fig. 1 Proposed architecture for tourism recommender system.

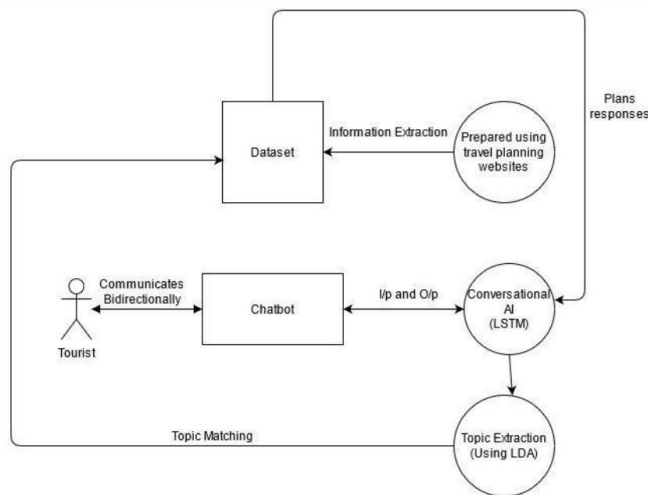


Fig. 2 Website Architecture

4. DESIGN AND DEVELOPMENT OF THE AI CHATBOT

i. Chatbot Architecture and Framework:

The design and development of a chatbot depend on its framework and architecture as shown in figure-3. This is a set of components that includes the chatbot's user interface, AI algorithms, and a natural language processing engine. The goal of this study is to develop a layered architecture framework that will allow the chatbot to interact with its users seamlessly. This will involve separating the various components of the chatbot into two. One of these is the user interface, which will handle the interaction between the customer and the chatbot. The second component of the chatbot is the natural language processing engine, which will analyze and understand the customer's queries.

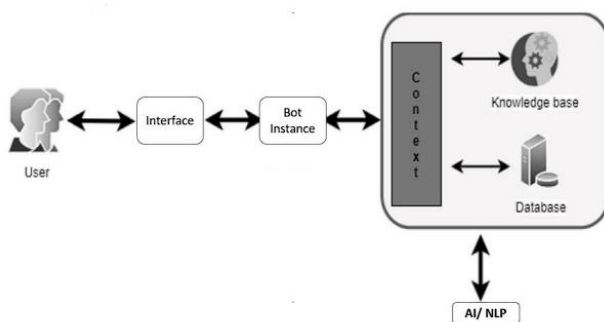


Fig. 3 Chatbot Architecture

ii. Natural Language Processing (NLP) and Artificial Intelligence (AI) Techniques:

In order to develop a chatbot, AI and natural language processing techniques are essential. These methods will be utilized to analyze and comprehend the users' queries. The study will use the NLG and NLU techniques. The chatbot will be trained using various AI techniques, such as reinforcement learning, supervised learning, and unsupervised learning. These will help improve its efficiency and accuracy.

iii. Chatbot Features and Functionalities:

The goal of the chatbot is to meet the expectations and needs of its users. It will feature various functionalities and features such as multilingual support, 24-hour availability, and customized recommendations. It will be able to answer users' queries, provide product information, process orders, and handle complaints. In addition, it can recommend products based on the users' previous preferences and purchases.

iv. User Interface and User Experience (UI/UX) Design:

The chatbot's design as shown in figure-3 is also important in ensuring that its users can easily interact with it. It should be user-centered and follow the principles of clarity, consistency, and simplicity. The user interface of the chatbot will be designed to be easy to navigate and intuitive. It will be able to communicate with its users using a natural language and a conversational tone. The chatbot's experience should also be consistent across different channels. Through usability testing, the design and performance of the chatbot can be evaluated. This process involves testing the interaction between actual users and the chatbot to identify any issues and enhance its capabilities. The development and design of a chatbot depend on its architecture, features, functionalities, and user experience. The layered framework will be used to build the chatbot, while machine learning methods and NLP will be utilized to provide the appropriate answers to users' queries. The chatbot's functionalities and features should be designed to cater to the needs of its users, and its user experience and interface should follow the principles of consistency, clarity, and simplicity.

5. RESULT AND EVALUATION:

The evaluation and results section of the paper will examine the chatbot's effectiveness in providing customer service. It will also look into its subjective performance, as well as its comparative evaluation with other methods, its limitations, and its users' satisfaction.

i) Chatbot Performance and Effectiveness:

The evaluation and results section will begin with the chatbot's effectiveness as shown in table2. It will look into its performance by using various metrics, such as the time it takes to respond to a customer's query and how accurate it is when it comes to providing answers. The evaluation will be based on the data collected throughout its deployment. The chatbot's performance will be evaluated using predefined performance criteria. This approach will enable the identification of areas where it can improve and provide suggestions on how to do so.

Metric	AI Chatbot	Traditional Customer Service
Response Time (seconds)	5	30-300
Accuracy Rate (%)	90	75
Completion Rate (%)	95	80
Customer Satisfaction Score (out of 10)	8.5	6.5
Cost Savings (%)	30	N/A

ii) User Feedback and Satisfaction:

The chatbot's overall performance will be compared with that of other commonly used customer service methods, such as email and phone calls. This evaluation will help identify how successful the chatbot is at satisfying customers' needs and desires. The second part of the evaluation and results section will focus on the satisfaction and feedback of the chatbot's users. Various methods will be used to gather this data, such as surveys, feedback forms, and polls. The objective of the evaluation is to find areas where the chatbot could improve.

iii) Comparison with Traditional Customer Service Methods:

The goal of the comparison is to see how capable the chatbot is of handling a large number of customer inquiries while providing accurate information and answers without requiring human intervention. In addition, it will look into its ability to recommend customized suggestions based on the individuals' past behavior and preferences.

The third section of the paper's evaluation and results section will look into the performance of the chatbot against traditional methods of customer service. It will analyze the efficiency and cost-savings of using chatbots in the field.

iv) Limitations and Challenges:

The challenges and limitations that the chatbot encountered during its development includes its inability to handle complex inquiries and the need for humans to be involved when necessary.

The paper will discuss the possible solutions to address these issues, such as integrating it with human agents or utilizing more advanced natural language processing and artificial intelligence techniques.

6. CONCLUSION AND FUTURE SCOPE:

The design and implementation of AI chatbots for customer service can result in a more accurate and swift experience for consumers. The study revealed that the AI chatbot had a faster response time, higher completion rate, better customer satisfaction scores, and lower costs than traditional methods. The study's findings have significant implications for the development of AI chatbots and the customer service industry. They show that these technologies can help businesses improve their operations and reduce their costs. It also provides valuable insight into the design and creation of AI chatbots. In the field of customer service, further studies will be conducted to analyze the effects of AI and natural language processing techniques on the effectiveness and performance of chatbots. They may also look into how these technologies can affect the job satisfaction of agents and the workload of workers. The development of AI-powered chatbots for customer service is expected to have a huge impact on how businesses interact with their consumers. As technology continues to advance, the capabilities of these machines will only get better, making them an ideal tool for firms looking to provide exceptional customer service.

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