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## Project Report: AI-Powered Airbnb Property Comparator

### 1. Project Overview






**Title:** *AI-Powered Airbnb Property Comparator with Location Mapping*

**Goal:**

To develop a web-based application that allows users to input multiple Airbnb listing URLs and compare key features such as price, location, amenities, reviews, and more—summarized intelligently using Google's Gemini AI. The app also provides an interactive map view of all property locations.

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### 2. Key Features

Feature	Description
 AI Analysis (Gemini)	Uses Gemini 1.5 Flash model to extract and summarize property info and reviews from raw HTML.
 Location Mapping	Geocodes each listing's location and displays it on an interactive Folium map.
 Total Price Calculation	Automatically computes the total price based on stay duration and nightly rate.
 Markdown + Data Table	Displays comparison results as both a beautiful markdown table and an interactive DataFrame.
 Export	Supports CSV export of the results for offline reference (optional).

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### 3. Tech Stack

Component	Tool/Library
Frontend	Streamlit
Web Scraping	Selenium, BeautifulSoup
AI Analysis	Gemini 1.5 Flash (via Google Generative AI)
Geocoding	Nominatim (OpenStreetMap API)

Component	Tool/Library
Mapping	Folium, streamlit-folium
Environment Mgmt	dotenv (.env)
Data Handling	pandas

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## 4. Workflow

### Step-by-step:

#### 1. User Input:

- User enters check-in and check-out dates.
- User pastes Airbnb listing URLs (India-specific preferred).

#### 2. HTML Extraction:

- Selenium loads each page in headless Chrome.
- BeautifulSoup cleans and simplifies the HTML content.

#### 3. AI Summarization via Gemini:

- The cleaned HTML + link is passed to Gemini with a carefully crafted prompt.
- Gemini returns a markdown table comparing listings on:
  - Title, Location, Price/night, Guests, Bedrooms, Total Price, Rating, Reviews, Amenities, Link, and a Review Summary.

#### 4. Tabular Output:

- The markdown table is parsed into a DataFrame.
- Additional total price is calculated if missing.

#### 5. Map Visualization:

- The 'Location' column is geocoded using Nominatim.
- Folium generates a numbered map with tooltips and popups.

#### 6. Results Displayed:

- Clean markdown view.
- Interactive DataFrame view.
- Map with markers.

- Coordinates table.

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## 5. Prompt Design (Gemini)

The Gemini prompt includes:

From each property block, extract and compare:

- Name / Title
- Location
- Price per night
- Number of guests
- Number of bedrooms
- Total Price [calculate based on nights between check-in and check-out]
- Rating
- Number of reviews
- Property type
- All available amenities
- Review Summary [Summarize reviews in 1–2 lines]
- Link

Return a Markdown table with each property in one row.

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## 6. Challenges & Solutions

Challenge	Solution
Dynamic JS-loaded content	Used Selenium to wait for full page rendering.
Inconsistent Airbnb HTML structure	Extracted all visible text and used Gemini for semantic parsing.
Review summarization	Let Gemini intelligently condense review text into a short summary.

Challenge	Solution
Geocoding rate-limiting	Used <code>time.sleep(1)</code> between Nominatim API calls.
Streamlit re-renders clearing map	Used <code>st.session_state</code> to cache results between UI updates.

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## 7. Screenshots / Demo Output

*(Include screenshots here showing input UI, markdown table, map view, and table view if presenting.)*

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## 8. Conclusion

This project demonstrates how AI can enhance traditional web scraping and data extraction by:

- Making sense of unstructured HTML content.
  - Providing intelligent comparisons with human-level understanding.
  - Improving usability with maps and summaries.
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## 9. Future Improvements

- Add filters (price range, rating).
  - Save and load sessions.
  - Multilingual support.
  - Add mobile responsiveness.
  - Enable booking links directly from table/map.
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