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AI-Powered Personalised Travel Itinerary Planning Application (Karnataka)

Vinutha Prakash, Vanishree Arun, Jahnvi MR, Prithvi JP, Purvika S Bennur, Shree Harshini

Department of Information Science and Engineering, JSS SCIENCE AND TECHNOLOGY UNIVERSITY, Mysuru, India

Abstract: The use of AI for personalized travel planning augments its efficiency which is a remarkable advanced feature of smart tourism. Unlike previous planning methods, it enables both adaptive and fully independent support for users. Considering how contemporary societies place more value on individually curated travel experiences, traditional travel tools still seem to lack appropriate recommendations that are timely, relevant, and user-friendly. To address these issues, this paper presents an automated travel planning solution powered with ever-evolving artificial intelligence and machine learning technologies that adapt to the user's context and creates fully personalized itineraries. The system integrates various traveler profiles, including solo tourists, family groups with children, and adventure seekers, by blending user's moods, interests, travel budgets, and trip duration. Crucial aspects include user-definable real-time profiling with Adaptive Preference Classification (APC) and behavioral-driven activity and destination selection via the Multi-Constraint Itinerary Optimization Algorithm (MCIOA). With enhanced relevance and agility to improve system adaptability, real-time weather forecasts and local events updates can be integrated. Tests show that the adaptive system has greatly enhanced planning accuracy and user satisfaction and engagement. The system has potential for use by tourism offices, augmented and virtual reality previews, and sustainable development initiatives.

Index Terms: AI, Travel Itinerary, Personalization, Recommendation Systems, Mood Detection, Google Maps API, Adaptive Profiling

I. INTRODUCTION

A. General Introduction

The future AI-powered Dynamic Travel Planning System is a revolutionary solution that will revolutionize how humans explore the globe with hyper-personalized, smart, and frictionless travel experiences. At the center of this effort is a revolutionary AI engine that employs user information, real-time information, and contextual feeds to craft dynamic itineraries that are refined to the personality, interests, mood, and budget of the traveler. Unlike conventional travel applications, this system does not merely provide prelisted places to visit. Instead, it generates an holistic, dynamic travel experience that adjusts in real time as the visitor moves through a location. For instance, when a visitor selects travel dates and expresses interest in adventure sports and culture, the system will generate an automatically created day-by-day itinerary with relevant events, festivals, and experiences that are occurring when they visit. Via integrations such as the Google Maps API and local event databases, the system computes best routes, reduces transit time, and increases the entertainment quotient. It even considers user mood, energy level, and travel mode to personalize suggestions like beach holidays for unwinding or high-energy city tours for the action-seekers. The site provides automated budget suggestions, smart alerts for weather or transport updates, and digital guidebooks for real-time guidance. Additionally, the bookings for transportation, activities, accommodations, and flights are also embedded directly in the system, thus relieving the users of third-party applications. Targeted at individuals and businesses, the platform can help travel agencies streamline the procedure for making itineraries, help business enterprises plan business traveling efficiently, and help tourism boards sell off-the-beaten-path locations. With scalability in mind, the solution is designed to include modular architecture and APIs to allow third-party system integration. The project is essentially geared towards a smart, responsive, and integrated travel environment with personalized trips, optimized experience, and in effect reinventing how humans engage with the world around them.

B. About the Project

The concept of travel has been transformed over the past few years. It is not a question of traveling to new locations or checking off places from one's bucket list. For modern-day travelers, each trip provides an opportunity to know oneself, explore different cultures, and share experiences that reflect one's personality, mood, and aspirations. While social media, experiential travel, and digital personalization gained momentum, travelers' expectations have evolved too rapidly. They now desire experiences that are immersive, intuitive, and emotionally engaging.

But with the global ubiquity of digital travel tools, it is still frustratingly complex and disconnected to plan a trip. Travelers end up toggling across multiple accounts—book flights and hotels, discover activities, track spending, driven directions, and plan daily agendas. Fragmented tools are usually built for mass-one-size-fits-all use, providing standard itineraries that fail to reflect the user's personal preferences and desires. Planning holidays therefore becomes clunky, confusing, and lacking the spontaneity and personalization holidaymakers crave. While data and AI technologies have evolved wonderfully in other industries, the travel sector is still behind in tying all this together into one umbrella solution. This disconnect between traveler need and available tools is a quintessential market gap. Travelers increasingly need a common platform that understands the dynamic and emotional nature of travel—a platform that goes beyond logistics and serves as an actual companion during the journey. One that can realign in real time, recommend based on user activity and desire, and make each trip not just efficient but also deeply rewarding. As the world embraces personalization and smart experiences more and more, the travel business also needs to adapt in response, providing intelligent, connected solutions that align with the traveler's personality and goals.

II. LITERATURE REVIEW

Personalized travel recommender systems have gained considerable momentum with the rise of machine learning approaches. They are designed to offer users customized travel experiences by examining behavioral patterns, interest profiles, and contextual information. The subsequent literature describes contemporary research developments that dictate the architecture and design of smart itinerary planners, such as algorithms for user modeling, recommendation generation, and multimodal integration.

Badouch and Boutaounte [1], in their research entitled "Personalized Travel Recommendation Systems: A Study of Machine Learning Approaches in Tourism" (2023), discussed several machine learning methods used in the context of tourism, such as collaborative filtering, content-based filtering, and hybrid methods. Their research emphasizes data-driven personalization as a contribution to improving user satisfaction, providing a foundation for real-time adaptive systems based on user behavior and interests.

Zhong et al. [2] presented, via the article "A Personalized Recommendation Algorithm for Tourist Attractions Using User Behavior Data" (2024), a recommendation model based on behavioral tracking to personalize travel recommendations. Through edge computing and augmented reality, the platform amplifies contextual accuracy to match the expectations of today's experiences in being immersive and dynamic for tourists.

Shouxin Zhang [3], in "Automated Tourism Path Recommendation System Using Convolutional Neural Network based Bidirectional Long Short-Term Memory" (2024), introduced a deep learning model of CNN and BiLSTM for sequential path recommendation. The model solves problems of sentiment analysis in conventional tourism recommendation engines, thus enhancing semantic correspondence between user sentiment and destination recommendation.

Prabha et al. [4], in their research paper entitled "Personalized Travel Itinerary Generator System" (2024), integrated Restricted Boltzmann Machines (RBM) and Alternating Least Squares (ALS) to create optimized travel itineraries. The model stresses the importance of using hybrid algorithms to create personalized itineraries on the basis of both user choice and contextual information such as location and time.

Intissar et al. [5], "TourOptiGuide: A Hybrid and Personalized Tourism Recommendation System" (2024), centered on recommendation methods based on travel behavior, especially for coastal resorts in winter. The system brings out the importance of using smart advisory mechanisms that include the incorporation of booking histories and seasonal trends to offer more suitable recommendations in contemporary tourism platforms.

III. THEORETICAL BACKGROUND

A. Functional Requirements

The proposed system includes several key functional modules to ensure a smooth travel planning experience. User Account Management allows users to register, login, and manage their profiles using SSMS (SQL) authentication, with administrators capable of updating user details. The Generate Itinerary module enables users to input travel preferences, which are categorized using sentiment analysis to detect mood, followed by the application of a distance optimization algorithm for efficient route planning. In the Place Recommendation feature, users have the flexibility to add or remove locations after the itinerary is generated; the system dynamically updates the plan based on new preferences. The Map Plotter integrates Google Places API to retrieve geographic coordinates and display routes visually. The Storage Module organizes itineraries into Ongoing, Upcoming, and Past categories, using SSMS (SQL) for persistent data storage.

B. Non-Functional Requirements

The system is designed to meet several non-functional criteria essential for usability and performance. Scalability ensures support for a growing number of users without degradation in performance. Security is addressed through safe user authentication and protection of personal data. The system also emphasizes high performance with rapid itinerary generation and a responsive interface. Finally, a user-friendly UI makes the application intuitive and accessible, enabling users to plan trips with minimal learning curve.

C. Tools and Technologies

The development environment includes a robust set of tools and frameworks. Visual Studio Code serves as the primary code editor, offering a cross-platform, lightweight, yet powerful solution for writing, debugging, and version-controlling code. React JS is utilized to build dynamic and responsive front-end user interfaces, benefiting from its component-based architecture and efficient virtual DOM rendering. ASP.NET MVC (Model-View-Controller) in C# structures the application into logical layers—Model for data tables, View for UI, and Controller for APIs—allowing scalable and maintainable code. Together, these tools provide a strong foundation for building a modern, intelligent, and interactive web-based travel planning application.

IV. SYSTEM REQUIREMENTS AND ANALYSIS

AI-based Travel Itinerary Generator aims to offer personalized travel planning based on user mood, user inclination, and real-time data. This section describes the analysis of the system, functional, and non-functional requirements and the hardware and software infrastructure needed to allow easy development and deployment.

- 1) Presentation Layer: Interface for user interaction.
- 2) Business Logic Layer: Handles user input, preferences, and generates itineraries.
- 3) Data Layer: Holds user profiles, travel information, and history in structured databases.

A. Functional Requirements

- User Profile Management and Authentication: Registration, login, and profile updates.
- Dynamic Itinerary Generation: Creates day-to-day schedules from chosen mood, interests, location, and duration using AI algorithms.
- Mood-Based Recommendations: Suggests activities based on sentiment analysis of user mood.
- Map Integration: Google Maps API is used to map destinations and routes.
- Event and Activity Suggestions: Integrates local events in real-time based on availability, location, and user interests.
- Feedback System: Enables users to rate and comment on generated itineraries for continuous enhancement.
- Trip Categorization: Trips are stored as Past, Upcoming, or Ongoing in the database.

B. Non-Functional Requirements

- Scalability: Supports increasing numbers of simultaneous users without degrading performance.
- Performance: Itinerary creation and feedback processing occur within 2–3 seconds.
- Reliability: Provides 24/7 access to planning tools with high availability.
- Security: Secure processing of user data with proper authentication and authorization protocols.
- User Experience: Responsive, clutter-free UI developed using ReactJS for cross-device support.

C. Hardware Requirements

The system is designed to run efficiently on mid-to-high range hardware. The minimum recommended hardware specifications are:

- RAM: At least 8 GB of memory to handle processing without lag.
- Processor: Intel i5 or higher with a clock speed of at least 2.4GHz.
- Storage: 40 GB or more of available disk space to store application data and user information.
- Graphics: Integrated or dedicated GPU (optional) for improved rendering and responsiveness.

D. Software Requirements

To support the development and deployment of the AI-based travel itinerary generator, the following software components are required:

- Operating System: Windows (preferably the latest version for compatibility and security).
- Front-End Framework: ReactJS for building interactive user interfaces.
- Back-End Framework: ASP.NET MVC using C# for server-side logic and API handling.
- Database: SQL Server (SSMS) for storing user profiles, itineraries, and feedback.
- IDE: Visual Studio Code for code development and debugging.
- APIs: Google Maps API and custom REST APIs for real-time data integration and location services.

E. Tools and Technologies

- Visual Studio Code: Primary development environment.
- ReactJS: Used for building dynamic and modular UI components.
- ASP.NET MVC (C#): Server-side logic and routing.
- SQL Server: Structured storage for user and itinerary data.
- Google Maps API: Provides mapping and route optimization.

V. SYSTEM DESIGN

A. Architectural Overview

The AI-powered travel itinerary system employs a modular, multi-stage process combining user preference modeling, mood classification, destination filtering, and route optimization. Users choose between an AI-guided MCQ interface or keyword search. In the AI path, structured inputs on travel intent and mood feed a rule-based classifier to profile users psychologically, guiding destination filtering. Destinations are clustered spatially and thematically, with a recommendation engine (using collaborative and content-based filtering) suggesting optimal spots. Users can refine preferences or manually select destinations. Once confirmed, the system sets the route endpoints and uses Google Maps API for optimal routing, travel time estimation, and feasibility checks. The itinerary is then organized day-wise and stored in a MySQL database. A feedback loop collects user evaluations to update recommendation models via reinforcement or collaborative learning. Positive feedback improves future suggestions, while negative feedback triggers iterative refinement with the user. This architecture blends adaptive intelligence, human feedback, and hybrid decision-making to deliver personalized and robust travel plans.

B. Workflow Design

The flow diagram illustrates the sequential workflow of the AI-powered travel itinerary platform. It begins with the Frontend UI built using ReactJS, where users input mood, destination, and travel dates. This data flows into the Input Processing Module and Mood Prediction Model, which leverages a pre-trained ML model (OpenAI or custom) to classify mood. Based on this, the Itinerary Generation Engine (ASP.NET MVC backend) creates a day-wise plan, while the Event Recommendation Engine integrates live events using external APIs like Google Maps API. Finally, the itinerary is formatted, stored in a SQL Server database, and rendered for user interaction.

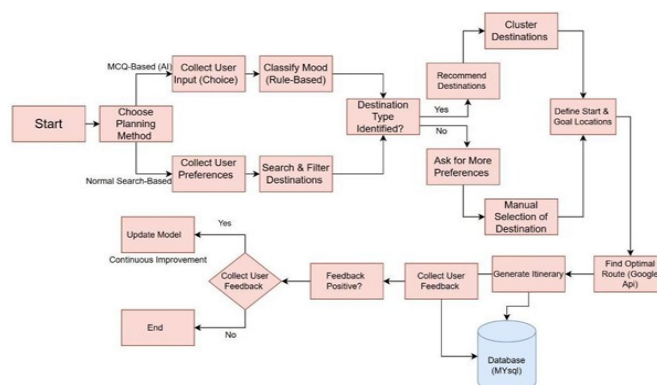


Fig.1. Architectural Diagram Illustrating the Modular Workflow for AI-Powered Personalized Travel Itinerary Generation

C. Output Compilation

The AI-powered travel itinerary generation system adopts a modular, multi-stage architecture that transforms user inputs into personalized travel plans. Users begin by selecting a planning mode, either an AI-guided MCQ-based interface or a keyword-driven search. In the AI-driven flow, structured inputs like travel intent, preferences, and emotional tone are collected and processed through a rule-based mood classifier to form a psychological user profile. This profile aids in filtering destination types aligned with user mood and context.

Relevant destinations are then clustered using spatial and thematic attributes, followed by recommendation via collaborative and content-based filtering. Users can refine suggestions or manually select locations. Upon confirmation, the system determines the route using the Google Maps API, optimizing for time, constraints, and feasibility. A day-wise itinerary is generated and stored in a MySQL database. A feedback module continuously improves the system by updating recommendation logic based on user ratings, using reinforcement or collaborative learning. The architecture reflects adaptive intelligence and iterative refinement, ensuring both personalization and robustness in the travel planning process.

VI. SYSTEM IMPLEMENTATION

The implementation of the AI-powered Travel Itinerary Generator follows a modular and service-oriented architecture, enabling flexibility, scalability, and maintainability. The system is developed using a combination of web technologies, machine learning models, and geospatial APIs to deliver context-aware and mood-driven travel recommendations. The backend is powered by ASP.NET MVC with C#, orchestrating data flow and business logic, while the frontend is built using ReactJS to provide a responsive and interactive user interface.

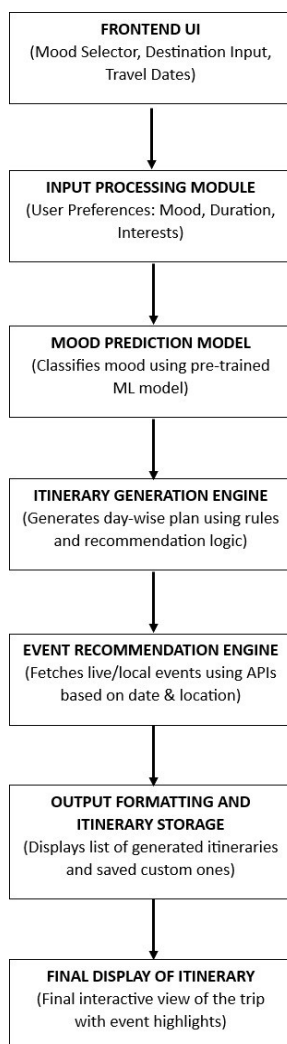


Fig.2. Flow Diagram Depicting the Transformation of User Input into Personalized Itinerary Results

A. Frontend Layer

The user interface is developed using ReactJS with Material UI components, allowing for dynamic and form-based input collection. Users interact through a guided panel to input preferences such as destination, travel dates, duration, mood, interest categories, and travel type (e.g., solo, family, or friends). Mood selection is captured either directly via form elements or inferred from pre-defined questions. Asynchronous requests are sent to the backend via REST APIs to trigger mood classification and itinerary generation. The frontend also handles rendering of maps, day-wise plans, and live event previews using embedded Google Maps and event APIs.

B. Backend Layer and APIs

The backend, implemented in ASP.NET MVC (C#), is responsible for orchestrating all server-side logic, managing user sessions, and invoking AI models and route optimizers. Upon receiving user input, the backend triggers a mood classification module, implemented using a pre-trained machine learning model or rule-based inference engine. The mood output is passed to the preference matching engine, which filters and clusters destinations from the internal tourism database using feature matching and distance metrics.

Once the destination pool is finalized, the itinerary generation engine dynamically composes a time-optimized, day-wise travel plan. This involves integrating third-party APIs such as the Google Maps API for route optimization and event discovery APIs for real-time activity suggestions. All intermediate and final outputs are logged and stored in a SQL Server database for continuity and future recommendations.

C. Mood Prediction and Personalization

Mood prediction is a core component of the personalization logic. Based on user responses or selection, the system applies either a rule-based classification or invokes an ML classifier trained on labeled travel sentiment datasets. Identified mood states such as relaxed, adventurous, or spiritual guide the filtering and ranking of destinations and experiences.

Clustering of destinations is carried out using a K-Means-based location grouping algorithm, followed by collaborative filtering to personalize suggestions based on historical user behavior (if available). A hybrid recommender ensures a balance between context-aware filtering and user-specific preferences.

D. Itinerary and Map Rendering

For each selected destination, the system calculates the optimal route using the Google Maps Directions API. The results include estimated travel time, transit details, and place metadata. The itinerary is structured into morning, afternoon, and evening slots, ensuring a logical progression of activities per day. The entire schedule is rendered interactively on the frontend with options for user customization and download.

The database (SQL Server) maintains a structured schema for users, preferences, generated itineraries, and feedback logs, enabling both historical reference and personalization in future sessions.

E. Feedback Loop and Continuous Improvement

After each itinerary is generated and reviewed, the system prompts users for feedback. This feedback is evaluated to determine satisfaction. Positive feedback updates the model's recommendation weights, while negative feedback triggers additional preference elicitation. Over time, the system applies collaborative filtering and weighted scoring to improve result quality, forming a loop of continuous learning and adaptation.

VII. CONCLUSION

The proposed AI-powered travel itinerary generator marks a significant advancement in intelligent travel planning by combining user-centric design with adaptive machine learning techniques. Unlike conventional itinerary tools that offer static suggestions, this system personalizes travel plans by interpreting user mood, preferences, and contextual factors through a combination of mood classification, clustering, and route optimization.

Built upon a modular architecture that integrates a ReactJS frontend, an ASP.NET MVC backend, and APIs such as Google Maps, the platform delivers seamless end-to-end functionality, from mood inference and preference filtering to route planning and real-time feedback integration. The use of a structured SQL Server backend and RESTful APIs ensures data consistency, scalability, and extensibility.

Beyond technical robustness, the system illustrates the transformative role of AI in enhancing user experience, offering personalized, adaptive, and emotionally aligned itineraries. Its potential extends to various domains such as tourism management, travel personalization engines, and smart city experiences, offering value to both end-users and service providers.

While the current implementation operates in a cloud-hosted environment with support for basic mood classification and English-language input, future enhancements aim to include multilingual interfaces, dynamic re-planning, edge deployment for offline usability, and integration of generative models for richer recommendation outputs. These developments will position the system as a next-generation travel companion capable of delivering context-aware, responsive, and intelligent itineraries for diverse user needs.

In conclusion, this platform demonstrates how modular architecture, AI models, and real-time data can converge to redefine the landscape of personalized travel planning, setting a strong foundation for future research in affective computing, adaptive routing, and experiential travel design.

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