

AI-Driven Platform for Safe and Sustainable Travel Planning

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Abstract— Modern travelers navigate a fragmented ecosystem of disconnected tools for booking, navigation, accommodation, and emergency support — increasing cognitive load and safety risks. To address this, we develop SMART-ROUTE, a unified mobile application consolidating the entire travel workflow in one interface. Users input a source, destination, trip duration, budget, group size, and travel category (Solo, Couple, Friends, or Family). The platform generates a structured day-wise itinerary with hotel suggestions, transport options, flight data, local attractions, AI-generated guidance, and sustainability insights. An embedded map renders the route, delegating navigation to Google Maps. One-tap emergency shortcuts connect travelers to hospitals, police, fuel stations, and mechanics, while a context-aware AI assistant supports the journey throughout. Authenticated users can persistently store and retrieve trips via MongoDB Atlas. The client is built on React Native with Expo; the server uses Node.js and Express.js with JWT authentication and Mongoose for data management. The platform advances SDG 11 by promoting sustainable and responsible tourism. This work presents a functional prototype; performance benchmarking and large-scale user studies remain as future work.

I. INTRODUCTION

Organizing a trip — even a brief one — demands navigating a fragmented digital landscape. Travelers independently consult separate tools for route planning, hotel bookings, transport comparison, attraction discovery, and budget tracking, then manually reconcile the results into a coherent plan. This disconnection amplifies decision fatigue, inflates planning time, and increases the likelihood of poor trade-offs, particularly when budget, trip duration, and traveler preferences must all be balanced simultaneously. The problem deepens when unexpected situations arise; emergency needs such as medical help, vehicle breakdowns, or police assistance are rarely anticipated within conventional planning tools and are typically searched for only after an incident occurs.

Prior research has explored isolated aspects of this challenge. AI-driven recommendation engines have improved personalization in tourism contexts [1], intelligent guide systems have enhanced in-destination experiences [2], and generative AI has been combined with personality profiling to tailor travel suggestions [4]. Integrated platforms addressing itinerary planning and group budgeting have also been proposed [5]. However, none of these works unifies itinerary generation, real-time navigation, multi-

modal transport, accommodation, emergency access, and an AI travel assistant within a single deployable system. Furthermore, travel planning carries a sustainability dimension: thoughtful route and transport recommendations can support SDG 11 (Sustainable Cities and Communities) by reducing redundant movement and promoting responsible tourism behavior.

To bridge these gaps, this paper introduces SMART-ROUTE — a mobile travel-planning application that consolidates trip discovery, itinerary generation, service aggregation, emergency support, and AI assistance into one cohesive workflow. Given a source, destination, duration, budget, group size, and travel category, the platform generates a personalized day-wise itinerary alongside hotel options, transport recommendations, flight data, local attractions, route visualization, and sustainability insights. Emergency one-tap shortcuts and a context-aware AI assistant are embedded within the same interface. The system is built on React Native (Expo) for the client, Node.js/Express.js for the backend, and MongoDB Atlas for persistent, user-specific trip storage secured via JWT authentication. The core contribution is not the novelty of any individual service, but their functional integration at prototype level within a single, end-to-end implemented system.

II. LITERATURE SURVEY

Tourism recommendation systems have been a primary focus of recent AI-driven research. Karras et al. [1] investigate prediction models that improve the accuracy of tourist attraction recommendations, demonstrating measurable gains in suggestion relevance. However, their scope is confined to the recommendation layer; budget allocation, day-wise scheduling, and route handling fall entirely outside their framework. Similarly, Wang et al. [2] examine AI tour-guide services through a lifelong machine learning perspective, proposing intelligent guidance mechanisms for in-destination experiences. While the work charts a forward-looking direction for adaptive tourism AI, it addresses neither end-to-end trip automation nor integrated budgeting — both of which are central to the SMART-ROUTE workflow.

The role of generative AI in personalizing travel has also attracted attention. Aribas and Daglarli [4] combine large language model capabilities with personality profiling to

tailor destination and activity recommendations to individual traveler traits. Their approach advances personalization considerably; however, the system remains recommendation-centric and does not extend to route visualization, transport aggregation, or emergency support. Manoharan et al. [3] take a broader perspective in a book-chapter exploration of how artificial intelligence reshapes the overall tourism experience, illustrating AI's potential to elevate traveler engagement. Nevertheless, the work remains conceptual with respect to real-time navigation and crisis-response integration, areas where a practical mobile system must deliver concrete functionality.

The most closely related effort is that of Srikanthan et al. [5], who propose an AI-driven smart tourism platform that unifies group recommendation, itinerary construction, and budget management. This work represents the most comprehensive integration found in the reviewed literature. Yet, as acknowledged within the work itself, real-time navigation, live weather updates, and emergency service access are not incorporated into the planning pipeline. This gap — the absence of a single deployable system that pairs intelligent itinerary generation with navigation hand-off, emergency shortcuts, and a context-aware AI assistant — defines the primary motivation for SMART-ROUTE.

Across the reviewed works, a consistent pattern emerges: prior systems optimize one or two aspects of the travel planning problem — personalization, recommendation accuracy, or platform integration — without delivering a unified, end-to-end mobile experience. SMART-ROUTE addresses this integration gap by combining itinerary generation, multi-modal transport and accommodation data, route visualization, one-tap emergency access, and a trip-aware AI assistant within a single implemented application. The contribution is positioned at prototype scale and does not claim quantitative superiority over the referenced systems; rather, it targets the functional completeness that the reviewed literature collectively leaves unaddressed.

III. EXISTING SYSTEM

The conventional approach to travel planning relies on a collection of independent, unconnected digital tools rather than a unified platform. A traveler begins by manually searching for destinations across general-purpose web browsers or travel blogs, then separately consults mapping applications for route estimation. Accommodation is booked through dedicated hotel platforms, while transport arrangements — including buses, trains, or cabs — require additional application switches. Flight bookings are handled through separate airline or aggregator portals. Once individual services are confirmed, the traveler manually

assembles an itinerary using notes or spreadsheets, with no automated coordination between budget, duration, and activity feasibility. Attraction discovery depends on review platforms such as Google Maps or TripAdvisor, again consulted independently. Crucially, emergency assistance — whether medical, mechanical, or security-related — is not embedded in any planning tool and must be searched for reactively during the journey. This fragmented workflow increases cognitive load, wastes planning time, and leaves travelers without integrated support when unexpected situations arise.

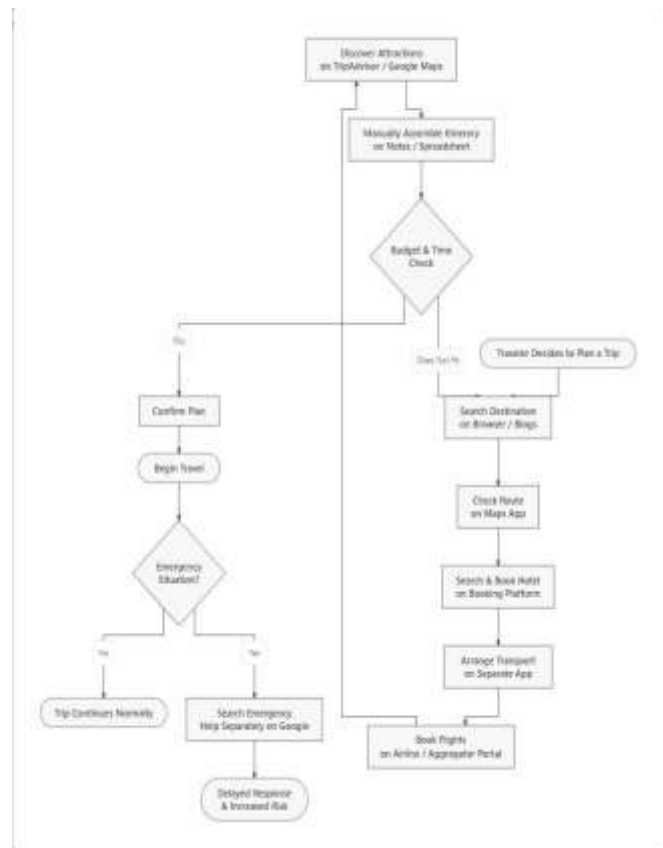


Fig. 1. Flowchart of the Existing Travel Planning System

IV. PROPOSED SYSTEM

The proposed system consolidates intelligent itinerary generation, travel service aggregation, route visualization, emergency support, and AI assistance into a single mobile application. The system architecture follows a clear and structured flow, enabling personalized trip planning and real-time travel support within a unified interface.

The flow is as follows:

1. The user provides trip inputs — source, destination, trip duration, budget, number of travelers, and travel type

(Solo, Couple, Friends, or Family) — through the React Native mobile interface.

2. The client transmits the input data to the Node.js/Express.js backend via secured REST API endpoints, authenticated using JSON Web Token (JWT) to ensure user-specific access control.
3. The backend processes the received inputs and invokes the generative AI module, which synthesizes a structured, day-wise itinerary enriched with hotel suggestions, transport options, flight data, local attractions, an agentic recommendation, and sustainability insights.
4. The decision layer selects and ranks transport modes based on budget suitability and trip type, and surfaces a primary transport recommendation alongside alternative options for the user.
5. The response is delivered to the mobile client, where a map view renders the origin-to-destination route. Turn-by-turn navigation is delegated to the device's native Google Maps application upon user request.
6. Throughout the journey, one-tap emergency shortcuts provide direct access to nearby hospitals, police stations, fuel stations, and mechanics. A context-aware AI travel assistant, aware of the active trip, remains available within the same interface. Authenticated users may save the complete generated plan to MongoDB Atlas and retrieve multiple saved trips at any time.

V. METHODOLOGY

This study presents SMART-ROUTE, a unified mobile travel-planning platform that integrates generative AI-driven itinerary generation, multi-modal travel services, emergency support, and an AI travel assistant into a single deployable application. The methodology combines structured user input collection, intelligent content generation, REST API communication, and cloud-based data persistence. It builds on existing research while addressing their limitations in delivering a fully integrated, end-to-end travel planning experience.

1. System Overview:

The proposed system follows a structured pipeline that includes user input collection, backend processing, AI-based itinerary generation, service aggregation, route visualization, emergency access, and trip persistence. User inputs are securely transmitted to the backend, where generative AI synthesizes a personalized travel plan. The resulting itinerary alongside travel services and route data is returned to the mobile client. The system operates within a continuous

request-response cycle, allowing it to adapt generated content based on user-defined trip parameters in real time.

2. Data Collection and Input Processing:

Trip parameters are collected from the user through a structured input form on the React Native mobile interface. These inputs include:

- Source and destination locations
- Trip duration (number of days)
- Available budget and number of travelers
- Travel type: Solo, Couple, Friends, or Family

The backend validates and preprocesses these inputs before forwarding them to the generative AI module. JWT authentication ensures all requests are linked to verified user accounts, maintaining data integrity and access control throughout the session.

3. Feature Extraction:

Based on the processed inputs, relevant planning features are extracted to represent the trip context effectively:

- Itinerary features: Day-wise activity schedule tailored to trip duration and travel type
- Service features: Hotel options, transport modes, flight information, and local attractions
- Advisory features: Agentic recommendation, sustainability insights, and budget breakdown

These extracted features collectively enable the system to generate a complete, contextually relevant, and personalized travel plan within a single unified response.

4. Model Development:

To achieve reliable and personalized output, a layered hybrid approach is adopted:

- Generative AI Techniques: Used for itinerary synthesis, agentic recommendation, and sustainability guidance based on user-defined trip constraints and travel type patterns.
- Service Aggregation Methods: Multi-modal transport ranking and budget-aware filtering are applied to surface the most suitable accommodation, transport, and attraction options.
- Persistence-Based Personalization: MongoDB Atlas with Mongoose stores complete trip documents per user, enabling retrieval and comparison of multiple saved plans.

The system dynamically adapts generated content based on travel type and available budget to improve personalization and practical relevance across varied trip scenarios.

5. Control and Feedback Module:

The delivery module presents all generated content within the React Native mobile interface. Based on the itinerary data and destination inputs:

- A map view renders the origin-to-destination route, with navigation delegated to the device's native Google Maps application upon user request.
- Emergency shortcuts provide one-tap access to hospitals, police stations, fuel stations, and roadside mechanics, embedded directly within the trip dashboard.
- A trip-aware AI travel assistant remains available throughout the journey, responding to contextual queries relevant to the active trip plan.
- User feedback on saved trips closes the loop, supporting future refinement and personalization of generated recommendations.

VI. SYSTEM IMPLEMENTATION

the layered architecture adopted for the SMART-ROUTE system. The end-to-end data flow follows the sequence: User → Mobile App → Backend Server → AI & Travel Services → Database.

Mobile Application Layer. The client-side interface is developed using React Native with Expo and Expo Router. It exposes seven primary screens: user registration and login, travel detail entry, itinerary display, routes and services overview, an AI travel assistant, emergency support shortcuts, and profile management. All outbound requests from the client are transmitted to the backend over HTTP using structured REST API calls.

Backend Layer. A Node.js and Express.js server governs authentication, request handling, trip planning logic, route processing, service orchestration, and response delivery. The server operates on port 5000 and exposes a /health endpoint that reports the application name, database connection status, and version number. At the time of writing, the health endpoint returned the server as running, MongoDB as connected, and version as 5.0.0.

AI and Travel Services Layer. This layer encompasses five service categories: AI-driven itinerary generation, route optimization, travel recommendations covering transport, hotels, and attractions, a context-aware AI travel assistant, and weather and location services. The architecture diagram in Fig. 2 depicts all five categories; Table II explicitly identifies which among these are implemented versus proposed.

Database Layer. MongoDB Atlas, accessed via Mongoose, persists all application data. A SavedTrip document stores the

fields: userId, source, destination, days, budget, travelers, travelType, plan, createdAt, and updatedAt. This schema supports retrieval and management of multiple saved trips per authenticated user.

Authentication Flow. Upon successful login, the server generates a JSON Web Token (JWT) that the client stores in AsyncStorage and attaches to all subsequent protected requests, including saved-trip operations. Trip data is therefore strictly scoped to the authenticated user, preventing cross-user data exposure.

Client-Side Data Handoff. The complete /plan API response payload is substantially large. Passing this payload directly as a navigation parameter introduced instability. This was resolved by writing the full plan object to AsyncStorage under the key currentGeneratedTrip and navigating between screens using only lightweight parameters — source, destination, days, budget, travelers, and travelType. The trip dashboard then reads the complete plan from AsyncStorage at render time.

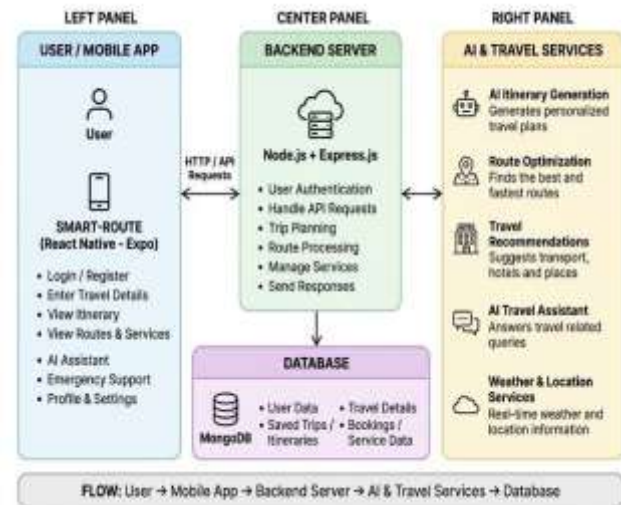


Fig. 2. System Architecture of SMART-ROUTE

VII. IMPLEMENTATION

SMART-ROUTE is implemented as a cross-platform mobile application using React Native with Expo and Expo Router on the client side, and Node.js with Express.js on the server side, with all data persisted in MongoDB Atlas via Mongoose. The frontend organizes screens through a file-based routing structure provided by Expo Router, covering user registration, login, travel detail entry, itinerary display, map view, emergency shortcuts, AI assistant, saved trips, and profile management. Trip inputs — source, destination, duration, budget, group size, and travel type — are collected through a structured form and transmitted to the backend via HTTP POST requests. The backend processes these inputs,

invokes the generative AI module to synthesize a day-wise itinerary enriched with hotel options, transport recommendations, flight data, local attractions, agentic guidance, and sustainability insights, and returns the complete plan as a structured JSON response. To handle the large response payload, the full plan object is written to AsyncStorage under the key `currentGeneratedTrip`, and the dashboard screen retrieves it at render time rather than passing it as a navigation parameter. JWT-based authentication secures all protected endpoints, with tokens stored in AsyncStorage on the client and validated through middleware on the server. Authenticated users can save generated trips to MongoDB and retrieve them from a dedicated saved-trips screen. Emergency shortcuts are embedded as one-tap buttons within the trip dashboard, and the map view delegates turn-by-turn navigation to the device's native Google Maps application via a deep-link handoff.

VIII. RESULTS AND DISCUSSION

The functional evaluation of SMART-ROUTE confirms that all core implemented features operate as intended within the prototype. Upon submitting trip inputs — source, destination, duration, budget, group size, and travel type — the system successfully generates a structured, day-wise itinerary enriched with hotel recommendations, ranked transport options, flight information, local attraction suggestions, an agentic recommendation, and sustainability insights, all returned within a single unified response. Fig. 3 illustrates the trip plan screen for a sample Hyderabad-to-Goa itinerary, demonstrating the day-wise schedule, recommended hotel card, transport options with pricing, agentic recommendation block, and sustainability tips rendered cohesively within the mobile interface. The transport ranking logic correctly surfaces the fastest, budget, and economy options based on input constraints, and the agentic recommendation provides contextually relevant travel guidance aligned with the selected travel type.

The emergency support module, shown in Fig. 4, provides one-tap access to four assistance categories — hospital, police, fuel station, and mechanic — each delegating a contextual Google Maps query upon tap. This feature addresses a gap identified in the related literature, where emergency access is absent from integrated planning tools. JWT-based authentication operates correctly across registration, login, and protected endpoints; saved trips are scoped to the authenticated user and persist across sessions in MongoDB Atlas. The client-side data handoff mechanism — writing the full plan to AsyncStorage under `currentGeneratedTrip` — resolves payload instability that arose when passing the large

response as a navigation parameter. The `/health` endpoint consistently reported server running, MongoDB connected, and version 5.0.0 throughout testing. It must be noted that this evaluation is entirely functional and prototype-level; no response-time benchmarks, user adoption metrics, or field studies were conducted, and these are identified as priorities for future work.

The map view correctly renders the origin-to-destination route and delegates turn-by-turn navigation to the device's native Google Maps application via a deep-link handoff, confirming that route visualization operates without requiring an in-app navigation engine. The saved-trips feature allows authenticated users to store multiple complete trip plans and retrieve them independently across sessions, with each document correctly associated to the corresponding user identifier in MongoDB Atlas. The AI travel assistant responds to contextual travel queries within the active trip session, providing relevant guidance without requiring the user to exit the planning interface. Across all tested input combinations — varying source-destination pairs, budget ranges, traveler counts, and travel types — the system produced structurally consistent and contextually appropriate responses, with no critical failures observed during functional testing.



Fig. 3. Trip Plan Screen — Day-wise itinerary, hotel, transport, agentic recommendation, and sustainability tips.



Fig. 4. Emergency Support Screen — One-tap access to hospital, police, fuel station, and mechanic assistance.



Fig. 5. (Left) Route Map View — Hyderabad to Goa route with Google Maps handoff. (Right) AI Travel Assistant — contextual chat interface within active trip session.

IX. CONCLUSION

This paper presents SMART-ROUTE, a unified mobile travel-planning platform designed to address the fragmentation that characterizes conventional trip preparation workflows. By consolidating itinerary generation, hotel and transport recommendations, flight information, attraction discovery, route visualization, emergency support, and an AI travel assistant within a single React Native application, the system delivers a cohesive end-to-end planning experience that existing tools — evaluated individually — do not provide. The backend, built on Node.js and Express.js with JWT authentication and MongoDB Atlas persistence, supports multi-trip storage scoped to authenticated users. Functional evaluation across varied input combinations confirms that all implemented features operate correctly at prototype scale.

The work explicitly distinguishes implemented functionality from proposed functionality and does not report performance benchmarks or user-adoption figures, as these were not within the scope of the current prototype. The integration gap identified in the literature — the absence of a deployable system combining intelligent itinerary generation with navigation, emergency access, and an AI assistant — is addressed here at prototype level. Future work will prioritize quantitative performance evaluation, large-scale user studies, real-time weather integration, live pricing APIs, and progressive expansion toward a production-ready deployment. SMART-ROUTE's alignment with SDG 11 through sustainability-oriented recommendations and consolidated travel planning represents an early step toward more responsible and informed tourism behaviour.

X. ACKNOWLEDGMENT

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