

Datacrowd

Final Presentation TEAM 01

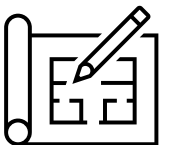
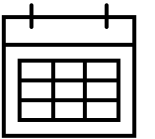
Tsampras Konstantinos
Papoutsas Georgios

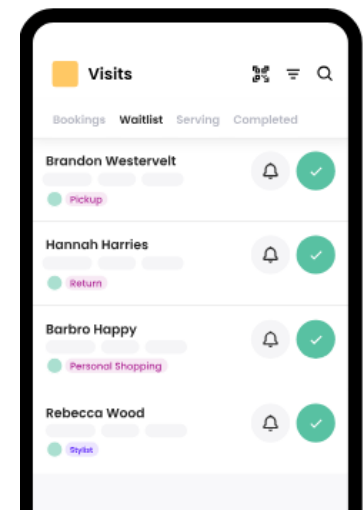
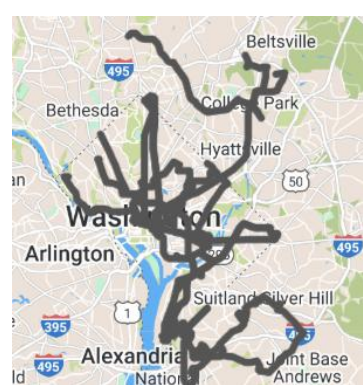
Mission Statement

Crowd Monitoring in Public Spaces

Problems:

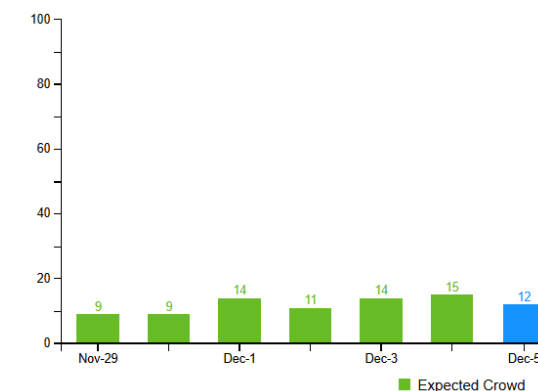
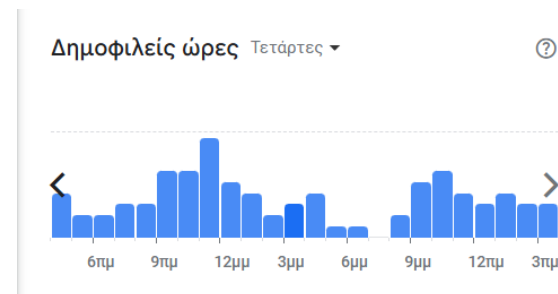
- **Overcrowding**
 - Disease Transmission Risk [Hospitals, Public Spaces]
 - Air Quality Considerations [Closed areas, Shops etc.]
- Personal Scheduling
 - **Avoid High Traffic Hours or Spaces**
 - Visit recreational spaces during peak popularity
- Resource Management
 - **Ineffective Employee timetables**
 - Marketing in Public Spaces





Features/App	Public Transit apps	Avoid crowds	Waitwhile	Google Places API	Foursquare	Datacrowd
Crowd Prediction		X	X	X	X	X
Multi-source model						X
Business & Authorities Insights			X	X	X	X
Commute Scheduling	X			X	X	X

- <https://www.wmata.com/service/status/>
- <https://avoid-crowds.com/>
- <https://waitwhile.com/>
- <https://developers.google.com/maps/documentation/places/web-service>
- <https://foursquare.com/>



Other solutions

Data sources



Δημοφιλείς ώρες Τετάρτες ▾



Collect data from:

- Traffic in public networks (**WiFi4EU**, Eduroam)
- Environmental sensors (**CO₂**, Temperature, Humidity)
- Google APIs (Air Quality, Maps, Geocoding, Directions, Places)
- **Web Scraping Google Maps**

Requirements

Access to traffic in public networks (~25€ each)

Google APIs (~12€ per month)

Sensors (CO₂, Temperature, Humidity) (~69€)

Target audience

- Citizens
 - Students
 - Users of Public Transport and Services
 - Tourists
- Authorities and Businesses
 - Educational Institutions
 - **Municipal Authorities**
 - **Private Businesses**
 - **Groups of Businesses**

<https://www.kotsovolos.gr/computing/networking/switches-access-points/215768-tp-link-access-point-tl-wa801n>

<https://developers.google.com/maps/documentation/places/web-service/overview>

https://mapsplatform.google.com/pricing/?utm_experiment=13102152

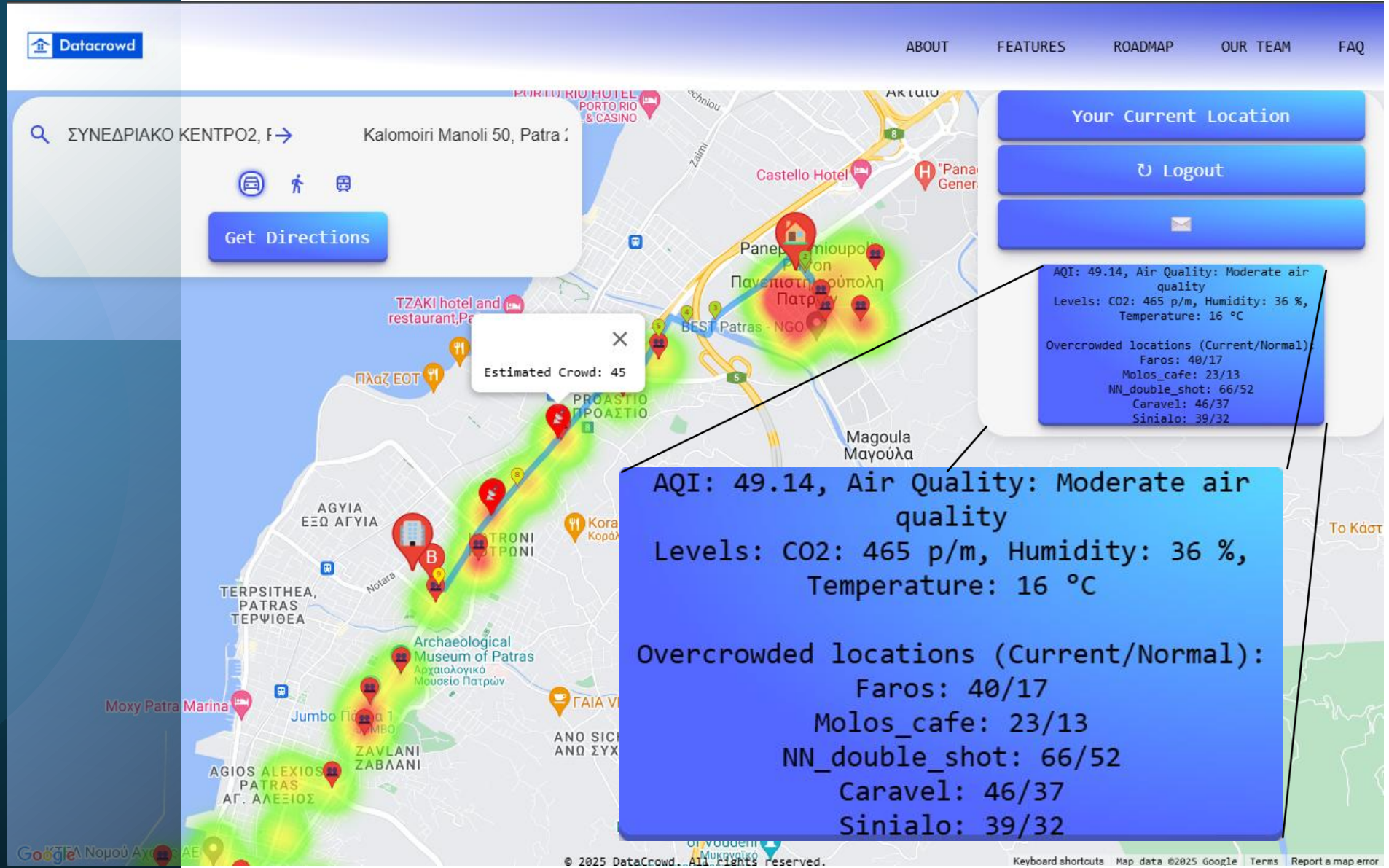
<https://mclimate.eu/products/mclimate-co2-sensor-notifier-lorawan?variant=47859023806796>

Citizens' Experience

A citizen wants to navigate efficiently to a destination of their choice while avoiding **overcrowded areas** and being aware of the **air quality** along the way.

By using our service, they receive **warnings** based on real-time crowd data on their selected route, helping them choose **less congested and more comfortable paths**. Additionally, they gain access to **air quality insights** for the areas they pass through, ensuring a healthier and more informed travel experience

Citizens



Businesses' Experience

A business owner wants to manage employee schedules more efficiently and advertise to the public during peak hours and high-traffic locations. They also want access to **air quality data** to optimize ventilation for **better customer and employee satisfaction and experience**.

By using our service, they gain access to **historical, real-time and predictive crowd estimation data**, based on the sensors of their choice. Additionally, they can purchase **premium access** to the entire sensor network, beyond those located within their own business premises.

Authorities' Experience

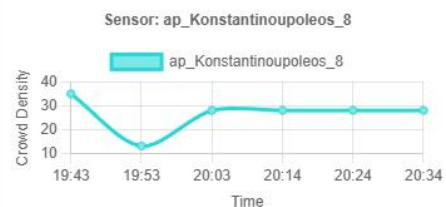
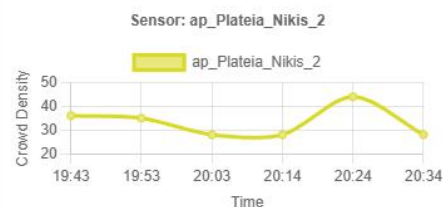
Authorities want to **monitor crowd density and air quality** to improve **public safety**, and **citizen well-being**.

By using our service, they gain **historical, real-time and predictive insights** on crowd movement and air quality, helping them **manage high-traffic areas**, and **enhance public space efficiency**.

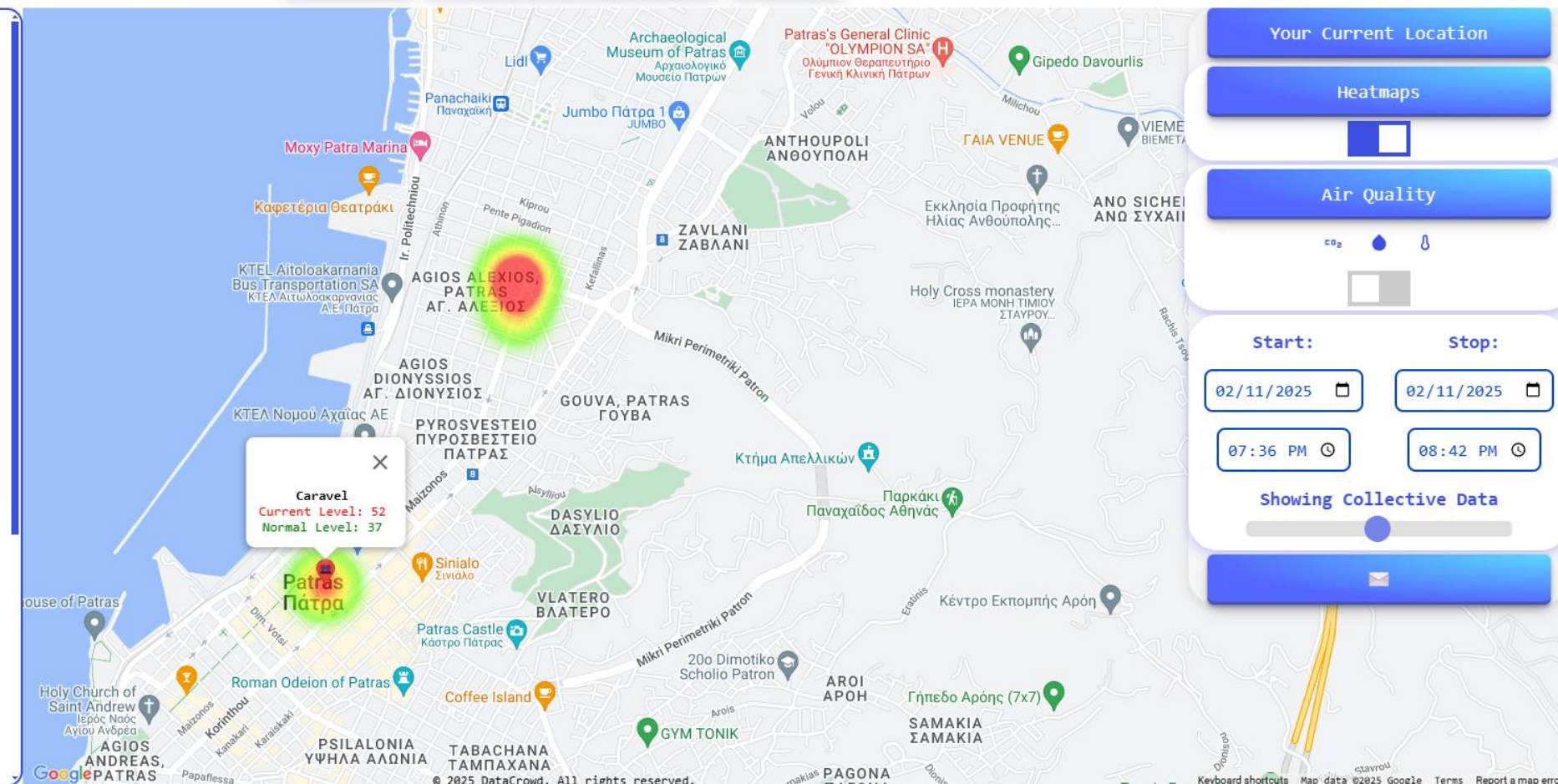
Businesses

Monitoring

Get Access to More Sources

[🔙 Logout](#)

Sensor: air_quality_sensor_Caravel_2



Your Current Location

Heatmaps

Air Quality

Start:

Stop:

02/11/2025

02/11/2025 02/11/2025

07:36 PM

07:36 PM

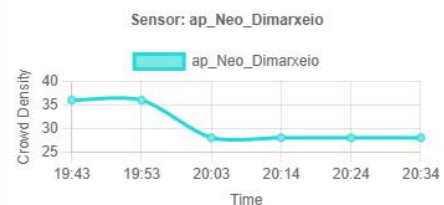
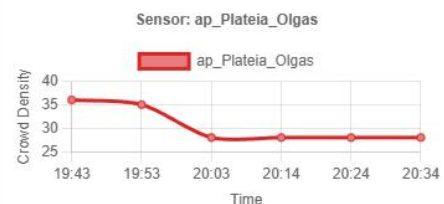
Showing Collective Data

Authorities

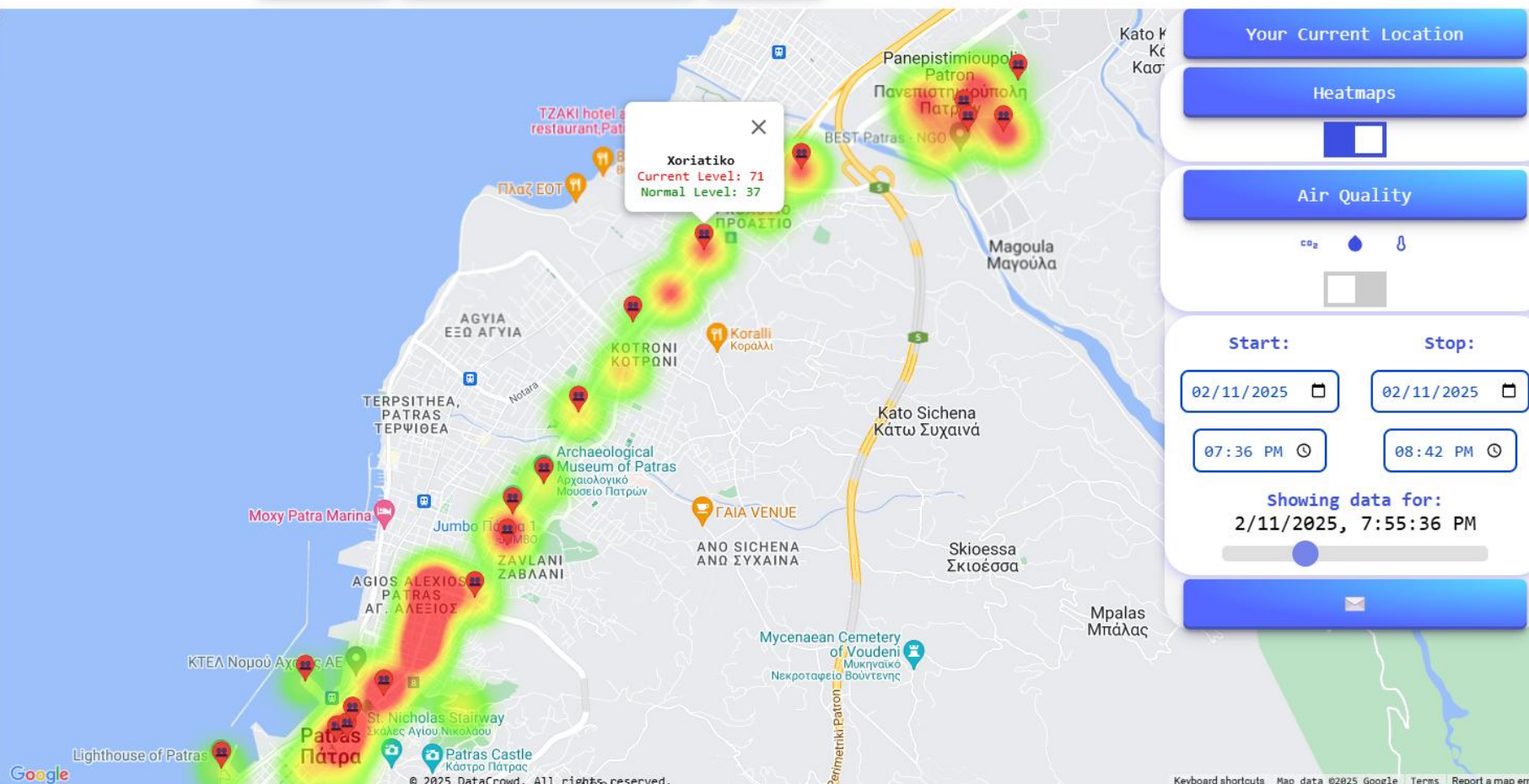
Monitoring

Get Access to More Sources

Logout



Sensor: ap_Konstantinoupoleos_1



Your Current Location

Heatmaps

Air Quality

CO₂

Start:

Stop:

02/11/2025


02/11/2025

07:36 PM

08:42 PM

Showing data for:
2/11/2025, 7:55:36 PM

Data Sources Marketplace

Datacrowd

ABOUTFEATURESROADMAPOUR TEAMFAQ

MonitoringGet Access to More SourcesLogout

Account Page

business ID:14

Username: carave11

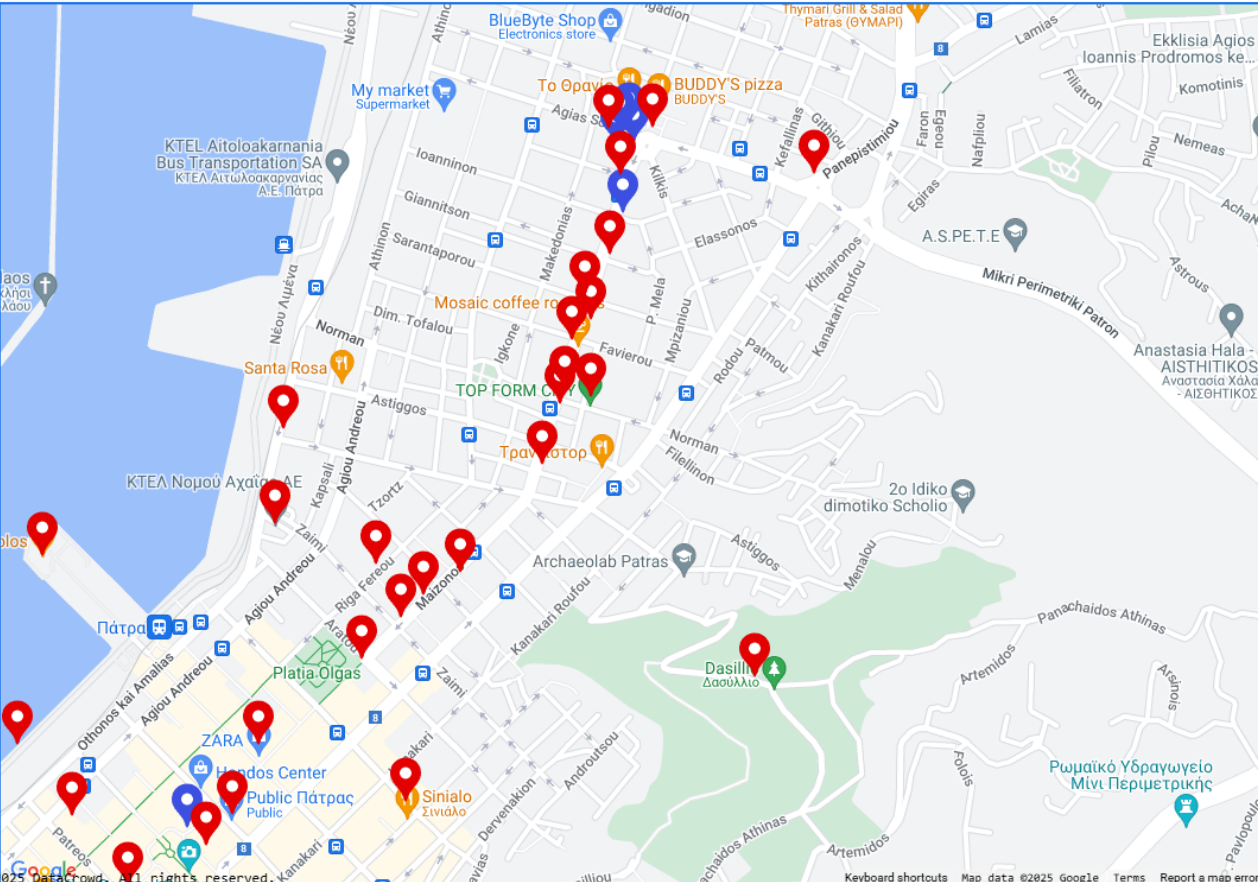
Name: Carave11
Type: Bakery
Phone: 2106772111
Address: Βορείου Ηπείρου
City: Πάτρα
Zip code: 262 23

Your Data Sources

Source ID: 20
Type: airquality
Location: Caravel_2
Delete Source
Source ID: 8
Type: airquality
Location: Caravel
Delete Source
Source ID: 64
Type: wifi
Location: Plateia_Voreio

Available Data Sources

Source ID: 1
Type: wifi
Location: fake_kentro1
Add Source
Source ID: 2
Type: airquality
Location: fake_kentro2
Add Source
Source ID: 3
Type: airquality
Location: fake_kentro3



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Keyboard shortcuts Map data ©2025 Google Terms Report a map error

Data processing



The sensor data needs to be organized and processed.



The access point traffic data will be used to estimate the number of people connected to the Local Area Network.



The CO2 readings from the climate sensors will be used to determine the rough size of the crowd in a closed space.



Live and historic data from Web Scraping Google Maps will be used for live and predictive crowd estimations.

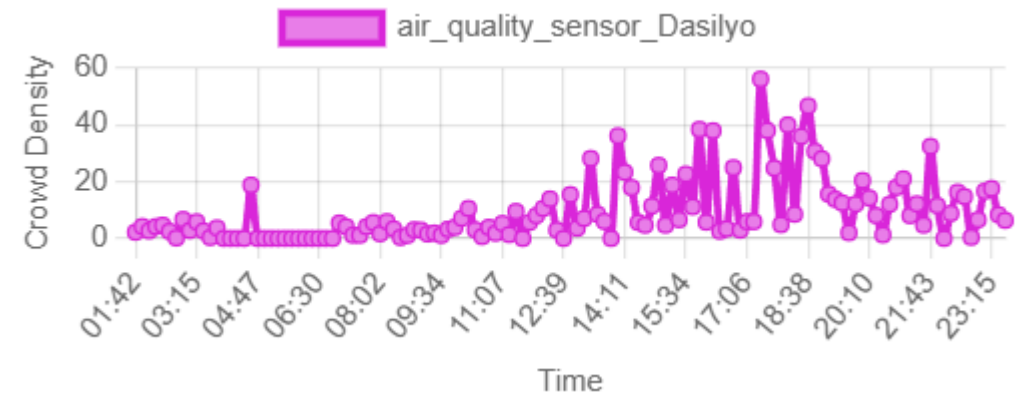
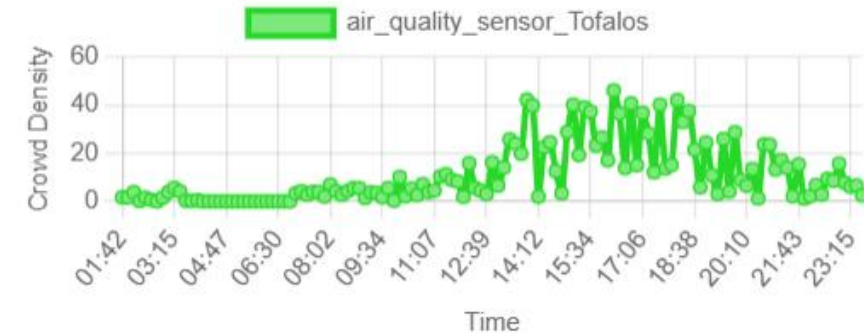
Fake Data Generation

We use a combination of real and fake data for our model.

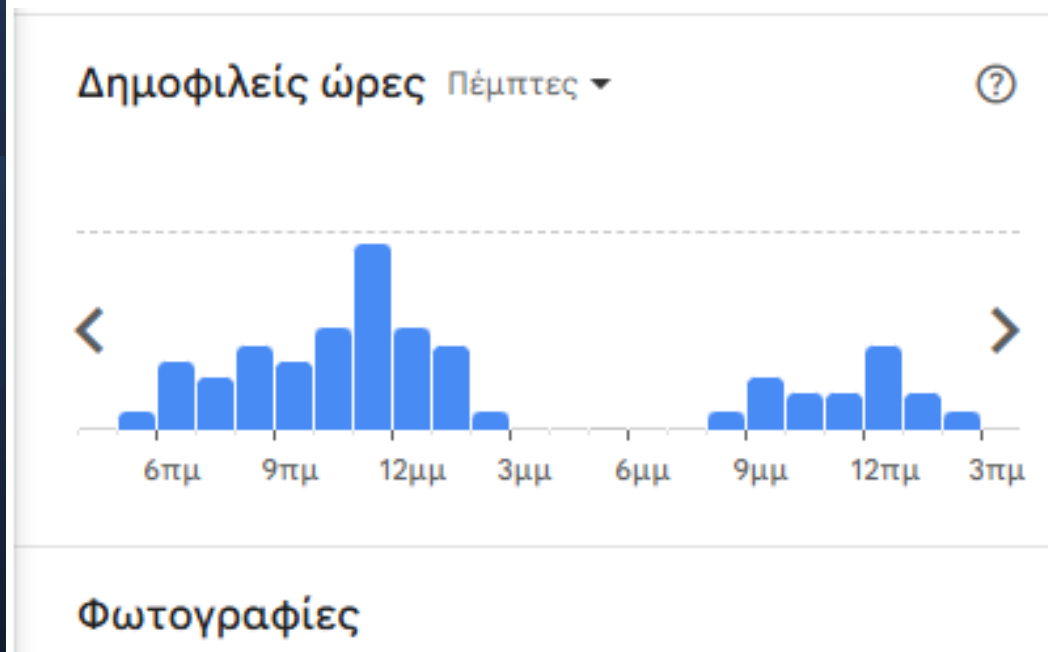
- Real Climate Sensor data from our lab.
- Real Access Point data from Aps around the Campus
- Fake Climate Sensors around the Campus and City center
- Fake Access Point data at real PatrasWifi locations

Fake data are set to follow shifted Gaussian curves during the day with a chance of variation.

<https://smartcity.patras.gr/map?typeId=4>



Web Scraping Popular Times From Google Maps



Δένδρα Κουνάβη

4,8 ★★★★★ (26) ⓘ
Ιστορικό αξιοθέατο

Επισκόπηση Κριτικές Πληροφορίες

Οδηγίες Αποθήκευση Κοντά Αποστολή σε τηλέφωνο Κοινοποίηση

📍 Ηρώων Πολυτεχνείου, Πανεπιστημιούπολη Πατρών 265 04

🕒 Άνοιχτά όλο το 24ωρο

🌐 des.upatras.gr

📍 7QQQ+7C Πανεπιστημιούπολη Πατρών

🛡️ Κατοχύρωση αυτής της επιχείρησης

🕒 Η δραστηριότητά σας στους Χάρτες

📌 Προσθήκη ετικέτας

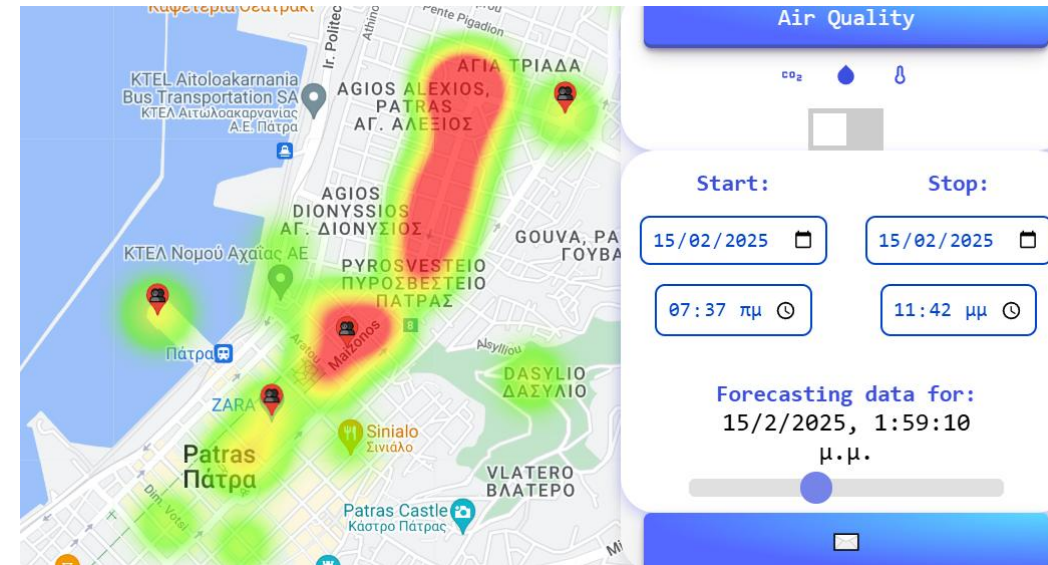
✎ Τροποποίηση

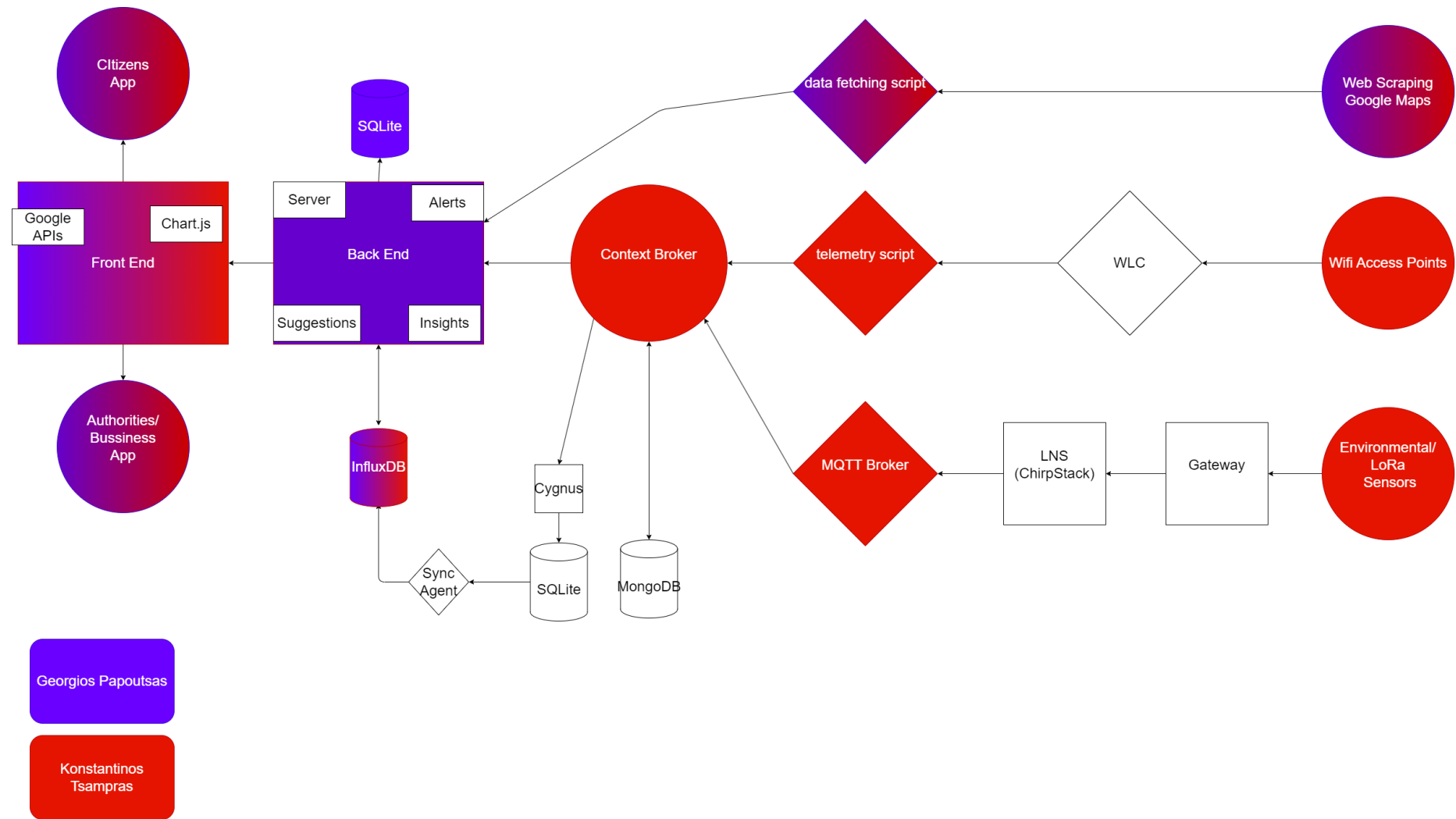
Crowd Estimations and Predictions

Crowd estimations are conducted for Access Point and Climate Sensor locations.

Using the number of connected users or the concentration of CO₂, an estimation is conducted for the number of people in the area.

Predictions for future time slots use current crowd estimations and curve data (according to the current and target date) in order to produce future heatmaps and graphs.





Final App Architecture

Technologies



Google APIs



Sensor Protocols:
LoRa, SNMP



University Lab
Infrastructure:
Context Broker



Back End:
Node.js



Front End:
Html, CSS,
Handlebars



Databases:
MongoDB, Sqlite3,
InfluxDB

Name	↓ Requests
Air Quality API	676
Maps JavaScript API	624
Geocoding API	578
Directions API	109
Places API	10



Smart Data Models:
For sensor data*



Design:
Figma



Web Scraping:
Selenium,
BeatifulSoup

<https://github.com/smart-data-models/dataModel.OCF/tree/master/Measurement>
<https://developers.google.com/maps>

Difficulties Encountered and Technologies not in final build

Live Camera
Feeds

AI model

Google Places
API doesn't
provide crowd
density data

Time Zone
Inconsistency in
Data(InfluxDB, JS
Date, Local)

VIDEO DEMO

<https://youtu.be/0GJYFtE6fGQ>

https://github.com/Papiqulos/Project_IoT





Thank you for your time!