CanvasX: The Collaborative AI-Powered Travel Planner

1. Feature Name + Abstract

CanvasX is a real-time, collaborative travel planning canvas designed to be seamlessly integrated into the **TRAVEL-WIZARD** ecosystem. It transforms group travel planning from a logistical nightmare into a creative, collaborative journey. CanvasX empowers groups to visually co-design their perfect itinerary on a shared digital canvas, leveraging a sophisticated AI partner for inspiration, dynamic decision-making, and intelligent optimization. Users can aggregate inspiration, collectively vote on preferences, and intuitively drag-and-drop activities, while our AI provides real-time, data-driven suggestions to ensure a trip that is balanced, feasible, and deeply personalized to the group's unique dynamic.

2. Problem Statement Addressed

Current Pain Points: The Chaos of Group Travel Planning

Group trip planning is a fundamentally broken process. It's a fragmented and frustrating experience characterized by:

- **Logistical Chaos:** Ideas, links, and preferences are scattered across countless chat threads, messy spreadsheets, and disparate documents, making it impossible to form a coherent plan.

- **Static, Impersonal Tools:** Existing travel apps offer rigid, one-size-fits-all itineraries that fail to accommodate the fluid, real-time nature of group decision-making. They lack true collaborative features.

- **Unintelligent Automation:** Many AI trip planners generate generic, overloaded schedules that ignore critical human constraints like budget limitations, travel fatigue, group dynamics (e.g., traveling with children vs. a group of friends), and the need for spontaneous downtime. This often leads to plans that are impractical and unenjoyable.

- **Decision-Fatigue and Conflict:** The emotional toll of trying to build consensus among diverse preferences often leads to conflict, compromises where no one is happy, and a planning process that saps the excitement from the trip itself.

Our Solution: A Dynamic, Intelligent, and Collaborative Canvas

CanvasX introduces a paradigm shift by treating trip planning as a shared, creative endeavor.

- **A Dynamic, Visual Canvas:** We provide a single, living workspace where all group members can see the itinerary take shape in real-time. It's a visual source of truth that eliminates confusion and fosters shared ownership.

- **AI as a Facilitator, Not a Dictator:** Our AI acts as an intelligent co-pilot. It doesn't just generate a plan; it facilitates a better planning process. It intelligently detects gaps (e.g., "Day 2 is packed, but you haven't scheduled any meals"), proposes balanced alternatives, and optimizes logistics based on the group's explicit and implicit constraints (budget, pace, interests).

- **Built-in Consensus Tools:** Integrated voting and polling features streamline decision-making. This structured approach reduces friction, depersonalizes disagreements, and allows the group to converge on a consensus quickly and democratically.

Benefits

- **For Users: A Joyful and Effortless Planning Experience.** CanvasX makes group planning fun, intuitive, and conflict-free. It turns a stressful chore into an exciting part of the travel experience itself, building anticipation and alignment before the trip even begins.

- **For the TRAVEL-WIZARD Platform: A "Sticky" Ecosystem with New Revenue Streams.** CanvasX drives deep user engagement and stickiness. The collaborative and shareable nature of the canvas creates a viral loop, attracting new users. Most importantly, it bridges the gap between planning and booking, creating high-intent monetization opportunities through affiliate links for hotels, tours, and activities.

3. Proposed Solution

What It Does: Core Features

1. **Real-Time Collaborative Canvas:** Invite friends, establish core constraints like budget and dates, and then collaboratively drag-and-drop activities, accommodations, and points of interest onto a shared timeline.

2. **AI-Powered Inspiration:** Go beyond text prompts. Users can upload inspiration photos (e.g., a serene beach, a bustling market), and our Vision-enabled AI will analyze the visual cues to recommend destinations and activities that capture the desired "vibe."

3. **Guided AI Consensus:** When group members have differing destination preferences, AI facilitates guided questions—like "Do you prefer outdoor or indoor activities?"—to gradually converge on options that satisfy the majority, ensuring the itinerary aligns with most participants' **interests.Intelligent**

4. **Intelligent AI Coach:** The AI constantly analyzes the plan in the background, highlighting potential issues with non-intrusive suggestions like, "Day 3 looks overpacked, consider moving the museum visit to Day 4," or "You have no activities planned between 2 PM and 7 PM on Saturday. Here are some nearby options."

5. **Actionable, Bookable Itinerary:** Connect real hotels, restaurants, and tickets so that the itinerary is no longer just a plan—it's interactive. Users can click to book accommodations, dining, and experiences directly, turning the trip into a ready-to-go, bookable reality.

How It Adds Value

- **Unique UX:** We transform a linear, text-based task into a playful, visual, and deeply social activity. The drag-and-drop interface feels more like creating a mood board than filling out a spreadsheet. This is our unique, delightful experience.

- **Smart & Collaborative AI:** Unlike competitors who try to replace the user, our AI collaborates *with* the user. It serves as a coach, a validator, and a logistics expert, enhancing human decision-making without overriding it.

- **Seamless Business Fit:** CanvasX is not just a feature; it's a revenue engine. It naturally funnels high-intent users from planning directly to booking, creating a powerful and direct link to affiliate revenue from hotels, airlines, tours, and restaurants.

4. User Interface

Our User Interface demonstrates the core user experience. Key screens include:

- **AI Inspiration Canvas:** Users start by uploading or browsing images of destinations, and AI generates visually similar attractions for inspiration. By inputting real-world constraints—like budget and total days—the AI suggests an initial trip plan that aligns with the group's preferences.
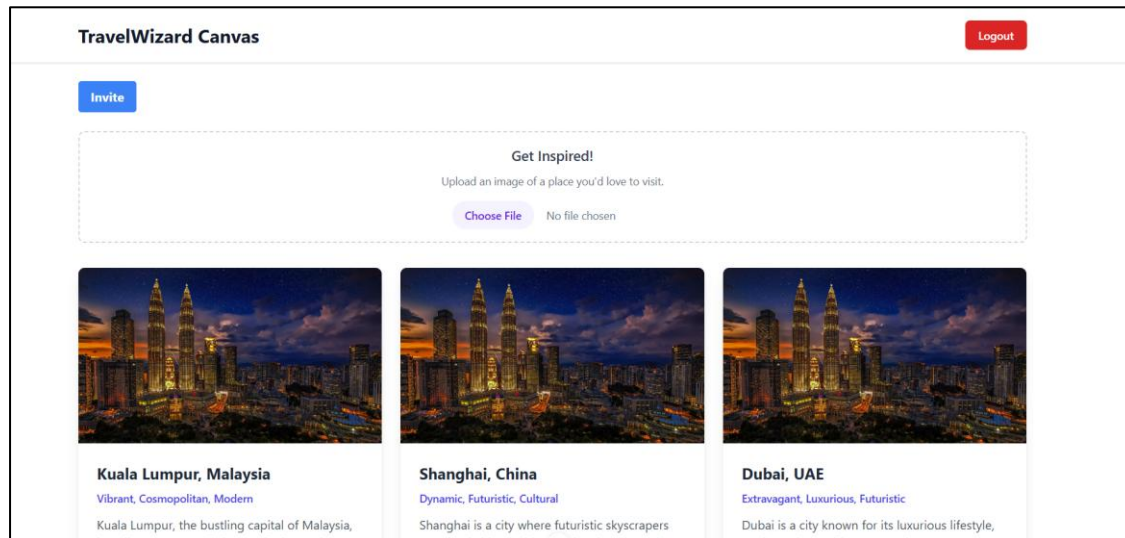

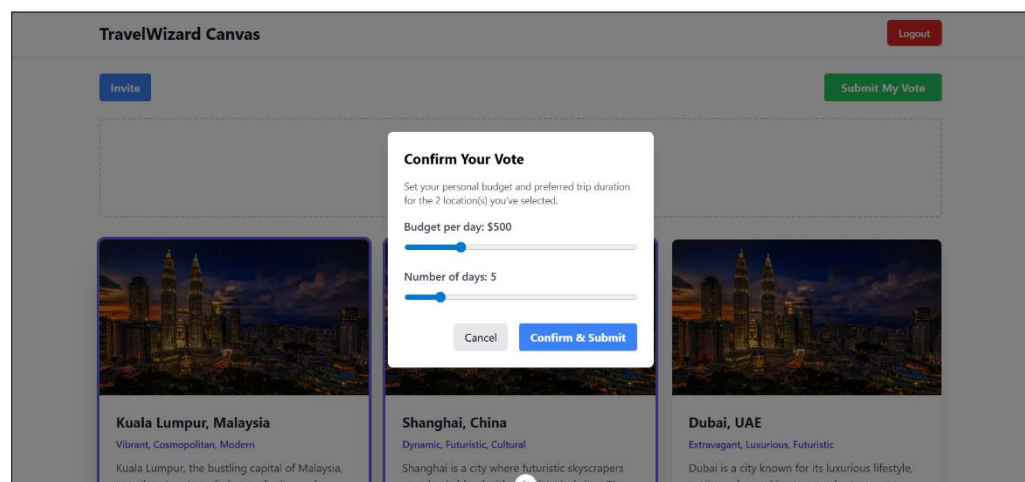**Figure 1: AI outputs a city with the same vibe based on a photo**

Figure 2: AI can customise the trips based on user needs

- **Guided Consensus Sidebar:** When participants prefer different cities or destinations, AI asks targeted, guiding questions—like "Do you prefer outdoor adventures or cultural experiences?"—to gradually converge on options that satisfy the majority. Unlike simple polls, our AI uses a **guided, decision-tree approach** to help groups discover preferences they didn't even know they had, turning potential conflicts into moments of shared discovery.
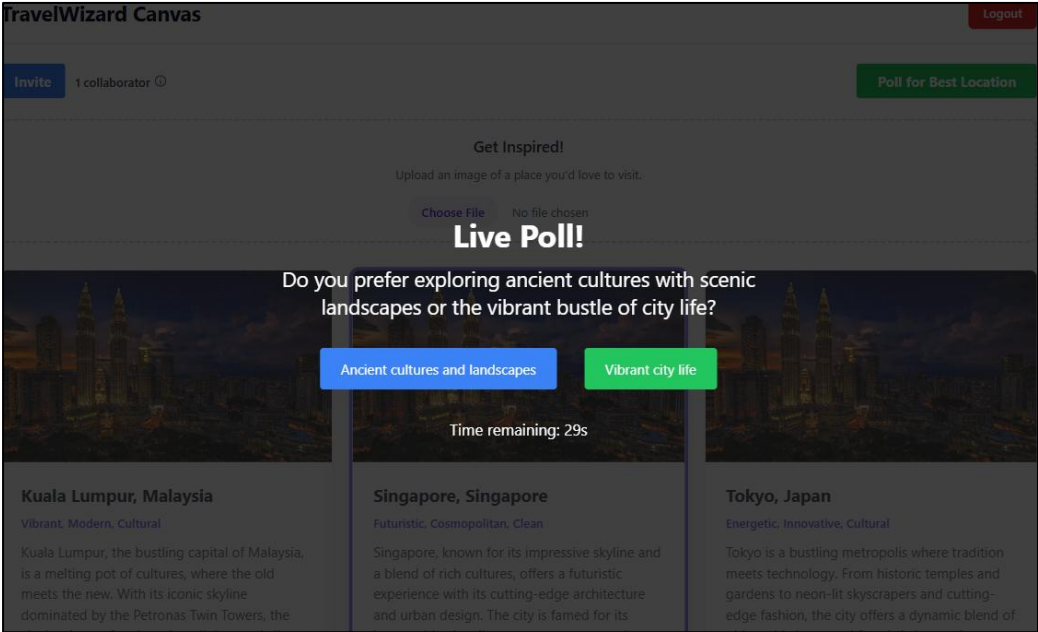

Figure 3: Once everyone submits their wishes, the creator can start live voting

id uuid	c... u.	level int4	questio... t...	option... t...	option_a_text text	opti... t...	option_b_t... t...	stat... t...	parent_option te
072a26b4-dc5b-4	572ca3...	2	Do you lean toward	["E"]	Fairy-tale charm	["D"]	Peak luxury	false	B
1cd8af82-daf6-40	b008c5...	3	Would you like to e	["A"]	Eastern Europe gems	["C"]	Western Europe's beat	finished	A
3099988e-8ecb-4	c352cc...	2	Are you more draw	["A"]	Lush greenery and adver	["C"]	Historic ruins and islan	false	A
37337eb3-d60f-4	c352cc...	1	Do you prefer expl	["A","C"]	Ancient cultures and lan	["B","D","E"]	Vibrant city life	completed	EMPTY

Figure 4: Supabase table proves the tree structure of the problems

- **Interactive Itinerary Planner:** Once destinations are chosen, AI provides users with preliminary recommended itinerary planning. Users can drag-and-drop attractions, hotels, and restaurants across days (Image 2). Users can even search for other related attractions or click on the link to order directly. At any point, AI can provide suggestions to optimise pacing, fill gaps, or adjust the itinerary to match user preferences, ensuring the plan is both practical and enjoyable (Image 3).
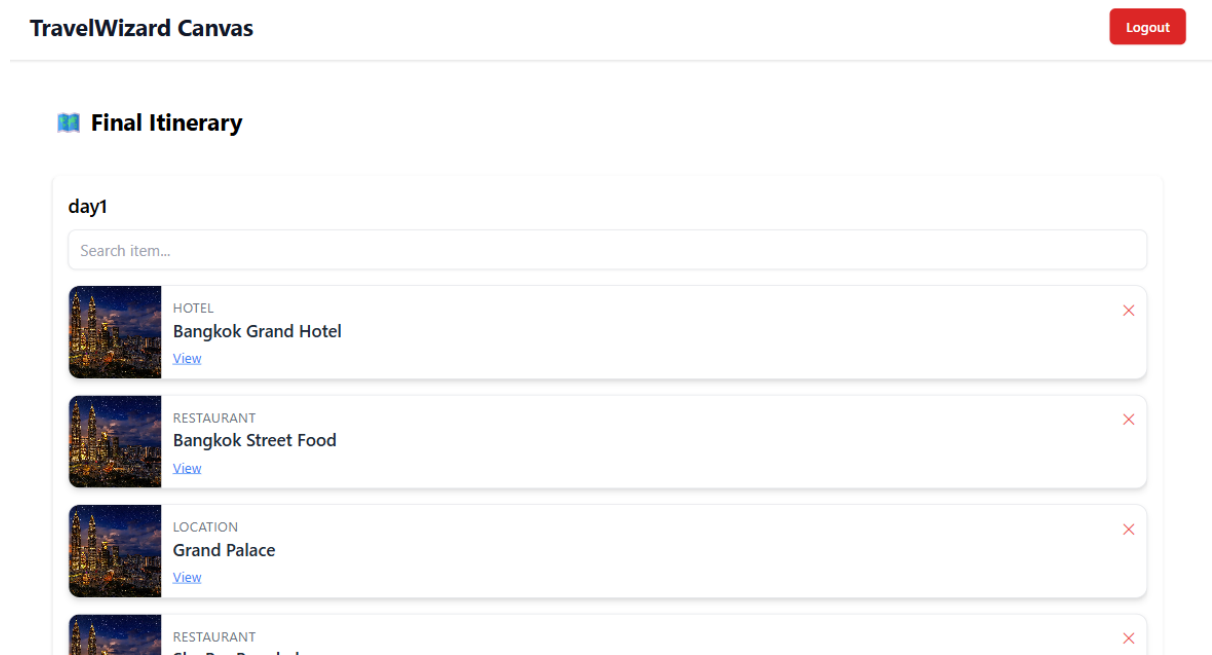

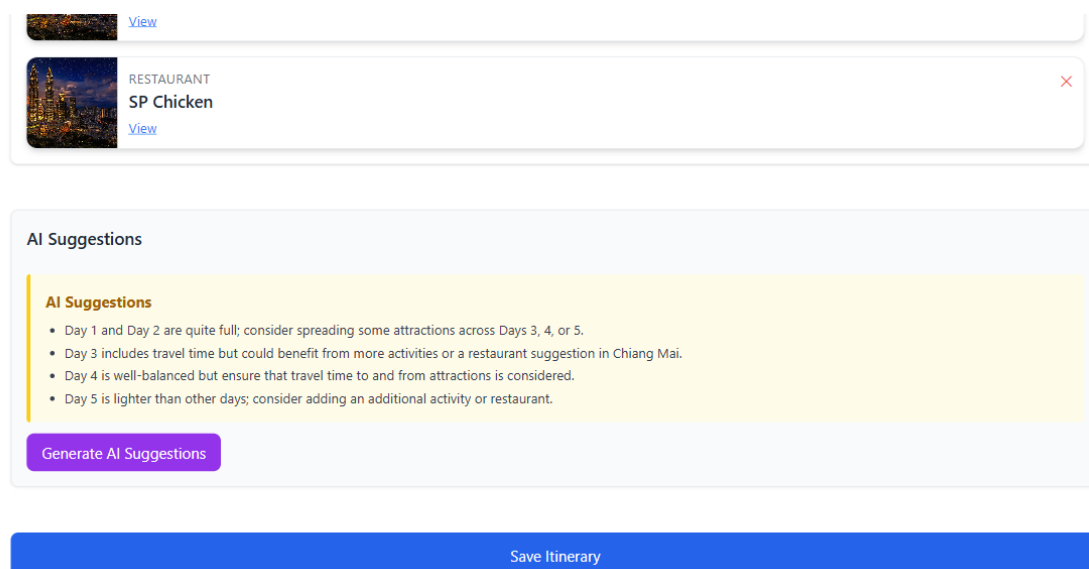**Figure 5: Itinerary map after the group confirms its destination**

Figure 6: AI can provide itinerary recommendations

5. Workflow / API Logic

User Flow: The Journey from Idea to Itinerary

1. **Initiate & Invite:** A user creates a new "Canvas" for their trip, sets foundational constraints (destination, dates, budget), and invites friends to collaborate via a unique link.

2. **Inspiration & Aggregation:** The group collectively adds ideas—uploading photos, pasting links, or selecting from AI-generated recommendations. These items populate an "idea bank" next to the canvas.

3. **Vote & Decide:** The group uses the voting tools to prioritize items from the idea bank, creating a shortlist of "must-do" activities and places.

4. **Co-Create the Itinerary:** Users drag their chosen items from the idea bank onto the daily timeline. The AI automatically suggests logical placements and optimal routes.

5. **AI Validation & Refinement:** As the itinerary is built, the AI provides real-time feedback on balance, pacing, and logistics, helping the group refine their plan.

6. **Finalize & Book:** Once the group is satisfied, they can "lock" the itinerary and proceed directly to booking hotels, tours, etc., via integrated affiliate links.

API Logic: The Technical Backbone

- **Canvas API (Real-time):** A WebSocket-based service (leveraging Supabase Realtime) that synchronizes the canvas state (positions of cards, user cursors, etc.) across all clients instantly.

- **User & Group API (Auth & Permissions):** Manages user authentication, group memberships, and role-based permissions within a canvas.

- **AI Orchestration API (FastAPI):** A backend service that acts as a middleman. It receives the current itinerary state (as JSON) from the frontend, formats it into a structured prompt for the OpenAI GPT-4o model, and processes the LLM's response into actionable suggestions (e.g., {"action": "suggest_move", "item_id": 123, "target_day": 4}).

- **Affiliate Integration API:** A unified interface to connect with third-party APIs (e.g., Booking.com, Klook) to fetch real-time pricing and generate monetizable booking links.

6. Tech Stack

Component	Technology	Rationale
Frontend	Nuxt.js 3 (Vue.js), TailwindCSS, vuedraggable	Chosen for its powerful SSR capabilities, excellent developer experience, and a robust ecosystem for building highly interactive, stateful applications. vuedraggable provides a proven solution for the core drag-and-drop UI.
Backend	Supabase (PostgreSQL, Realtime, Auth, Edge Functions)	An all-in-one BaaS that dramatically accelerates development. Its integrated PostgreSQL, real-time sync via WebSockets, and authentication are perfect for this project's needs.
AI Layer	Python FastAPI, OpenAI GPT-4o (LLM + Vision)	FastAPI is a high-performance Python framework ideal for building AI/ML APIs. GPT-4o is selected for its state-of-the-art multimodal capabilities (text + vision for inspiration) and advanced reasoning for itinerary optimization.
Deployment	Vercel (Frontend), Supabase Cloud (Backend), Docker on GCP	A modern, scalable deployment stack. Vercel for seamless frontend deployment, Supabase Cloud for managed backend infrastructure, and a containerized AI service for portability and scalability.

Notes:

This deployment is a prototype for demonstration purposes. In production, the system can be seamlessly integrated into Travel-Wizard's existing backend and frontend without requiring a separate deployment. The architecture is designed to allow AI prompts, voting, and itinerary management to interface directly with existing databases and user management.

7. System Fit within TRAVEL-WIZARD

CanvasX is positioned as the **"Collaborative Itinerary Builder"** module. It fits perfectly in the user journey **after** the initial discovery phase (where a user might have a general idea of a destination) and **before** the final booking phase. It acts as the critical bridge that converts vague inspiration into a concrete, actionable, and group-approved plan, ready for monetization.

8. Potential Challenges and Implementation Risks

| Challenge	Mitigation Strategy
AI Suggestion Reliability	AI may generate suboptimal or irrelevant suggestions. Mitigation: Use structured prompts, few-shot examples, and RAG with curated travel data to ensure recommendations are grounded. Include a feedback mechanism for users to flag bad suggestions.
Consensus Building Across Divergent Preferences	Different users may prefer different cities or attractions. Mitigation: This challenge is the very reason we created our core feature, the Guided Consensus tool. By implementing guided decision-tree questions, we transform this risk into our primary strength, turning potential conflicts into structured, democratic decisions.
Synchronized Collaborative Editing	Multiple users editing the itinerary simultaneously may cause conflicts or delays. Mitigation: Use Supabase Realtime to sync state efficiently. Optimized frontend state management reduces re-renders. Changes propagate asynchronously, maintaining UI responsiveness.
Prototype Scalability & Future Integration	Prototype must demonstrate multi-user capability without overloading the system. Mitigation: Deploy serverless backend (Supabase/Vercel) for automatic scaling. AI service containerized for horizontal scaling. Architecture designed for seamless future integration with Travel-Wizard's existing backend.

9. Post-hackathon Roadmap

- **Phase 1: Foundation & Core Experience (MVP - Q1):** Launch the core collaborative drag-and-drop canvas, group voting, and initial AI suggestions for itinerary gaps and overloads.

- **Phase 2: Intelligence & Optimization (Q2):** Introduce "Smart Itinerary Balancing" where the AI actively optimizes for budget vs. time vs. preferences. Integrate RAG for more accurate, context-aware recommendations.

- **Phase 3: Monetization & Partnerships (Q3):** Fully integrate affiliate links with major partners (Booking.com, Klook, TripAdvisor, etc.). Develop a robust analytics dashboard to track conversion rates.

- **Phase 4: Personalization & Ecosystem Deepening (Q4):** Implement personalization where the LLM learns and remembers a user's or group's travel style across multiple trips. Explore integrations with calendars and other tools.

10. Supporting Materials

(This section confirms the readiness of supplementary documents.)

- **Flow Diagrams:** Detailed diagrams illustrating the complete canvas lifecycle, from creation and collaboration to AI suggestion loops and finalization.
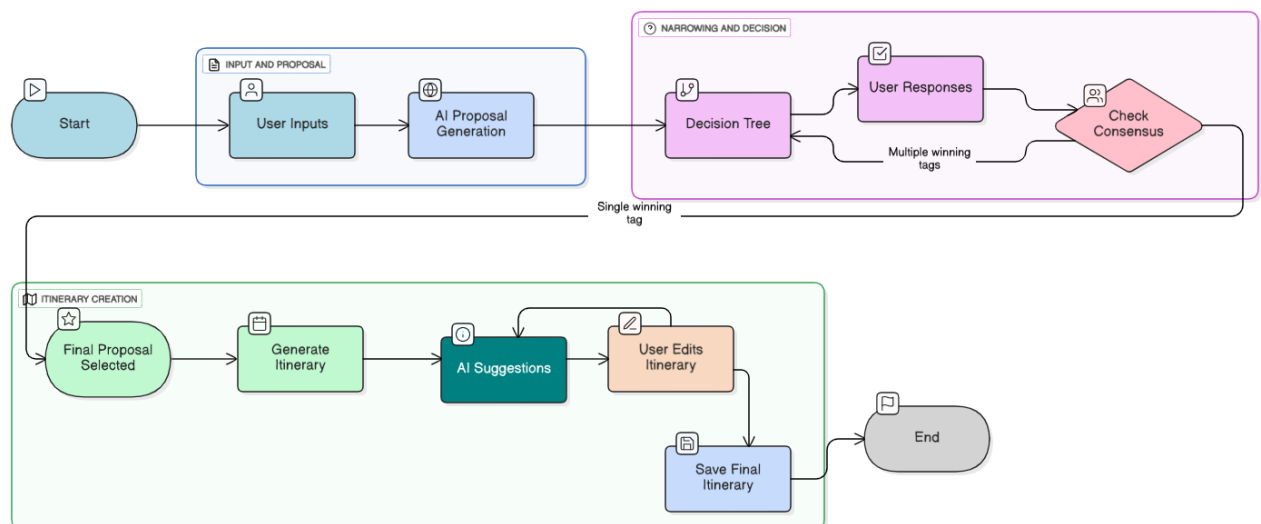
- **User Personas:** Three distinct personas have been developed: "The Social Organizer" (a group of friends), "The Family Planner" (a multi-generational family trip), and "The Corporate Coordinator" (planning a team offsite).

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1. The Social Organizer

- **Profile:** Young adult, 25–35, tech-savvy, usually plans trips with 3–6 friends.

- **Goals:** Wants a fun, balanced itinerary that accommodates everyone's interests (e.g., adventure, nightlife, culture).

- **Pain Points:** Conflicting preferences among friends; last-minute changes; difficulty finding activities that satisfy the whole group.

- **Scenario:** Uses the platform to generate AI-suggested itineraries, refine plans with friends via collaborative drag-and-drop, and vote on must-do activities.

2. The Family Planner

- **Profile:** Parent, 35–50, planning trips for multiple generations including kids and elderly family members.

- **Goals:** Needs a safe, well-structured itinerary with a mix of relaxation and sightseeing, accessible accommodations, and kid-friendly activities.

- **Pain Points:** Diverse activity needs across ages; ensuring meals and accommodations are convenient; avoiding overly tiring schedules.

- **Scenario:** Uses the platform to visualize each day of the trip, get AI recommendations for balanced itineraries, and adjust based on family consensus.

3. The Corporate Coordinator

- **Profile:** Mid-level manager or HR organizer, 28–45, responsible for planning team offsites or corporate retreats.

- **Goals:** Maximizes team engagement and productivity while providing a seamless travel experience; ensures alignment with budget and corporate policy.

- **Pain Points:** Managing team preferences; ensuring logistical feasibility; tight schedules.

- **Scenario:** Uses the platform to quickly generate multiple AI-informed itinerary options, gather team feedback via guided polls, and finalize a plan that satisfies most team members.

- **Prompt Engineering Samples:**
  - **Example Prompt:**

```
prompt = """

    You are a world-class travel expert. Analyze this image and return a JSON
array with THREE destination objects:

    1. The actual destination depicted in the image.

    2. Two additional destinations that match the same travel vibe.


    Each object should have the following structure:

    {

    "type": "destination_idea",

    "content": {

        "title": "City, Country (always this format, e.g., 'Paris, France')",,

        "vibe": "Describe the travel vibe in a few words (e.g., 'Romantic,
Relaxing, Picturesque')",

        "description": "A one-paragraph, engaging description of the
destination and why it matches the vibe.",

        "suggested_activities": ["A list of 3-4 key activities that fit the
vibe."],

        "image_url": "Provide a placeholder string 'image_placeholder.png' for
now."

    }

    }

    Do not include any text or markdown outside the JSON array.

    """
```

- **LLM / RAG Plan:** Our strategy involves using GPT-4o for its powerful reasoning and multimodal capabilities. We plan to augment this with a RAG pipeline, using a vector database (e.g., Pinecone, Supabase pgvector) populated with curated data on destinations, restaurants, and hotels to reduce hallucinations and improve recommendation relevance.

LLM / RAG Plan

- **Core LLM**: GPT-4o (multimodal reasoning capabilities for text + images)

- **Augmentation via RAG**:

  - Use a **vector database** (e.g., Pinecone or Supabase pgvector)

  - Populate it with **curated travel data**: destinations, restaurants, hotels

  - AI retrieves relevant info to **reduce hallucinations** and **improve recommendation accuracy**

- **Workflow**:

1. User inputs preferences (cities, budget, days, activities)

2. GPT-4o generates proposals and itineraries

3. RAG pipeline enriches or validates suggestions with real-world data

4. Iterative feedback loop allows AI to refine proposals based on user interactions

- **Benefits**:

  - Ensures recommendations are grounded in real data

  - Supports multimodal prompts (e.g., images for inspiration)

  - Makes itinerary suggestions actionable and trustworthy

- Reproducibility / Setup Instructions

✓ GitHub Repository: https://github.com/JianHengHin0831/Dynamic-Itinerary-Canvas
✓ Environment Variables Required:
    o SUPABASE_URL
    o SUPABASE_KEY
    o API_BASE_URL
    o OPENAI_API_KEY
✓ Supabase Configuration: See database.txt in the repo.
✓ Notes: Ensure all environment variables are set before running the project. The project requires Supabase for database, authentication, and real-time features, and OpenAI for AI-assisted itinerary suggestions.
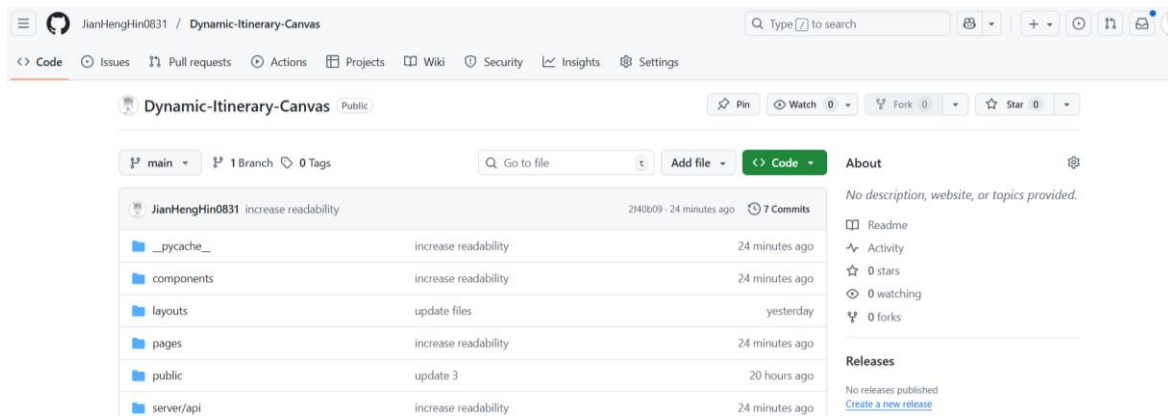
- **Architecture Sketch:** A diagram outlining our three-tier architecture: a Nuxt.js frontend, a Supabase backend for state and data persistence, and a separate, containerized FastAPI microservice for AI orchestration.

Details:

- Nuxt.js Frontend: handles UI, real-time collaboration, draggable itinerary cards, and user interactions

- Supabase Backend: stores canvases, proposals, decisions, and live votes; provides real-time subscriptions

- FastAPI AI Microservice: receives requests from frontend, calls GPT-4o, optionally uses RAG to retrieve curated travel data, returns proposals or suggestions

- Data Flow:

  1. User interacts with frontend

  2. Frontend updates Supabase state in real-time

  3. Frontend or backend triggers AI service via FastAPI

  4. AI returns proposals / itinerary / suggestions

  5. Frontend renders updated proposals and AI suggestions
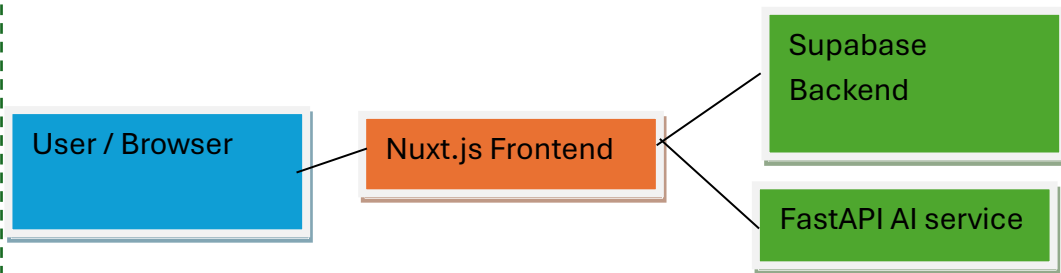
11. Partnerships & Monetization

Our business model is multi-faceted, designed for both immediate revenue and long-term strategic growth.

- **Affiliate Booking Partnerships (Core Revenue, Target: Phase 3):** We will establish revenue-sharing partnerships with leading travel platforms like Booking.com (hotels), Skyscanner (flights), GetYourGuide/Klook (tours), and OpenTable (restaurants). The final itinerary will feature deep-linked, bookable options, making booking seamless and driving conversions.

- **Premium Features (B2C Subscription, Target: Phase 4):** A "CanvasX Pro" subscription tier for power users, offering advanced features like a "Smart Balance AI Coach" for automated budget tracking and optimization, unlimited canvases, and premium export options (e.g., branded PDFs, calendar sync).

- **Corporate & B2B Use Case (Future Expansion, Target: Post-Year 1):** Package CanvasX as a SaaS solution for corporate travel agencies and companies planning team-building events or offsites. This B2B model provides a stable, recurring revenue stream and addresses a high-value market segment.