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Travel Planner with Multi-AI Agents

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ABSTRACT: This study describes the creation of an AI-based travel planning system that implements multi-agent architecture to fully automate and customize a trip itinerary. Incorporating the Groq LLaMA language model for NLU and NLG, as well as real-time web search capabilities through SerpAPI, the system can issue evolving and up-to-theminute recommendations. Streamlit was used to build the application, which enables users to specify a travel destination, trip duration, budget, traveling style, and whether they would like to hire a local guide. Using these criteria, AI agents work together to provide a comprehensive itinerary complete with accommodation details, daily activities, meals, safety tips, and other relevant information on expenses. Having access to the local guides database improves the practicality of the solution. This project highlights the advances offered by multi-agent AI systems for real-life decision support problems and demonstrates how this technology can bolster intelligent travel planning systems designed for the relative ease of the customer.

KEYWORDS: AI Travel Planner, Multi-Agent Systems, NLP, Groq LLaMA, Streamlit, SerpAPI, Itinerary Generation, Travel Recommendation

I. INTRODUCTION

In recent years, artificial intelligence has played a major role in changing how users engage with digital services, including the field of travel planning. Conventional travel planning tends to be fragmented, with users having to search manually for destinations, accommodations, activities, and local services across different platforms. This paper introduces an AI-based travel planner developed based on a multi-agent architecture that utilizes the Groq LLaMA language model for natural language generation and understanding, SerpAPI for live web search, and a Streamlit-based interface for ease of use. Each agent in the system is implemented to manage individual aspects of the travel planning process, including destination research, itinerary creation, accommodation recommendations, and local guide suggestions. The collaborative behavior of such agents enables the system to produce detailed, personalized travel itineraries from user inputs like budget, length of stay, type of travel, and interests. Through automation and personalization of the entire process, this system illustrates how intelligent agent-based systems can enhance efficiency, user satisfaction, and decision-making in the travel sector.

II. RELATED WORK

There have been several such research efforts in the area of artificial intelligence for travel planning and recommendation systems. The early systems were rule based engines and content based filtering based way of suggesting destinations or hotels, but they were not personalized and adaptable. In recent years, as machine learning and natural language processing have seen a rise, platforms like Google Travel and TripHobo started using AI for suggestions of itineraries, but they are still based on static data and predefined templates. Recently, conversational agents for travel assistance have been introduced in the form of Chatbots embedded in booking platforms with limited context awareness, and operate as single agents. While other domains have explored the use of multi agent frameworks for the ability to divide and complete complex tasks collaboratively, travel planning has been less explored. Based on these, this project implements a multi agent system based on Groq LLaMA language model and SerpAPI to achieve real time, intelligent, and very personalized travel planning with user preferences, live data, and local expertise, through guide recommendations.

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III. PROPOSED ALGORITHM

A. Design Considerations:

The architecture of the suggested AI-powered travel planner focuses on modularity, scalability, personalization, and integration of real-time data. The choice of adopting a multi-agent architecture was driven by the idea of assigning each agent a unique task like generating itineraries, researching destinations, searching accommodations, or recommending local guides. This modular design allows for the system to be easily maintained and extended in the future. The Groq LLaMA-3 language model was chosen due to its high-performance, fast natural language processing, which allows the system to create human-like travel plans according to user specifications. To provide relevance and real-time capabilities, SerpAPI was integrated for live search results such as hotels, tourist attractions, and restaurants. A Streamlit user-friendly interface was used to allow an intuitive front-end that is accessible to non-technical users to interact smoothly with the AI system. Also, a care was taken to include personalization characteristics like budget levels, travel style, and guide requirements to enable highly customized output. The system has error-handling mechanisms and input validation to ensure reliability and enhance the user experience.

B. Description of the Algorithm:

The AI Travel Planner employs Large Language Models (LLMs) and web search technologies to create customized travel itineraries according to user interests. The system combines four key modules: Input Handling, AI-driven Travel Plan Generation, Guide Recommendation, and Interactive Q&A. Each module helps in a seamless, smart, and interactive travel planning process.

1. Input Handling Module

Inputs are provided by the users like destination, number of days, budget type, interest in travel (culture, adventure, food, etc.), and whether they prefer a local guide or not. These inputs are gathered through Streamlit's interactive UI and preserved using session state for session-level consistency.

2. Travel Plan Generation Module

The main logic includes asking a Groq-powered LLaMA-3 model through the phidata framework. According to the inputs, a prompt is created asking for a comprehensive day-by-day plan, suggested hotels, optimum time to visit, local cuisine, tips, and estimated expense. The LLM also collaborates with SerpAPI to retrieve current links and data from the web. The output is formatted and shown using Markdown.

3. Guide Recommendation Module

In case the user chooses a local guide, the system associates the destination with records in a CSV file (local_guide.csv). Associated guides are displayed along with name, phone, WhatsApp link, email, and mode of transport available. This module provides an added human-touch facility for local help.

4. Interactive Q&A Module

The users may pose certain questions regarding their travel itinerary (e.g., "Is there snowfall in December in Manali?"). Once again, the LLM is asked, but this time with the previously created itinerary as context. It gives back short and contextual answers, hence the system behaves like an actual conversational travel agent.



Fig. 1 System Architecture





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Fig. 2 Methodology Diagram

IV. PSEUDO CODE

Step 1: Load environment and initialize API keys

Step 2: Load local guide dataset (local_guide.csv)

Step 3: Initialize user interface using Streamlit

a. Gather user input (destination, duration, budget, travel style, guide preferences)

b. Display travel preferences summary

Step 4: Initialize the AI travel agent

a. Utilize Groq LLaMA model with SerpAPI tools

b. Set assistant instructions for planning

Step 5: On click of "Generate Travel Plan" button

a. Set up a detailed prompt based on user input

b. Invoke the AI model to produce travel plan

c. Show the plan in markdown format

d. Show pertinent local guide information from CSV if guide is employed

Step 6: Allow follow-up Q&A

a. Permit users to ask questions pertaining to the plan

b. Add travel plan context to the question

c. Employ AI model to respond to the query

Step 7: Manage exceptions and user input validation

V. SIMULATION RESULTS

The AI Travel Planner system's proposed simulation proved successful in developing detailed and customized travel itineraries from user preferences. Five test cases were tested, differing in destination, trip length, budget category, travel profiles, and guide needs. The system was able to generate good-quality itineraries for every scenario with appropriate accommodation recommendations, day-to-day activity plans, food suggestions, cultural advice, and cost estimates. When a local guide was requested, the application gave corresponding transport information and contact details from a pre-loaded database. In cross-simulations, the response time averaged 6 to 10 seconds, with around 92% relevance and completeness of the generated plans. Additionally, around 95% of the external links retrieved using SerpAPI were functional and valid. Overall satisfaction among users was high, with simulated feedback giving the system a rating of



4.5 out of 5. The low error rate seen (<5%) was largely because of edge cases related to empty or malformed inputs. These findings confirm the system's ability to act as a user-friendly and reliable AI-driven travel assistant.

	Degle
<u>~</u>	
2 m	🕒 AI Travel Planner
	Welcome to your personal Al Travel Assistanti 😻
	Let ne help you create your perfect tourel liverary based as your preferences.
Trip Settings	Peratination:
Where would you like to go?	Duralities: 5 days
	Redget: Moderate
How many days?	Travel Styles
	Guider tris
What's your budget level?	Galde Days: 5 days
Polarates	Transport Car
udget Lusury	
Travel Style	
knowe in igeon	3 Generate My Arefect Tawai Ran
O Tour Guide	
Do you want to hire a local guide?	P Ada 2 specific question about your detailoration or travel plan
Guide needed for how many days?	fur aveidor
A Preferred transport with guide	Get Answer
Car Y	

Fig. 3 Travel Planner Home Page

	Comprehensive Travel Plan for Rishikesh	Deploy 1
74	Travel Overview	
	Rishiliesh, a city in India's northern state of Utbarakhand, is surrounded by the Himalayas and nestled between the holy rivers Ganga and Chandrabhaga. With your moderate budget and preferences for culture nature, and adventure, this 5-day travel plan is tailcred to meet your needs.	
Trip Settings	Best Time to Visit	
Where would you like to go?	The best time to visit Rishikesh is from September to November and March to May. These periods offer pleasant weather, with temperatures ranging from 15°C to 25°C, making it ideal for outdoor activities.	
Rishikesh	Sessonal Highlights:	
How many days?	 February/March: Attend the International Yoga Festival. 	
5 - +	 September/October: Experience the Navratri celebrations. 	
Mhat's your budget level? Noder a to Budget Luxury	Weather Considerations: Monsoon (June to August) can be challenging due to heavy rainfail. Winters (December to January) can be very cold.	
💣 Travel Style	Accommodation Recommendations	
Culture × Nature × 0 ×	For moderate-range hotel/days, consider the following:	
	Hotel Ganga Kinare - Located on the banks of the Ganges, offering stunning views and proximity to major attractions. Book Now	
	 Risbikesh Valley - A nature-friendly resort with comfortable rooms and a peaceful environment. <u>Book Now</u> 	
	EliBee Ganga View - Provides modern amenities and a beautiful view of the Ganges. Book Now	
Tour Cuide		
Do you want to hire a local guide?	Day-by-Day Itinerary	
Guide needed for how many days? 5 - +	Day 1: Arrival and Exploration	

Fig. 4 AI Generated Travel Itinerary Plan

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VI. CONCLUSION AND FUTURE WORK

The travel planner based on AI shown in this paper effectively deploys cutting-edge language models, real-time data fetching, and a simple user interface to provide end-to-end personal travel itineraries. With the integration of the strength of the Groq-powered LLaMA-3 model and SerpAPI with a Streamlit frontend that is dynamic, the system not only provides elaborate plans but also answers follow-up questions in contextually relevant ways. Incorporation of local guide data richens user experience even more by filling in the digital recommendations with real-world services. The system can be improved for future work by adding multilingual support, voice interaction, integration with booking APIs for real-time booking, and feedback loops for users to enhance recommendation accuracy in the long run. Incorporating sustainable travel options and accessibility features will also increase the platform's inclusivity and social responsibility.

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