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Tour Sentiments Personalized Recommendations System Using AI and Deep Learning



Abstract: - In a world saturated with travel information overload and generic recommendations, "Tour Sentiments: A Personalized Travel Recommendation System Using AI " emerges as a groundbreaking initiative. This project seeks to transform travel planning by harnessing the capabilities of Artificial Intelligence and real-time google Maps with street view and duration of travel. The primary goal of 'Tour Sentiments' is to create a personalized travel recommendation system that adapts to the changing emotions and preferences of travelers. By employing real-time sentiment analysis using google gemini, the system aims to offer tailored suggestions that align closely with individuals' current feelings and desires, departing from conventional one-size-fits-all approaches. Beyond mere efficiency, the ultimate vision of 'Tour Sentiments' is to elevate the travel experience, infusing it with joy, discovery, and lasting memories. Through the amalgamation of AI and sentiment analysis, the project aspires to make global exploration more accessible and captivating, setting a new standard for personalized travel guidance and enriching journeys worldwide.

Keywords: AI, Tour recommendation, Sentiment Analysis, google Gemini, google maps.

I. INTRODUCTION

In today's fast-evolving world, travel and tourism are undergoing a transformation due to abundant information and a desire for unique experiences. This research pioneers an "AI Tour Recommendation System" to revolutionize trip planning. It aims to reimagine travel planning by using AI to tailor adventures to individual preferences, aspirations, and visions. Beyond suggesting destinations, it aims to be a digital companion crafting personalized journey. The ambition is to democratize bespoke travel experiences, making them enriching and accessible to all. It aims to inaugurate a new era of travel, liberated from standardized routes, and schedules, offering extraordinary adventures that resonate deeply with travelers. Deep immersive experience using street view of tourist locations. Street View offers panoramic views taken in numerous cities across 20 countries spanning four continents.

This initiative seeks to redefine exploration by combining technology with human desires, turning travel planning into a personalized symphony celebrating adventure, curiosity, and connection. It's a commitment to shaping a world where every journey becomes an enriching tale, celebrating the endless wonders awaiting those who seek to explore and embrace the world. Through this innovative approach, travelers can explore new destinations, forging lasting memories and connections that transcend borders and cultures.

In addition to offering personalized recommendations and immersive experiences, this AI Tour Recommendation System aspires to foster sustainability and responsible travel practices. It strives to minimize environmental impact while maximizing positive social and economic contributions. Through partnerships with conservation

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organizations and cultural institutions, it aims to promote preservation efforts and cultural heritage awareness, ensuring that future generations can continue to enjoy and learn from the world's diverse wonders. This holistic approach not only enriches individual journeys but also contributes to the collective well-being of our planet and its inhabitants, paving the way for a more sustainable and harmonious future of travel

II. LITERATURE SURVEY

To create our personalized recommendation tour system, we referred to various articles/books as follows to briefly understand various technologies we need to use for our system.

"Personalized travel suggestions for tourism websites," [16] A. Coelho and A. Rodrigues highlights the growing consensus within the tourism industry regarding the significance of personalization in enhancing user engagement and satisfaction on tourism websites. As these platforms evolve, there's a notable trend towards standardizing features and best practices, enabling efficient template development that can be tailored to specific tourist regions. However, despite this progress, a critical challenge persists: the scarcity of user experience data during the initial stages of website deployment. This deficiency impedes the effective implementation of personalized travel suggestions, as data mining processes rely heavily on comprehensive datasets to deliver accurate recommendations aligned with individual preferences.

"Text Similarity Calculation Method Based on Optimized Cosine Distance," [21] J. Zhang, F. Wang, F. Ma and G. Song learned about the shortcomings inherent in traditional cosine distance measurements for assessing text similarity. While these methods effectively consider the angle between text vectors post-vectorization, they overlook the dynamic changes in individual vector dimensions. Addressing this deficiency, the paper introduces an innovative algorithm that enhances the cosine distance measure by integrating both directional aspects of vectors and the impacts of dimensional changes on text similarity. These findings suggest that the proposed approach offers significant advancements in text similarity calculation.

Tourism Recommendation System Based on User Reviews. We understood collaborative filtering and recommending based on reviews of the users. Hybrid Recommendation System for Tourism. Got understanding on hybrid recommendations and integrating various recognition techniques to enhance accuracy. A Tourist Place Recommendation and Recognition System. Understood k modes clustering algorithm used in machine learning and data analysis. We learnt about providing navigational guidance to users.

Tour recommendation system based on web information and GIS. Got a basic understanding of a system that extracts tourist spots from web and recommends routes. We learnt about recommendation algorithms. Deep Learning based Recommendation System: A Review of Recent Works. From this book, We got an overview of collaborative and content-based filtering. We understood deep learning technologies. Research Paper Recommender Systems: A Random-Walk Based Approach. Understood recommendation system using graphs and collaborative filtering. Recommendation Systems with Machine Learning. We understood collaborative filtering approach for recommendation systems. We learnt about how machine learning can help in recommendations. Our understanding extends to the collaborative filtering technique employed in recommendation systems, elucidating how machine learning significantly enhances personalized suggestions by analyzing user interactions and preferences

III. TRADITIONAL AND EXISTING SYSTEMS

Traditional travel recommendation systems suffer from several limitations that hinder their effectiveness in providing personalized and dynamic travel plans. These systems often fail to consider the individual preferences of users, offering generic recommendations that may not align with their interests. Moreover, they rely on limited data sources and static information, overlooking real-time factors and lesser-known destinations. Interactivity is typically limited, with users having little control over customizing their travel plans. Scalability issues further hamper these systems, particularly in managing large volumes of users and diverse preferences. Additionally, sentiment analysis techniques employed by traditional systems may lack sophistication, leading to unreliable insights into user feedback. Lastly, while some systems offer basic map visualization, they often lack advanced features that enhance the user experience. Addressing these limitations necessitates the adoption of advanced

technologies to develop more personalized, dynamic, and interactive travel recommendation systems capable of delivering superior user experiences.

Comparative analysis of Gemini with other LLMs:

	Gemini Ultra	Gemini Pro	GPT-4	GPT-3.5	PaLM 2-L	Claude 2	Infection-2	Grok 1	LLAMA-2
MMIU Multiple-choice questions in 57 subjects (professional & academic) (Hendrycks et al., 2021a)	90.04% CoT@32*	79.13% CoT@8*	87.29% CoT@32 (via API**)	70% 5-shot	78.4% 5-shot	78.5% 5-shot CoT	79.6% 5-shot	73.0% 5-shot	68.0%***
	83.7% 5-shot	71.8% 5-shot	86.4% 5-shot (reported)						
GSM8K Grade-school math (Cobbe et al., 2021)	94.4% Maj1@32	86.5% Maj1@32	92.0% SFT & 5-shot CoT	57.1% 5-shot	80.0% 5-shot	88.0% 0-shot	81.4% 8-shot	62.9% 8-shot	56.8% 5-shot
MATH Math problems across 5 difficulty levels & 7 subdisciplines (Hendrycks et al., 2021b)	53.2% 4-shot	32.6% 4-shot	52.9% 4-shot (via API**)	34.1% 4-shot (via API**)	34.4% 4-shot	—	34.8%	23.9% 4-shot	13.5% 4-shot
			50.3% (Zheng et al., 2023)						
BIG-Bench-Hard Subset of hard BIG-bench tasks written as CoT problems (Srivastava et al., 2022)	83.6% 3-shot	75.0% 3-shot	83.1% 3-shot (via API**)	66.6% 3-shot (via API**)	77.7% 3-shot	—	—	—	51.2% 3-shot
HumanEval Python coding tasks (Chen et al., 2021)	74.4% 0-shot (IT)	67.7% 0-shot (IT)	67.0% 0-shot (reported)	48.1% 0-shot	—	70.0% 0-shot	44.5% 0-shot	63.2% 0-shot	29.9% 0-shot
Natural2Code Python code generation. (New held-out set with no leakage on web)	74.9% 0-shot	69.6% 0-shot	73.9% 0-shot (via API**)	62.3% 0-shot (via API**)	—	—	—	—	—
DROP Reading comprehension & arithmetic. (metric: F1-score) (Dua et al., 2019)	82.4 Variable shots	74.1 Variable shots	80.9 3-shot (reported)	64.1 3-shot	82.0 Variable shots	—	—	—	—
HellaSwag (validation set) Common-sense multiple choice questions (Zellers et al., 2019)	87.8% 10-shot	84.7% 10-shot	95.3% 10-shot (reported)	85.5% 10-shot	86.8% 10-shot	—	89.0% 10-shot	—	80.0%***
WMT23 Machine translation (metric: BLEURT) (Tom et al., 2023)	74.4 1-shot (IT)	71.7 1-shot	73.8 1-shot (via API**)	—	72.7 1-shot	—	—	—	—

Table-01: Comparative analysis of Gemini with other LLMs

IV. PROPOSED SYSTEM

"Tour Sentiment" is a user-friendly, AI-powered trip planning tool that is designed to cater to a wide range of travel needs. Whether you're embarking on a relaxing vacation, a workation, or an everyday adventure, this system promises to be your go-to companion for crafting the perfect travel experience. At the heart of this system is its ability to create personalized travel itineraries. It does this by considering your individual preferences, such as the places you'd like to visit, dining preferences, and lodging choices. It's like having a knowledgeable travel advisor by your side, ensuring that your journey is tailored precisely to your desires.

To enhance recommendation generation, our system employs a dual-stage approach involving cosine similarity and Gemini AI. Initially, cosine similarity identifies top recommendations based on user interests. These candidates are then refined using Gemini AI, providing deeper insights and nuances to the recommendations. This two-tiered method ensures that recommendations are not only based on surface-level similarities but also take into account more intricate factors. By leveraging Gemini AI, which excels in understanding human communication nuances, we refine the initial recommendations, ensuring they align closely with users' preferences and desires.

In essence, this hybrid approach combines the computational strength of cosine similarity with the sophisticated understanding provided by Gemini AI, resulting in more accurate and personalized recommendations for users.

A. Features of Tour Sentiment:

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

I) Optimal Tour Planning:

We have integrated GEMINI Api which is a large language model developed by Google AI. Trained on massive datasets of code and text, GEMINI excels at human-to-machine communication. It can generate natural-sounding text, translate languages fluently, and craft creative content in various formats. Additionally, GEMINI offers informative answers to your questions. It empowers users with custom-built itineraries by analyzing user preferences, location, and budget to generate a structured, day-by-day schedule catering to their specific interests.

II) PERSONALIZE YOUR ADVENTURE:

Personalization is key, and this system empowers you to freely add, edit, or delete activities from your itinerary. This level of customization ensures that your journey reflects your unique interests and desires. No two itineraries are the same. The application follows a systematic approach to provide personalized travel itineraries to users. Initially, data is gathered from various platforms like Expedia and TripAdvisor, followed by rigorous cleaning processes to ensure accuracy. Categorized data on destinations and attractions is then used, alongside user input on preferences such as interests, budget, and travel dates, to generate personalized itineraries. Interactive maps are utilized to present itinerary details, aiding in navigation. Users are also given the flexibility to customize their itineraries further. Feedback provided by users helps refine future recommendations and enhance overall user satisfaction, completing the iterative cycle of data-driven travel planning and improvement.

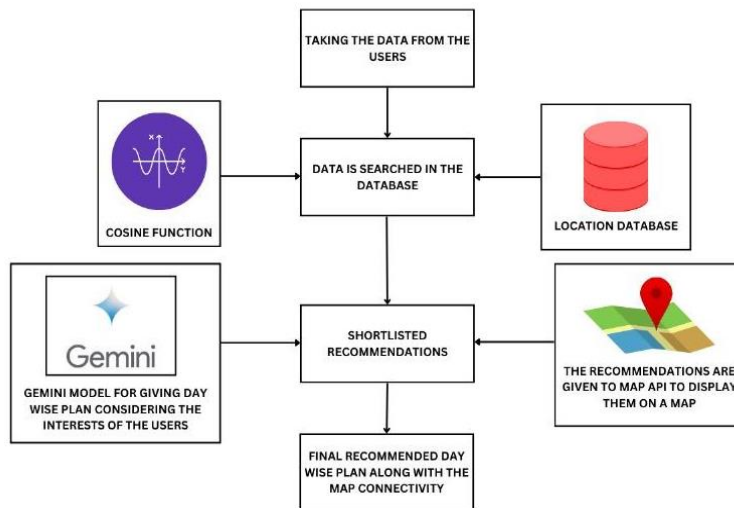


Fig-01:- The Basic Project Block Diagram

V. ALGORITHM AND PROCESS DESIGN

The search engine for the recommendation system works using cosine similarity search.

A) INTRODUCTION

The cosine similarity algorithm serves as a valuable tool for assessing the similarity between two non-zero vectors within an inner product space. Its widespread use in information retrieval, natural language processing, and machine learning highlights its significance in various domains. The algorithm evaluates the cosine of the angle between vectors to quantify their similarity, with a higher cosine similarity indicating greater resemblance.

B) MATHEMATICAL FOUNDATION

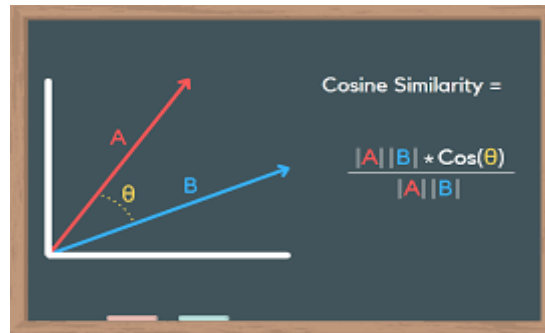


Fig-02 Cosine Similarity

"Cosine similarity to determine similarity measure: Study case in online essay assessment," [20] A. R. Lahitani, A. E. Permanasari and N. A. Setiawan says that the cosine similarity is computed using the following formula:

$$\text{cosine_similarity}(A,B) = \frac{A \cdot B}{(\|A\| \cdot \|B\|)}$$

Here:

$A \cdot B$ represents dot product of vectors A and B

$\|A\|$ and $\|B\|$ represent magnitudes of vectors of A and B respectively

C) ALGORITHM FOR RECOMMENDATION SEARCH

Steps to Calculate Cosine Similarity :*I) TOKENIZATION:*

Convert the text or data into a suitable format, such as vectors, for analysis.

II) VECTOR REPRESENTATION

Represent each item (document, sentence, etc.) as a vector. Common techniques include Bag-of-Words, TF-IDF, or word embeddings.

III) CALCULATION OF DOT PRODUCT:

Compute the dot product of the vectors A and B

IV) CALCULATION OF MAGNITUDE:

Calculate the magnitudes $\|A\|$ and $\|B\|$ of the vectors A and B

V) COMPUTE COSINE SIMILARITY:

Use the formula to calculate the cosine similarity

In our case the `cosine_similarity` is imported from `sklearn.metrics.pairwise` library. The text entered in the search bar is compared with the place description column present in the sql database.

Given the following documents, our objective is to compute their cosine similarity:

Document 1(Database): 'goa has adventure sport'

Document 2(User Query): 'Interested in adventure sport'

After constructing a word table from the documents, we can represent them with the following vectors:

	Doc1	Doc2
goa	1	0
has	1	0
adventure	1	1
sport	1	1
Interested	0	1
in	0	1

Table-02:Word Table

$$\text{Doc1} = [1,1,1,1,0,0]$$

$$\text{Doc2} = [0,0,1,1,1,1]$$

initially calculating Dot Product:

$$\text{Doc1} \cdot \text{Doc2} = 1 \cdot 0 + 1 \cdot 0 + 1 \cdot 1 + 1 \cdot 1 + 0 \cdot 1 + 0 \cdot 1 = 2$$

Calculating magnitude of both documents:

$$\|\text{Doc1}\| = (1^2 + 1^2 + 1^2 + 1^2 + 0^2 + 0^2)^{0.5} = 2$$

$$\|\text{Doc2}\| = (0^2 + 0^2 + 1^2 + 1^2 + 1^2 + 1^2)^{0.5} = 2$$

Finally calculating cosine similarity:

$$\begin{aligned} \text{Similarity}(\text{Doc1}, \text{Doc2}) &= \frac{\text{Doc1} \cdot \text{Doc2}}{(\|\text{Doc1}\| * \|\text{Doc2}\|)} \\ &= \frac{2}{2 * 2} \\ &= 0.5 \end{aligned}$$

Angle between the vector is:

$$\cos \theta = 0.5$$

$$\theta = \arccos(0.5)$$

$$\theta = 60^\circ$$

lower the angle the greater the similarity between user query and the database document

C) ALGORITHM FOR TRIP PLANNER

a) The user enters the place Details like Noof days he/she is going for the trip, Interests ,Place_name, Budget

Fig-03 The Input We Take From The User

b) The Entered Details are Searched in SQL Database Using the Cosine function.

c)The Recommended Places and Hotels are Shortlisted.

d) Those recommendations are passed to GEMINI along with the custom-made instruction.

e) Gemini Generates a Detailed Planned Based on the Recommendations.

f) Those Recommended Places and Hotels Are also Passed to Google Maps to gets a Detailed View of that Place along with Street-View, Duration of travel, path of travel, Distance between places.

D) DATASET

id	City	Ratings	Distance	Place	Place_desc
11	Mumbai	4.2	2.5	Gateway of India	The iconic Gateway of India, overlooking the Arabian Sea, stands as a symbol of Mumbai's ...
12	Mumbai	3.9	3.8	Marine Drive	Nestled along the coastline, Marine Drive beckons health and wellness enthusiasts for its s...
13	Mumbai	4.5	1.2	Chhatrapati Shivaji Terminus	A UNESCO World Heritage site, CST blends historical significance with architectural grande...
14	Mumbai	4.0	7.5	Juhu Beach	Juhu Beach, a haven for both locals and tourists, attracts sports enthusiasts engaged in b...
15	Mumbai	3.8	5.0	Siddhivinayak Temple	The Siddhivinayak Temple, dedicated to Lord Ganesha, is a spiritual retreat for devotees s...
16	Mumbai	4.3	3.0	Haji Ali Dargah	Floating off the coast, Haji Ali Dargah is a spiritual beacon drawing visitors from all walks of...
17	Mumbai	4.1	12.0	Elephanta Caves	Nestled on Elephanta Island, the ancient Elephanta Caves attract history and heritage ent...
18	Mumbai	4.4	2.2	Colaba Causeway	Colaba Causeway, a bustling shopping district, beckons culture enthusiasts and shoppers ...
19	Mumbai	3.7	9.5	Bandra-Worli Sea Link	The Bandra-Worli Sea Link is a marvel of modern engineering that captivates admirers of ar...
20	Mumbai	4.0	1.8	Chhatrapati Shivaji Maharaj Vastu Sangrahalaya	Formerly known as the Prince of Wales Museum, this cultural institution attracts history an...
21	Pune	4.9	3.0	Shaniwar Wada	Shaniwar Wada, Pune's historic fort, stands as a testament to the city's rich past. History ...
22	Pune	3.3	7.0	Aga Khan Palace	Aga Khan Palace, surrounded by tranquil gardens, is a significant landmark intertwined wit...
23	Pune	4.8	25.0	Sinhagad Fort	Perched atop the Sahyadri Mountains, Sinhagad Fort provides breathtaking views and a jo...
24	Pune	3.3	6.0	Osho Ashram	Osho Ashram, a spiritual retreat in Pune, beckons those seeking inner peace and holistic w...
25	Pune	4.7	1.5	Dagdusheth Halwai Ganpati Temple	The Dagdusheth Halwai Ganpati Temple is a revered shrine attracting devotees and cultur...
26	Pune	4.9	2.5	Pataleshwar Cave Temple	Carved from a single rock, Pataleshwar Cave Temple is a hidden gem in Pune. History and ...
27	Pune	3.5	2.0	Raja Dinkar Kelkar Museum	The Raja Dinkar Kelkar Museum houses an extensive collection of artifacts, creating a hav...
28	Pune	3.8	10.0	Pashan Lake	Pashan Lake, surrounded by lush greenery, is a tranquil retreat for nature lovers and bird...

Fig-04: Sample Dataset for Tour Recommendation

Attributes in the dataset:

id - primary key

City: name of city

Ratings: rating (user feedback)

Distance: Distance from city center

Place: tourist place name of the city

Place_desc : Description of the tourist place

This is the primary dataset which is used to generate recommendation and cosine similarity is used to find best fit rows from this dataset

VI. RESULTS

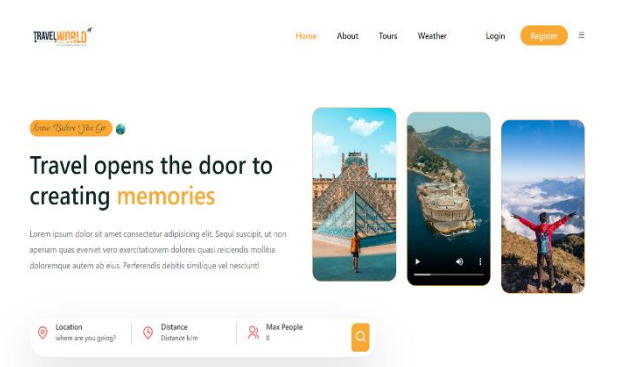


Fig-05: Home Page

This is the home of the website. From this page users can navigate to a plan generating page, weather page to see recent weather of the tourist place and recommendation page to generate the recommendations of a tour.

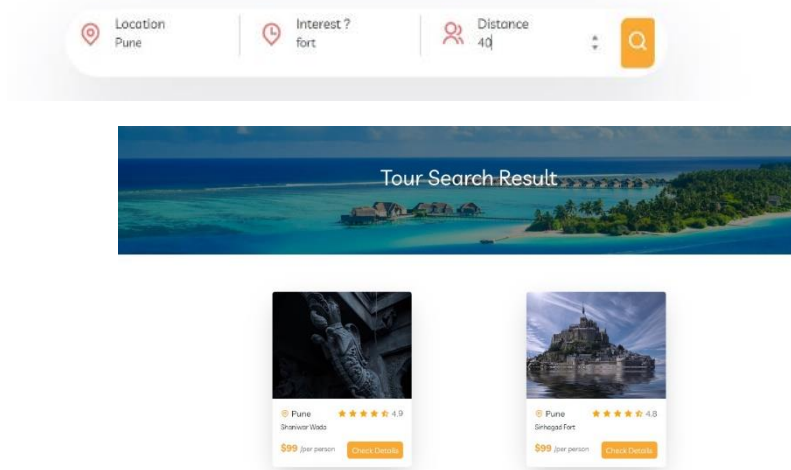


Fig-06: Recommendation on basis of interest

Locations are recommended to the users on the basis of Place and User Interest. For example City is Pune and User interest is to visit Fort. So locations like Shaniwar wada, etc are recommended to the user. Recommendation is done using cosine similarity.

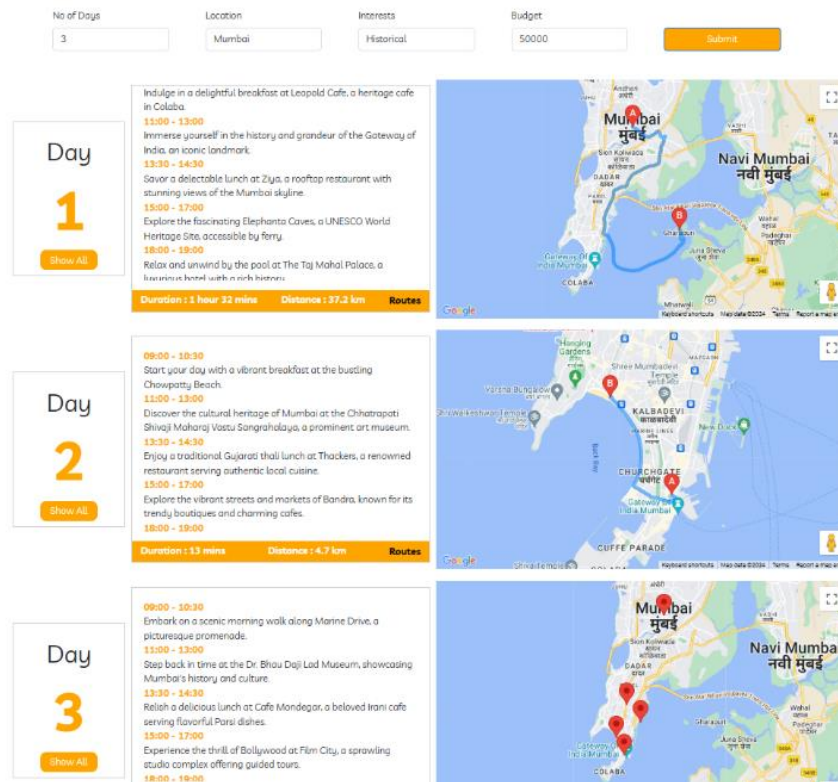


Fig-07: Day wise detailed plan

The page exhibits a comprehensive day-wise itinerary for the trip, providing a detailed breakdown of activities and destinations planned for each day. Additionally, markers are placed on the map to denote the locations included in the itinerary, offering users a visual representation of their planned journey.

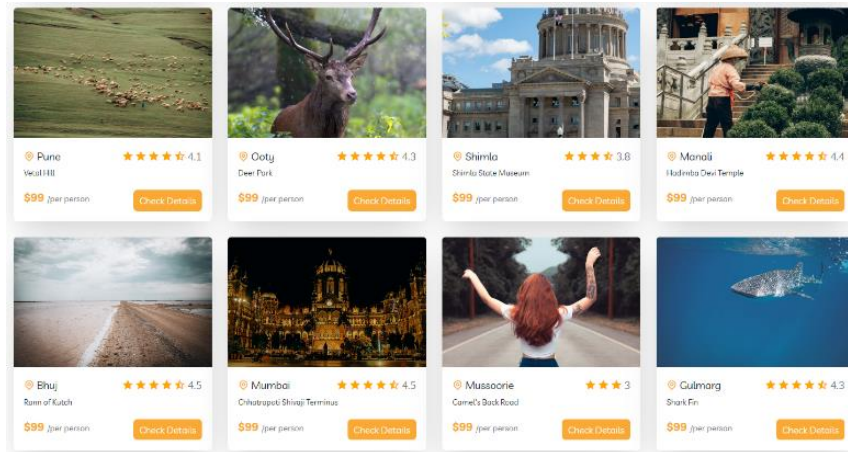


Fig-08: Tours Section

These tours are fetched from our database. The Place name and City is provided to Unsplash Api to display image of that particular location.

The recommendations are generated, they are displayed to the user and now the user can view the places connected via a map and also take in the street view of the place for a prime traveling experience.

This section gives further description of that location such as distance from city center, time required to reach that location from current position and route between the two places.

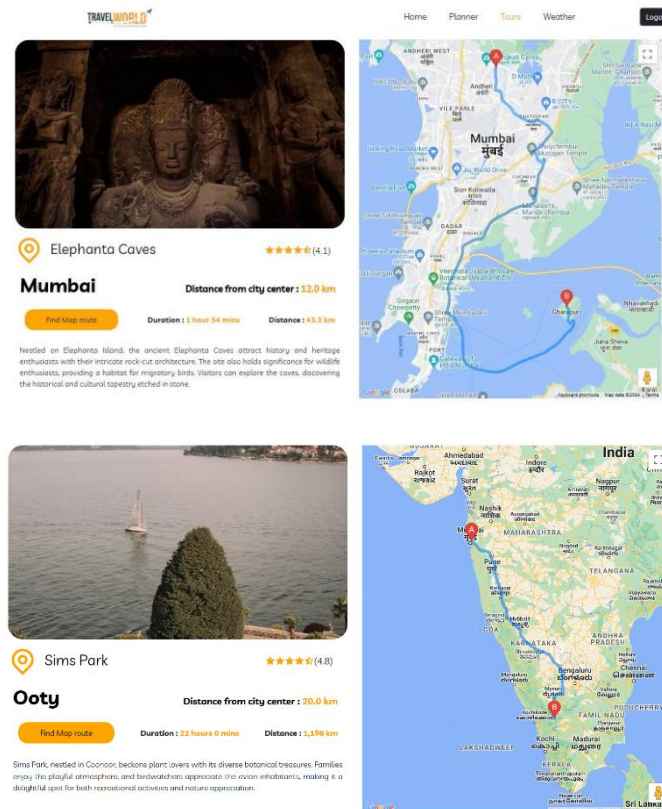


Fig-09: Response generated

This section will ask the users questions regarding their trip such as location, number.of days, their interests and budget to plan their trip accordingly. This recommendation is generated using the cosine function and Gemini ai to further improve the result.

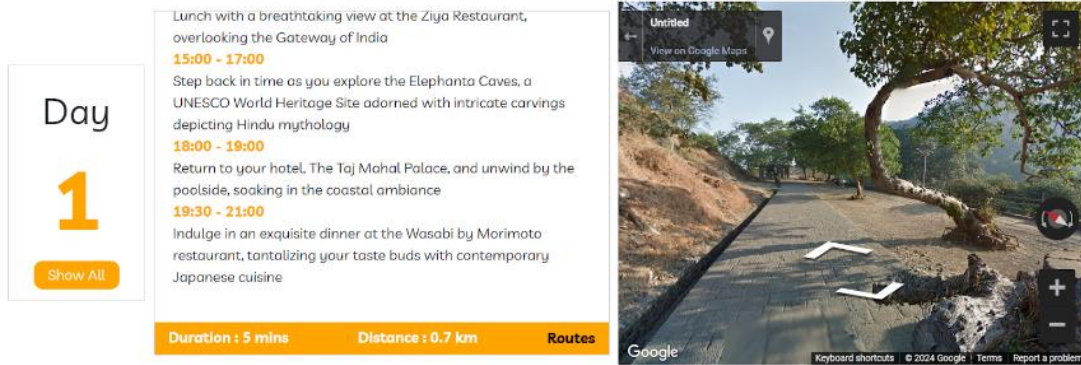


Fig-10: Street View 1

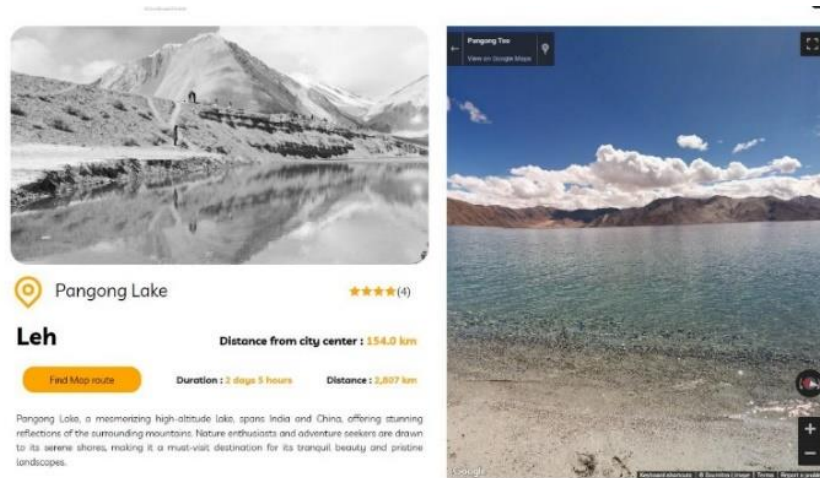


Fig-11: Street View 2

"Integrated Google Maps and smooth street view videos for route planning" [19] C. Peng, B. -Y. Chen and C. -H. Tsai taught us about using the street view to our advantage.

The system presents recommendations on a map interface, accompanied by real-time updates on travel duration and distance to each recommended destination.

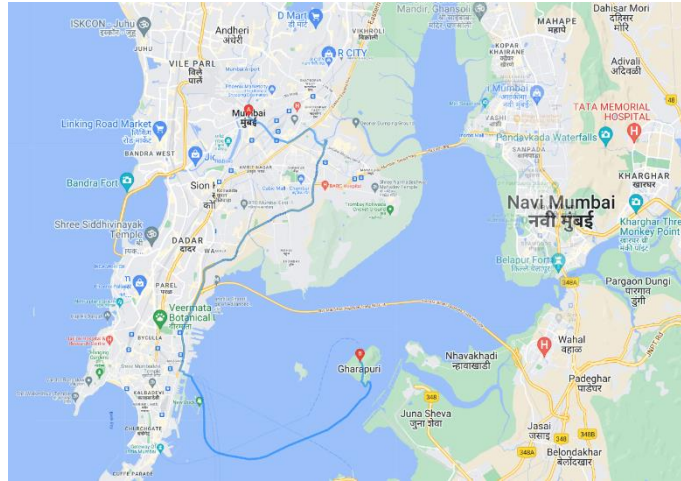


Fig-12: Routes between two destinations

The day wise tour plan generated by the system is then displayed on the website. Along with the connected Routes. the google map had a function to do so.

VII. CONCLUSION

In conclusion, "Tour Sentiment" represents a groundbreaking advancement in travel planning, offering a glimpse into a future where personalized, efficient, and captivating travel experiences are the standard. By harnessing the power of AI, this system not only enhances user satisfaction but also has far-reaching implications for the travel industry as a whole. It signifies a shift away from generic itineraries towards journeys uniquely tailored to individual preferences and aspirations. As technology continues to evolve, "Tour Sentiment" stands as a testament to the transformative potential of innovation within the realm of travel, promising to redefine exploration for generations to come.

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