Travel Buddy: An AI-Powered Personalized Trip Planning and Itinerary Generation Platform

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Abstract—Planning a trip traditionally requires significant time and effort, as travellers must research destinations, accommodations, activities, and routes across multiple disconnected platforms. Existing travel systems provide generic, non-personalised suggestions that fail to address individual preferences such as travel mood, group type, and budget constraints. To address these challenges, this paper presents Travel Buddy, an AI-powered personalised trip planning and itinerary generation platform developed using Python (Django) as the backend framework, SQLite as the database, and the Groq API for AI-driven recommendations. The proposed system accepts user inputs including destination, travel duration, mood, group type, and budget, and generates comprehensive day-wise itineraries with activity suggestions, dining recommendations, accommodation options, and cost estimates. The platform includes features such as user authentication, trip customisation, hotel booking assistance, interactive map visualisation, and trip history management. The system was evaluated across multiple trip planning scenarios and demonstrated significant improvements in planning efficiency, personalisation quality, and user experience when compared to conventional travel platforms. Travel Buddy provides an accessible, scalable, and intelligent solution for modern travellers seeking customised trip planning without manual research overhead.

Keywords—AI Trip Planner, Personalised Itinerary, Groq API, Django, Travel Automation, Mood-Based Planning, Smart Tourism, Web Application.

I. INTRODUCTION

Travel planning is an essential part of modern life, enabling individuals and groups to explore destinations for leisure, business, and cultural experiences. Despite increasing digitalisation, the process of planning a trip remains fragmented and time-consuming for many travellers. Users must browse multiple platforms to gather information about destinations, hotels, activities, local cuisine, and transportation options before building a coherent plan.

Traditional travel planning methods create several practical challenges. Travellers spend excessive time comparing recommendations across platforms such as TripAdvisor, Google Travel, and Booking.com, while these platforms primarily offer static, non-personalized suggestions. Existing systems do not consider contextual factors such as a traveler's mood, preferred activities, group composition, or available budget when generating recommendations. This leads to generic itineraries that often fail to match the actual preferences of users.

Modern travellers expect intelligent, automated solutions that can generate complete, personalized trip plans with minimal manual effort. There is growing demand for systems that can understand individual travel preferences and produce contextually appropriate recommendations in real time. Artificial Intelligence, particularly large language models, offers a promising approach for building such personalized and adaptive travel planning systems.

To address these challenges, this paper presents Travel Buddy, an AI-powered personalized trip planning platform developed using Python and the Django framework, with AI recommendations powered by the Groq API. The system allows users to input their travel preferences and instantly receive complete, day-wise itineraries tailored to their destination, duration, mood, group type, and budget. The platform also supports trip customization, hotel booking assistance, weather integration, and saved trip management.

The remainder of this paper discusses the literature survey, problem statement, objectives, system architecture, functional modules, implementation methodology, experimental analysis, advantages, future scope, and conclusion of the proposed system.

II. LITERATURE SURVEY

A. AI and Natural Language Processing in Travel Systems

Large language models (LLMs) and AI-based recommendation systems have been increasingly applied to travel and tourism domains. Conversational AI systems enable users to interact naturally with planning tools, generating contextually relevant suggestions based on described preferences. The Groq API provides high-speed LLM inference capabilities that make real-time itinerary generation feasible within interactive web applications.

B. Web Technologies for Travel Applications

Python and the Django framework are widely adopted for developing scalable, secure web applications due to Django's built-in authentication system, ORM capabilities, and REST framework support. HTML5, CSS3, Bootstrap, JavaScript, and jQuery provide the front-end technologies required to build responsive and interactive interfaces accessible on both desktop and mobile devices.

C. Existing Travel Platforms and Limitations

Existing travel platforms such as Google Travel, TripAdvisor, and Booking.com provide destination suggestions and booking services but rely heavily on manual user effort for itinerary creation. Google Travel discontinued its dedicated trips feature and integrated suggestions into general search, resulting in limited personalization. TripAdvisor provides reviews and recommendations but requires users to manually assemble their own plans. Booking.com and Expedia focus primarily on accommodation and flight booking without contextual trip planning capabilities. These platforms lack AI-driven dynamic customization based on mood, group type, or integrated budget planning.

D. Research Gap

Existing travel systems focus on individual components of trip planning such as accommodation booking, review aggregation, or activity discovery. Very few systems combine AI-powered itinerary generation, mood-based and group-type personalization, budget optimization, interactive customization, and trip history management within a single integrated platform. Additionally, most commercial travel solutions are not designed for lightweight, cost-effective deployment suitable for academic or small-scale use. Travel Buddy addresses this gap by providing a unified, AI-driven trip planning solution using open-source and freely available technologies.

III. PROBLEM STATEMENT

Planning a trip is often overwhelming and time-consuming because travellers must gather information from multiple disconnected sources. Existing systems such as TripAdvisor, Google Travel, and Booking.com provide general recommendations but lack personalized, AI-driven itineraries based on individual preferences. Some key challenges observed in traditional travel planning systems include:

- Generic recommendations that do not account for travel mood, group composition, or budget constraints.
- Excessive time spent browsing multiple platforms to research destinations, accommodations, and activities.
- Absence of automated, day-wise itinerary generation tailored to specific user inputs.
- Limited customization options after initial plan generation.
- No integration of cost estimation and budget optimization within the planning process.
- Lack of a unified platform combining planning, booking assistance, and trip management.

These problems reduce planning efficiency and create unnecessary effort for travellers. A smart, AI-integrated trip planning platform is needed to simplify the process and deliver personalized, ready-to-use travel plans.

IV. OBJECTIVES

The main objectives of the proposed Travel Buddy platform are:

- To develop an AI-powered web application for personalized trip itinerary generation.
- To accept user inputs such as destination, duration, mood, group type, and budget for tailored planning.
- To generate complete day-wise itineraries including activities, attractions, dining, and accommodation options.
- To integrate the Groq API for high-quality, real-time AI-driven travel recommendations.
- To provide interactive itinerary customization allowing users to modify, add, or remove activities.
- To include hotel booking assistance and estimated budget calculations within the platform.
- To implement user authentication for secure profile management and trip history storage.
- To deliver a responsive, user-friendly interface accessible on desktop and mobile devices.
- To build a scalable and maintainable system using open-source web technologies.

V. PROPOSED SYSTEM

A. System Overview

Travel Buddy is a web-based AI trip planning platform designed to generate personalized travel itineraries using intelligent processing of user preferences. The system combines user preference collection, AI itinerary generation, interactive customization, hotel booking assistance, and trip management within a single integrated application. The platform supports two primary user roles: registered users who can save and manage trip plans, and guest users who can access limited itinerary generation functionality.

B. System Architecture

Travel Buddy follows a three-layer architecture separating frontend presentation, backend processing, and data storage.

- Presentation Layer: Developed using HTML5, CSS3, Bootstrap, JavaScript, and jQuery. Provides a responsive and user-friendly interface for trip input, itinerary display, customization, and profile management. The frontend communicates with backend views through HTTP requests.
- Application Layer: Developed using Python and the Django framework. Handles user authentication, trip input processing, Groq API communication, business logic for mood and group-type filtering, itinerary refinement, and hotel booking management.
- Database Layer: SQLite is used for storing user profiles, trip records, generated itineraries, hotel bookings, and user preferences using Django's ORM for efficient data access.

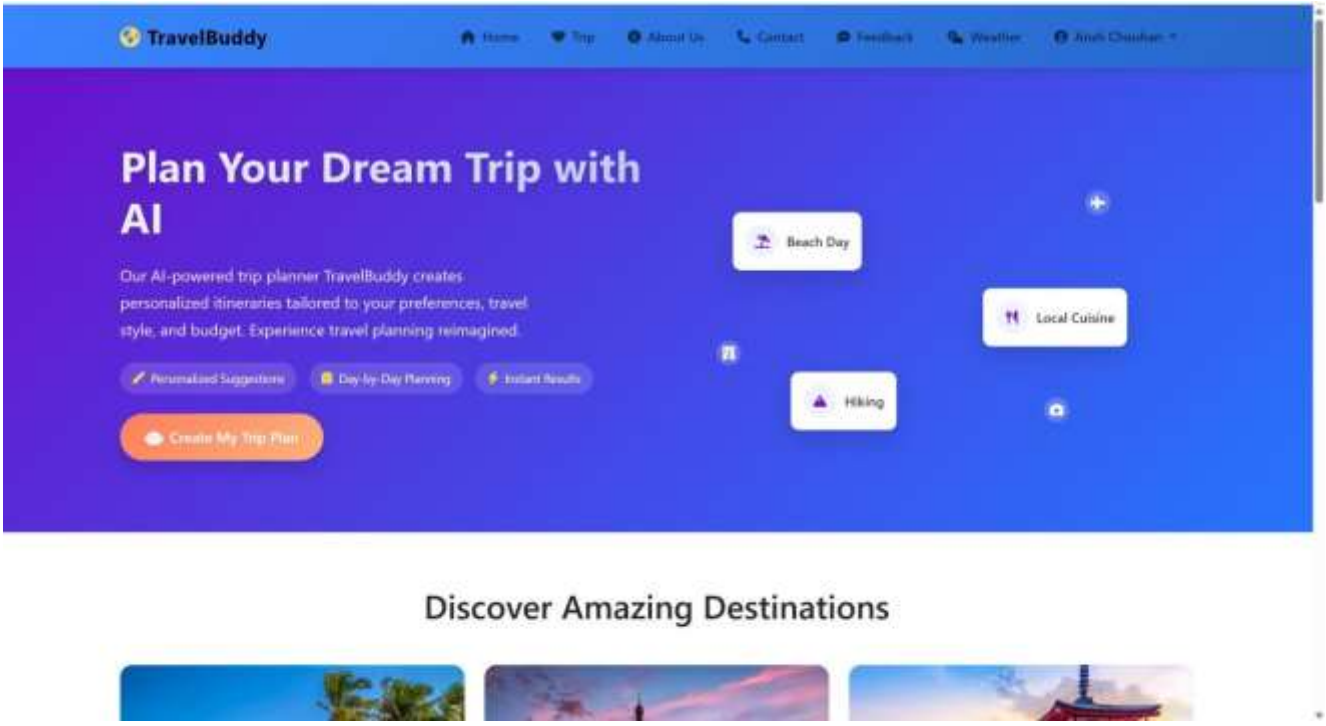
C. Authentication and Security

The system implements Django's built-in authentication system for user registration, login, and session management. User passwords are hashed using Django's default PBKDF2 algorithm before storage. Role-based access ensures that trip data and user profiles are accessible only to authenticated users. All client-server communication is protected through HTTPS in deployment environments.

VI. FUNCTIONAL MODULES

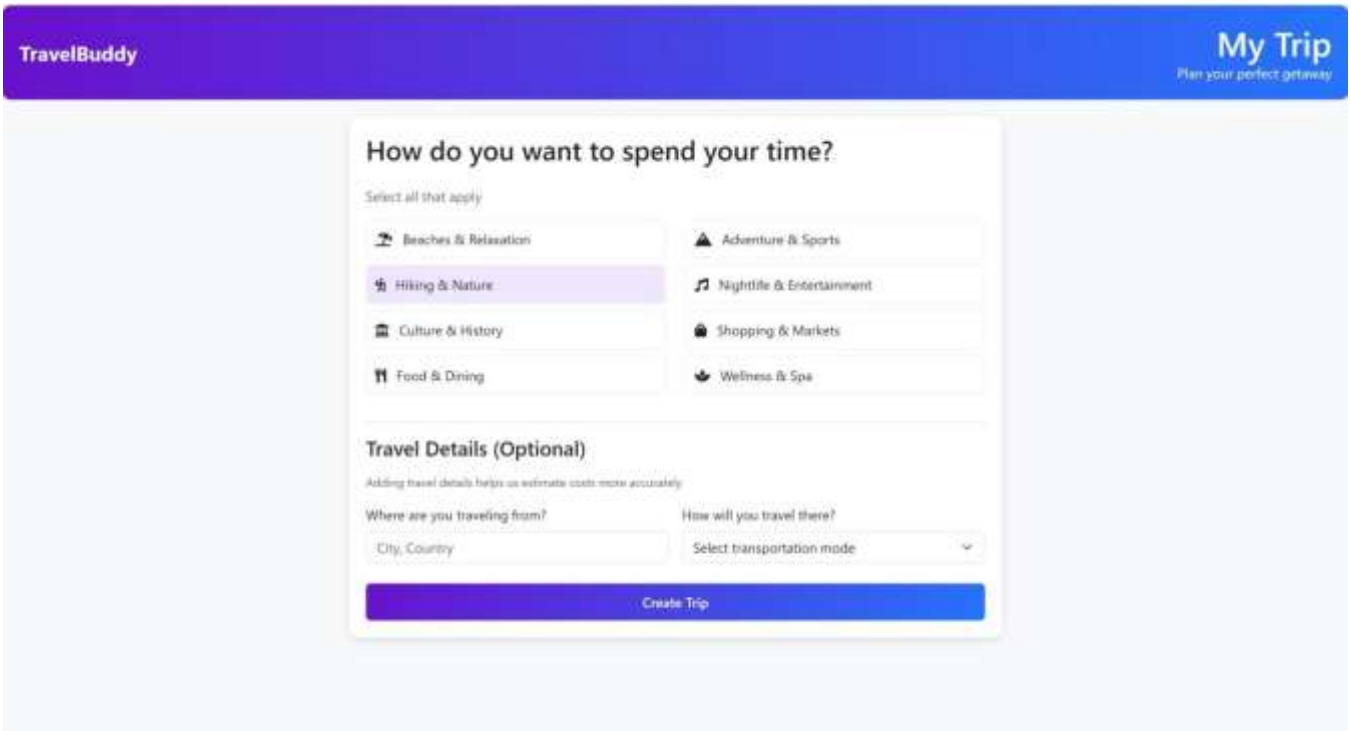
A. User Authentication and Profile Management

The authentication module allows users to register, log in, and manage their profiles securely. User profiles store personal information, travel preferences, preferred language, budget range, and profile pictures. Registered users can access their trip history and saved itineraries through the personalized dashboard.



B. Trip Input and Preference Collection

The trip input module provides an interactive multi-step form that collects travel parameters from the user. Users specify their destination through a search interface, select travel dates using an integrated calendar, choose group type from options including Solo, Partner, Friends, and Family, and select travel mood preferences such as Adventure, Beaches and Relaxation, Culture and History, Food and Dining, or Wellness and Spa. Optional travel details including origin city and transportation mode further refine cost estimates.

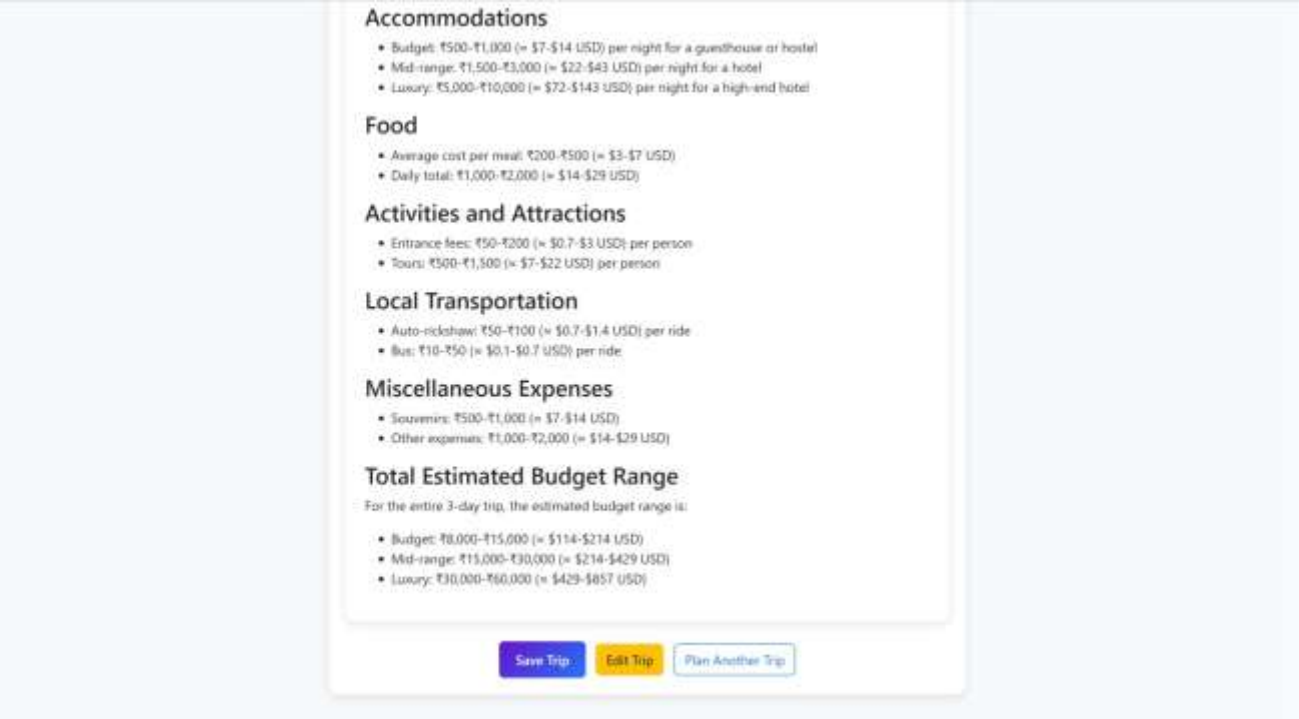


C. AI-Powered Itinerary Generation

The itinerary generation module processes collected user inputs and communicates with the Groq API to generate personalized, day-wise travel plans. The system constructs a structured prompt incorporating destination, duration, mood preferences, group type, and budget constraints. The Groq API returns comprehensive itinerary content including morning, afternoon, and evening activity schedules, specific attraction recommendations, dining suggestions, insider tips, and a detailed cost estimation breakdown covering accommodation, food, activities, transportation, and miscellaneous expenses.

D. Itinerary Customization

After initial itinerary generation, users can modify their trip plan through the customization module. Users can add new activities to specific time slots, remove suggested activities that do not match their preferences, adjust the sequence of planned visits, and update notes for individual itinerary items. Changes are saved back to the database and reflected immediately in the displayed itinerary.

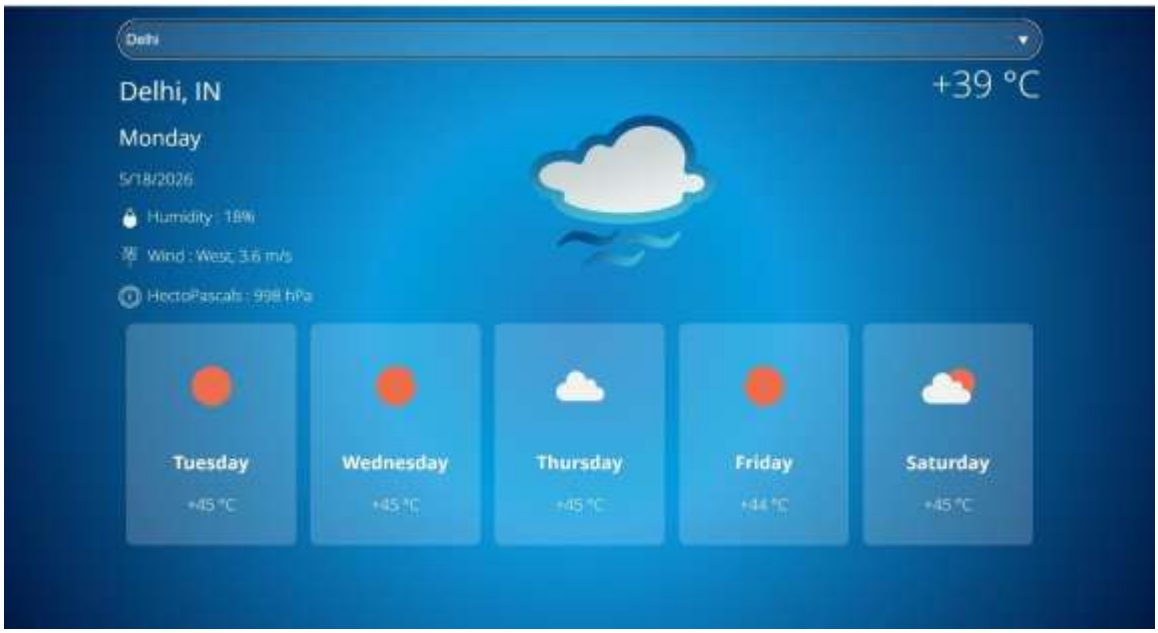


E. Hotel Booking Assistance

The hotel booking module presents accommodation options relevant to the user's destination and budget range. Users can view hotel details including name, room type, price per night, check-in and check-out dates, and booking status. Booking selections are stored in the database and linked to the corresponding trip record for consolidated trip management.

F. Weather Integration

The platform includes a weather information feature accessible from the home page. Users can enter a destination city to retrieve current weather conditions before finalizing their travel plans. Weather data helps users make informed decisions about packing, activity planning, and travel timing.



Map View and Timeline Visualization

The map and timeline module provides visual representations of the generated itinerary. Users can view their planned activities on an interactive map showing recommended locations and routes. A timeline view displays daily activities in a chronological format to help users understand the overall structure and pacing of their trip.

G. Saved Trips and Trip History

Registered users can save generated itineraries to their profile for future reference. The saved trips module displays all previously planned trips with key details including destination, travel dates, group type, and estimated budget. Users can revisit, modify, or use saved trips as templates for planning future travel.

VII. DEVELOPMENT METHODOLOGY

Travel Buddy was developed using the Agile Software Development methodology with Scrum as the process framework. Agile methodology was selected because it supports iterative development, continuous stakeholder feedback, and flexible adaptation to changing requirements during implementation.

A. Requirement Analysis

The first phase involved studying travel planning workflows and identifying the limitations of existing travel platforms. Requirements were gathered through analysis of platforms including TripAdvisor, Google Travel, and Booking.com, study of Groq API capabilities, and discussions with potential users including students and travellers. Functional and non-functional requirements were documented and prioritized into a product backlog.

B. System Design

During the design phase, the database schema was defined using SQLite with entities for User, Trip, Itinerary, and Hotel Booking. System architecture was planned to separate frontend, backend, and API integration concerns. Frontend wireframes were designed for all major screens including home, registration, trip input, itinerary display, customization, hotel booking, and profile management.

C. Implementation Phases

The implementation was organized into incremental sprints. Sprint 1 covered project setup, authentication system, and basic UI structure. Sprint 2 addressed user profile management and preference storage. Sprint 3 implemented Groq API integration and basic itinerary generation. Sprint 4 added mood-based and group-type personalization logic. Sprint 5 delivered trip visualization including map view and timeline. Sprint 6 implemented hotel booking and weather integration. Sprint 7 and 8 focused on unit testing, integration testing, bug fixing, and responsive design optimization. Sprints 9 and 10 covered documentation, final testing, and deployment.

D. Testing

Testing was performed at multiple levels during development. Unit testing validated individual Django views and API integration functions. Integration testing verified correct communication between the frontend, Django backend, and Groq API. User acceptance testing evaluated the platform using realistic trip planning scenarios with different destinations, group types, and mood preferences. Testing confirmed that itinerary generation, customization, and data storage functions performed as expected.

E. Deployment

The application was deployed using a cloud-based hosting environment with the Django application served through a production-grade web server. The SQLite database is suitable for development and small-scale deployment, with a migration path to PostgreSQL available for larger production environments.

VIII. TECHNOLOGY STACK

Travel Buddy was developed using widely adopted, open-source web technologies that support scalability, security, and rapid development. The complete technology stack is presented in Table I.

TABLE I. Technology Stack

Technology	Purpose
Python 3.x	Core Backend Language
Django Framework	Web Application Backend
Django REST Framework	RESTful API Development
HTML5 & CSS3	Page Structure and Styling
Bootstrap	Responsive UI Design
JavaScript & jQuery	Frontend Interactivity
SQLite	Lightweight Database Management
Groq API	AI-Powered Itinerary Generation
Git & GitHub	Version Control
Postman	API Testing and Debugging

Python and Django were selected for backend development due to Django's robust built-in features including ORM, authentication, and admin interface, which reduce development overhead. Bootstrap ensures a mobile-first responsive interface suitable for travellers accessing the platform on various devices. The Groq API was chosen for its high-speed LLM inference capability, enabling real-time itinerary generation within acceptable response times. SQLite provides a lightweight, zero-configuration database solution suitable for development and small-scale deployment.

IX. EXPERIMENTAL RESULTS AND ANALYSIS

The Travel Buddy platform was evaluated using multiple trip planning scenarios with varying destinations, durations, group types, and mood preferences. The system was compared with traditional manual trip planning methods and existing travel platforms to assess practical improvements in planning efficiency, personalization quality, and usability.

A. Itinerary Generation Performance

The primary objective of the system was to generate complete, personalized itineraries with minimal user effort. Traditional travel planning requires users to research multiple platforms and manually compile information over extended periods. Travel Buddy generates complete day-wise itineraries within seconds after user input submission. Results are summarized in Table II.

TABLE II. Itinerary Generation Performance Comparison

Operation	Traditional Method	Travel Buddy
Average Planning Time	2–4 Hours	Under 30 Seconds
Itinerary Completeness	Partial / Manual	Complete Day-Wise Plan
Personalization	Generic	AI-Driven (Mood + Group + Budget)
Budget Estimation	Manual / Approximate	Automated & Detailed
Customization	Requires New Research	Inline Edit & Save

B. Personalization Quality Analysis

The personalization module was tested by generating itineraries for the same destination with different mood preferences, group types, and budgets. Results confirmed that the system generates distinct itineraries reflecting the specified mood and group context. Solo adventure itineraries prioritized outdoor activities and local experiences, while family itineraries recommended family-friendly attractions and dining options. Couple itineraries included romantic dining and cultural experiences. Table III summarizes personalization test results.

TABLE III. Personalization Analysis Results

Feature	Existing Platforms	Travel Buddy
Mood-Based Customization	Not Available	Supported
Group-Type Adaptation	Limited	Fully Supported
Budget-Aware Recommendations	Manual	Automated
Day-Wise Activity Scheduling	Not Available	Supported
Dining Recommendations	Generic Lists	Contextual Suggestions

C. System Feature Comparison

Travel Buddy was compared against leading travel platforms including Google Travel and TripAdvisor across key functional dimensions. The comparison demonstrates that Travel Buddy addresses multiple limitations of existing platforms within a single integrated system.

TABLE IV. Comparative Feature Analysis

Feature	Google Travel	TripAdvisor	Travel Buddy
AI Itinerary Generation	Limited	Not Available	Fully Supported
Mood-Based Planning	Not Available	Not Available	Supported
Budget Estimation	Not Available	Not Available	Automated
Itinerary Customization	Basic	Manual	Interactive
Trip History Storage	Limited	Manual	Supported
Hotel Booking Integration	Via Third-Party	Via Third-Party	Integrated
Weather Integration	Available	Limited	Supported
Ease of Use	Moderate	Moderate	Simple, Intuitive

D. User Experience Evaluation

The platform was evaluated by users performing typical trip planning tasks including destination search, preference selection, itinerary generation, customization, and hotel booking. Users found the multi-step trip input flow intuitive and straightforward. The generated itineraries were assessed as comprehensive, well-structured, and contextually relevant to the specified preferences. The responsive design performed consistently across desktop and mobile test environments. Overall user feedback indicated that the platform significantly reduced planning effort compared to manual research methods.

X. ADVANTAGES OF THE PROPOSED SYSTEM

The Travel Buddy platform provides several practical and technical advantages for modern travellers.

- Reduced Planning Effort: AI-driven itinerary generation eliminates the need for manual research across multiple platforms, saving travellers significant time and effort.
- Personalized Recommendations: Mood-based and group-type customization ensures that generated itineraries reflect individual travel styles and preferences rather than generic suggestions.
- Comprehensive Day-Wise Plans: The system generates complete itineraries covering morning, afternoon, and evening activities, dining options, and accommodation suggestions within a single output.
- Automated Budget Estimation: Detailed cost breakdowns covering accommodation, food, activities, transportation, and miscellaneous expenses help travellers plan financially without manual calculation.
- Interactive Customization: Users can modify, add, or remove activities from generated plans without regenerating the entire itinerary, preserving planning flexibility.
- Integrated Trip Management: Trip history, hotel bookings, and saved itineraries are managed within a single platform, reducing reliance on multiple disconnected tools.
- Scalable Architecture: The Django-based architecture supports future integration of additional APIs such as flight booking, real-time weather, and currency conversion without major restructuring.
- Cost-Effective Deployment: The use of open-source technologies and the Groq API's accessible pricing model makes the platform viable for academic and small-scale commercial deployment.

XI. FUTURE SCOPE

Although Travel Buddy successfully delivers personalized AI-driven trip planning, several enhancements can be implemented in future versions to extend functionality and accessibility.

- Flight and Hotel API Integration: Connecting with services such as Skyscanner, Amadeus, or Booking.com APIs will enable real-time availability and pricing for flights and hotels within the platform.
- Mobile Application Development: Dedicated Android and iOS applications will improve accessibility for travellers who prefer mobile-first planning experiences.
- Real-Time Weather and Currency Conversion: Integration of live weather forecasts and currency conversion rates will provide additional practical value for international travellers.
- AI Chatbot for Travel Assistance: An integrated conversational AI chatbot will allow users to ask travel-related questions and receive instant recommendations within the platform.
- Multilingual Support: Supporting multiple languages will make the platform accessible to travellers from diverse linguistic backgrounds.
- Offline Mode: Allowing users to download generated itineraries for offline access will improve usability in areas with limited internet connectivity.
- AI-Powered Demand and Pricing Forecasting: Machine learning models trained on historical travel data can predict optimal travel periods, pricing trends, and destination popularity to assist planning decisions.
- Social and Collaborative Planning: Features for sharing itineraries and planning trips collaboratively with travel companions will enhance the group travel experience.
- Personalized Recommendation Memory: Storing user travel history and preferences to improve future recommendations through persistent personalization will increase long-term platform value.

XII. CONCLUSION

Travel Buddy is an AI-powered personalized trip planning and itinerary generation platform developed using Python, Django, and the Groq API to address the limitations of traditional and existing digital travel planning methods. The proposed system combines user preference collection, real-time AI itinerary generation, interactive customization, hotel booking assistance, weather integration, and trip history management within a single, user-friendly web application.

Experimental evaluation demonstrated that the platform generates comprehensive, personalized day-wise itineraries within seconds, significantly reducing planning effort compared to manual research. The mood-based and group-type personalization features produce contextually appropriate recommendations that improve travel planning quality and user satisfaction. The comparative analysis confirmed that Travel Buddy addresses multiple gaps present in existing platforms such as Google Travel and TripAdvisor by delivering a unified, AI-driven planning experience.

The platform also provides a strong architectural foundation for future enhancements including flight booking integration, mobile application development, multilingual support, and advanced AI features. Overall, Travel Buddy demonstrates how intelligent AI integration can transform travel planning into an efficient, personalized, and accessible experience for modern travellers.

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