

AI-Powered Location Insights: Using Google Gemini API for Smart Descriptions



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Tech-Driven Economic Development

Agenda

- **GenAI**
- **Google Gemini**
- **Google Maps**
- **Integrating Maps with Gemini**
- **Building Chrome Extension**

What is Generative AI



Generative AI is an umbrella term that refers to artificial intelligence models that have the capability to generate content. Generative AI can generate text, code, images, video, and music. Examples of generative AI include Gemini, DALL-E, and ChatGPT.

Large language models (LLMs) are a type of generative AI that are trained on text and produce textual content. Google Gemini is a popular example of generative text AI.

Google Gemini



Google Gemini

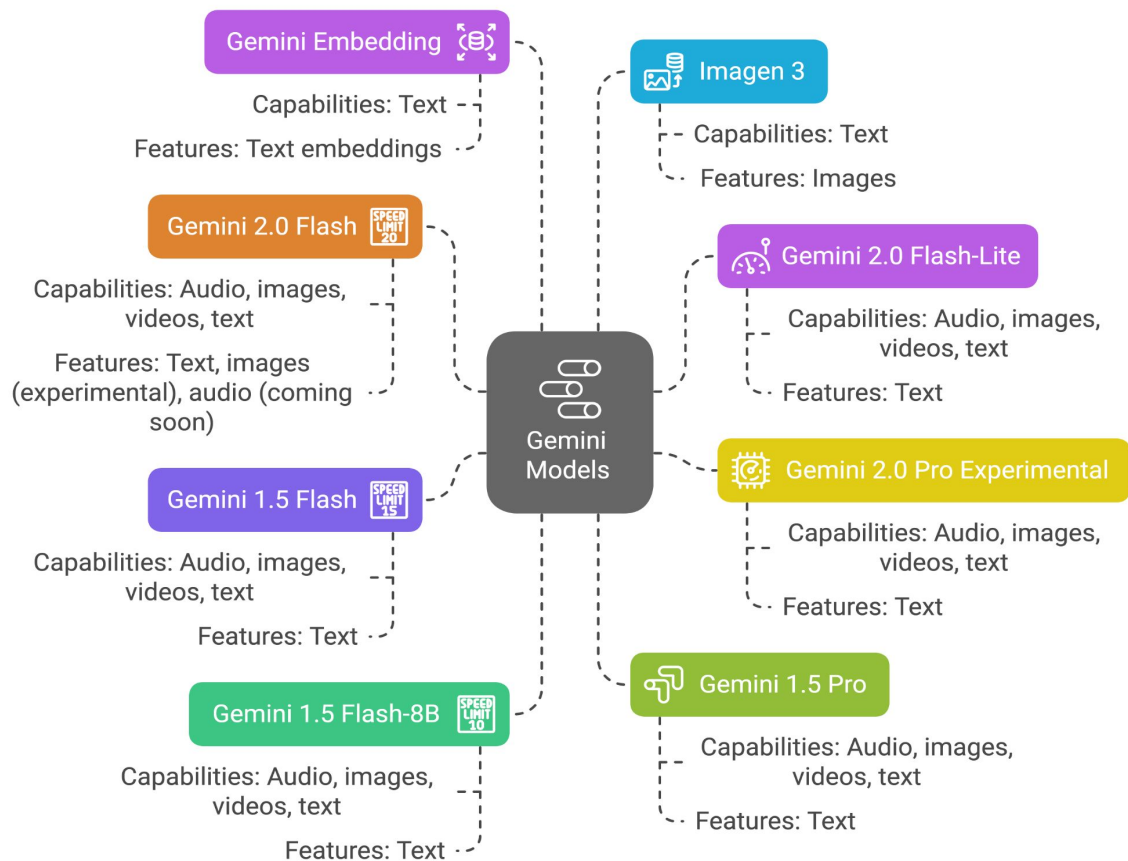
Google's next-generation multimodal AI system

- Released in December 2023
- Available through Google AI Studio and API

Capabilities

- Text generation and understanding
- Spatial reasoning
- Knowledge of geography and landmarks
- Context-aware responses





Gemini API

```
// Make sure to include these imports:
// import { GoogleGenerativeAI } from "@google/generative-ai";
const genAI = new GoogleGenerativeAI(process.env.API_KEY);

const model = genAI.getGenerativeModel({
  model: "gemini-1.5-flash",
});

const prompt = `List a few popular cookie recipes using this JSON schema:

Recipe = {'recipeName': string}
Return: Array<Recipe>`;

const result = await model.generateContent(prompt);
console.log(result.response.text());
```

Google Maps



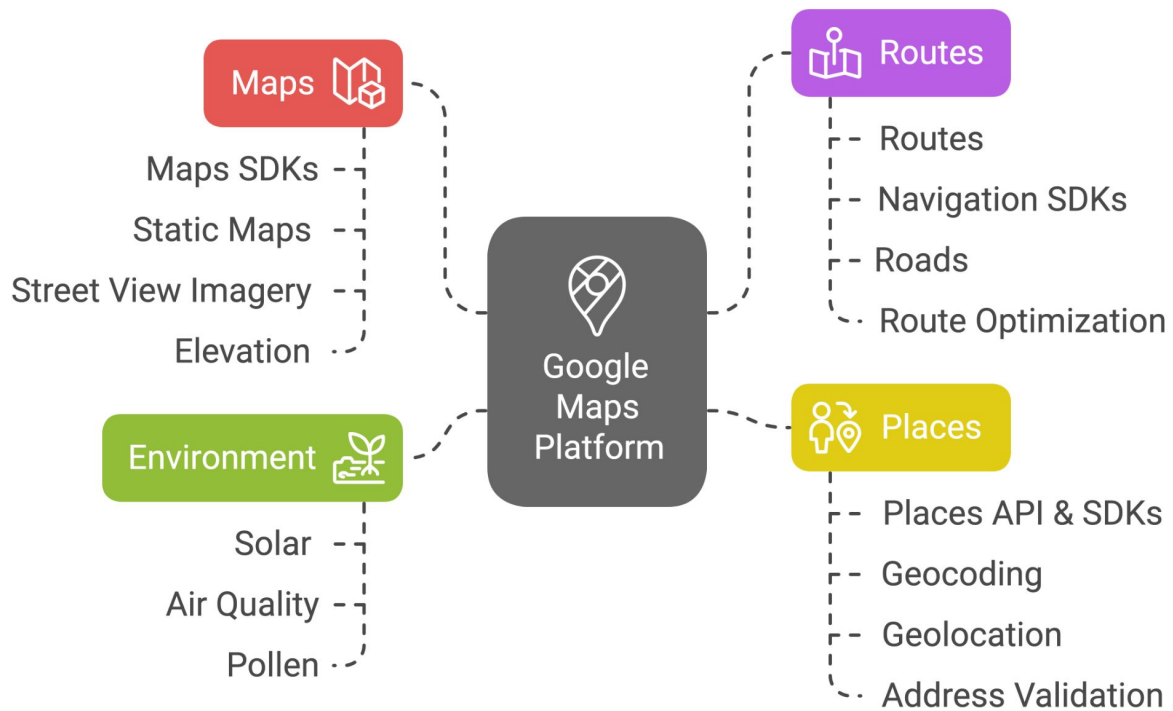
Google map logo is registered trademarks of Alphabet LLC

Google Maps API Platform

Suite of APIs and SDKs that allows

- **Embed maps**
- **Realtime data about locations**
- **Routes**





Gemini for Maps



Why Gemini for Location Insights?

World Knowledge: Pre-trained with global geographic information

Context Awareness: Understands spatial relationships

Multimodal Understanding: Can process coordinates and generate text

Simple API: Easy to integrate into applications

Cost-Effective: Free tier available for experimentation

Run GeoExplorer WebApp

1. Clone Repo <https://github.com/aitechnav/Geoexplorer-Webapp.git>
2. Run localhost server:

 npm install -g http-server Or

 python3 -m http.server 8000
3. Add keys in js/config.js
4. Open on browser <http://localhost:8000/index.html>



GeoExplorer AI

- ✓ Default Map
- Satellite
- Terrain
- Night Mode
- Retro
- Silver

Map

Satellite

Location Coordinates

Search for a location

Search

Latitude: 42.729763,
Longitude: -73.678888

Address: 110 8th St, Troy, NY
12180, USA

Save This Location

Map Layers

Traffic ☒

Transit ☐

Bicycling ☐



Core Components

Map Configuration (map-config.js): Sets up the map and its initial state

Location Manager (location-manager.js): Handles location interactions & storage

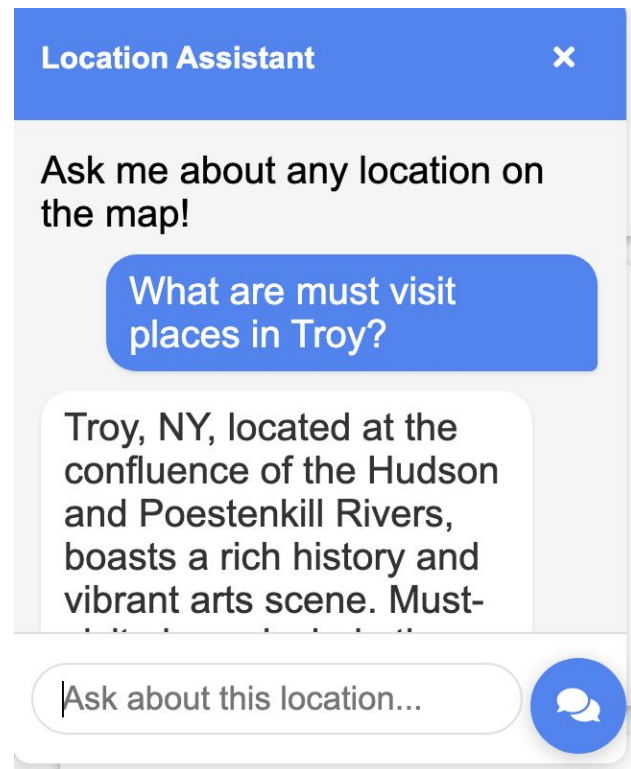
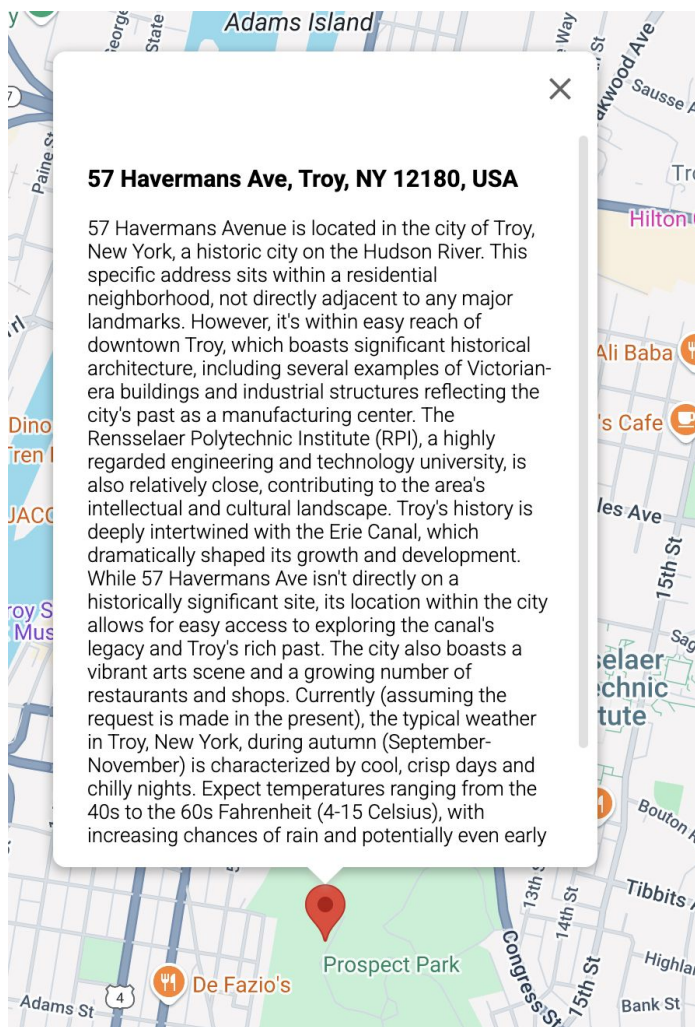
UI Controller (ui-controller.js): Manages all user interface events

API Service (api-service.js): Interfaces with Google Maps & Gemini API

Chat Interface (chat-interface.js): Provides AI assistant capabilities

Data Flow

- User interacts with map (click) → **handleMapClick()** triggered
- Coordinates captured and Geocoding happens → **reverse lookup for address**
- Gemini API generates content about location → **generateContent()**
- Info window displays with location information
- User can save locations to local Storage for future reference



Making API Communication Reliable and Secure

- **Reliability strategies**

- Fallback mechanism
- Async pattern
- Indicated loading states
- Separate api logic

- **Security consideration**

- Validate all inputs (avoid injection attack)
- Use HTTPS
- Handle connectivity issues

GeoExplorer Chrome Extension

Manifest V3 Structure

Background Service Worker

Content Scripts

Storage API

Map Integration

Cross-Origin Security Considerations



Main Components

1. Entry Point and Initialization

- `app-leaflet.js`: Contains the DOMContentLoaded event listener that starts everything
- `initializeApp()`: The main bootstrapping function that sets up the application

2. Map Management

- `map-config-leaflet.js`:
 - `initializeMap()`: Creates and configures the Leaflet map
 - `applyMapStyle()`: Handles the visual styling of the map
- `location-manager-leaflet.js`:
 - `handleMapClick()`: Processes clicks on the map
 - `reverseGeocode()`: Converts coordinates to human-readable addresses

3. AI Integration

- `api-service-leaflet.js`:
 - `generateContent()`: Gets location descriptions from Gemini
 - `generateChatResponse()`: Gets AI responses to user questions
- `background.js`:
 - Contains the actual API request logic to Google's Gemini
 - Keeps API keys secure in the background script

1. Chat Interface

- `chat-interface-leaflet.js`:
 - `initChatInterface()`: Creates the chat UI
 - `handleChatSubmit()`: Processes user questions and displays responses

2. Data Persistence

- `background.js`:
 - `saveLocation()`: Stores locations in Chrome storage
 - `getSavedLocations()`: Retrieves saved locations
 - `deleteLocation()`: Removes saved locations

3. UI Management

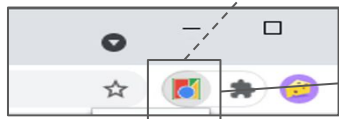
- `ui-controller-leaflet.js`:
 - `setupEventListeners()`: Sets up all the UI interactions
 - `updateSavedLocationsUI()`: Updates the saved locations panel

Inside of Chrome

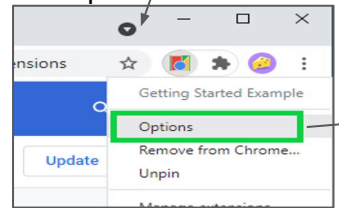
Outside of Chrome

UI

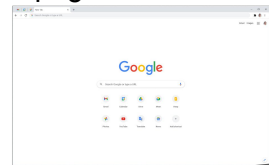
Toolbar button



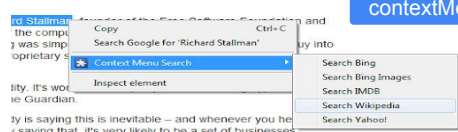
Menu / Option



Web page

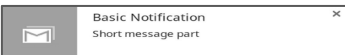


Context menu



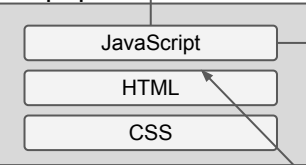
contextMenus

Notification

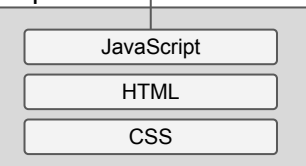


Background

Popup window



Option window



Contents Script



action

runtime.message

Background Script

Service_worker
(JavaScript)

alarm

runtime.message

notification

data

storage

Chrome Data

cookie

pageCapture

bookmark

browserAction

history

External API

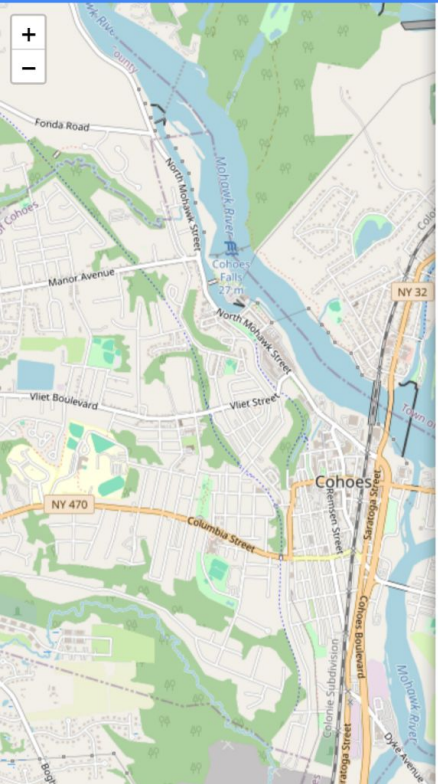
External API

chrome.message

OS

filesystemProvider

printing



2210, 13th Street, The Hill, City of Troy, Rensselaer County, New York, 12180, United States

2210 13th Street is located in the Hill neighborhood of Troy, New York, a historic city in Rensselaer County. This area is characterized by its predominantly residential streets with a mix of housing styles, reflecting Troy's diverse architectural history. The address is situated within a relatively quiet residential zone, though it's within reasonable proximity to the bustling downtown area of Troy, known for its vibrant arts scene, independent businesses, and historical landmarks like the Rensselaer Polytechnic Institute (RPI) and several preserved Victorian-era buildings. While the specific address itself isn't a major landmark, its location offers easy access to several points of interest within Troy. The city boasts a rich industrial past, particularly in the manufacturing of textiles and other goods, a legacy visible in its architecture and museum collections. The area's cultural relevance stems from this history and its current revitalization as a hub for



Rensselaer Polytechnic Institute

Search

Latitude: 42.734689, Longitude: -73.677986

Address: 2210, 13th Street, The Hill, City of Troy, Rensselaer County, New York, 12180, United States

Save Location

Map Settings

Default

Traffic

Transit

Bicycling

Saved Locations

2210 13th street

3/23/2025

Delete


Reference Code

github.com/aitechnav

Q&A

Thank you

Resources for Hackathon and Future

- Google AI Studio: aistudio.google.com
- Google Gemini API ai.google.dev/gemini-api/docs
- Google Maps developers.google.com/maps
- Leaflet Documentation: leafletjs.com/
- Google Maps Hackathon googlemapsplatform.devpost.com/project-gallery
- Chrome Extension Docs: developer.chrome.com/docs/extensions/
- GitHub Repository: <https://github.com/aitechnav>
- Contact:  [anujtyagi1](https://www.linkedin.com/in/anujtyagi1)