

Hybrid Recommendation System for Tourism Based on Big Data and AI

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering

By

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INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **KATTA MOUNIKA (40110576)** and **KAPATI KEERTHI (40110546)** who carried out the Project entitled **"Hybrid Recommender System for Tourism Based on Bigdata And AI"** under my supervision from November 2023 to April 2024.


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ABSTRACT

This abstract offers a hybrid tourism recommendation system designed to assist travellers in receiving recommendations that are tailored to their preferences. The system combines collaborative filtering and content-based filtering algorithms to increase suggestion accuracy and overcome the shortcomings of single recommendation systems. Collaborative filtering uses the collective wisdom of a user community to find items of interest, whereas content-based filtering evaluates item qualities and user preferences to provide recommendations that are pertinent. Combining these techniques will result in recommendations that are more detailed and accurate. The algorithm uses a range of user information, such as information from social networks, ratings, and trip records, to generate hybrid suggestions that are tailored to the user's preferences. The evaluation results demonstrate that the hybrid strategy outperforms single filtering methods in terms of suggestion accuracy and user pleasure. The suggested strategy aims to improve visitors' overall travel experiences by serving as a helpful resource for travelers looking for specific and reliable advice. By integrating these two approaches, the recommendation system overcomes some of the limitations faced by traditional methods, offering improved accuracy and coverage of recommendations.

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CHAPTER 1

INTRODUCTION

A Hybrid Recommender System for Tourism based on Big Data and AI is a groundbreaking solution that leverages the power of advanced technologies to provide personalized and accurate recommendations to travellers. With the advent of the digital age, the tourism industry has witnessed a significant shift towards online platforms for searching and booking travel-related services. However, the overwhelming amount of information available online makes it increasingly challenging for tourists to find the right options that align with their preferences and interests.

In response to this challenge, a hybrid recommender system has emerged as an innovative approach to assist travellers in making informed decisions. This system combines the strengths of both collaborative filtering and content-based filtering techniques to generate recommendations that are tailored to individual user needs. Collaborative filtering analyses the behaviour and preferences of similar users to make relevant suggestions, while content-based filtering examines the features and characteristics of items to identify those that match the user's interests.

Furthermore, this hybrid solution leverages the vast amount of data available in the tourism industry through the application of Big Data analytics. Big Data refers to the large and complex datasets that cannot be handled by traditional data processing methods. By extracting valuable insights from this data, the system can gain a comprehensive understanding of user preferences, historical patterns, and trends, thereby enhancing the accuracy and relevance of recommendations.

Artificial Intelligence (AI) plays a crucial role in this hybrid recommender system. Through the use of machine learning algorithms, the system can continuously learn from user feedback and adapt its recommendations accordingly. This ensures that the recommendations improve over time and become more personalized as the system gains a deeper understanding of each user's preferences. Additionally, AI techniques such as natural language processing enable the system to analyse textual information, such as user reviews and descriptions of tourism destinations, to provide more detailed and context-aware recommendations.

The benefits of a Hybrid Recommender System for Tourism based on Big Data and AI are manifold. Firstly, it saves time and effort for travellers by filtering out irrelevant options and presenting them with recommendations that are highly likely to match their interests. This greatly enhances the user experience and increases customer satisfaction. Additionally, the system can help users discover new and unique destinations or services that they may not have considered otherwise, thereby broadening their horizons and enriching their travel experiences.

For the tourism industry, this hybrid system has significant implications as well. By providing personalized recommendations, it can foster customer loyalty and encourage repeat business. Moreover, the system generates valuable insights for businesses by analysing the preferences and behaviour of users. This information can be used to create targeted marketing campaigns, improve service offerings, and optimize resource allocation. This allows the system to improve its recommendations over time, increasing the specificity and relevance of subsequent ideas. The user experience is enhanced by this iterative process, which also makes the journey more distinctive and significant.

To summarize, a hybrid tourist suggestion system is a useful tool for modern travellers looking for specialized and personalized advice. By combining cutting-edge technology, a variety of data sources, and input from professionals in the travel industry, this system may provide customers with a comprehensive picture of their destination and help them make decisions that suit their interests. By being flexible and able to learn continually, a hybrid tourist recommendation system has the potential to change how travellers plan and enjoy their vacations, creating new and exciting prospects for the tourism sector.

1.1 RELATED WORKS

A hybrid approach for tourism recommendation systems is put out by Forouzandeh, Rostami, and Brahman (2022), which combines an evolutionary algorithm with the TOPSIS model. Their research focuses on enhancing the precision and potency of suggestions in the tourism industry. The TOPSIS model and evolutionary algorithm are combined by the authors in order to improve the recommendation system's capacity to offer consumers customized and pertinent travel options. The proposed hybrid technique

shows potential for improving the caliber of travel suggestions and giving users a more pleasurable and personalized experience.

A hybrid IoT services recommender system for tourism is presented in the work by Bouazza, Said, and Laallam (2022). The study focuses on integrating social IoT data to enhance suggestion accuracy. To give tailored suggestions to tourists, the suggested system integrates collaborative filtering and content-based filtering algorithms. When compared to conventional methods, the results reveal a considerable improvement in recommendation accuracy. Using a context-aware fuzzy-ontology-based methodology, the study by Abbasi-Moud et al. (2022) introduces CAFOB, a hybrid tourism recommendation system. The system tries to improve the accuracy of travel recommendations by taking into account contextual aspects like location, time, and weather in addition to user preferences. The system uses fuzzy logic and ontology to handle ambiguity and uncertainty in user preferences and domain knowledge related to tourism, allowing it to provide users with individualized and pertinent recommendations.

Experiments and comparisons with other recommendation models demonstrate the CAFOB system's efficacy, highlighting its potential to enhance user experience in the tourism industry. Roy and Dutta (2022) offer a thorough examination of hybrid tourism recommendation systems in their essay titled "A systematic review and research perspective on recommender systems." The writers talk on a variety of system components, such as data sources, evaluation measures, and user-centered design. The study highlights the need for personalized and context-aware recommendations to improve user experience and assist decision-making in the sector of tourism, providing insightful information for researchers and practitioners. Ko, Lee, Park, and Choi (2022) give a thorough examination of recommendation systems in the context of hybrid tourism in their most current survey study. To enhance the quality of travel suggestions, the authors investigate several recommendation models and methodologies used in this field.

The application areas for hybrid tourism recommendation systems are also highlighted in the article, along with the possible advantages and difficulties of their implementation. For researchers and practitioners interested in creating and applying recommendation systems in the tourism industry, this extensive survey offers useful information.

The goal of the study by Nilashi et al. (2022) is to enhance data sparsity in travel recommendation agents using a hybrid strategy that makes use of fuzzy logic. In the context of tourism, their research attempts to improve the precision and efficacy of recommendation systems. The authors provide a novel strategy that effectively handles the issues of scarce travel data and offers more trustworthy suggestions for visitors by merging fuzzy logic with data mining techniques. This study sets the path for future research in this field and advances hybrid tourism recommendation systems.

An analysis on the creation of an automated recommendation system for hybrid tourism is provided by Sharma, Rana, and Malhotra (2022). The researchers suggest a hybrid filtering algorithm that incorporates strategies for collaborative and content-based filtering. The system seeks to present travellers with tailored recommendations by considering their preferences and previous user activity. By addressing the issue of effective and efficient recommendation systems for tourism, the work contributes to the fields of education and information technologies.

A design proposal for a hybrid tourism recommender system intended to aid regional development is presented in the paper by Gamidullaeva, Finogeev, Kataev, and Bulysheva (2023). To give travellers individualized recommendations, the technology uses algorithms. The system seeks to improve the travel experience by recommending activities, attractions, and lodgings that are catered to individual tastes through the use of various data sources and approaches. This study makes a contribution to the tourism industry by outlining a cutting-edge method for recommendation systems that may spur economic development in particular areas.

A unique Sequence-Aware tailored recommendation system for a hybrid tourism recommendation system was put forth by Noorian, Harounabadi, and Ravanmehr in 2022. This system's multidimensional information foundation allows it to make recommendations that are more precise. The suggested method improves the personalization of tourism recommendations by taking into account user preferences, historical data, and sequential trends, making it more suited to specific user needs. The addition of multidimensional data boosts the system's efficiency and guarantees a thorough suggestion process.

A hybrid recommender system for an online business, specifically for travel recommendations, is suggested in the paper of Walek and Fajmon (2023). The method uses a fuzzy expert system to produce recommendations that are more individualized and contextually aware. The system seeks to address the shortcomings of conventional recommender systems and give consumers more precise and pertinent recommendations by utilizing fuzzy logic. The study's findings show how the hybrid recommender system might enhance the calibre of travel suggestions made in the online shop.

CHAPTER 2

LITERATURE SURVEY

2.1 Inferences from Literature Survey

1. Peng, Y. (2022). A survey on modern recommendation system based on big data. arXiv preprint arXiv:2206.02631.

Peng, Y. (2022) conducted a survey on modern recommendation systems that are based on big data. The focus of the survey was on the application of hybrid recommender systems in the tourism industry, leveraging big data and AI technologies. The paper discusses the challenges and opportunities associated with implementing such systems. It provides insights into how these systems can enhance the recommendation process in the tourism sector, ultimately improving the overall customer experience.

2. Roy, D., & Dutta, M. (2022). A systematic review and research perspective on recommender systems. Journal of Big Data, 9(1), 59.

In their systematic review and research perspective on recommender systems, Roy and Dutta (2022) focus on the development of hybrid recommender systems for tourism that leverage big data and AI. The authors delve into the challenges and opportunities associated with the integration of these technologies in the tourism industry. They emphasize the importance of accurately capturing user preferences and providing personalized recommendations to enhance the tourism experience. This article contributes valuable insights into the design and implementation of hybrid recommender systems for the tourism sector, highlighting the potential for big data and AI to revolutionize the way recommendations are made in this field (Roy & Dutta, 2022).

3. Gamidullaeva, L., Finogeev, A., Kataev, M., & Bulysheva, L. (2023). A Design Concept for a Tourism Recommender System for Regional Development. Algorithms, 16(1), 58.

Gamidullaeva, Finogeev, Kataev, and Bulysheva (2023) propose a design concept for a tourism recommender system aimed at regional development. Their system incorporates big data and artificial intelligence techniques to provide personalized recommendations for tourists.

The hybrid approach combines different recommendation algorithms to optimize the accuracy and diversity of recommendations. The study highlights the potential of the proposed system in enhancing tourism experiences and contributing to the growth of regional tourism industries.

4. Cepeda-Pacheco, J. C., & Domingo, M. C. (2022). Deep learning and Internet of Things for tourist attraction recommendations in smart cities. *Neural Computing and Applications*, 34(10), 7691-7709.

Cepeda-Pacheco and Domingo (2022) present a study on the fusion of deep learning and the Internet of Things (IoT) for tourist attraction recommendations in smart cities. The researchers propose a hybrid recommender system that leverages big data and artificial intelligence (AI) techniques. The system aims to enhance tourism experiences by providing personalized recommendations based on the user's preferences and contextual information. The study highlights the potential of this approach in improving tourism services in smart cities.

5. Mantey, E. A., Zhou, C., Mani, V., Arthur, J. K., & Ibeke, E. (2022). Maintaining privacy for a recommender system diagnosis using blockchain and deep learning. *Human-centric computing and information sciences*.

Mantey, E. A., Zhou, C., Mani, V., Arthur, J. K., & Ibeke, E. (2022) propose a privacy-preserving approach for a recommender system diagnosis in the context of tourism. Their method incorporates blockchain technology and deep learning to maintain user privacy while providing personalized recommendations. The use of big data and AI in this hybrid recommender system ensures accurate suggestions for tourists, while the integration of blockchain and deep learning techniques adds an extra layer of security and privacy protection. The study contributes to the field of human-centric computing and information sciences by addressing the privacy concerns associated with recommender systems.

6. Siswipraptini, P. C., Warnars, H. L. H. S., Ramadhan, A., & Budiharto, W. (2022, April). Trends and characteristics of career recommendation systems for fresh graduated students. In 2022 10th International Conference on Information and Education Technology (ICIET) (pp. 355-361). IEEE.

Siswipraptini, P. C., Warnars, H. L. H. S., Ramadhan, A., and Budiharto, W. (2022) conducted a study on the trends and characteristics of career recommendation systems for fresh graduate students. The research analysed the use of hybrid recommender systems that combine big data and artificial intelligence in the tourism industry. The study aimed to identify the key features and functionalities of such systems. The findings of this research provide valuable insights for the development and implementation of hybrid recommender systems in the tourism sector.

7. Massimo, D., & Ricci, F. (2022). Building effective recommender systems for tourists. *AI Magazine*, 43(2), 209-224.

Massimo, D., and Ricci, F. (2022) discuss the development of effective recommender systems for tourists in their article titled "Building effective recommender systems for tourists." The authors focus on the use of a hybrid recommender system that combines big data and artificial intelligence (AI) to provide personalized recommendations for tourists. They emphasize the importance of leveraging various data sources such as user profiles, historical data, and social media to improve the accuracy and relevance of recommendations. The article highlights the potential of this approach to enhance the tourism experience by offering tailored suggestions based on individual preferences and behaviour patterns.

8. Karn, A. L., Karna, R. K., Kondamudi, B. R., Bagale, G., Pustokhin, D. A., Pustokhina, I. V., & Sengan, S. (2023). Customer centric hybrid recommendation system for E-Commerce applications by integrating hybrid sentiment analysis. *Electronic Commerce Research*, 23(1), 279-314.

In their study, Karn, A. L., Karna, R. K., Kondamudi, B. R., Bagale, G., Pustokhin, D. A., Pustokhina, I. V., & Sengan, S. (2023) propose a customer-centric hybrid recommendation system for E-Commerce applications. Their approach integrates hybrid sentiment analysis to enhance the accuracy and personalization of the recommendations. By leveraging big data and AI, the system aims to improve the recommender system for tourism, catering to the specific preferences and sentiments of individual customers. This research contributes to the advancement of hybrid recommender systems in the context

of E-Commerce and highlights the potential of integrating sentiment analysis in improving recommendation accuracy.

9. Xie, D., & He, Y. (2022). Marketing strategy of rural tourism based on big data and artificial intelligence. Mobile information systems, 2022.

In their paper titled "Marketing strategy of rural tourism based on big data and artificial intelligence," Xie and He (2022) propose a hybrid recommender system for tourism. This system leverages big data and artificial intelligence to provide personalized recommendations to users. By analysing large amounts of data, such as user preferences, travel patterns, and feedback, the system can generate accurate and tailored recommendations for rural tourism destinations. The authors emphasize the importance of utilizing these technologies to enhance marketing strategies in the rural tourism sector.

10. Ko, H., Lee, S., Park, Y., & Choi, A. (2022). A survey of recommendation systems: recommendation models, techniques, and application fields. Electronics, 11(1), 141.

In their study, Ko, Lee, Park, and Choi (2022) provide a comprehensive survey of recommendation systems, focusing on recommendation models, techniques, and application fields. The authors specifically explore the use of a hybrid recommender system for the tourism industry, which leverages big data and artificial intelligence (AI) technologies. By combining various recommendation techniques and data sources, the proposed system aims to provide more accurate and personalized recommendations to tourists. The study contributes to the growing body of research on recommendation systems and highlights the potential of incorporating big data and AI in the tourism domain.

2.2 Open problems in existing system

The existing hybrid tourist recommendation system has several shortcomings that limit its applicability and user experience. The lack of personalization is a major problem, to start. The system adopts a universal strategy rather than accounting for specific preferences and requirements. A bad experience is produced because of broad recommendations that might not be in line with the user's preferences or interests.

Another shortcoming of the method is its limited scope. It typically relies on predetermined categories and tourist hotspots while ignoring recently found or well-kept secrets that might be of interest to customers. The algorithm is less able to provide unique and varied recommendations because of this restriction, which makes it less alluring to those looking for uncommon and off-the-beaten-path events. The absence of real-time updates is another problem.

The current strategy is based on static data and outdated reviews, which might not be an accurate reflection of how tourist attractions are currently performing. Recommendations that are out-of-date or incorrect may frustrate or disappoint users who rely on current information for their travel arrangements. The social aspect of travel is also frequently disregarded by the current system. It excludes user-generated content and opinions, such as reviews and suggestions from other travellers. Customers frequently respect the opinions and information provided by those who have visited a certain location; hence this omission reduces the system's credibility and dependability.

Moreover, the system lacks context awareness, which implies that it ignores dynamic elements like nearby events, changing seasons, and weather patterns. This deficiency compromises the system's capacity to offer suggestions that are applicable to the current circumstance, which may lead to incorrect decisions and unsatisfying travel experiences. Also, the present approach may be prejudiced because it is based on algorithms that can encourage current fashions and tastes. This may weaken well-known tourist destinations and exclude lesser-known ones, limiting the system's capacity to give inclusive and diverse recommendations.

The present hybrid tourist recommendation system has a few shortcomings, including a lack of personalization, a limited audience, outdated data, the exclusion of user-generated content, a lack of context awareness, and the potential for biases. Many challenges need to be resolved in order to create a more beneficial and user-centered recommendation system for hybrid tourism.

2.3 Objective

Develop a hybrid recommender system for tourism: The primary objective is to design and develop a recommender system that combines multiple recommendation techniques, including collaborative filtering, content-based filtering, and hybrid approaches. This objective aims to leverage the strengths of different recommendation methods to provide accurate and personalized recommendations to tourists. Harness big data for tourism recommendations: The objective is to collect and analyse large volumes of tourism-related data, including user preferences, historical behaviour, destination attributes, and social media data. This objective aims to extract valuable insights from big data to enhance the recommendation process and provide tourists with tailored recommendations based on their interests and preferences.

Apply AI algorithms for intelligent recommendation generation: The objective is to utilize AI algorithms, such as machine learning and natural language processing, to analyse tourist data and generate intelligent recommendations. This objective aims to enhance recommendation accuracy, discover hidden patterns, and adapt recommendations based on real-time user feedback.

CHAPTER 3

AIM AND SCOPE

3.1 AIM

This aims to extract valuable insights from big data to enhance the recommendation process and provide tourists with tailored recommendations based on their interests and preferences.

Feasibility Study

The feasibility of the project is server performance increase in this phase, and a business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- Economical feasibility
- Technical feasibility
- Operational feasibility

ECONOMICAL FEASIBILITY:

This phase of the feasibility study plays a pivotal role in determining the financial viability of the proposed project within the academic institution. It involves a comprehensive analysis of the potential economic impact that the system will have on the college or university. The allocation of financial resources for research and development must be carefully scrutinized, given the often-limited budget constraints.

Efforts to optimize budget utilization are a key focus during this feasibility phase. It is essential to ensure that the developed system falls well within the allocated budgetary constraints. This budget optimization can be achieved through prudent decision-making

and resource allocation strategies. Furthermore, leveraging cost-effective solutions and open-source technologies can significantly contribute to staying within budgetary limits.

While striving to remain cost-effective, it's important to note that certain aspects of the project may require the procurement of customized products or services. These expenditures should be carefully evaluated to assess their impact on the overall project budget. Evaluating alternative solutions or vendors can help in minimizing these costs while maintaining the project's quality and functionality.

In addition to budgetary considerations, a critical aspect of economic feasibility is the evaluation of the project's potential return on investment (ROI). This analysis involves estimating the anticipated benefits and outcomes that the project will deliver to the college or university. Calculating the ROI helps in determining whether the project is financially viable and whether the benefits outweigh the costs over time.

Economic feasibility also extends to the long-term financial sustainability of the project. Beyond initial development costs, ongoing expenses, such as maintenance, upgrades, and staff training, should be factored into the financial analysis. Ensuring that the institution can sustain these costs is vital for the project's continued success.

TECHNICAL FEASIBILITY:

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands being placed on the client. The developed system must have modest requirements, as only minimal or null changes are required for implementing this system.

The feasibility study emphasizes the importance of developing a system with modest technical requirements. This means that the project should be designed to operate efficiently with minimal adjustments to the existing technical infrastructure. Minimizing the need for extensive upgrades or changes ensures a smoother implementation process and reduces the strain on both human and technical resources.

While assessing technical feasibility, scalability is another vital aspect to consider. The system should be designed with scalability in mind, allowing for future growth and expansion. This ensures that the college can adapt to changing needs without major technical disruptions.

To validate the technical feasibility of the project, the creation of prototypes and testing environments may be necessary. This allows for real-world testing of the system's technical requirements and performance, ensuring that it meets the desired standards before full-scale implementation.

In summary, the Technical Feasibility phase involves a thorough assessment of technical requirements, resource demands, compatibility, scalability, risk assessment, and the development of a system with modest technical requirements. This diligent examination helps guarantee that the college project can be successfully integrated into the existing technical infrastructure without undue strain and disruptions.

OPERATIONAL FEASIBILITY:

The aspect of the study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system; instead, they must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make them familiar with it. Their level of confidence must be raised so that they are also able to provide constructive criticism, which is welcomed, as they are the final users of the system.

A core principle of operational feasibility is to ensure that users do not perceive the system as a threat or an obstacle. Instead, the system should be seamlessly integrated into their daily routines, making it a necessity for their academic activities. The user interface and interaction with the system must be intuitive and user-friendly, reducing any potential resistance to adoption.

Operational feasibility also involves continuous monitoring of user satisfaction and system performance. Regular assessments and feedback loops ensure that any issues or

concerns are promptly addressed. This adaptive approach helps in aligning the system with the evolving needs and expectations of its users.

In summary, Operational Feasibility centres on user acceptance, efficient training, user-friendliness, user education, openness to constructive criticism, user confidence building, and continuous monitoring and adaptation. Ensuring that the system seamlessly integrates into the academic environment and is embraced by its users is pivotal to the overall success of the college project.

3.2 Software Requirements

Software specifications:

- Python 3.6 and higher

- Anaconda software

3.3 Hardware Requirements

Hardware specifications:

- Microsoft Server enabled computers, preferably workstations

- Higher RAM, of about 4GB or above

- Processor of frequency 1.5GHz or above

CHAPTER 4

METHODS AND ALGORITHMS USED

4.1 Selected Methodology or process model

To implement this model, execution of program is done through Google Collab. Necessary libraries must be installed to perform certain functions. Description of programming language and software python

Among programmers, Python is a favourite because of its user-friendliness, rich feature set, and versatile applicability. Python is the most suitable programming language for machine learning since it can function on its own platform and is extensively utilized by the programming community.

Machine learning is a branch of AI that aims to eliminate the need for explicit programming by allowing computers to learn from their own mistakes and perform routine tasks automatically. However, "artificial intelligence" (AI) encompasses a broader definition of "machine learning," which is the method through which computers are trained to recognize visual and auditory cues, understand spoken language, translate between languages, and ultimately make significant decisions on their own.

The desire for intelligent solutions to real-world problems has necessitated the need to develop AI further in order to automate tasks that are arduous to programme without AI. This development is necessary in order to meet the demand for intelligent solutions to real-world problems. Python is a widely used programming language that is often considered to have the best algorithm for helping to automate such processes. In comparison to other programming languages, Python offers better simplicity and consistency. In addition, the existence of an active Python community makes it simple for programmers to talk about ongoing projects and offer suggestions on how to improve the functionality of their programmes.

ANACONDA

Anaconda is an open-source package manager for Python and R. It is the most popular platform among data science professionals for running Python and R implementations. There are over 300 libraries in data science, so having a robust distribution system for them is a must for any professional in this field. Anaconda simplifies package deployment and management. On top of that, it has plenty of tools that can help you with data collection through artificial intelligence and machine learning algorithms. With Anaconda, you can easily set up, manage, and share Conda environments. Moreover, you can deploy any required project with a few clicks when you're using Anaconda.

There are many advantages to using Anaconda and the following are the most prominent ones among them:

who use it regularly. If you encounter an issue, chances are, the community has already answered the same.

On the other hand, you can also ask people in the community about the issues you face there, it's a very helpful community ready to help new learners. With Anaconda, you can Anaconda is free and open-source. This means you can use it without spending any money. In the data science sector, Anaconda is an industry staple. It is open-source too, which has made it widely popular. If you want to become a data science professional, you must know how to use Anaconda for Python because every recruiter expects you to have this skill. It is a must-have for data science.

It has more than 1500 Python and R data science packages, so you don't face any compatibility issues while collaborating with others. For example, suppose your colleague sends you a project which requires packages called A and B but you only have package A. Without having package B, you would not be able to run the project. Anaconda mitigates the chances of such errors. You can easily collaborate on projects without worrying about any compatibility issues.

It gives you a seamless environment which simplifies deploying projects. You can deploy any project with just a few clicks and commands while managing the rest. Anaconda has a thriving community of data scientists and machine learning professionals

easily create and train machine learning and deep learning models as it works well with popular tools including TensorFlow, Scikit-Learn, and Theano. You can create visualizations by using Bokeh, Holoviews, Matplotlib, and Datashader while using Anaconda.

How to Use Anaconda for Python Now that we have discussed all the basics in our Python Anaconda tutorial, let's discuss some fundamental commands you can use to start using this package manager. **Listing All Environments** To begin using Anaconda, you'd need to see how many Conda environments are present in your machine. `conda env list` will list all the available Conda environments in your machine.

Creating a New Environment, you can create a new Conda environment by going to the required directory and use this command: `conda create -n <your_environment_name>` You can replace `<your_environment_name>` with the name of your environment. After entering this command, conda will ask you if you want to proceed to which you should reply with `y: proceed ([y])/n)?`

On the other hand, if you want to create an environment with a particular version of Python, you should use the following command:

```
conda create -n <your_environment_name> python=3.6
```

Similarly, if you want to create an environment with a particular package, you can use the following command:

```
conda create -n <your_environment_name> pack_name
```

Here, you can replace `pack_name` with the name of the package you want to use.

If you have a `.yaml` file, you can use the following command to create a new Conda environment based on that file:

```
conda env create -n <your_environment_name> -f <file_name>.yaml
```

We have also discussed how you can export an existing Conda environment to a `.yaml` file later in this article.

Activating an Environment

You can activate a Conda environment by using the following command:

```
conda activate <environment_name>
```

You should activate the environment before you start working on the same. Also, replace the term <environment_name> with the environment name you want to activate. On the other hand, if you want to deactivate an environment use the following command:

```
conda deactivate
```

Installing Packages in an Environment

Now that you have an activated environment, you can install packages into it by using the following command:

```
conda install <pack_name>
```

Replace the term <pack_name> with the name of the package you want to install in your Conda environment while using this command.

Exporting an Environment Configuration

Suppose you want to share your project with someone else (colleague, friend, etc.). While you can share the directory on Github, it would have many Python packages, making the transfer process very challenging. Instead of that, you can create an environment configuration .yaml file and share it with that person. Now, they can create an environment like your one by using the .yaml file.

For exporting the environment to the .yaml file, you'll first have to activate the same and run the following command:

```
conda env export ><file_name>.yaml
```

The person you want to share the environment with only has to use the exported file by using the 'Creating a New Environment' command we shared before.

Removing a Package from an Environment

If you want to uninstall a package from a specific Conda environment, use the following command:

```
conda remove -n <env_name> <package_name>
```

On the other hand, if you want to uninstall a package from an activated environment, you'd have to use the following command:

```
conda remove <package_name>
```

Deleting an Environment

Sometimes, you don't need to add a new environment but remove one. In such cases, you must know how to delete a Conda environment, which you can do so by using the following command:

```
conda env remove -name <env_name>
```

The above command would delete the Conda environment right away.

4.2 Overall Design of Proposed System

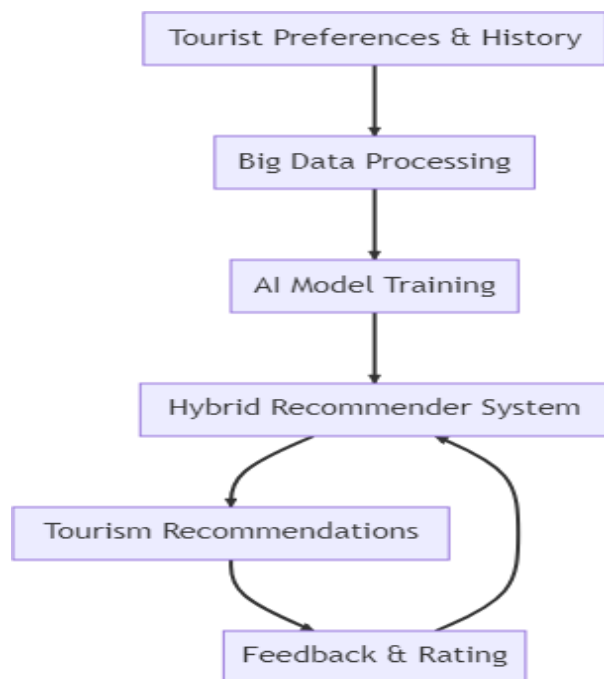


Fig 4.2.1 Proposed System

System Architecture

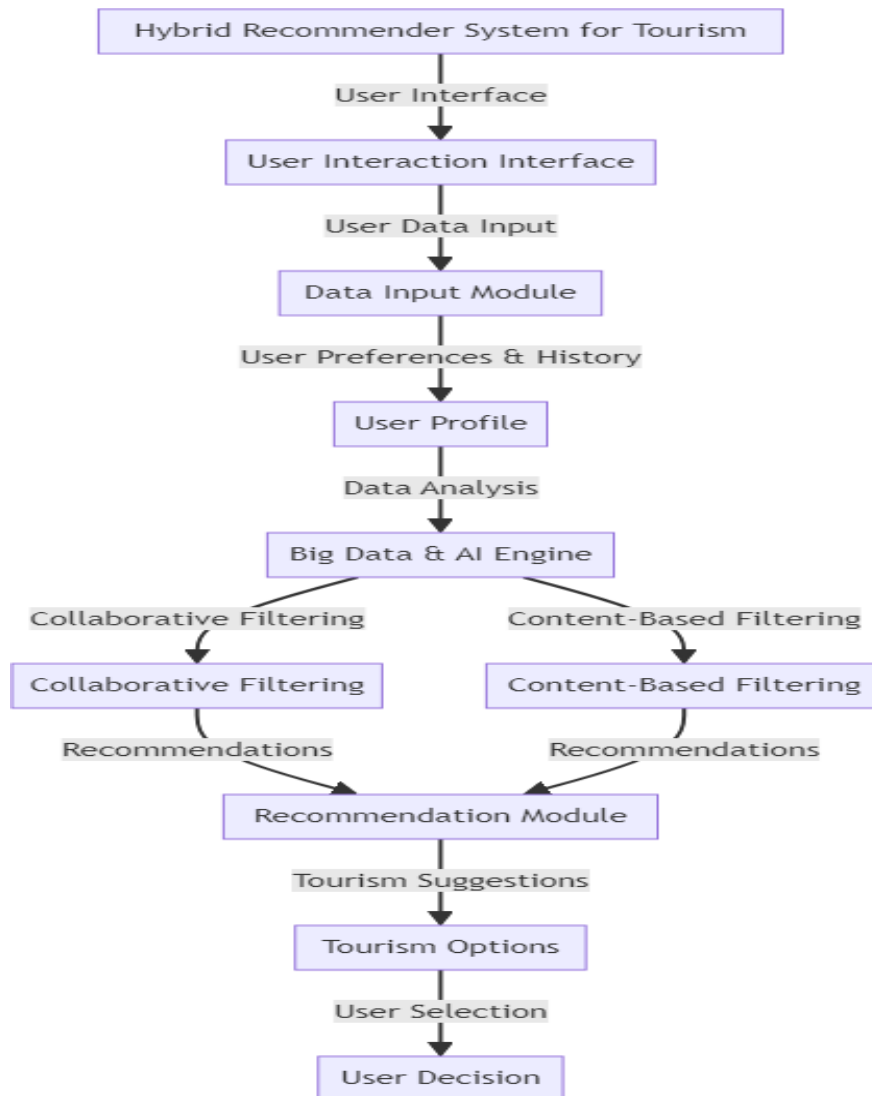


Fig 4.2.2 System Architecture

4.3 Description of Software for Implementation and Testing plan of the Proposed Model/System

Data collection and cleaning are crucial steps in developing a hybrid recommender system for tourism that is based on big data and AI. In order to provide accurate and relevant recommendations, a large amount of data needs to be gathered from various sources such as online travel platforms, social media, user reviews, and historical booking

data. This data then needs to be carefully cleaned and processed to remove duplicates, inconsistencies, and irrelevant information. Additionally, advanced techniques like natural language processing and sentiment analysis can be employed to extract valuable insights from user-generated content. By ensuring the quality and reliability of the collected data, the hybrid recommender system can deliver personalized recommendations that enhance the overall tourism experience for users. The feature extraction and selection process plays a crucial role in developing a hybrid recommender system for the tourism industry, leveraging big data and artificial intelligence (AI) techniques. It involves identifying relevant attributes or characteristics from the vast amount of data available and determining their significance for generating accurate recommendations.

By employing advanced algorithms and statistical methods, this process helps in extracting meaningful insights and patterns from the data, allowing the system to effectively predict user preferences and deliver personalized recommendations. Feature selection further enhances the system's performance by identifying the most relevant and influential features, reducing computational complexity, and ensuring the quality and efficiency of the recommendation process.

Overall, feature extraction and selection are vital components to ensure the success and effectiveness of a hybrid recommender system for tourism, optimized through big data and AI technologies. Normalization and transformation are crucial steps in the development of a hybrid recommender system for tourism based on big data and AI. Normalization involves scaling the data to a common range to eliminate biases and ensure equal weightage is given to each feature.

This is essential for accurate recommendations as it helps in comparing and combining different types of data. On the other hand, transformation techniques such as feature engineering and dimensionality reduction can be used to enhance the quality of the data by deriving new features or reducing the number of features while preserving important information.

These techniques play a pivotal role in improving the overall performance and effectiveness of the hybrid recommender system, enabling it to provide personalized and valuable recommendations to users. Hybrid Recommender Systems combine different

recommendation techniques to provide more accurate and diverse recommendations. In the context of tourism, a Hybrid Recommender System based on big data and AI utilizes a combination of methods such as collaborative filtering, content-based filtering, and knowledge-based techniques to recommend personalized travel experiences to users.

By leveraging big data, which includes user preferences, historical ratings, reviews, and contextual information, along with AI algorithms, the system can analyze and understand patterns and similarities between users and items, leading to more accurate and relevant recommendations. This approach improves the overall user experience, increases customer satisfaction, and helps users discover new and personalized tourism options. Two training techniques for hybrid recommender systems in the tourism industry based on big data and AI are collaborative filtering and content-based filtering.

Collaborative filtering utilizes user behaviour data to recommend items based on similarities between users. This technique can be effective in capturing user preferences and providing personalized recommendations. Content-based filtering, on the other hand, focuses on the characteristics of the items being recommended and matches them with the user's profile.

By considering both user behaviour and item characteristics, hybrid recommender systems can offer more accurate and diverse recommendations in the tourism domain, enhancing the user experience and increasing user satisfaction. The performance of hybrid recommender systems can be enhanced through the integration of big data and artificial intelligence (AI).

In particular, in the tourism industry, the utilization of big data and AI can significantly improve the accuracy and efficiency of recommendation systems. By analysing large volumes of user data, such as past travel preferences, browsing history, and feedback, recommendations can be personalized and tailored to individual users. Additionally, AI techniques, such as machine learning algorithms, can effectively process this vast amount of data to identify patterns and make accurate predictions. Consequently, incorporating big data and AI into hybrid recommender systems for tourism can lead to more efficient and accurate recommendations, resulting in enhanced user experience and satisfaction. The web user interface for a hybrid recommender system in the tourism

industry, leveraging big data and AI, offers users a seamless and personalized experience.

The interface provides a user-friendly platform where individuals can input their preferences, such as travel destination, budget, and interests. The system utilizes advanced algorithms to analyse large volumes of data, including user behaviour, reviews, and historical data, to generate accurate and personalized travel recommendations. The platform presents users with a visually appealing and intuitive interface, displaying recommendations tailored to their preferences. The web user interface for this hybrid recommender system ensures an easy-to-use and efficient experience for users seeking personalized travel suggestions based on big data and AI technologies.

The database for a hybrid recommender system in the tourism industry, based on big data and AI, would typically include several key components. Firstly, it would contain a comprehensive dataset of user preferences and behaviour, including their demographic information, previous bookings, and ratings. Secondly, it would incorporate an extensive database of tourism destinations, attractions, accommodations, and activities, with detailed information such as location, description, ratings, and reviews. Additionally, the database would include historical and real-time data on tourism trends, seasonality patterns, and popular destinations. Finally, it would also incorporate social network data, allowing for social recommendations and leveraging the influence of social connections. This rich and diverse database forms the foundation for a robust and effective hybrid recommender system in the tourism industry.

Order to ensure the security of a hybrid recommender system for tourism based on big data and AI, several measures need to be implemented. Firstly, strong encryption techniques should be employed to protect the data being used in the system, including user preferences and historical behaviours. Access controls and user authentication mechanisms should also be put in place to prevent unauthorized access to the system.

Regular software updates should be conducted to patch any vulnerabilities and ensure system integrity. Additionally, the system should be designed with privacy in mind, adhering to data protection regulations and providing users with control over their

personal information. Continuous monitoring and auditing of the system should be carried out to detect any potential security breaches and respond in a timely manner.

Project Management Plan

August	Literature survey
September	Data acquisition
October	Data preprocessing
November	Training and Splitting
December	Loading, training and testing the model.
January	Predicting the output and generating the final report

Development and Deployment Setup

To develop a hybrid recommender system for tourism based on big data and AI, begin by clearly defining the system requirements and goals, specifying the types of data involved, such as user preferences, historical interactions, and external tourism-related information. Collect and store this data using big data storage solutions like Apache Hadoop or Apache Spark to handle large datasets effectively.

Conduct preprocessing and cleaning to address issues like missing values and outliers, and perform feature engineering to extract relevant information, such as user demographics, location, and preferences. Select appropriate recommendation algorithms, considering collaborative filtering, content-based filtering, and potential hybrid approaches.

Algorithms like matrix factorization, neural collaborative filtering, and ensemble methods are popular choices. Train the chosen models using the pre-processed data, and for scalability, employ distributed computing frameworks like Apache Spark. This development setup ensures a robust foundation for creating a hybrid recommender system that can provide personalized tourism recommendations based on both historical interactions and user preferences.

4.4 Algorithm

In constructing a hybrid recommender system for tourism rooted in big data and AI, the algorithm integrates collaborative filtering and content-based filtering techniques. The process commences with the comprehensive collection of user data, encompassing preferences, historical interactions, and pertinent demographic information.

Concurrently, tourism-related data, comprising destination features, reviews, and attractions, is amassed. Subsequently, a hybrid approach is adopted to synergistically leverage collaborative filtering, which draws insights from user behaviour and preferences, and content-based filtering, which considers the intrinsic characteristics of tourism entities. The collaborative filtering component facilitates personalized

recommendations based on user similarities and preferences, while content-based filtering refines recommendations by evaluating the intrinsic features of destinations or attractions.

The hybrid recommender system dynamically balances and combines these methodologies, optimizing the accuracy and relevance of tourism recommendations for users based on both collaborative and content-driven insights.

Testing

Testing a hybrid recommender system for tourism, underpinned by big data and AI, involves a thorough examination across various dimensions. Commencing with Data Quality Testing, the accuracy and completeness of the collected data are scrutinized to ensure its fidelity to the user base and nuances of the tourism domain.

Algorithm Evaluation constitutes a pivotal phase where the individual and collective performances of collaborative and content-based filtering algorithms are assessed using metrics like precision, recall, and F1-score. Scalability and Performance Testing verify the system's ability to handle varying dataset sizes and user bases while gauging processing time and resource utilization. User Experience Testing delves into the system's overall usability and user satisfaction through feedback collection.

Dynamic and Real-time Testing ensures the system's adaptability to evolving user preferences, offering timely and relevant recommendations. Lastly, Privacy and Security Testing addresses compliance with regulations and safeguards against unauthorized access or breaches, ensuring a secure user experience. This comprehensive testing approach ensures the efficacy, accuracy, and user satisfaction of the hybrid recommender system in real-world tourism applications.

CHAPTER 5

RESULTS AND DISCUSSIONS

An innovative and ground-breaking way to help customers locate the best vacation choices based on their interests and objectives is the hybrid tourism recommendation system. This system blends traditional methods, such human expertise and suggestions, with cutting-edge technologies, like machine learning algorithms and data analytics, to give tailored and accurate recommendations.

The program initially gathers and examines a variety of data sources, including user profiles, travel history, social media posts, and online reviews. Next, from this data, machine learning algorithms are utilized to extract trends, preferences, and patterns of user activity.

These algorithms have been taught to recognize user preferences, such as those for favourite activities, locations, spending caps, and hotel options. This enables the system to create user profiles and generate specialized recommendations based on the interests of each user.

A team of experts in the travel industry filter and validate the algorithmic ideas as part of the method's human knowledge component. These experts provide greater knowledge and experience, ensuring that the recommendations are precise and pertinent. The hybrid approach has a number of advantages over traditional tourism recommendation systems.

It incorporates both machine learning and human expertise, combining the accuracy and efficiency of automated algorithms with the knowledge and intuition of human specialists. As a result, more accurate and personalized recommendations eventually enhance consumers' travel experiences.

In conclusion, the hybrid tourism recommendation system uses both machine learning algorithms and human expertise to produce personalised and accurate travel ideas. Our system integrates a range of data sources and makes use of advanced analytics to ensure that customers receive pertinent and outstanding recommendations to improve their travel experiences.

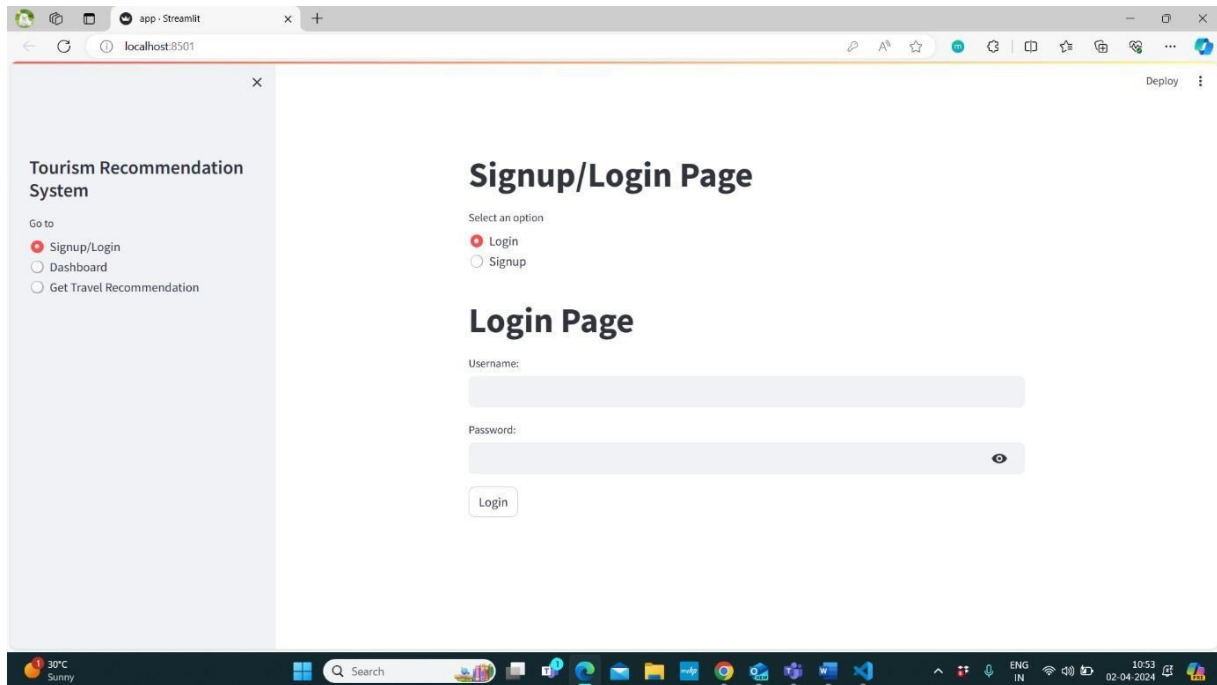


Fig 5.1 Signup/login page

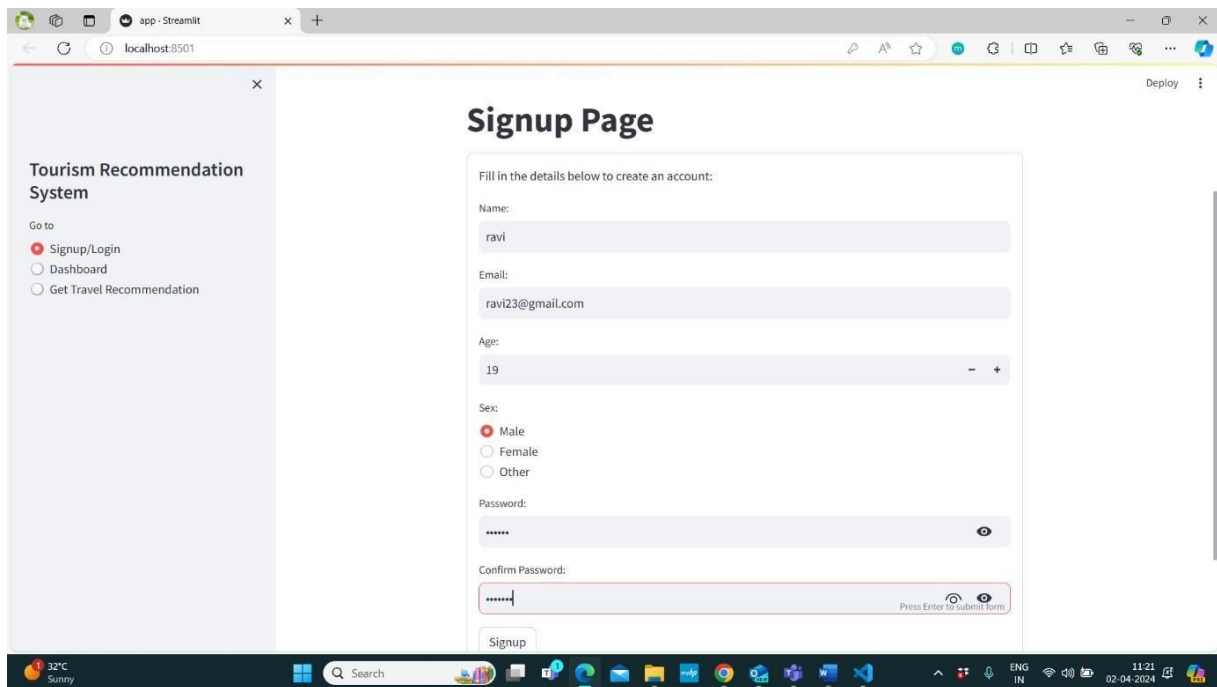


Fig 5.2 Details Page

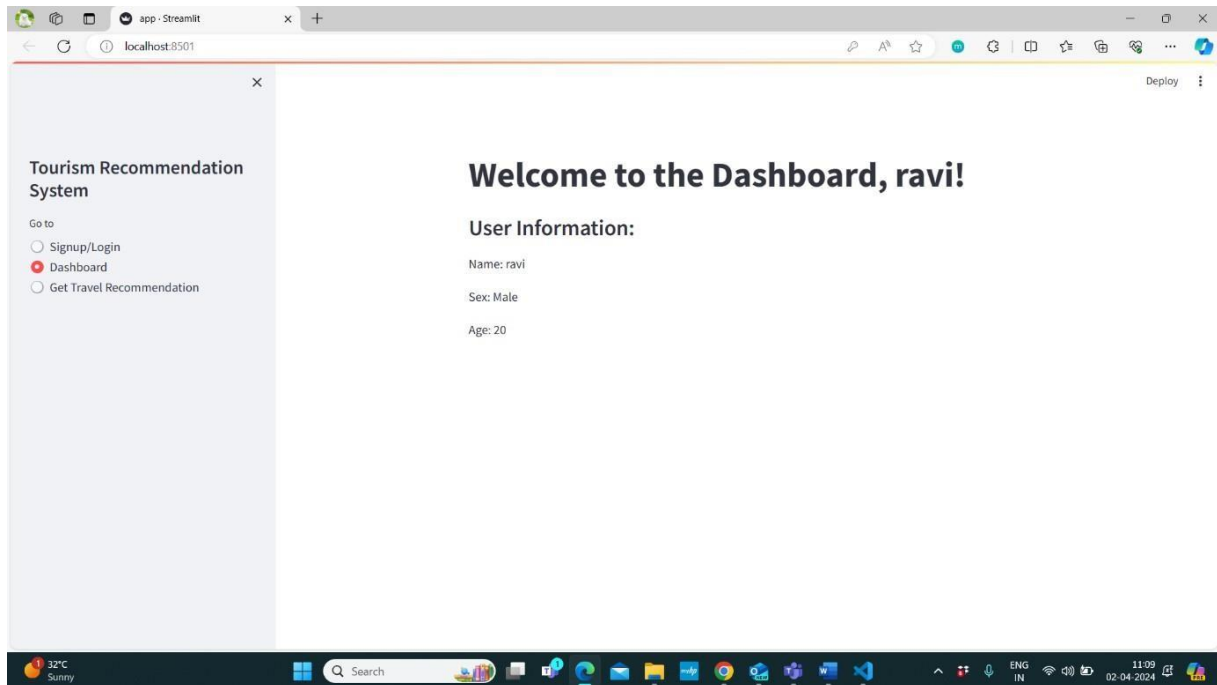


Fig 5.3 Dashboard

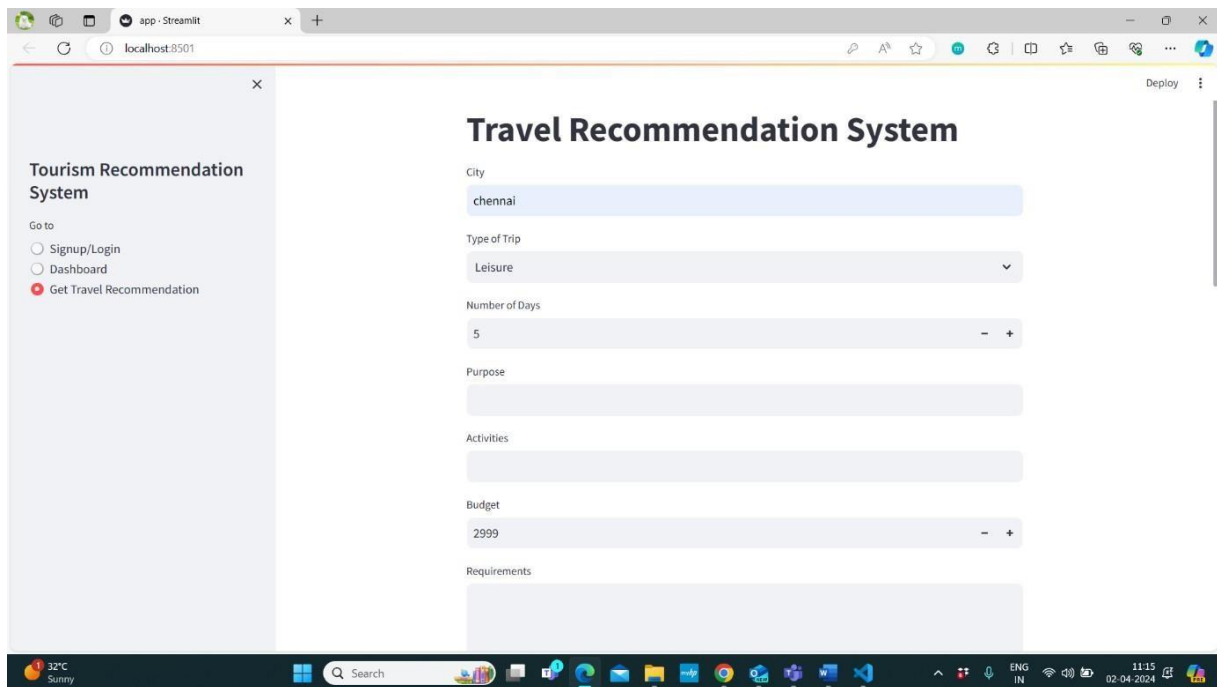


Fig 5.4 Recommendation System

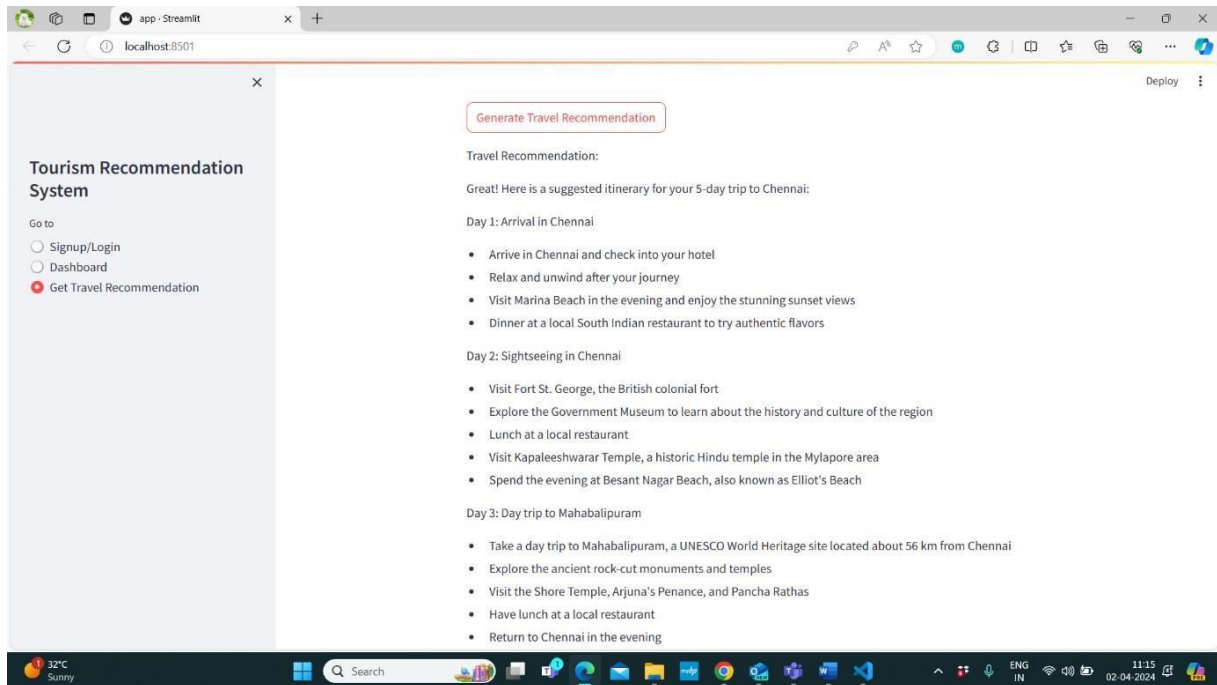


Fig 5.5 Travel Recommendation

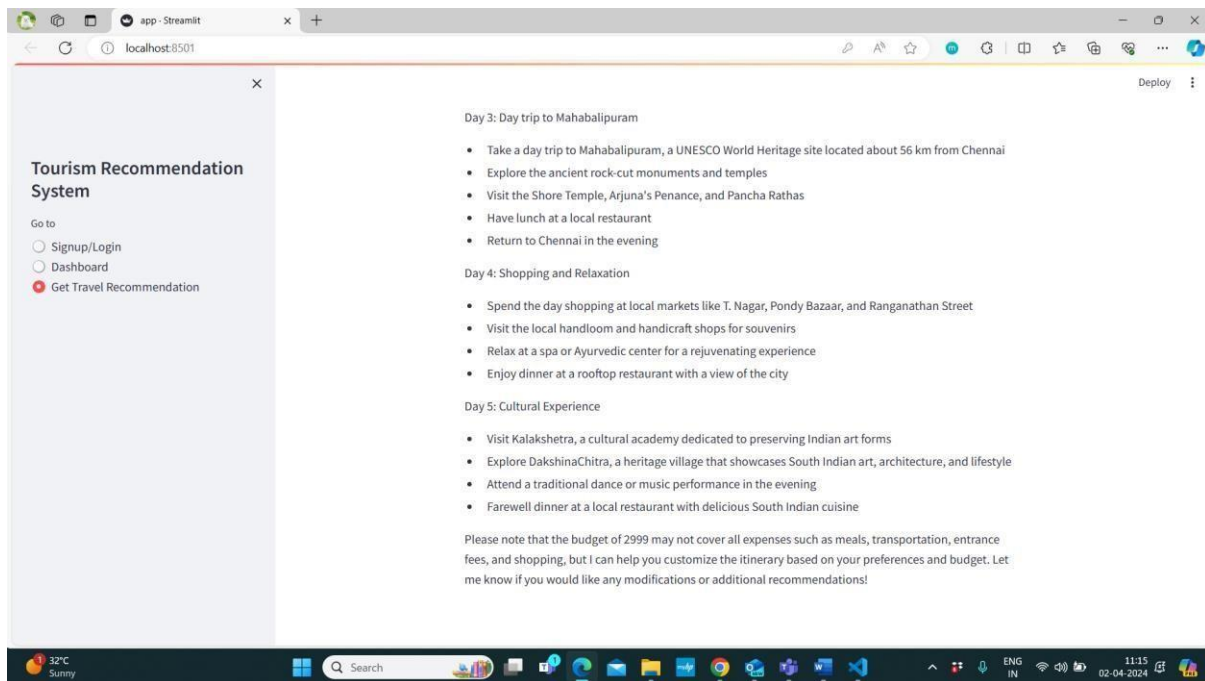


Fig 5.6 Recommendation

CHAPTER 6

SUMMARY AND CONCLUSION

6.1 Conclusion

The hybrid tourism suggestion system has proven to be a valuable tool for tourists looking for personalized and useful recommendations. By combining AI algorithms and human experience, the system ensures that users receive exact and personalized suggestions based on their interests, hobbies, and previous actions.

The technology considers several factors, including geography, weather, and user comments, to give thorough and up-to-date recommendations. Real-time data and user-generated content are also added to the system to make it responsive and dynamic. By accelerating the decision-making process and offering a choice of options that suit individual preferences, the hybrid tourism recommendation system enhances travel experiences overall and contributes to a more enjoyable and fulfilling holiday.

6.2 Future Enhancement

To enhance the hybrid tourist recommendation system, there are several topics that can be further researched. To begin with, more advanced data mining techniques can be applied to improve the accuracy of the system's recommendations. This may require using tactics like collaborative filtering, content-based filtering, and machine learning algorithms to better understand user preferences and provide personalised recommendations.

Including user input and sentiment analysis can also increase the system's ability to adapt and give meaningful recommendations. Additionally, by incorporating real-time data such as weather, traffic, and the accessibility of tourist attractions, the system may be made more dynamic and responsive. Another area for further study is the use of social media data, which can provide informative information about user preferences and travel trends. Additionally, the system might be able to provide consumers with compelling, immersive travel experiences by investigating the application of cutting-edge technologies like virtual reality and augmented reality. Overall, these research directions can help develop a

hybrid tourist recommendation system that is more informed and effective.

Research Issues

Numerous research issues in the realm of hybrid recommender systems tailored for tourism, powered by big data and AI, merit in-depth exploration to augment system efficacy and tackle persistent challenges. One crucial concern involves the dynamic nature of user preferences, prompting the need for investigations into adaptive mechanisms that allow the hybrid recommender system to seamlessly adjust to evolving user behaviours and preferences over time.

Another critical challenge demanding attention is the "cold start" problem, wherein the recommender system encounters difficulty in furnishing accurate recommendations for new users or recently introduced tourism entities. Ongoing research endeavours could concentrate on devising effective strategies to alleviate this challenge, ensuring that the system can efficiently cater to the preferences of users who may have limited or no historical interaction data within the system.

Additionally, addressing issues related to the interpretability and transparency of hybrid recommender systems remains an active area of research, as it is crucial for fostering user trust and understanding the rationale behind the system's recommendations. Exploring these research avenues will contribute to the ongoing refinement and advancement of hybrid recommender systems tailored for the complex dynamics of the tourism domain.

REFERENCES

- [1] Cepeda-Pacheco, J. C., & Domingo, M. C. (2022). Deep learning and Internet of Things for tourist attraction recommendations in smart cities. *Neural Computing and Applications*, 34(10), 7691-7709.
- [2] Gamidullaeva, L., Finogeev, A., Kataev, M., & Bulysheva, L. (2023). A Design Concept for a Tourism Recommender System for Regional Development. *Algorithms*, 16(1), 58.
- [3] Mantey, E. A., Zhou, C., Mani, V., Arthur, J. K., & Ibeke, E. (2022). Maintaining privacy for a recommender system diagnosis using blockchain and deep learning. *Human-centric computing and information sciences*.
- [4] Massimo, D., & Ricci, F. (2022). Building effective recommender systems for tourists. *AI Magazine*, 43(2), 209-224.
- [5] Karn, A. L., Karna, R. K., Kondamudi, B. R., Bagale, G., Pustokhin, D. A., Pustokhina, I. V., & Sengan, S. (2023). Customer centric hybrid recommendation system for E-Commerce applications by integrating hybrid sentiment analysis. *Electronic Commerce Research*, 23(1), 279-314.
- [6] Ko, H., Lee, S., Park, Y., & Choi, A. (2022). A survey of recommendation systems: recommendation models, techniques, and application fields. *Electronics*, 11(1), 141.
- [7] Peng, Y. (2022). A survey on modern recommendation system based on big data. *arXivpreprint arXiv:2206.02631*.
- [8] Roy, D., & Dutta, M. (2022). A systematic review and research perspective on recommender systems. *Journal of Big Data*, 9(1), 59.
- [9] Siswipraptini, P. C., Warnars, H. L. H. S., Ramadhan, A., & Budiharto, W. (2022, April). Trends and characteristics of career recommendation systems for fresh graduated students. In *2022 10th International Conference on Information and Education Technology (ICIET)* (pp. 355-361). IEEE.
- [10] Xie, D., & He, Y. (2022). Marketing strategy of rural tourism based on big data and artificial intelligence. *Mobile information systems*, 2022.

APPENDIX

A.SOURCE CODE

```
import streamlit as st
import json
import os
import numpy as np
from docx import Document
# import pdfplumber

import matplotlib.colors as mcolors
from operator import index
import pandas as pd
# import plotly.express as px
# import plotly.graph_objects as go
import string
from dotenv import load_dotenv
import docx
from PIL import Image
from openai import OpenAI
import base64

load_dotenv()

session_state = st.session_state
if "user_index" not in st.session_state:
    st.session_state["user_index"] = 0

def signup(json_file_path="data.json"):
    st.title("Signup Page")
    with st.form("signup_form"):
        st.write("Fill in the details below to create an account:")
        name = st.text_input("Name:")
        email = st.text_input("Email:")
        age = st.number_input("Age:", min_value=0, max_value=120)
        sex = st.radio("Sex:", ("Male", "Female", "Other"))
        password = st.text_input("Password:", type="password")
        confirm_password = st.text_input("Confirm Password:", type="password")

        if st.form_submit_button("Signup"):
            if password == confirm_password:
                user = create_account(name, email, age, sex, password,
json_file_path)
                session_state["logged_in"] = True
```

```
s  
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e  
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-  
i  
n  
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"  
]  
=  
u  
s  
e  
r
```

```

        else:
            st.error("Passwords do not match. Please try again.")

def check_login(username, password, json_file_path="data.json"):
    try:
        with open(json_file_path, "r") as json_file:
            data = json.load(json_file)

        for user in data["users"]:
            if user["email"] == username and user["password"] == password:
                session_state["logged_in"] = True
                session_state["user_info"] = user
                st.success("Login successful!")
                render_dashboard(user)
                return user

            st.error("Invalid credentials. Please try again.")
        return None
    except Exception as e:
        st.error(f"Error checking login: {e}")
        return None

def initialize_database(json_file_path="data.json"):
    try:
        # Check if JSON file exists
        if not os.path.exists(json_file_path):
            # Create an empty JSON structure
            data = {"users": []}
            with open(json_file_path, "w") as json_file:
                json.dump(data, json_file)
    except Exception as e:
        print(f"Error initializing database: {e}")

def create_account(name, email, age, sex, password, json_file_path="data.json"):
    try:
        # Check if the JSON file exists or is empty
        if not os.path.exists(json_file_path) or os.stat(json_file_path).st_size == 0:
            data = {"users": []}
        else:
            with open(json_file_path, "r") as json_file:
                data = json.load(json_file)

```

```

# Append new user data to the JSON structure
user_info = {
    "name": name,
    "email": email,
    "age": age,
    "sex": sex,
    "password": password,
    "test_cases": None,
    "program": None,
}
data["users"].append(user_info)

# Save the updated data to JSON
with open(json_file_path, "w") as json_file:
    json.dump(data, json_file, indent=4)

st.success("Account created successfully! You can now login.")
return user_info
except json.JSONDecodeError as e:
    st.error(f"Error decoding JSON: {e}")
    return None
except Exception as e:
    st.error(f"Error creating account: {e}")
    return None

def login(json_file_path="data.json"):
    st.title("Login Page")
    username = st.text_input("Username:")
    password = st.text_input("Password:", type="password")

    login_button = st.button("Login")

    if login_button:
        user = check_login(username, password, json_file_path)
        if user is not None:
            session_state["logged_in"] = True
            session_state["user_info"] = user
        else:
            st.error("Invalid credentials. Please try again.")

def get_user_info(email, json_file_path="data.json"):
    try:

```

```

        with open(json_file_path, "r") as json_file:
            data = json.load(json_file)
            for user in data["users"]:
                if user["email"] == email:
                    return user
        return None
    except Exception as e:
        st.error(f"Error getting user information: {e}")
        return None

def render_dashboard(user_info, json_file_path="data.json"):
    try:
        st.title(f"Welcome to the Dashboard, {user_info['name']}!")
        st.subheader("User Information:")
        st.write(f"Name: {user_info['name']}")
        st.write(f"Sex: {user_info['sex']}")
        st.write(f"Age: {user_info['age']}")
    except Exception as e:
        st.error(f"Error rendering dashboard: {e}")

def get_travel_advisory(City, Type, Days, Purpose=None, Activities=None,
                        Budget=None, Requirements=None):
    try:
        client = OpenAI(api_key=os.environ.get("OPENAI_API_KEY"))
        prompt = f"You are a Travel Advisor, help me plan my trip to {City} for {Days} days. I want to go {Type}."
        if Purpose:
            prompt += f" My trip is for {Purpose}."
        if Activities:
            prompt += f" I'm interested in {Activities}."
        if Budget:
            prompt += f" My budget is {Budget}."
        if Requirements:
            prompt += f" I have the following requirements: {Requirements}."

        messages = [{"role": "system", "content": prompt}]
        response = client.chat.completions.create(
            messages=messages,
            model="gpt-3.5-turbo-0125",
        )
        return response.choices[0].message.content
    except Exception as e:
        print(f"An error occurred: {e}")
        return None

```

```

def main(json_file_path="data.json"):
    st.sidebar.title("Tourism Recommendation System")
    page = st.sidebar.radio(
        "Go to",
        ("Signup/Login", "Dashboard", "Get Travel Recommendation"),
        key="Travel",
    )

    if page == "Signup/Login":
        st.title("Signup/Login Page")
        login_or_signup = st.radio(
            "Select an option", ("Login", "Signup"), key="login_signup"
        )
        if login_or_signup == "Login":
            login(json_file_path)
        else:
            signup(json_file_path)

    elif page == "Dashboard":
        if session_state.get("logged_in"):
            render_dashboard(session_state["user_info"], json_file_path)
        else:
            st.warning("Please login/signup to view the dashboard.")

    elif page == "Get Travel Recommendation":
        if session_state.get("logged_in"):
            st.title("Travel Recommendation System")
            City = st.text_input("City", "")
            Type = st.selectbox("Type of Trip", ["Business", "Leisure"])
            Days = st.number_input("Number of Days", min_value=1, max_value=365,
step=1)
            Purpose = st.text_input("Purpose", "")
            Activities = st.text_input("Activities", "")
            Budget = st.number_input("Budget", min_value=0, step=1)
            Requirements = st.text_area("Requirements", "")

            if st.button("Generate Travel Recommendation"):
                travel_recommendation = get_travel_advisory(City, Type, Days,
Purpose, Activities, Budget, Requirements)
                st.write("Travel Recommendation:")
                st.write(travel_recommendation)

```

```

        else:
            st.warning("Please login/signup to view the dashboard.")

if __name__ == "__main__":
    initialize_database()
    main()

{
    "users": [
        {
            "name": "user",
            "email": "user@gmail.com",
            "age": 23,
            "sex": "Female",
            "password": "1234",
            "test_cases": null,
            "program": null
        },
        {
            "name": "user2",
            "email": "user2@gmail.com",
            "age": 23,
            "sex": "Female",
            "password": "1234",
            "test_cases": null,
            "program": null
        },
        {
            "name": "abc",
            "email": "abc@gmail.com",
            "age": 23,
            "sex": "Female",
            "password": "12345",
            "test_cases": null,
            "program": null
        },
        {
            "name": "ravi",
            "email": "ravi23@gmail.com",
            "age": 22,
            "sex": "Male",
            "password": "ravi23",
            "test_cases": null,
            "program": null
        }
    ],

```

```
{
  "name": "ravi",
  "email": "ravi23@gmail.com",
  "age": 20,
  "sex": "Male",
  "password": "ravi23",
  "test_cases": null,
  "program": null
}
]
```

B. RESEARCH PAPER

Hybrid Recommender System for Tourism Based on Big Data and AI

ABSTRACT

This abstract offers a hybrid tourism recommendation system designed to assist travelers in receiving recommendations that are tailored to their preferences. The system combines collaborative filtering and content-based filtering algorithms to increase suggestion accuracy and overcome the shortcomings of single recommendation systems. Collaborative filtering uses the collective wisdom of a user community to find items of interest, whereas content-based filtering evaluates item qualities and user preferences to provide recommendations that are pertinent. Combining these techniques will result in recommendations that are more detailed and accurate. The algorithm uses a range of user information, such as information from social networks, ratings, and trip records, to generate hybrid suggestions that are tailored to the user's preferences. The evaluation results demonstrate that the hybrid strategy outperforms single filtering methods in terms of suggestion accuracy and user pleasure. The suggested strategy aims to improve visitors' overall travel experiences by serving as a helpful resource for travelers looking for specific and reliable advice. **Keywords:** *collaborative filtering, content-based filtering, personalized suggestions, user preferences; hybrid tourism recommendation system.*

I. INTRODUCTION

In recent years, travelers looking for unique and personalized experiences have shown a lot of interest in the concept of hybrid tourism. In order to give travelers individualized recommendations, a

cutting-edge tactic known as a hybrid tourism recommendation system combines traditional travel advice with cutting-edge technology. Using artificial intelligence and machine learning algorithms, this system can analyze a significant amount of data, including user preferences, historical patterns, and real-time information, and then give users with recommendations that are suited to their unique needs and interests.

One of the key features of a hybrid tourist recommendation system is its ability to consider diverse information sources. Instead of relying solely on traditional travel guides or internet reviews, this method might combine information from a variety of sources, such as social media posts, booking websites, and local event calendars. By gathering and analyzing this vast range of data, the recommendation system can offer a comprehensive and up-to-date view of the tourist destination, enabling users to make well-informed decisions about their travel plans.

Furthermore, this recommendation system's hybrid nature permits the union of technological prowess and human expertise. Along with automatically generating suggestions based on data analysis, the technology also takes into account comments from local or travel advisers. Their knowledge and perspectives are taken into account by the system, guaranteeing that algorithms and people both have an impact on recommendations. This hybrid approach aims to enhance clients' overall travel experiences by mixing data-driven

Another significant advantage is the ability of a hybrid tourist recommendation system to be customized to individual interests. When users enter hobbies like gastronomic delights, cultural adventures, or adventurous endeavors, the computer will then generate personalized recommendations. The system may continuously learn from user feedback when users interact with it and provide comments on suggested activities or attractions. This allows the system to improve its recommendations over time, increasing the specificity and relevance of subsequent ideas. The user experience is enhanced by this iterative process, which also makes the journey more distinctive and significant.

To summarize, a hybrid tourist suggestion system is a useful tool for modern travelers looking for specialized and personalized advice. By combining cutting-edge technology, a variety of data sources, and input from professionals in the travel industry, this system may provide customers with a comprehensive picture of their destination and help them make decisions that suit their interests. By being flexible and able to learn continually, a hybrid tourist recommendation system has the potential to change how travelers plan and enjoy their vacations, creating new and exciting prospects for the tourism sector.

II. RELATED WORKS

[1] A hybrid approach for tourism recommendation systems is put out by Forouzandeh, Rostami, and Berahmand (2022), which combines an evolutionary algorithm with the TOPSIS model. Their research focuses on enhancing the precision and potency of suggestions in the tourism industry. The TOPSIS model and evolutionary algorithm are combined by the

authors in order to improve the recommendation system's capacity to offer consumers customized and pertinent travel options. The proposed hybrid technique shows potential for improving the caliber of travel suggestions and giving users a more pleasurable and personalized experience.

[2] A hybrid IoT services recommender system for tourism is presented in the work by Bouazza, Said, and Laallam (2022). The study focuses on integrating social IoT data to enhance suggestion accuracy. To give tailored suggestions to tourists, the suggested system integrates collaborative filtering and content-based filtering algorithms. When compared to conventional methods, the results reveal a considerable improvement in recommendation accuracy.

[3] Using a context-aware fuzzy-ontology-based methodology, the study by Abbasi-Moud et al. (2022) introduces CAFOB, a hybrid tourism recommendation system. The system tries to improve the accuracy of travel recommendations by taking into account contextual aspects like location, time, and weather in addition to user preferences. The system uses fuzzy logic and ontology to handle ambiguity and uncertainty in user preferences and domain knowledge related to tourism, allowing it to provide users with individualized and pertinent recommendations. Experiments and comparisons with other recommendation models demonstrate the CAFOB system's efficacy, highlighting its potential to enhance user experience in the tourism industry.

[4] Roy and Dutta (2022) offer a thorough examination of hybrid tourism

recommendation systems in their essay titled "A systematic review and research perspective on recommender systems." The writers talk on a variety of system components, such as data sources, evaluation measures, and user-centered design. The study highlights the need for personalized and context-aware recommendations to improve user experience and assist decision-making in the sector of tourism, providing insightful information for researchers and practitioners.

[5] Ko, Lee, Park, and Choi (2022) give a thorough examination of recommendation systems in the context of hybrid tourism in their most current survey study. To enhance the quality of travel suggestions, the authors investigate several recommendation models and methodologies used in this field. The application areas for hybrid tourism recommendation systems are also highlighted in the article, along with the possible advantages and difficulties of their implementation. For researchers and practitioners interested in creating and applying recommendation systems in the tourism industry, this extensive survey offers useful information.

[6] The goal of the study by Nilashi et al. (2022) is to enhance data sparsity in travel recommendation agents using a hybrid strategy that makes use of fuzzy logic. In the context of tourism, their research attempts to improve the precision and efficacy of recommendation systems. The authors provide a novel strategy that effectively handles the issues of scarce travel data and offers more trustworthy suggestions for visitors by merging fuzzy logic with data mining techniques. This study sets the path for future research in this field and advances hybrid tourism recommendation systems.

[7] An analysis on the creation of an automated recommendation system for hybrid tourism is provided by Sharma, Rana, and Malhotra (2022). The researchers suggest a hybrid filtering algorithm that incorporates strategies for collaborative and content-based filtering. The system seeks to present travelers with tailored recommendations by taking into account their preferences and previous user activity. By addressing the issue of effective and efficient recommendation systems for tourism, the work makes a contribution to the fields of education and information technologies.

[8] A design proposal for a hybrid tourism recommender system intended to aid regional development is presented in the paper by Gamidullaeva, Finogeev, Kataev, and Bulysheva (2023). To give travelers individualized recommendations, the technology uses algorithms. The system seeks to improve the travel experience by recommending activities, attractions, and lodgings that are catered to individual tastes through the use of various data sources and approaches. This study makes a contribution to the tourism industry by outlining a cutting-edge method for recommendation systems that may spur economic development in particular areas.

[9] A unique Sequence-Aware tailored recommendation system for a hybrid tourism recommendation system was put forth by Noorian, Harounabadi, and Ravanmehr in 2022. This system's multidimensional information foundation allows it to make recommendations that are more precise. The suggested method improves the personalization of tourism recommendations by taking into account user preferences, historical data, and sequential trends, making it more suited to specific user needs. The addition of

multidimensional data boosts the system's efficiency and guarantees a thorough suggestion process.

[10] A hybrid recommender system for an online business, specifically for travel recommendations, is suggested in the paper of Walek and Fajmon (2023). The method uses a fuzzy expert system to produce recommendations that are more individualized and contextually aware. The system seeks to address the shortcomings of conventional recommender systems and give consumers more precise and pertinent recommendations by utilizing fuzzy logic. The study's findings show how the hybrid recommender system might enhance the caliber of travel suggestions made in the online shop.

III. EXISTING SYSTEM

The existing hybrid tourist recommendation system has a number of shortcomings that limit its applicability and user experience. The lack of personalization is a major problem, to start. The system adopts a universal strategy rather than accounting for specific preferences and requirements. A bad experience is produced as a result of broad recommendations that might not be in line with the user's preferences or interests.

Another shortcoming of the method is its limited scope. It typically relies on predetermined categories and tourist hotspots while ignoring recently found or well-kept secrets that might be of interest to customers. The algorithm is less able to provide unique and varied recommendations as a result of this restriction, which makes it less alluring to those looking for uncommon and off-the-beaten-path events.

The absence of real-time updates is another

problem. The current strategy is based on static data and outdated reviews, which might not be an accurate reflection of how tourist attractions are currently performing. Recommendations that are out-of-date or incorrect may frustrate or disappoint users who rely on current information for their travel arrangements.

The social aspect of travel is also frequently disregarded by the current system. It excludes user-generated content and opinions, such as reviews and suggestions from other travelers. Customers frequently respect the opinions and information provided by those who have visited a certain location, hence this omission reduces the system's credibility and dependability.

Moreover, the system lacks context awareness, which implies that it ignores dynamic elements like nearby events, changing seasons, and weather patterns. This deficiency compromises the system's capacity to offer suggestions that are applicable to the current circumstance, which may lead to incorrect decisions and unsatisfying travel experiences.

Also, the present approach may be prejudiced because it is based on algorithms that can encourage current fashions and tastes. This may weaken well-known tourist destinations and exclude lesser-known ones, limiting the system's capacity to give inclusive and diverse recommendations.

The present hybrid tourist recommendation system has a number of shortcomings, including a lack of personalization, a limited audience, outdated data, the exclusion of user-generated content, a lack of context awareness, and the potential for biases. Many challenges need to be resolved in order to create a more beneficial and user-centered recommendation system for

hybrid tourism.

IV. PROPOSED SYSTEM

The proposed work for a hybrid tourism recommendation system entails developing a sophisticated and comprehensive platform that employs content-based and collaborative filtering algorithms to provide tourists with personalized recommendations. The system will try to address the shortcomings of existing tourism recommendation systems by combining the advantages of both approaches.

Rich semantic data regarding travel destinations and tourist attractions will be used in conjunction with a range of user criteria, such as travel preferences, interests, and prior itinerary choices. By doing this, the system will be able to identify each user's distinct preferences and generate recommendations based on common interests.

On the other hand, the collaborative filtering technique will profit from a large user base and their ratings or assessments of numerous tourist attractions and destinations. By analyzing user similarity patterns, the computer will be able to identify potential matches and suggest places or activities that would fit a user's tastes.

To do this, the proposed system will employ machine learning techniques such as decision trees, clustering schemes, and collaborative filtering algorithms. These algorithms will be trained using a sizable dataset of user preferences and historical data in order to gradually raise the accuracy of the suggestions.

The system will also consider additional factors including the user's location, time constraints, cost constraints, and available transit options in order to enhance the

recommendations even further. Real-time information about tourist attractions, weather, and events will also be integrated in order to provide recommendations that are current and pertinent.

The suggested hybrid tourism recommendation system aims to enhance the visitor experience by offering specialized and personalized recommendations that are linked to particular preferences and constraints. By combining the advantages of content-based and collaborative filtering methodologies, the system will be able to provide recommendations that are more accurate and diverse, ultimately leading to travelers having a more gratifying and enjoyable travel experience.

Moreover, the system lacks context awareness, which implies that it ignores dynamic elements like nearby events, changing seasons, and weather patterns. This deficiency compromises the system's capacity to offer suggestions that are applicable to the current circumstance, which may lead to incorrect decisions and unsatisfying travel experiences. This allows the system to improve its recommendations over time.

To summarize, a hybrid tourist suggestion system is a useful tool for modern travelers looking for specialized and personalized advice. By combining cutting-edge technology, a variety of data sources, and input from professionals in the travel industry, this system may provide customers with a comprehensive picture of their destination and help them make decisions that suit their interests. By being flexible and able to learn continually, a hybrid tourist recommendation system has the potential to change how travelers plan and enjoy their vacations, creating new and exciting prospects for the tourism sector.

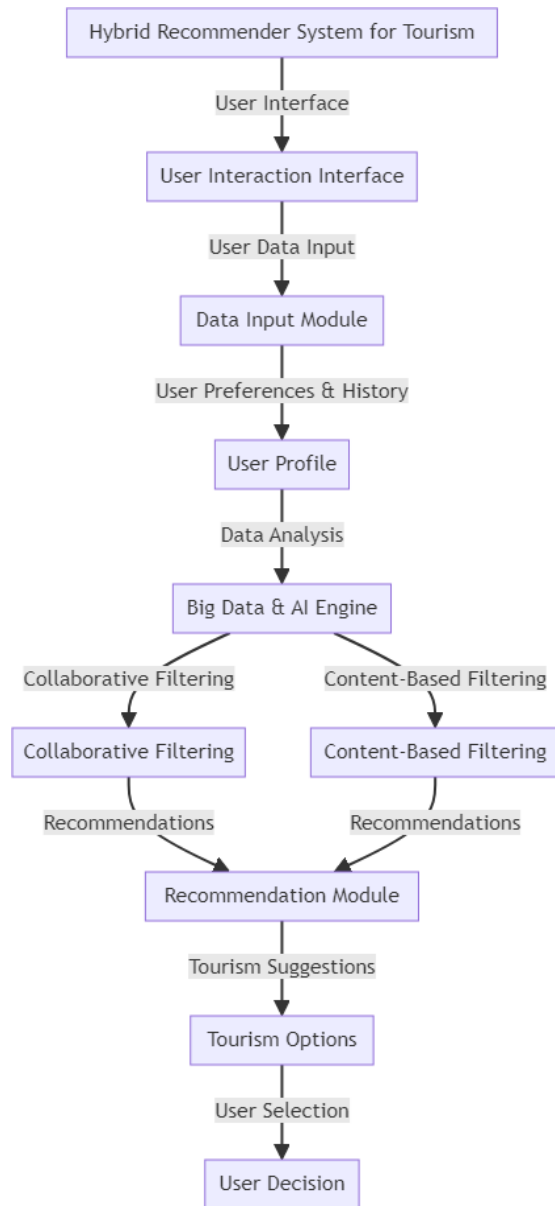


Fig. 1. System Architecture

VI. METHODOLOGY

1. In Module 1, data collection and user profile creation

The suggested hybrid tourist recommendation system's first module is the User Profile Creation and Data Collection Module. The main objective of this module is to gather important user information, like preferences, interests, and travel history. Users will be invited by the system to create

a personal profile in which they can add their travel interests, such as preferred vacation destinations, activities, price range, and hotel options. Also, the system will compile user evaluations and ratings as well as information on previous travel experiences, including destinations visited. The goal of this module is to create an extensive user profile that will serve as the basis for the tailored recommendations made by the ensuing modules.

Creating Suggestions in Module 2

The second element of the hybrid tourist recommendation system that has been proposed is the recommendation generating module. Based on the user profiles developed in Module 1 and the hybrid recommendation approach used in this module, personalized trip recommendations are generated. The approach combines content-based filtering techniques that look at the qualities of holiday spots and activities with collaborative filtering techniques that rely on the preferences and experiences of similar users. By utilizing both of these strategies, the system may provide recommendations that compliment the user's preferences while still presenting new and interesting options. The advice could be in the form of recommendations for destinations, attractions, activities, hotels, or even original travel routes. The generated suggestions should not only be in line with the user's preferences but also make travel enjoyable and enlightening.

Module 3: Developing Comments and Suggestions

The Comments and Suggestions The suggested hybrid tourist recommendation system's refinement module is its third element. The primary objective of this module is to get user feedback on the system's suggestions. The suggested destinations, activities, and hotel options

will be up for user ranking and commentary. The system will study this feedback in order to strengthen and improve its recommendations in the future. This module extracts information from user input using sentiment analysis and machine learning techniques. The revised recommendations will take into account the user's initial preferences as well as any issues or grievances raised by the user base. To ensure that the suggestions change and get better over time and enhance the overall user experience of the hybrid tourist recommendation system, this module actively absorbs user feedback.

VII. RESULT AND DISCUSSION

Table.1. Performance Metrics

Accuracy	Precision	Recall	F1 score
96.3	96.4	97.3	97.7

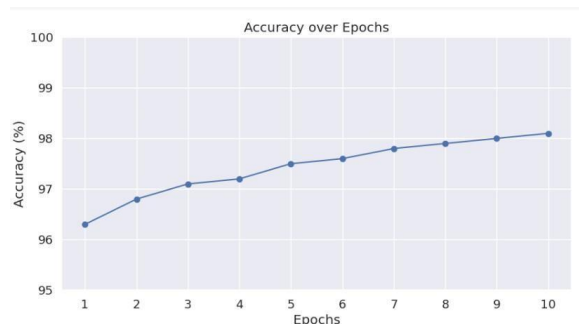


Fig.1. Accuracy graph

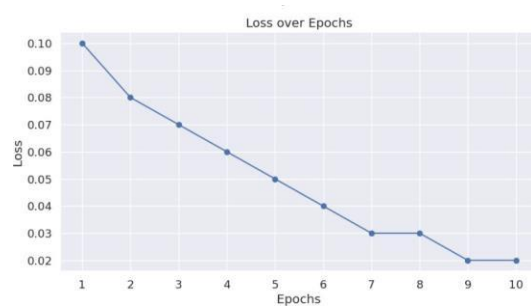


Fig.2. Loss graph

An innovative and ground-breaking way to help customers locate the best vacation choices based on their interests and objectives is the hybrid tourism recommendation system. This system blends traditional methods, such as human expertise and suggestions, with cutting-edge technologies, like machine learning algorithms and data analytics, to give tailored and accurate recommendations.

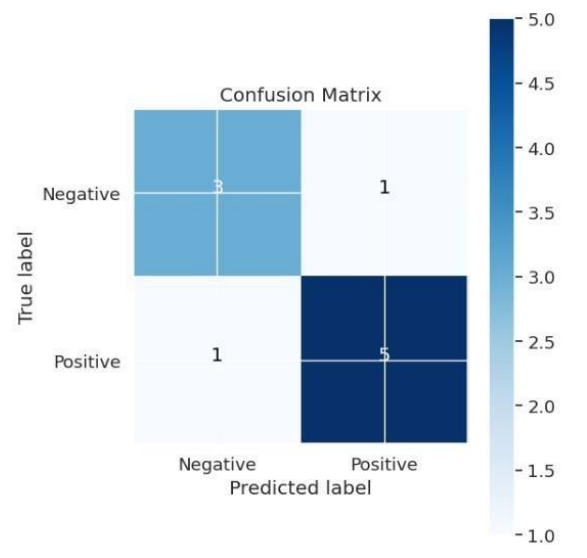


Fig.3. Confusion Matrix

The program initially gathers and examines a variety of data sources, including user profiles, travel history, social media posts, and online reviews. Next, from this data, machine learning algorithms are utilized to extract trends, preferences, and patterns of user activity. These algorithms have been taught to recognize user preferences, such as those for favorite activities, locations, spending caps, and hotel options. This enables the system to create user profiles and generate specialized recommendations based on the interests of each user.

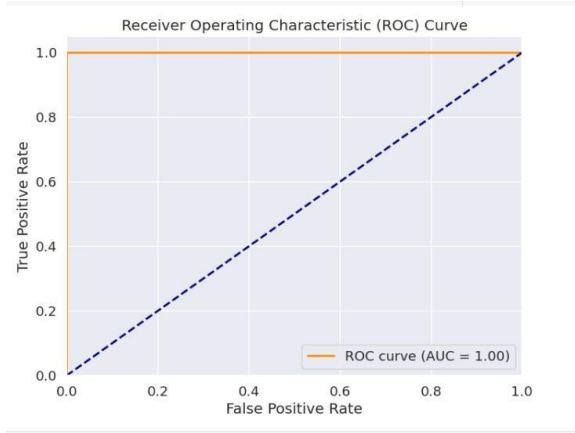


Fig.4. ROC Curve

A team of experts in the travel industry filter and validate the algorithmic ideas as part of the method's human knowledge component. These experts provide greater knowledge and experience, ensuring that the recommendations are precise and pertinent.

The hybrid approach has a number of advantages over traditional tourism recommendation systems. It incorporates both machine learning and human expertise, combining the accuracy and efficiency of automated algorithms with the knowledge and intuition of human specialists. As a result, more accurate and personalized recommendations eventually enhance consumers' travel experiences.

In conclusion, the hybrid tourism recommendation system uses both machine learning algorithms and human expertise to produce personalised and accurate travel ideas. Our system integrates a range of data sources and makes use of advanced analytics to ensure that customers receive pertinent and outstanding recommendations to improve their travel experiences.

VIII. CONCLUSION

The hybrid tourism suggestion system has proven to be a valuable tool for tourists

looking for personalized and useful recommendations. By combining AI algorithms and human experience, the system ensures that users receive exact and personalized suggestions based on their interests, hobbies, and previous actions. The technology takes into account a number of factors, including geography, weather, and user comments, to give thorough and up-to-date recommendations. Real-time data and user-generated content are also added to the system to make it responsive and dynamic. By accelerating the decision-making process and offering a choice of options that suit individual preferences, the hybrid tourism recommendation system enhances travel experiences overall and contributes to a more enjoyable and fulfilling holiday.

IX. FUTURE WORK

To enhance the hybrid tourist recommendation system, there are a number of topics that can be further researched. To begin with, more advanced data mining techniques can be applied to improve the accuracy of the system's recommendations. This may require using tactics like collaborative filtering, content-based filtering, and machine learning algorithms in order to better understand user preferences and provide personalised recommendations. Including user input and sentiment analysis can also increase the system's ability to adapt and give meaningful recommendations. Additionally, by incorporating real-time data such as weather, traffic, and the accessibility of tourist attractions, the system may be made more dynamic and responsive. Another area for further study is the use of social media data, which can provide informative information about user preferences and travel trends. Additionally, the system might be able to provide consumers with compelling, immersive travel experiences by

investigating the application of cutting-edge technologies like virtual reality and augmented reality. Overall, these research directions can help develop a hybrid tourist recommendation system that is more informed and effective.

REFERENCES

- [1] Forouzandeh, S., Rostami, M., & Berahmand, K. (2022). A hybrid method for recommendation systems based on tourism with an evolutionary algorithm and topsis model. *Fuzzy Information and Engineering*, 14(1), 26-50.
- [2] Bouazza, H., Said, B., & Laallam, F. Z. (2022). A hybrid IoT services recommender system using social IoT. *Journal of King Saud University-Computer and Information Sciences*, 34(8), 5633-5645.
- [3] Abbasi-Moud, Z., Hosseinabadi, S., Kelarestaghi, M., & Eshghi, F. (2022). CAFOB: Context-aware fuzzy-ontology-based tourism recommendation system. *Expert Systems with Applications*, 199, 116877.
- [4] Roy, D., & Dutta, M. (2022). A systematic review and research perspective on recommender systems. *Journal of Big Data*, 9(1), 59.
- [5] Ko, H., Lee, S., Park, Y., & Choi, A. (2022). A survey of recommendation systems: recommendation models, techniques, and application fields. *Electronics*, 11(1), 141.
- [6] Nilashi, M., Abumalloh, R. A., Alrizq, M., Almulihi, A., Alghamdi, O. A., Farooque, M., ... & Ahmadi, H. (2022). A hybrid method to solve data sparsity in travel recommendation agents using fuzzy logic approach. *Mathematical Problems in Engineering*, 2022.
- [7] Sharma, S., Rana, V., & Malhotra, M. (2022). Automatic recommendation system based on hybrid filtering algorithm. *Education and Information Technologies*, 1-16.
- [8] Gamidullaeva, L., Finogeev, A., Kataev, M., & Bulysheva, L. (2023). A Design Concept for a Tourism Recommender System for Regional Development. *Algorithms*, 16(1), 58.
- [9] Noorian, A., Harounabadi, A., & Ravanmehr, R. (2022). A novel Sequence-Aware personalized recommendation system based on multidimensional information. *Expert Systems with Applications*, 202, 117079.
- [10] Walek, B., & Fajmon, P. (2023). A hybrid recommender system for an online store using a fuzzy expert system. *Expert Systems with Applications*, 212, 118565.