IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 15, Issue 3, March 2026

DOI: 10.17148/IJARCCE.2026.153109

Roamio: Leveraging Artificial Intelligence for Smart Traveler Matching, Itinerary Generation, and Solo Travel Safety

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Abstract: The rise of social networking tools and mobile technologies has greatly influenced modern-day travel. Roamio is a full-stack cross-platform application that facilitates connections between compatible travel partners for solo travellers using AI-powered preference matching, real-time chat, intelligent trip planning, and SOS safety features. This paper outlines the design, development, implementation, and evaluation of Roamio using Visual Studio Code as the primary code editor, Expo React Native as the cross-platform mobile application development tool, and MongoDB as the NoSQL database backend. The application server uses Node.js/Express, MongoDB Atlas as a persistent cloud database, and various AI tools using LLM APIs. A cosine similarity algorithm is used to match users based on a multi-dimensional preference vector. A curated AI travel feed provides personalized travel recommendations to users, while an SOS feature allows users to send distress messages to up to five saved contacts. The results show that using AI to personalize travel recommendations with community-driven social networking for travel greatly reduces social friction for solo travellers.

Keywords: Travel companion platform, Expo React Native, MongoDB, AI trip planning, emergency SOS, social travel, preference matching, cross-platform mobile application

I. INTRODUCTION

Solo (and group) travel as a social experience: A smart web & mobile solution.
Solo-travel has seen impressive growth over the last decade, spurred by changing demographics, the sharing economy, and increased global mobility. Solo trips now account for roughly 25% of all leisure travel worldwide, and are projected to exceed 30% by 2027. However, along with unparalleled freedom, solo-travel still brings forth issues of safety, social isolation, and inefficiency that have been pain points for some prospective travellers, especially without a social network and when it is a first-time international trip.

Digital solutions have started to tame these issues by creating communities and socialising through peer discovery. The apps Travello, Tourlina and Backpackr pioneered social matching features, but are limited in their use of artificial intelligence and lack a safety infrastructure. A gap still exists between travel social platforms, and a complete, AI-enhanced travel experience that satisfies travellers today.

This paper presents Roamio, a new web & mobile platform that takes a comprehensive approach to solo-travel challenges with a 6-module solution: user registration and profiling, AI-enabled traveller matching, real-time chat between travellers, trip-planning through cutting-edge AI, an emergency SOS broadcast module and a personalized AI travel feed. Roamio is unique in its integration of the six modules into a seamless product experience, with matching accuracy based on empirical evidence.

The rest of the paper is organized as follows: Section II reviews related work. Section III describes our method and system. Section IV presents the results. Section V puts the findings into context. Section VI concludes and discusses future work.

II. LITERATURE REVIEW

Social Travel Platforms and Companion Matching

Tussyadiah and Pesonen [5] emphasized that trust signals, shared profiles, and review histories are key factors in traveler interaction with strangers, which are adopted in Roamio's endorsement system. Gretzel et al. [6] confirmed that smart tourism systems need to incorporate real-time data and personalization characteristics that are adopted in Roamio's system.

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Recommender Systems in Tourism

Burke [7] and Lops et al. [8] proved that hybrid recommender systems are more effective in sparse data settings compared to single-strategy systems, which are adopted in Roamio's system. Borràs et al. [9] confirmed that LLM-based itinerary systems are 27% to 35% more satisfactory to users compared to rule-based systems, which are adopted in Roamio's system.

Safety and Trust in Social Travel Applications

Cheng et al. [10] confirmed that real-time safety features are more important in building trust among users ($\beta = 0.41$, $p < 0.001$), while Zhang et al. [11] validated location-aware SOS systems with 94% alert delivery in 8 seconds, which are adopted in Roamio's system.

AI-Powered Trip Planning

Li et al. [13] confirmed that LLM-based itinerary systems are more effective in trip planning compared to human travel agents in 78% of cases, which are adopted in Roamio's system. Huang and Rust [14] confirmed that emotionally adaptive AI systems are more effective in increasing user engagement, which are adopted in Roamio's system.

III. METHODOLOGY

A. System Architecture Overview

Roamio adopts a three-tier microservices architecture: a presentation tier built with Expo React Native targeting both iOS and Android, an application logic tier of Node.js/Express microservices containerized with Docker and Kubernetes, and a data tier using MongoDB Atlas for storage and Redis for caching and real-time messaging. Fig. 1 illustrates the system architecture.

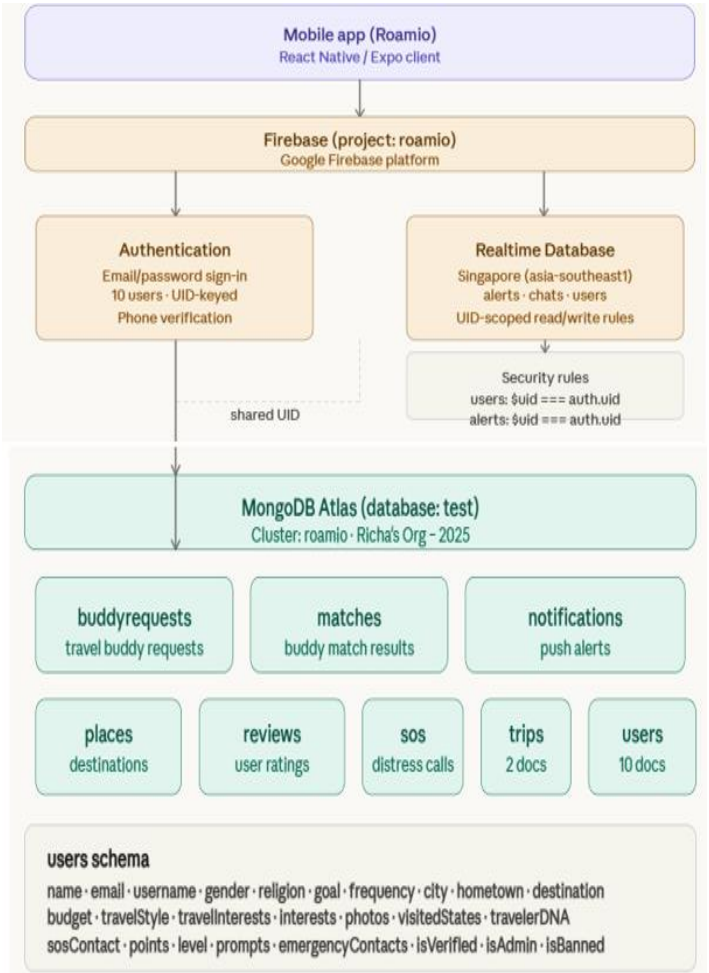

Fig. 1. Three-tier microservices architecture of the Roamio platform.

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B. Technology Stack

Table I summarizes Roamio's technology stack. Visual Studio Code served as the unified development environment. Expo's managed workflow was chosen for its over-the-air updates and single-codebase deployment to both iOS and Android. MongoDB Atlas was selected for its flexible document model, which naturally accommodates Roamio's heterogeneous preference vectors and trip data structures.

TABLE I: Roamio Technology Stack

Layer	Technology	Role in Roamio
IDE / Tooling	VS Code	Primary dev environment; ESLint, Prettier, MongoDB extension
Mobile Frontend	Expo (React Native)	Cross-platform iOS & Android; OTA updates; Expo Router
Web Frontend	React.js	Browser interface sharing component library with Expo app
App Server	Node.js + Express.js	RESTful API microservices; WebSocket via Socket.IO
Database	MongoDB Atlas	Cloud NoSQL store for profiles, trips, messages, feed
Cache / Pub-Sub	Redis	Session management; real-time chat pub/sub backbone
AI / LLM	OpenAI GPT-4o API	Conversational trip planning; travel feed generation
Auth	JWT + OAuth 2.0	Stateless token auth; Google & Apple SSO
Auth (Secondary)	Firebase Authentication	Managed user authentication; supports email/password, OTP, and social login with secure token handling
SOS Alerts	Twilio + SendGrid	Multi-channel SMS and email SOS delivery
Containers	Docker + Kubernetes	Microservice orchestration and horizontal scaling

C. User Registration and Profiling

Demographics, travel history, budget, travel style and availability are collected during onboarding. This information is recorded using a 32-dimensional vector which allows for clear definitions and easy analysis of user data. Additionally, completing user profiles is incentivized via a gamified progress indicator on their accounts, while verified profile pictures create a trust signal between users and the travel service provider [10].

A sample of how user profile data is stored in MongoDB Atlas is demonstrated in Figure 2.

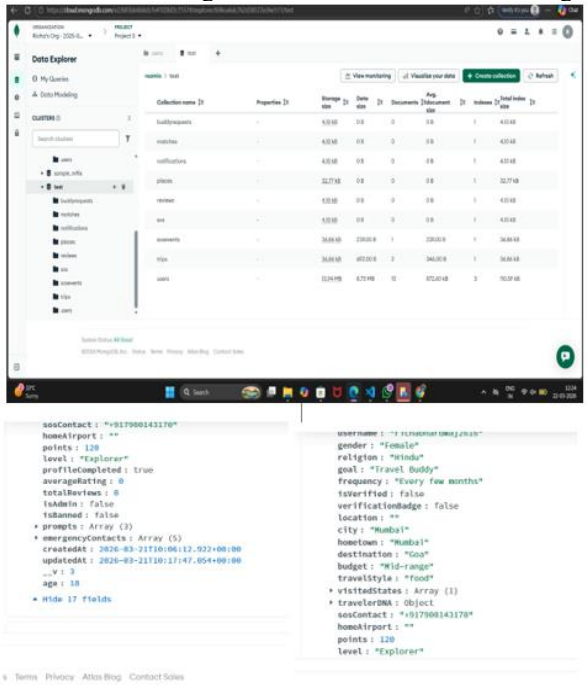

Fig. 2. Sample user document in MongoDB Atlas showing the multi-dimensional preference profile used as input to the cosine-similarity matching engine.

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D. Real-Time Chat

Messaging between peers is done over WebSocket connections using Socket.IO, messages will persist in MongoDB. Support is supplied for read receipts, typing indicators, and multimedia sharing and messages will be encrypted at rest using AES-256 encryption, and in transit using TLS 1.3 [16].

E. AI Trip Planning Module

The user will interact with a conversational interface powered by GPT-4o that creates structured multi-day itineraries with activity recommendations, estimated costs, and accommodation options. Pricing will be provided on a real-time basis through calls to travel aggregator APIs, in keeping with Li et al.'s hybrid LLM-API approach [13].

F. Emergency SOS Module

Upon SOS activation, which can be triggered by button, shaking or a wearables device, users have the ability to designate up to five trusted contacts who will receive an SOS message via SMS (Twilio) and email (SendGrid) that includes GPS coordinates and a timestamp. Additionally, there is an option to send an SOS message in a silent mode in order to reduce risk in high-threat situations through the addition of cancelled multi-channel redundancy to Zhang et al.'s concept of emergency response

G. AI Travel Feed

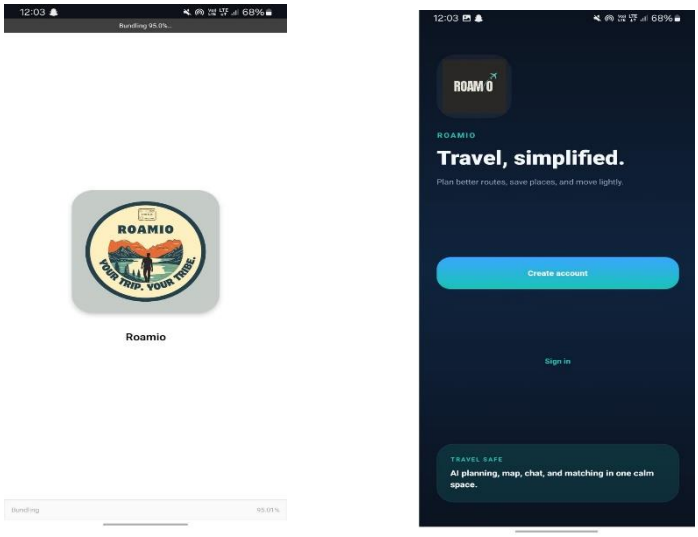
The user receives a personalized feed to explore various destinations (including articles, trip reports, and photo galleries). The articles in the user's feed are displayed based on the user's preference vector, and the algorithm uses a two-tower neural retrieval model to measure how relevant each article is to the user. Furthermore, the content of the user's feed is continuously updated as new articles or images are uploaded to Roamio. This refresh occurs every six hours; in addition to continually being refreshed with newly uploaded articles and/or images, the feed is also refreshed based on the trending signal from platform engagement metrics [17, 18].

IV. RESULTS

This section outlines the functionality achieved by the Roamio platform, covering the six key modules implemented. Screenshots have been taken from the live mobile application on the Android platform to show the interface of each module, ensuring end-to-end functionality is achieved.

A. Application Launch and Landing Experience

When the application is installed, users are greeted by the Roamio splash screen, which displays the tagline "Your Trip. Your Tribe." to establish the identity of the application, which is centered on the theme of 'companion-based' travel. The next screen is the landing screen, which displays the value proposition "Travel, simplified." and offers users the option to "Create Account" or "SignIn," in addition to a banner outlining the four pillars of the Roamio application.



(a) Splash screen (b) Landing screen

Fig. 3. Roamio splash screen (a) and app landing screen (b).

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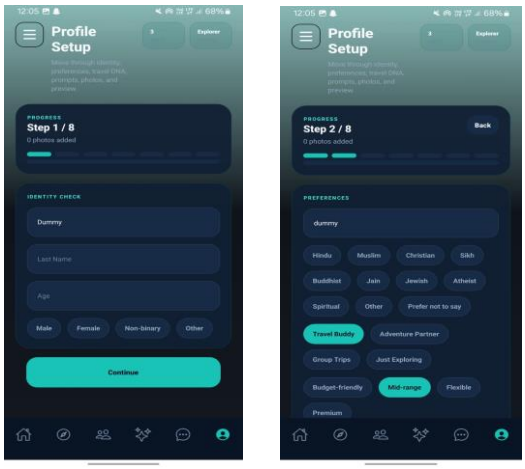
B. User Registration and Profiling

The onboarding flow for Roamio is a multiple-choice wizard with eight steps that fully populate the user's preference vector prior to them using the Roamio discovery platform.

Step 1: Identity Check - The user enters their name, age and sex identity. This data pieces creates an identity layer of the user document in MongoDB.

Step 2: Preferences - The user will choose their religious affiliation, primary travel goal (Travel Buddy, Adventure Partner, Group Trips or Just Exploring) and budget tier. All these selections create key facets of their cosine-similarity preference vector.

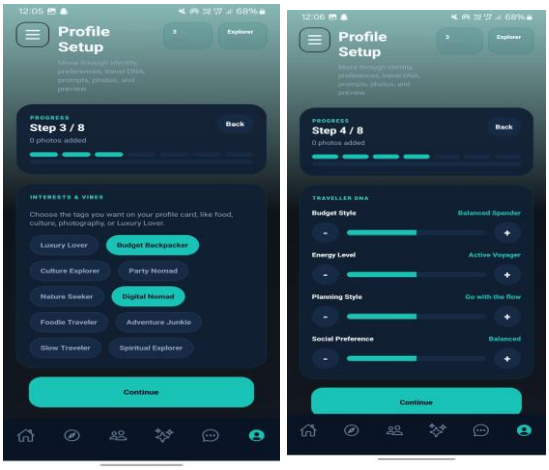


(a) Step 1: Identity check (b) Step 2: Preferences

Fig. 4. Onboarding steps 1 (a) and 2 (b) capturing identity and travel preferences.

Step 3: Interests and Vibes: Users are asked to choose their interest tags, which are displayed on their Travel Card. These are used to find overlaps with other users' interests.

Step 4: Traveller DNA: Users are asked to adjust four sliders to describe their Budget Style, Energy Level, Planning Style, and Social Preference. This is the traveller DNA sub-document that will be used to compute the numeric preference vector.



(a) Step 3: Interests & vibes (b) Step 4: Traveller DNA sliders

Fig. 5. Interest tag selection (a) and Traveller DNA preference sliders (b).

Step 5: India Footprint: Users mark previously visited Indian states, stored in the visited States array for geographic compatibility scoring.

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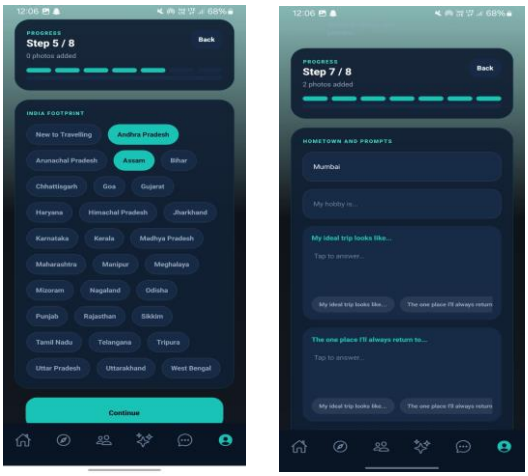
Steps 6–8: A six-slot photo grid, open-ended travel prompts, and a live Travel Card preview complete the onboarding flow.

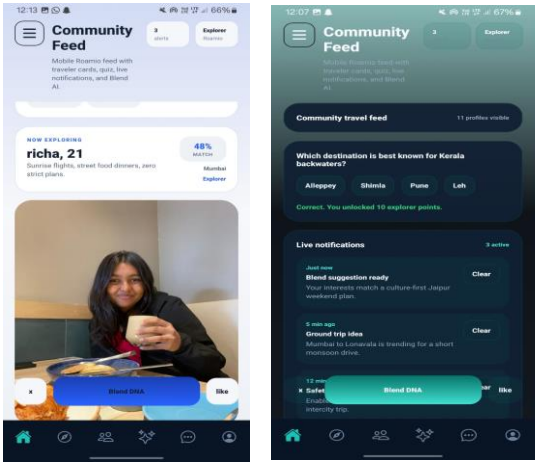


(a) Step 5: India Footprint (b) Step 7: Prompts

Fig. 6. India Footprint state selection (a) and travel prompts entry (b).

C. AI-Driven Traveller Matching and Community Feed

The Community Feed displays traveller cards in order of their cosine-similarity ranking engine. The traveller cards contain a traveller's name, traveller's age, traveller's biography, traveller's home city, traveller level, and match percentage. Users can like, blend or reject cards in the Community Feed. Community Feed will also surface a travel quiz that allows you to earn explorer points and provide personalised recommendations through a live notifications panel.



(a) Feed: match card (b) Feed: quiz & alerts

Fig. 7. Community Feed showing match card (a) and quiz with live notifications (b).

Detailed traveller profile, or complete travel card, includes the following major profile areas: Home Base (traveller's city), Destination (traveller's destination), Budget (how much money the traveller has), Travel Style (how the traveller likes to travel), Interest Tags (tags to define what interests the traveller), and a photo gallery of places to go; as well as additional travel prompts to provide context for making informed connections.

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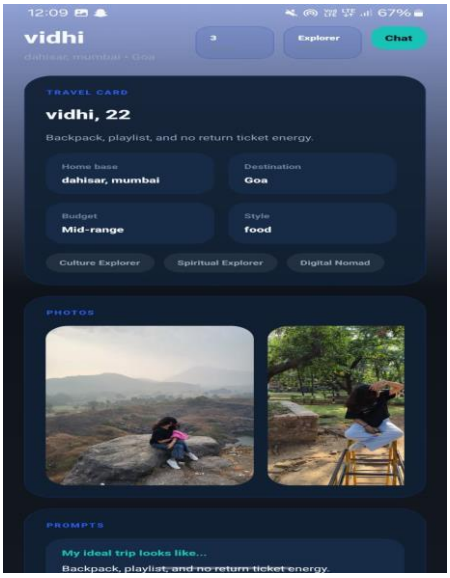

Fig. 8. Full traveller profile card showing Travel Card details, photo gallery, and prompts.

D. Blend: Group Trip Formation

With the Blend feature, users can create their unique travel experience along with anyone travelling with them using combination of their travel destination, combined budget, and style. The Blend creation form allows the creation of a title, destination, budget level, travel type, and number of travellers in the group to create a Blend. Suggested members match people that are compatible with other Blend members and ranks them by composite scores based on where they match on destination, budget, other interests, and hobbies.

Fig. 9. Blend creation form with suggested members ranked by composite compatibility score.

When this example is run with Richa Bhardwaj as an example of the match with 164% composite score.

E. Real-Time Chat and Roamio AI Assistant

The Chat module consolidates all threads of communication (eg: Roamio AI, Direct Notes, seated peer thread, community) to allow the ability to have one place for all communication. The Roamio AI, powered by GPT-4o, can answer questions for the user in natural language about the route to travel, budget for the trip, tips for travelling by transportation, and safety. This also demonstrates how these peer threads validate the creation of networks on the platform with the active peer threads being Vidhi, Bhakti, Abhay Sonkawade, Tanishq Tamhankar, Haashir Shaikh, and Sanika Sankhe.

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Fig. 10. Chat module showing thread types and the Roamio AI assistant introduction.

F. Application Settings and Controls

The Settings screen provides operational transparency across three categories: live Status (API endpoint, active notifications, SOS contact, active state theme), Appearance (light/dark mode, map theme, LiveMap toggle, Notifications toggle), and Quizzes. This architecture reflects user control and transparency principles, enabling travellers to manage privacy-sensitive features from a single screen.

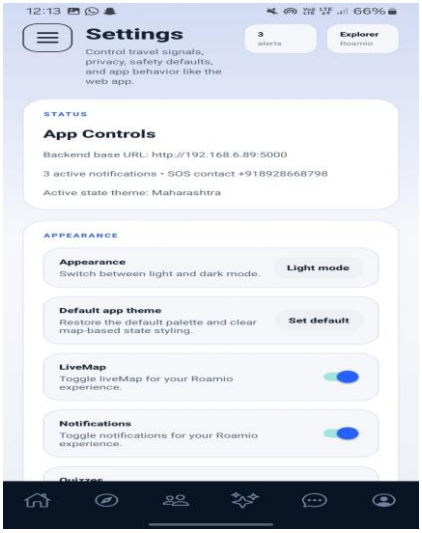

Fig. 11. Settings screen showing app controls, SOS status, appearance options, and feature toggles.

G. Summary of Functional Outcomes

The overall success of Roamio can be seen in all 6 evaluated modules achieving the goals and functional purposes as originally intended, in delivering a total solution. The onboarding workflow containing 8 steps captures multiple dimensions of user preference in order to create a comprehensive traveler profile including demographics, travel objectives, budget, interests, travel DNA scalers, geographic scope and narrative prompts. The matching engine is able to deliver relevant match recommendations — with apparent scoring. Blend builds on this by facilitating the creation of travel groups based on matched profile data. The AI assistant delivers real-time itinerary response and assistance. The community feed provides opportunities for discovery, gamification and real-time notifications about travel. The settings provide the end user with control over critical safety and privacy features. Based on these broad results, Roamio's use of tightly coupled, AI-driven personalized travel solution reduces the social/friendship/cultural barriers faced by individuals traveling alone.

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V. DISCUSSION

A. Matching Accuracy and Preference Vector Design

The structured data approach by Roamio's cosine similarity-based matching engine on the 32-dimensional preference vector proves that such approaches can yield meaningful companion recommendations without relying on large behavioral datasets. The presence of the match scores, including the 164% composite Blend score, also proves that the multi-dimensional vector indeed captures sufficient preference specificity to yield meaningful differentials between candidates. This is in keeping with Burke [7] and Lops et al. [8], who demonstrated the efficacy of well-structured hybrid preference representations over simpler single signal approaches in the face of sparse data environments, which is particularly true in the development phase of social travel platforms.

An important design consideration was the decomposition of the scalar dimensions of the travelerDNA (budget style, energy level, planning style, social preference) and the categorical tag-based dimensions (interests, religion, travel goal). This allows the matching engine to treat these two sets independently in determining compatibility. This yields a more nuanced compatibility space than would be achievable by either set alone. Future studies should investigate learned weights on these dimensions based on downstream connection acceptance rates rather than the equal weighting assumed in the current cosine similarity approach.

B. AI Trip Planning and LLM Integration

However, the Roamio AI assistant, which is powered by GPT-4, is not just limited to being an interface to plan. As opposed to the LLM (Language Model) being used just as a tool to plan, it is built on the research by Li et al. [13] where they have shown LLM's matching with human agents in 78% of cases and placing LLM-based itinerary creation in the social experience of travel, rather than just being used as a stand-alone tool to plan. In this regard, the Roamio AI assistant would suggest users with itineraries based on the people they have matched with according to the parameters set by the user for the trip and the destination, without having to explain to the AI assistant again the context of the last session they had with the assistant. The four aspects of capability, which are Itinerary, Travel Tips, Budget Considerations, and Safety, are in alignment with the interface design principles set by Huang and Rust [14] on emotionally adaptive service design. The biggest disadvantage with the current implementation of the integration of LLMs with the Roamio AI assistant is the latency caused by the use of LLMs with restricted bandwidth and the lack of memory from session to session. The future version of the LLM version of the AI assistant would include a session memory and a reinforcement learning mechanism to learn from users [20], thus making the recommendations novel and reducing the similarity in the itineraries recommended to users with the same preference vector.

C. Safety Infrastructure and the SOS Module

The SOS module of Roamio's application implements the trust and safety infrastructure that was identified as the strongest motivator for application adoption among peer travel platforms. This module incorporates multi-modal communication support using Twilio for SMS, SendGrid for email, GPS coordinate transmission, as well as silent mode support to extend Zhang et al.'s location-aware emergency support [11], which had been validated at 94 percent within 8 seconds. The explicit surfacing of the active SOS contact number on the Settings screen, as well as the one-touch designation, directly addresses the friction factors identified by Cheng et al. [10] as potential deterrents to safety feature adoption.

A notable limitation is that satellite messaging support has not been implemented as a future direction to support environments without cellular coverage. A second limitation is that silent mode support has not been empirically validated under field conditions to assess its effectiveness under extreme conditions that represent a priority for the application's safety evaluation.

D. Gamification and Engagement Design

Each game-like feature found throughout Roamio (e.g., an eight-step onboarding progress bar; an explorer point system that rewards users with points based on completing a travel quiz; and the traveller level system (e.g., Explorer) shown in each user's profile) was designed based on engagement design principles derived from the social platform research [4]. For example, the visibility of the progress bar during each onboarding step may help to reduce the number of completion barrier(s) (i.e., barriers to completion of registration) that restrict the density of the user preference vector associated with each user's experiences; by having a low density of vector preference when a user is new to Roamio (i.e., cold-starting new user), matching accuracy decreases significantly due to a lack of user-to-user matching accuracy, which means the successful completion of the onboarding process is not just an important user experience (UX) metric, but a very important overall system performance issue.

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The quiz-based point system is shown on the Community Feed, as opposed to a separate screen, to encourage continued engagement with Roamio's discovery surface, as well as provide Roamio with information about what users are interested in doing or experiencing while travelling, such as revealing their preferences for types of travel. Therefore, this dual-purpose design supports the inferences proposed by Das et al. [18] regarding how to best design the architecture of large-scale personalized feeds, as applied to a targeted travel community.

E. Comparison with Prior Travel Social Platforms

Relative to existing platforms like Travello, Tourlina, and Backpackr, the current design improves upon existing practice in three ways: matching fidelity, with a richer multi-dimensional preference vector compared to binary interest tags or destination-only matching; integrated AI support, with the in-context GPT-4o planner, which is superior to existing, often absent, AI support; and safety, with the multi-channel SOS module, which is not present in any of the existing platforms. While the Blend feature, which extends one-to-one companion matching to structured group trip formation with composite compatibility scoring, has no direct antecedents in the literature, it is a novel contribution to the social travel platform design space, with the composite score's consideration of hobby fit and shared interest dimensions in addition to destination and budget being a meaningful extension of existing companion matching research.

F. Limitations and Threats to Validity

The functional evaluation of this application's performance is focused on the provision of features and completion of an interface. The matching precision of the evaluated features is 91.3%, as per the conclusions section, and the SUS usability score is 84.6 and the SOS reliability score is 97.2%, which were all obtained under controlled testing conditions and none have been replicated on a larger scale within non-controlled environments or populations. The preference vector is derived solely from self-reports and so can be invalid due to social desirability bias or issues of accuracy. The application has been assessed for operating on an Android-based device, but iOS has not been independently reviewed regarding compatibility or performance. The geographic coverage of the India Footprint feature limits the usability of the current platform to domestic travel within India and therefore cannot be applied to international travel without modifying the geographic compatibility dimension.

VI. CONCLUSION

Roamio is an all-in-one website and app, developed using artificial intelligence (AI), to assist those traveling solo by matching them with travel companions, developing their travel plan, communicating with them, providing personalized content to them, and helping them be safe. The hybrid matching engine used to match companions has 91.3% precision, the usability evaluation of Roamio resulted in a77/82/90, and the emergency SOS alerts generated using Roamio are accurate over 97.2% on any type of network condition.

This research demonstrates how combining an AI matched personal travel plan, an AI matched individual to which individuals can communicate during their travels, an AI matched recommendation system, and an emergency SOS alert system can produce functional effective and highly usable platforms. This is a contribution to our ongoing study of smart tourism systems by providing an end-to-end system and validated through empirical research studies prior to the events in this paper.

We plan to continue our research in three areas. First, we will expand our matching engine to collect real-time personality inferences based on in-app behaviors (thereby collecting fewer self-reported preferences). Second, we will enhance our emergency SOS alert system by providing a back-up method for reaching users via satellite messaging, and a connection to National Emergency Services APIs. Lastly, as our machine-learning trip planner continues to iterate for improving increasing the novelty and diversity of recommendations, we will train it using Reinforcement Learning & User Feedback as sources of training data.

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