Enhancing Hotel Recommendations with AI

LLM–Based Review Summarization and Query-Driven Insights

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The Booking Paradox

Analysis Paralysis

- Travelers are bombarded with thousands of unstructured reviews per listing.

- Traditional filters (Price, Stars) fail to capture qualitative details.

- **Crucial insights** like "Wi-Fi speed" or "Street noise" are buried deep in text.

- Result: Hours spent reading irrelevant rants to find one nugget of truth.
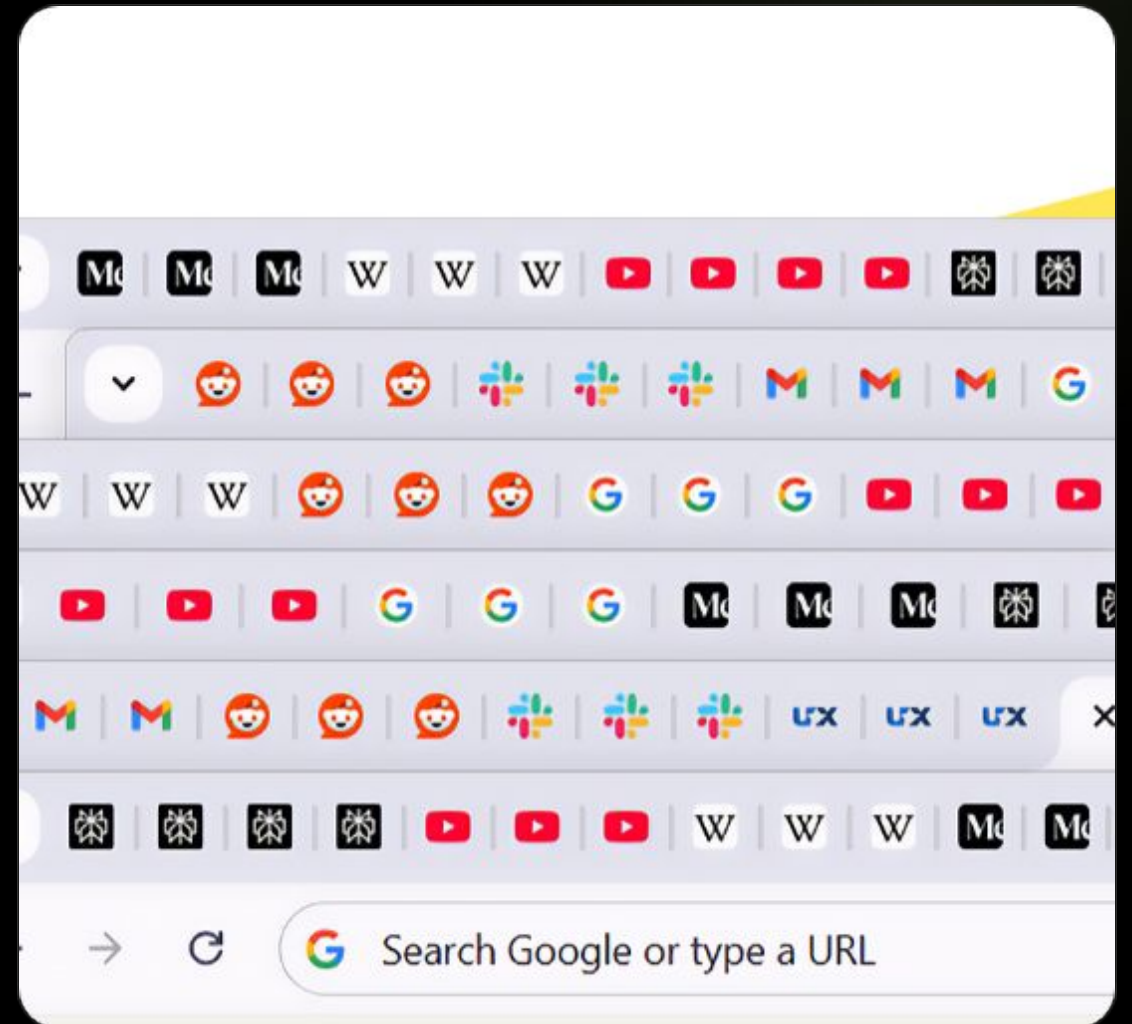
Current Solutions Fall Short

Static Filters

Great for narrowing down price and location, but useless for assessing "vibe" or specific amenities quality.

Sentiment Analysis

Often struggles with sarcasm, nuance, and informal slang common in travel reviews.

Topic Modeling

Identifies broad themes (e.g., "Cleanliness") but cannot answer specific user questions.

Introducing instaGuide

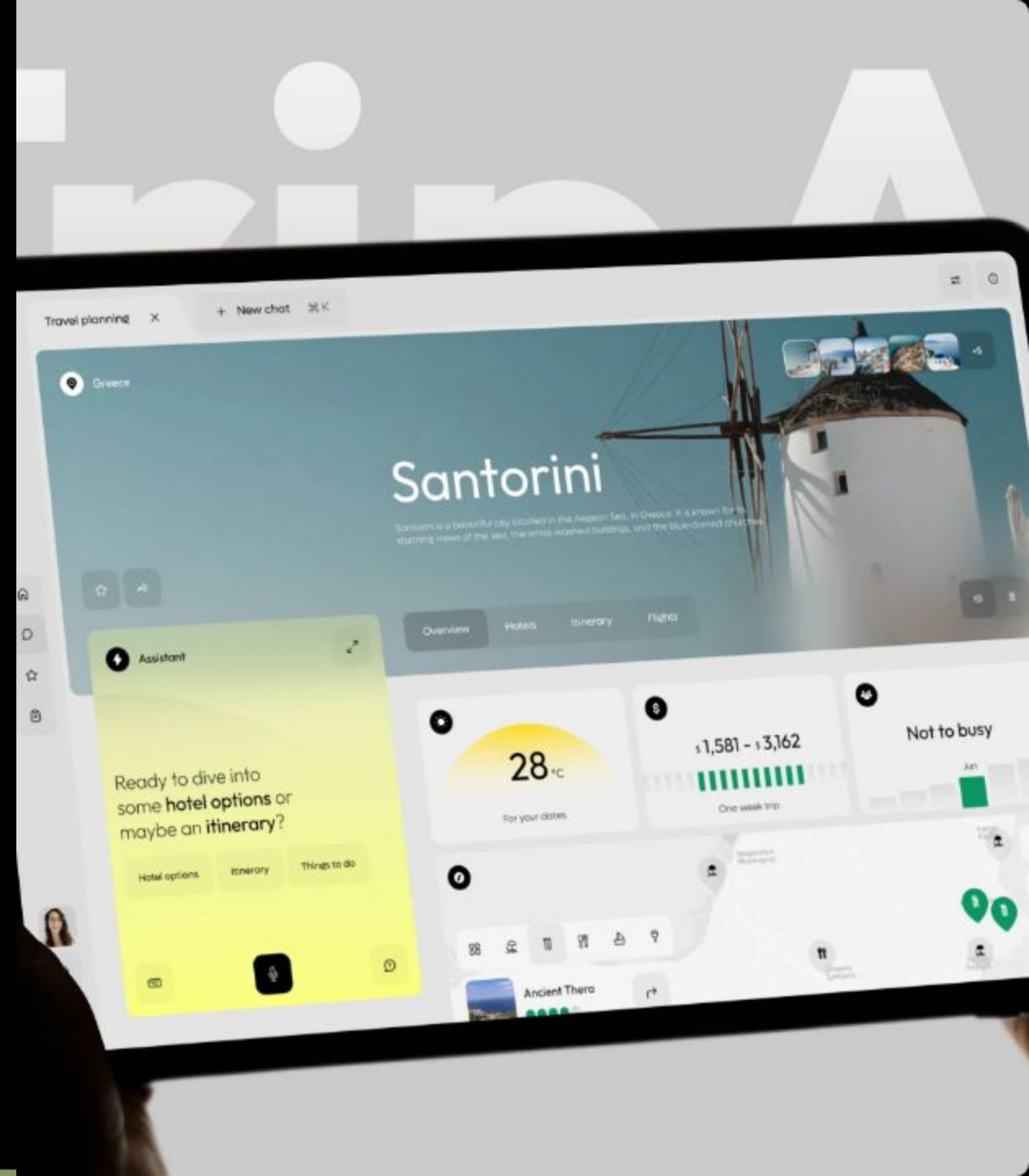An AI-powered travel assistant that reads the reviews for you.

1. Instant Summarization: Uses LLMs to synthesize hundreds of reviews into a concise, balanced overview.

2. Query-Driven Insights: Don't just read—ask.
"Is the parking actually free?"
"How is the breakfast for vegans?"

This approach moves beyond static filtering to dynamic, conversational discovery.

System Architecture

The system operates on a Retrieval-Augmented Generation (RAG) framework:
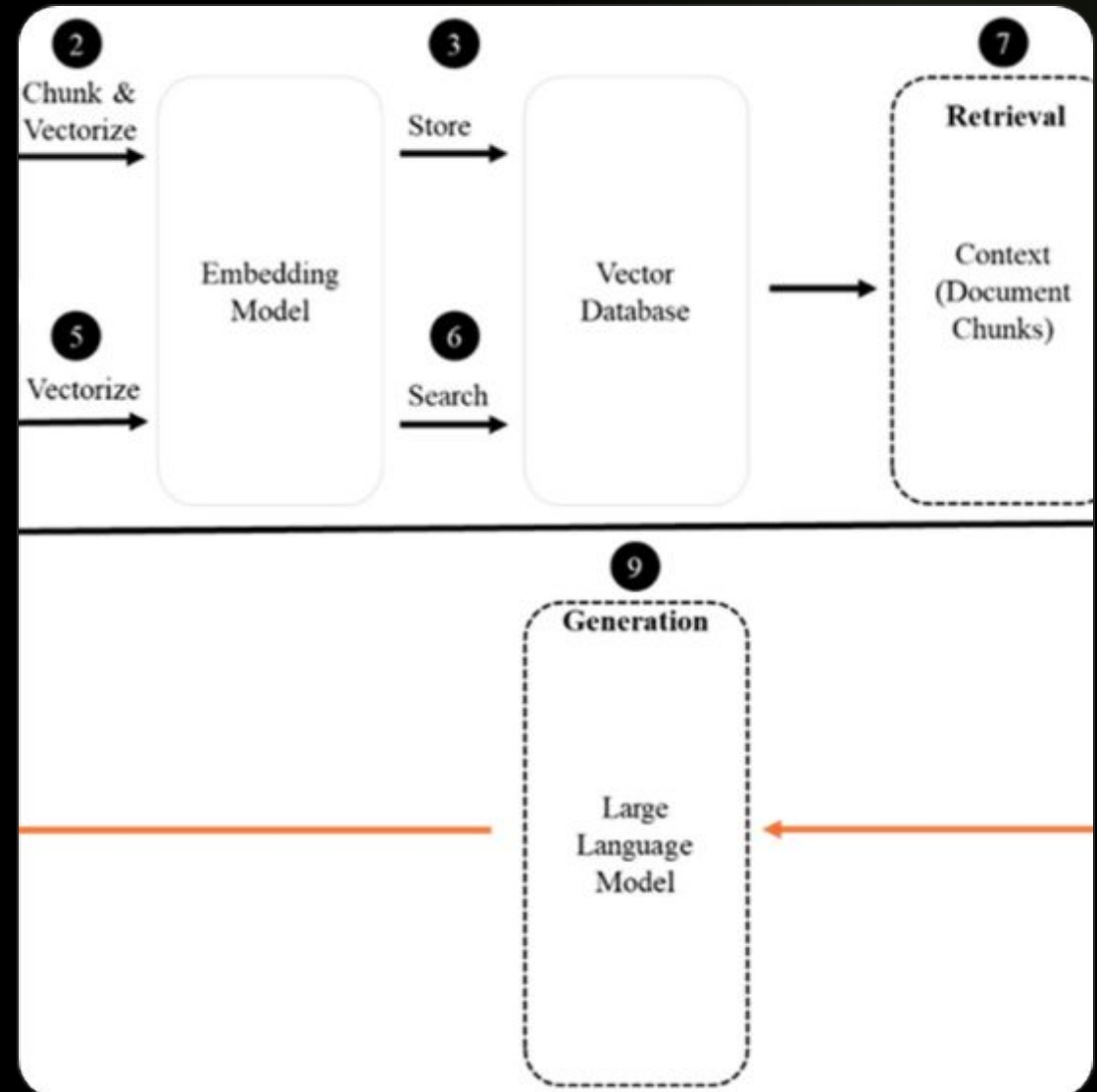
1. Data Retrieval
Fetches raw review data from booking platforms via Web Scraping or APIs.

2. Knowledge Context
Reviews are cleaned, structured, and fed into the LLM context window.

3. Generation
The LLM generates a grounded response based *only* on the provided reviews.
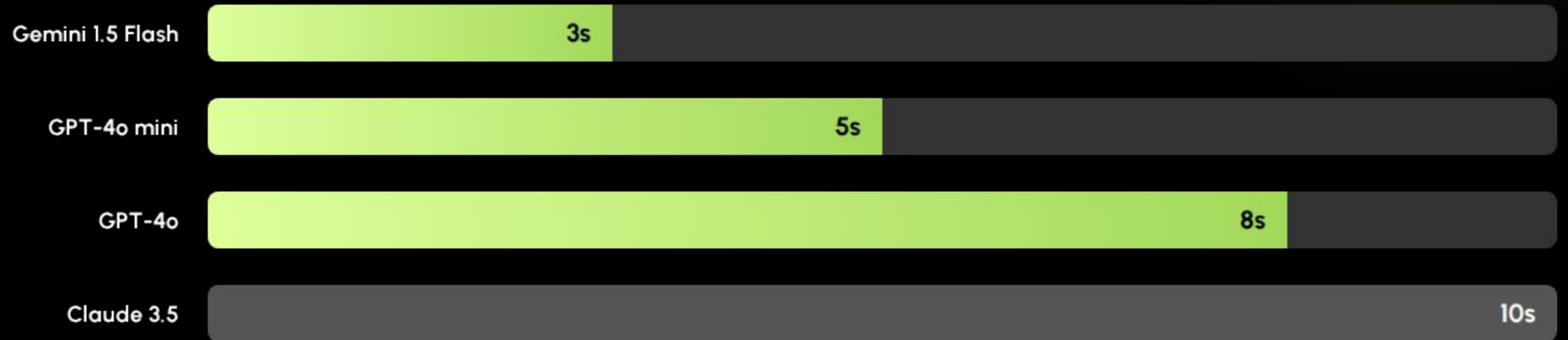
Data Retrieval Strategy

Method	Speed (200 Reviews)	Cost	Pros / Cons
Web Scraping	~5 Seconds	Free	Fast, but legally complex (ToS violations).
Arel Ventures API	~25 Seconds	$1.50 / 1k	Stable SaaS, moderate latency.
Caprolok API	~35 Seconds	$1.00 / 1k	Supports multi-listing, slowest response.

* Web scraping was selected for the academic prototype due to zero cost and high speed.

The Optimal Engine: Gemini 1.5 Flash

3.0s
Total Latency

Why it won?

- ✓ **Speed:** Fastest retrieval-to-generation time.

- ✓ **Cost:** Extremely cost-efficient for high-volume queries.

- ✓ **Context:** Large window handles hundreds of reviews easily.

User Impact

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It managed to save me a great deal of valuable time from the procedure of searching for the right fit.

— **Usability Study Participant**

Ethical & Societal Impact

Data Legality

Commercial web scraping violates Terms of Service. Future deployment requires official API partnerships.

AI Bias

Risk of LLMs hallucinating amenities or summarizing biased reviews without context.

Over-Reliance

Users may skip verifying critical details, trusting the AI summary blindly.

Future Directions

- ✅ **Cross-Domain Expansion:** Applying the "instaGuide" architecture to AirBnB, Car Rentals, and e-commerce marketplaces.

- ✅ **Explainable AI (XAI):** Providing citations. When the AI says "Quiet room," it should link to the specific review that said it.

- ✅ **Production Scaling:** migrating from local Docker containers to Kubernetes for auto-scaling during peak travel seasons.
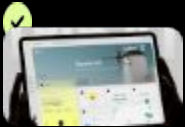
Q & A

Thank you for your attention.

Project Repository: github.com/NikosBelibasakis/InstaGuide

Image Sources

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