40 BYTE: AI POWERED PERSONALIZED ITINERARY GENERATION WEB APPLICATION

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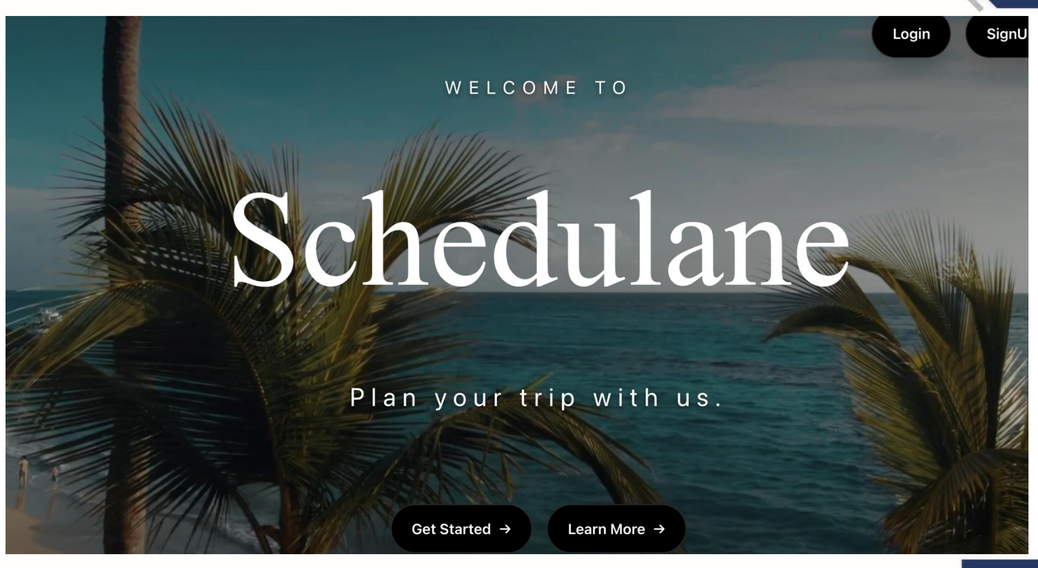
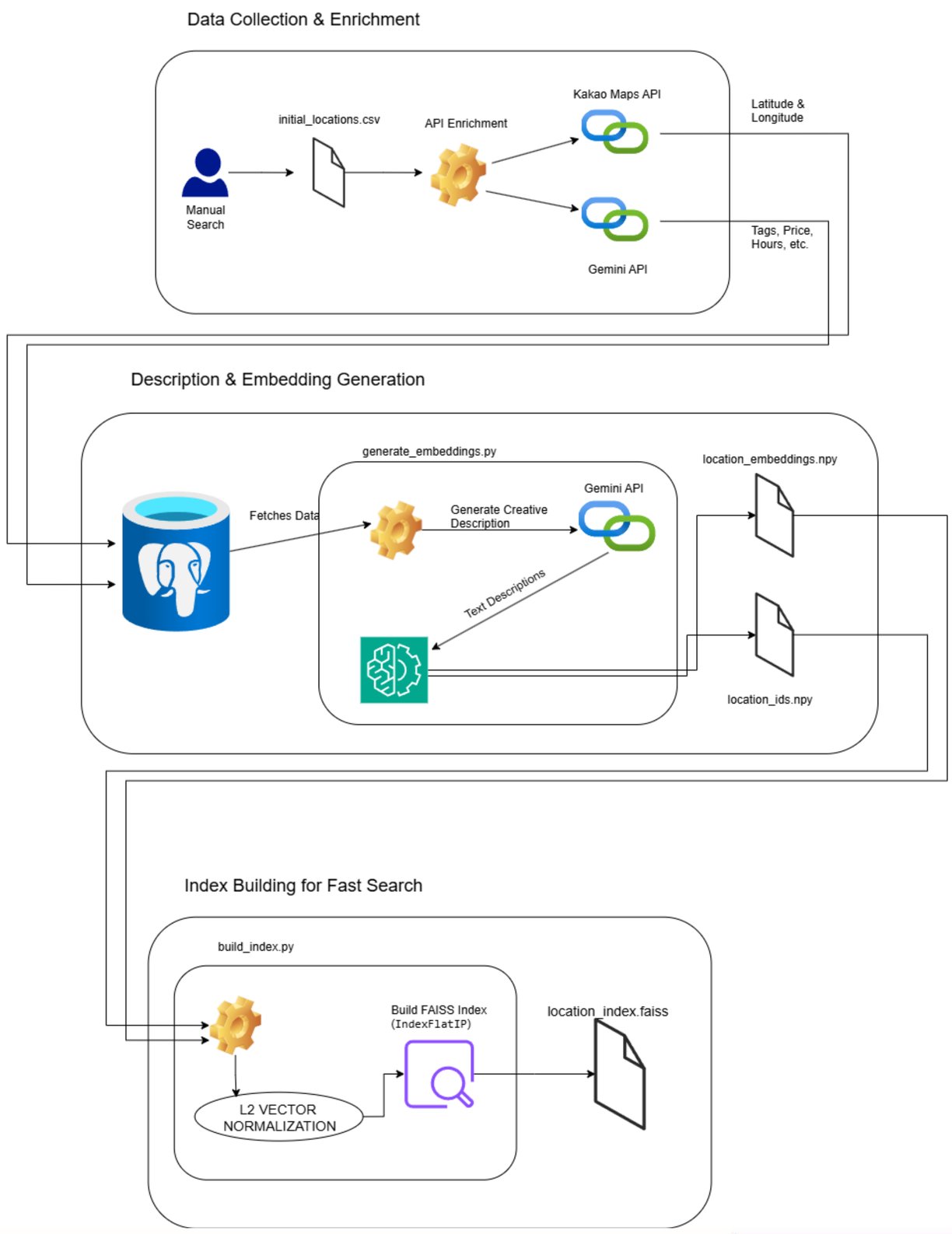
Introduction -1



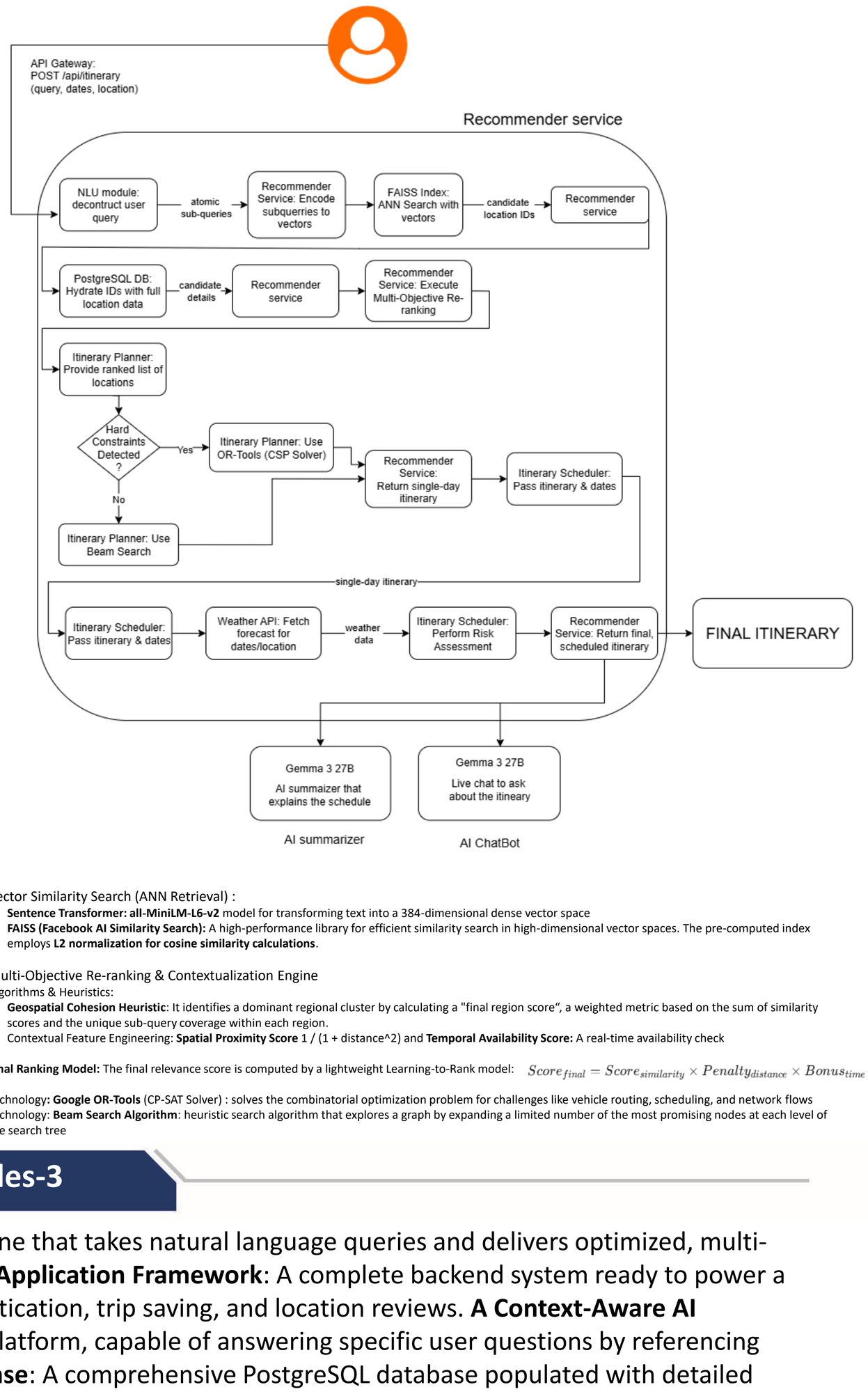
Our intelligent travel platform crafts personalized Busan itineraries based on your unique desires, moving beyond generic guides to include both famous landmarks and hidden gems loved by locals. By simply describing your ideal day, you receive a custom schedule where all activities are intelligently clustered in the same neighborhood, maximizing your exploration time and eliminating long transit. As a complete travel companion, our system allows you to save and customize your journey, share authentic reviews, and discover the city's best spots through a community of fellow explorers, ensuring a seamless and deeply personal adventure.

System workflow-2

Offline Preparation (Pre-computation)



Online Recommendation (Real-time User Request)



Vector Similarity Search (ANN Retrieval) :

1. **Sentence Transformer: all-MiniLM-L6-v2** model for transforming text into a 384-dimensional dense vector space
2. **FAISS (Facebook AI Similarity Search):** A high-performance library for efficient similarity search in high-dimensional vector spaces. The pre-computed index employs **L2 normalization for cosine similarity calculations**.

Multi-Objective Re-ranking & Contextualization Engine

Algorithms & Heuristics:

1. **Geospatial Cohesion Heuristic**: It identifies a dominant regional cluster by calculating a "final region score", a weighted metric based on the sum of similarity scores and the unique sub-query coverage within each region.
2. Contextual Feature Engineering: **Spatial Proximity Score** 1 / (1 + distance^2) and **Temporal Availability Score:** A real-time availability check

Final Ranking Model: The final relevance score is computed by a lightweight Learning-to-Rank model: $Score_{final} = Score_{similarity} \times Penalty_{distance} \times Bonus_{time}$

Technology**: Google OR-Tools** (CP-SAT Solver) : solves the combinatorial optimization problem for challenges like vehicle routing, scheduling, and network flows
Technology: **Beam Search Algorithm**: heuristic search algorithm that explores a graph by expanding a limited number of the most promising nodes at each level of the search tree

Deliverables-3

A Dynamic Recommendation Engine: A fully operational Python-based pipeline that takes natural language queries and delivers optimized, multi-day travel itineraries with real-time weather integration. **An Interactive Web Application Framework**: A complete backend system ready to power a user-facing website, featuring endpoints for itinerary generation, user authentication, trip saving, and location reviews. **A Context-Aware AI Chatbot**: An intelligent assistant (powered by Gemma 2) integrated into the platform, capable of answering specific user questions by referencing the context of their unique, generated itinerary. **A Curated Geospatial Database**: A comprehensive PostgreSQL database populated with detailed information on Busan's key attractions, restaurants, and cafes, including operating hours, categories, and precise geographic coordinates.