Datacrowd

Final Presentation TEAM 01

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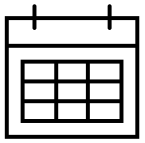
Papoutsas Georgios

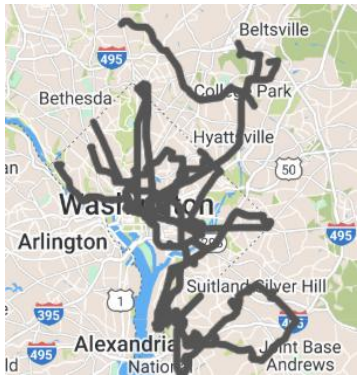
Mission Statement

Crowd Monitoring in Public Spaces

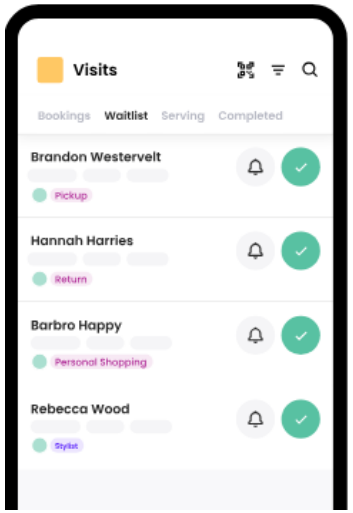
Problems:

- 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

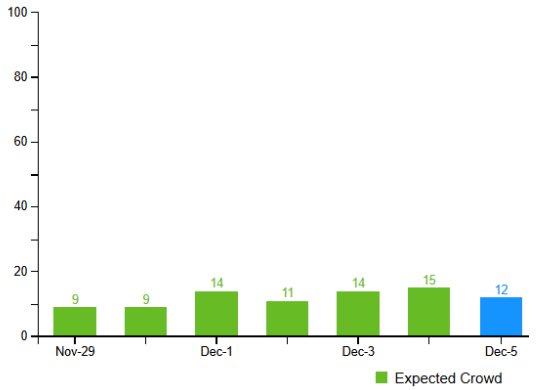




Features/App	Public Transit apps	Avoid crowds	Waitwhile	Google Places API	Foursquare	Datacrowd
Crowd Prediction		X	X	X	X	X
Multi-source model						X
Business & Authorities Insights			X	X	X	X
Commute Scheduling	X			X	X	X



- 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

Collect data from:

- Traffic in public networks (**WiFi4EU**, Eduroam)
- Environmental sensors (**CO_2**, 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 (CO_2, 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

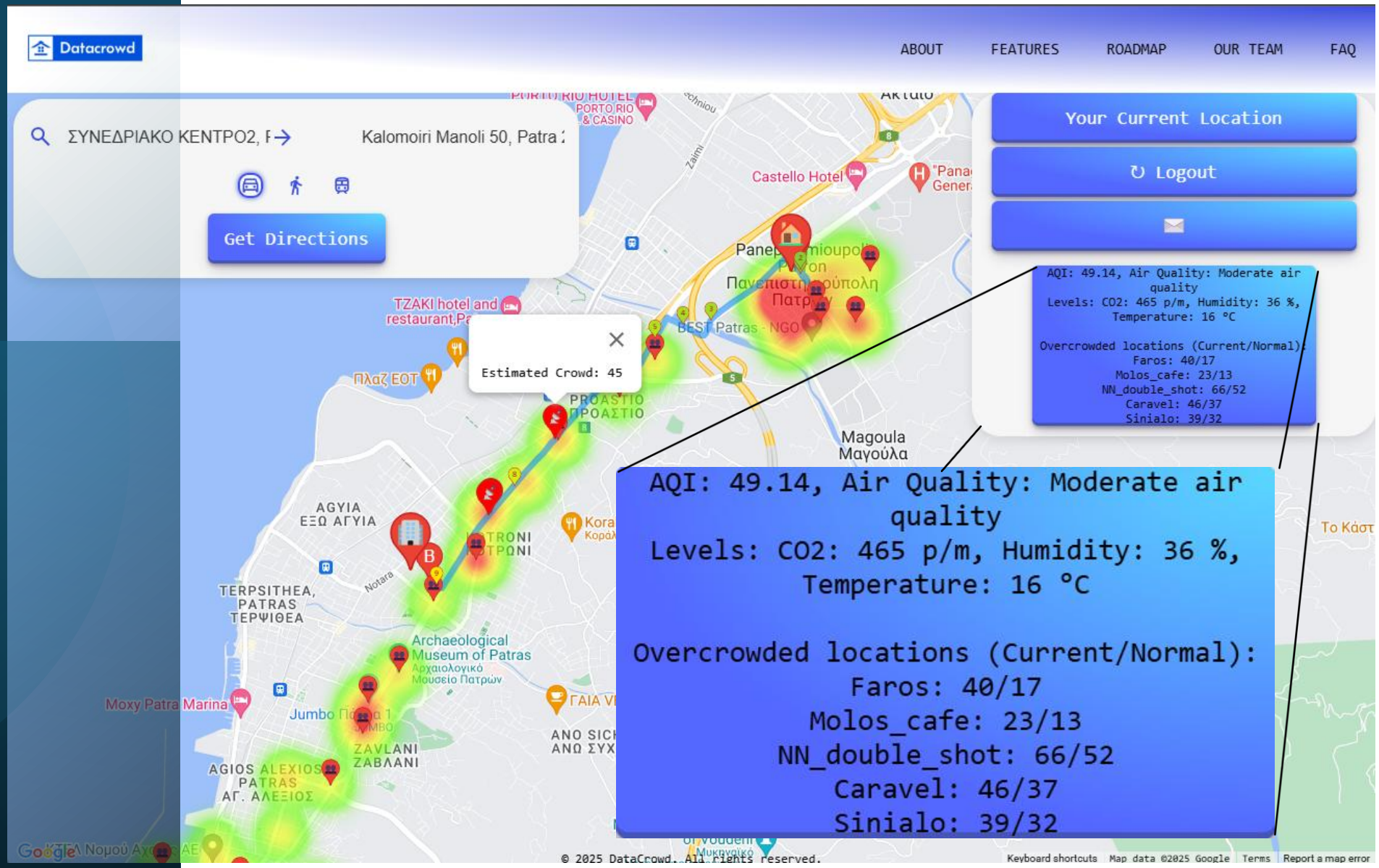
https://mclimate.eu/products/mclimate-co2-sensor-notifier-lorawan?variant=47859023806796

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 **optimized route suggestions** based on real-time crowd data, 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


Datacrowd
ABOUT
FEATURES
ROADMAP
OUR TEAM
FAQ
ΣΥΝΕΔΡΙΑΚΟ ΚΕΝΤΡΟ2, Γ
Kalomoiri Manoli 50, Patra
Get Directions
Your Current Location
Logout
Estimated Crowd: 45
AQI: 49.14, Air Quality: Moderate air quality
Levels: CO2: 465 p/m, Humidity: 36 %, Temperature: 16 °C
Overcrowded locations (Current/Normal):
Faros: 40/17
Molos_cafe: 23/13
NN_double_shot: 66/52
Caravel: 46/37
Sinialo: 39/32
Castello Hotel
TZAKI hotel and restaurant
Magoula
Μαγούλα
AGYIA
ΕΞΩ ΑΓΥΙΑ
TERPSITHEA, PATRAS
ΤΕΡΨΙΘΕΑ
Archaeological Museum of Patras
Moxy Patra Marina
ZAVLANI
ΖΑΒΛΑΝΙ
AGIOS ALEXIOS PATRAS
ΑΓ. ΑΛΕΞΙΟΣ
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Map data ©2025 Google
Terms
Report a map error

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**.

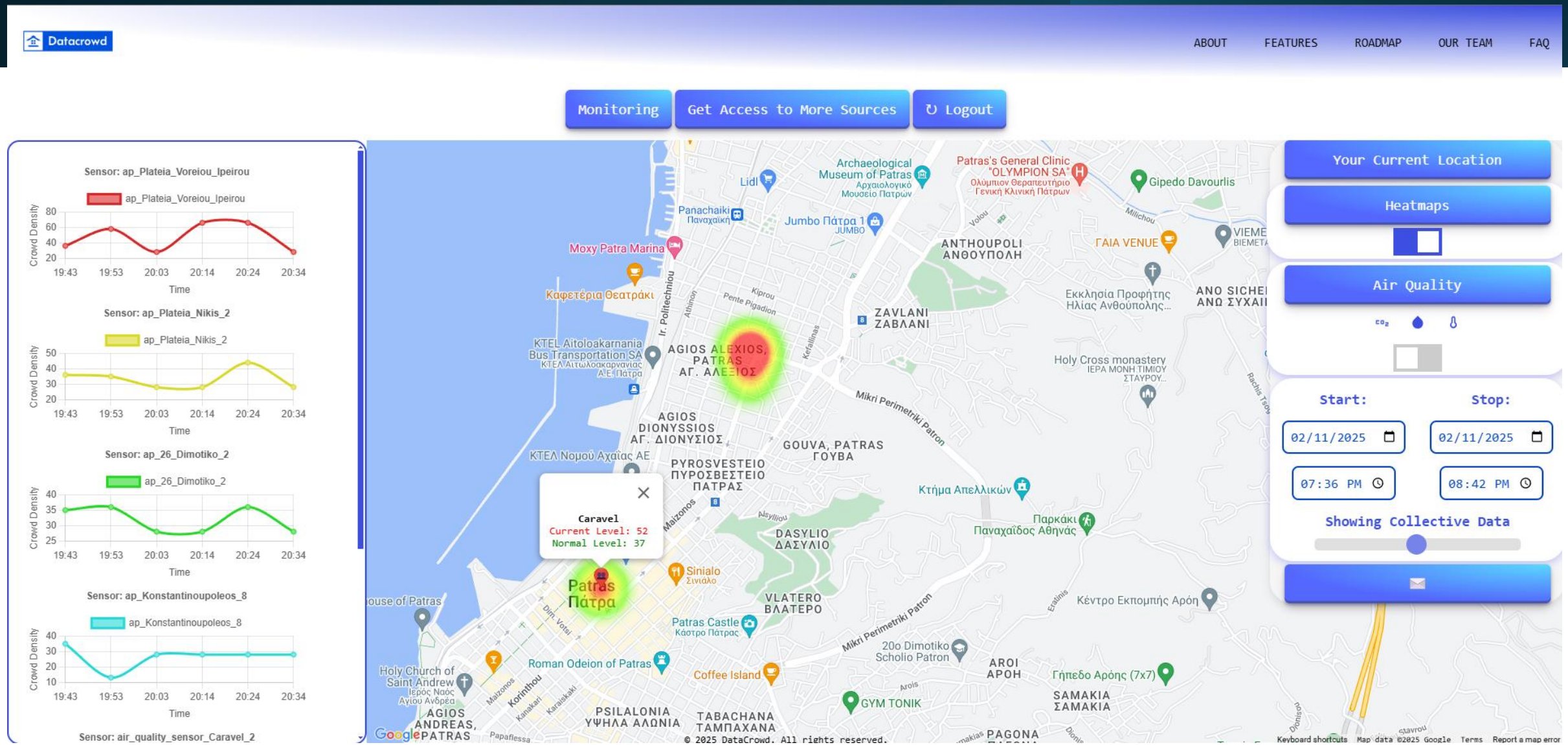
By using our service, they gain access to **historical, real-time and predictive crowd estimation data**, based on the sensors of their choice. Additionally, they can purchase **premium access** to the entire sensor network, beyond those located within their own business premises.

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


Datacrowd
ABOUT
FEATURES
ROADMAP
OUR TEAM
FAQ
Monitoring
Get Access to More Sources
Logout
Sensor: ap_Plateia_Voreiou_Ipeirou
ap_Plateia_Voreiou_Ipeirou
Crowd Density
Time
Sensor: ap_Plateia_Nikis_2
ap_Plateia_Nikis_2
Sensor: ap_26_Dimotiko_2
ap_26_Dimotiko_2
Sensor: ap_Konstantinoupoleos_8
ap_Konstantinoupoleos_8
Sensor: air_quality_sensor_Caravel_2
Caravel
Current Level: 52
Normal Level: 37
Your Current Location
Heatmaps
Air Quality
Start:
Stop:
02/11/2025
07:36 PM
08:42 PM
Showing Collective Data
Archaeological Museum of Patras
Patras's General Clinic "OLYMPION SA"
Gipedo Davourlis
Lidl
Panachaiki
Jumbo Πάτρα 1
Moxy Patra Marina
ANTHOUPOLI
ΑΝΘΟΥΠΟΛΗ
ΓΑΙΑ VENUE
Καφετέρια Θεατράκι
ZAVLANI
ΖΑΒΛΑΝΙ
Εκκλησία Προφήτης Ηλίας Ανθούπολης...
KTEL Aitoloakarnania Bus Transportation SA
AGIOS ALEXIOS, PATRAS
ΑΓ. ΑΛΕΞΙΟΣ
Holy Cross monastery
AGIOS DIONYSSIOS
ΑΓ. ΔΙΟΝΥΣΙΟΣ
GOUVA, PATRAS
ΓΟΥΒΑ
ΚΤΕΛ Νομού Αχαΐας ΑΕ
PYROSVESTEIO
ΠΥΡΟΣΒΕΣΤΕΙΟ
ΠΑΤΡΑΣ
Κτήμα Απελλικών
Παρκάκι Παναχαΐδος Αθηνάς
DASYLIO
ΔΑΣΥΛΙΟ
Sinialo
Σινιάλο
Patras
Πάτρα
VLATERO
ΒΛΑΤΕΡΟ
Κέντρο Εκπομπής Αρόη
Patras Castle
Κάστρο Πάτρας
20ο Dimotiko Scholio Patron
AROI
ΑΡΟΗ
Holy Church of Saint Andrew
Roman Odeion of Patras
Coffee Island
Γήπεδο Αρόης (7x7)
GYM TONIK
SAMAKIA
ΣΑΜΑΚΙΑ
AGIOS ANDREAS, PATRAS
PSILALONIA
ΥΨΗΛΑ ΑΛΩΝΙΑ
TABACHANA
ΤΑΜΠΑΧΑΝΑ
PAGONA
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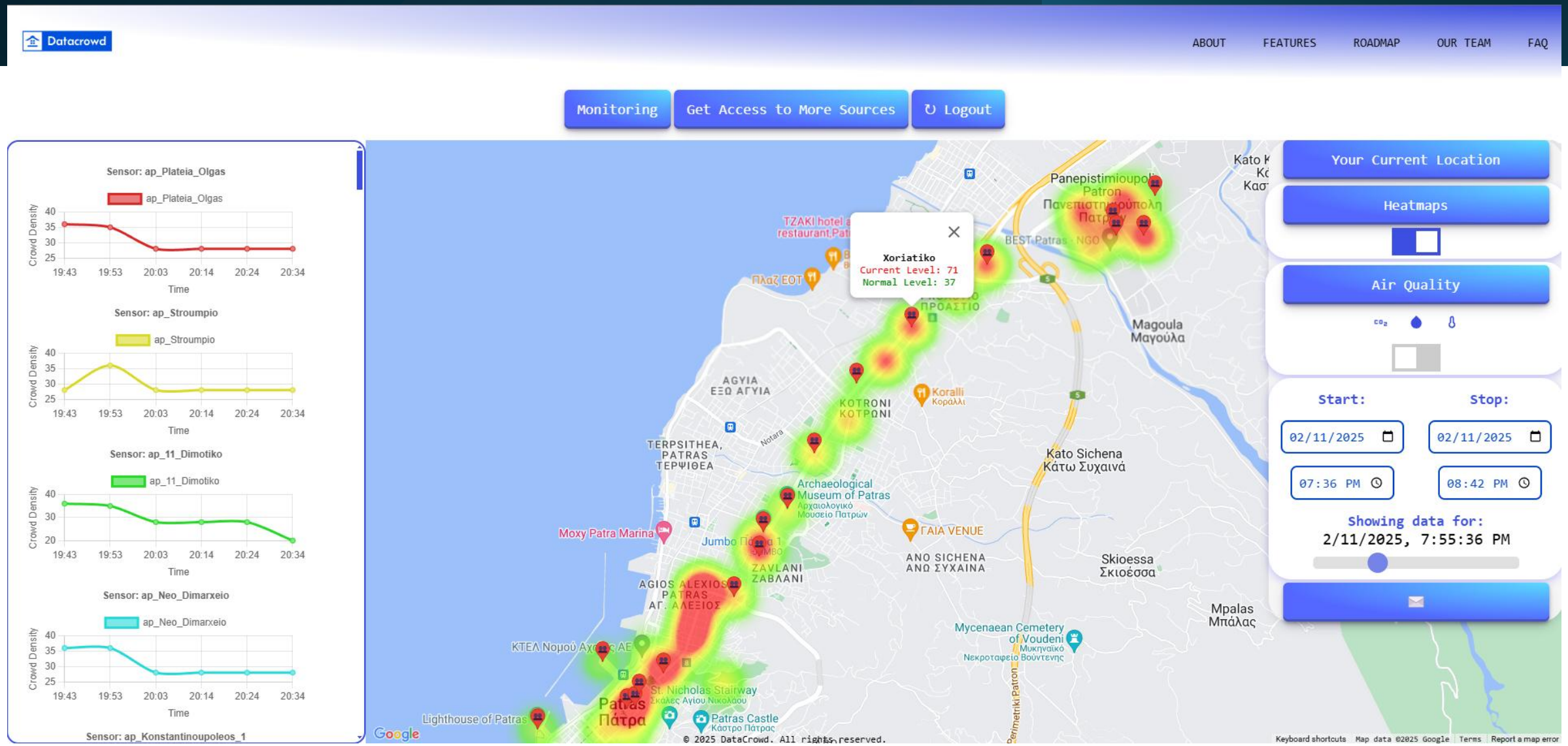
Authorities



Data Sources Marketplace

Datacrowd

ABOUT FEATURES ROADMAP OUR TEAM FAQ

Monitoring | Get Access to More Sources | ↻ Logout

Account Page

business ID:14

Username: caravel1

Name: Caravel1
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_Voreic

Available Data Sources

Source ID: 1

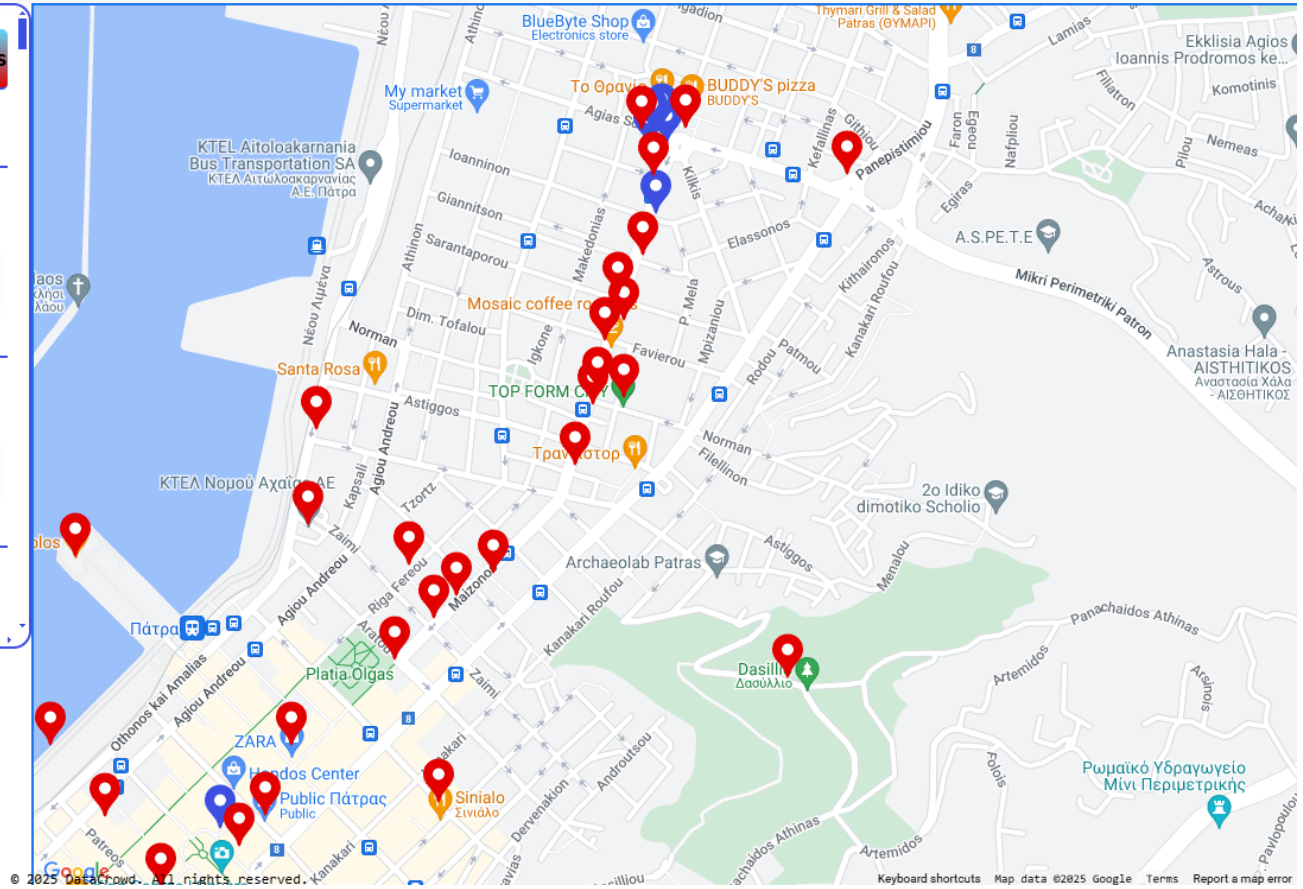
Type: wifi
Location: fake_kentro1
Add Source

Source ID: 2

Type: airquality
Location: fake_kentro2
Add Source

Source ID: 3

Type: airquality
Location: fake_kentro3



Data processing

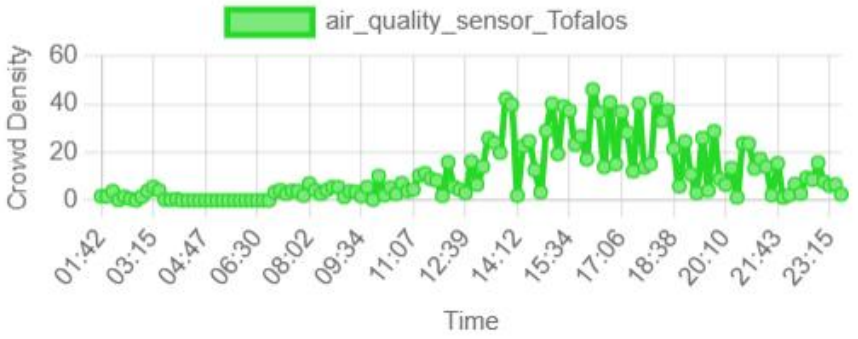
The sensor data needs to be organized and processed.

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

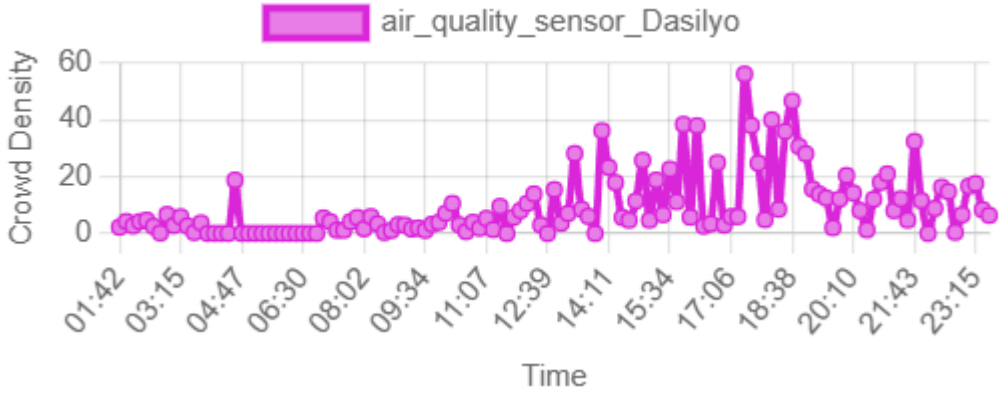


We use a combination of real and fake data for our model.

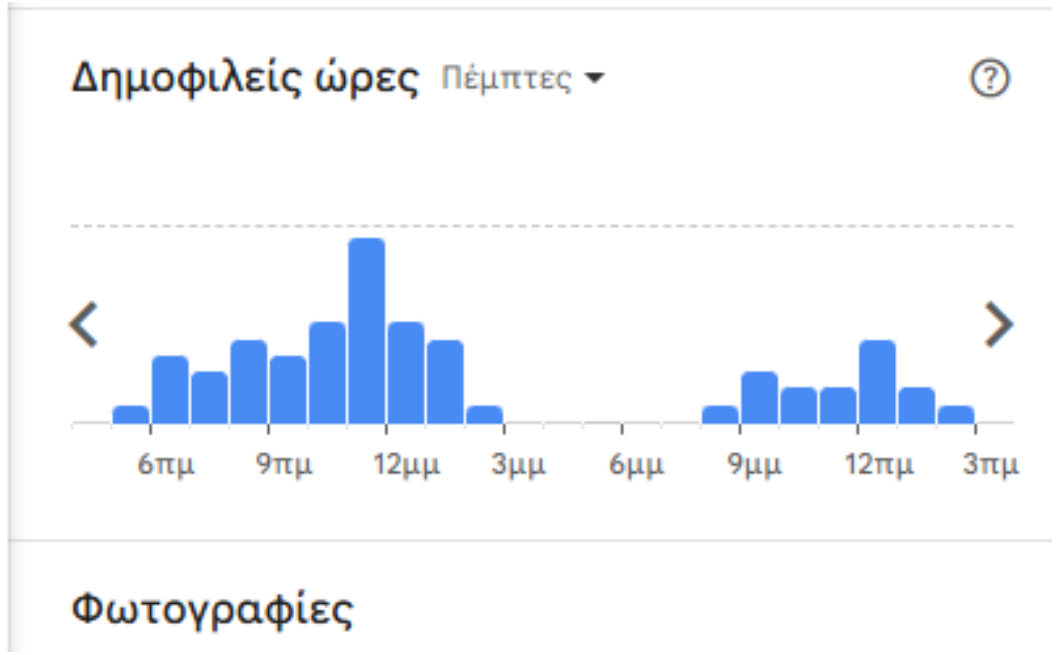
- Real Climate Sensor data from our lab.
- Real Access Point data from Aps around the Campus
- Fake Climate Sensors around the Campus and City center
- Fake Access Point data at real PatrasWifi locations

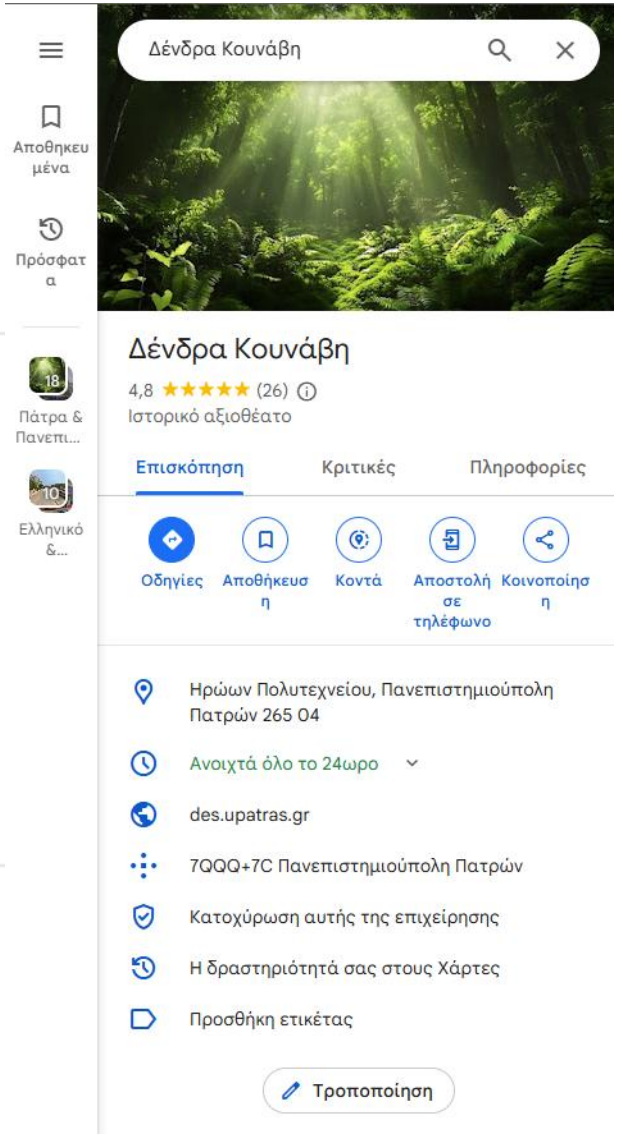
Fake data are set to follow shifted Gaussian curves during the day with a chance of variation.

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



Web Scraping Popular Times From Google Maps



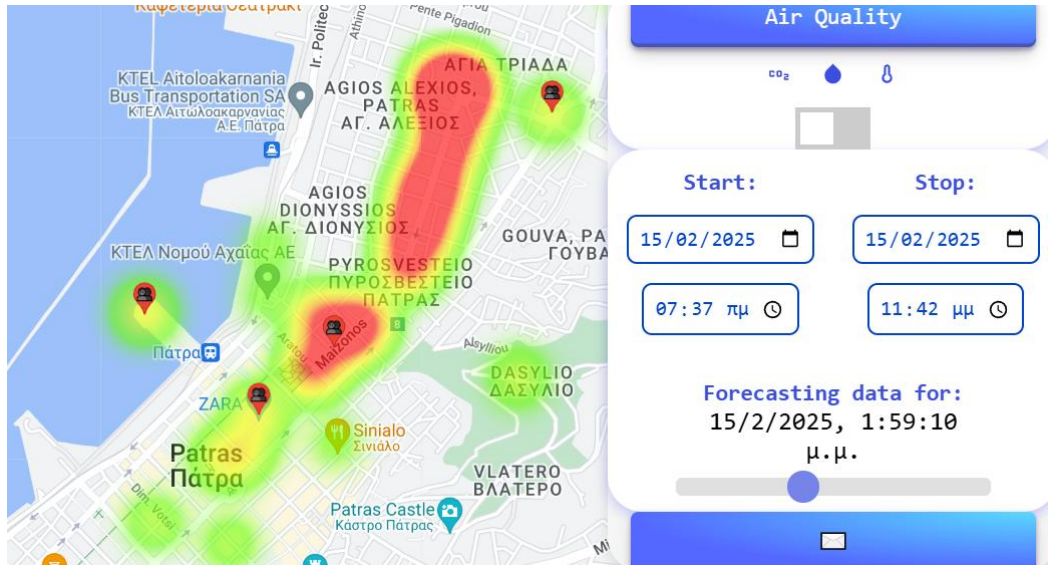


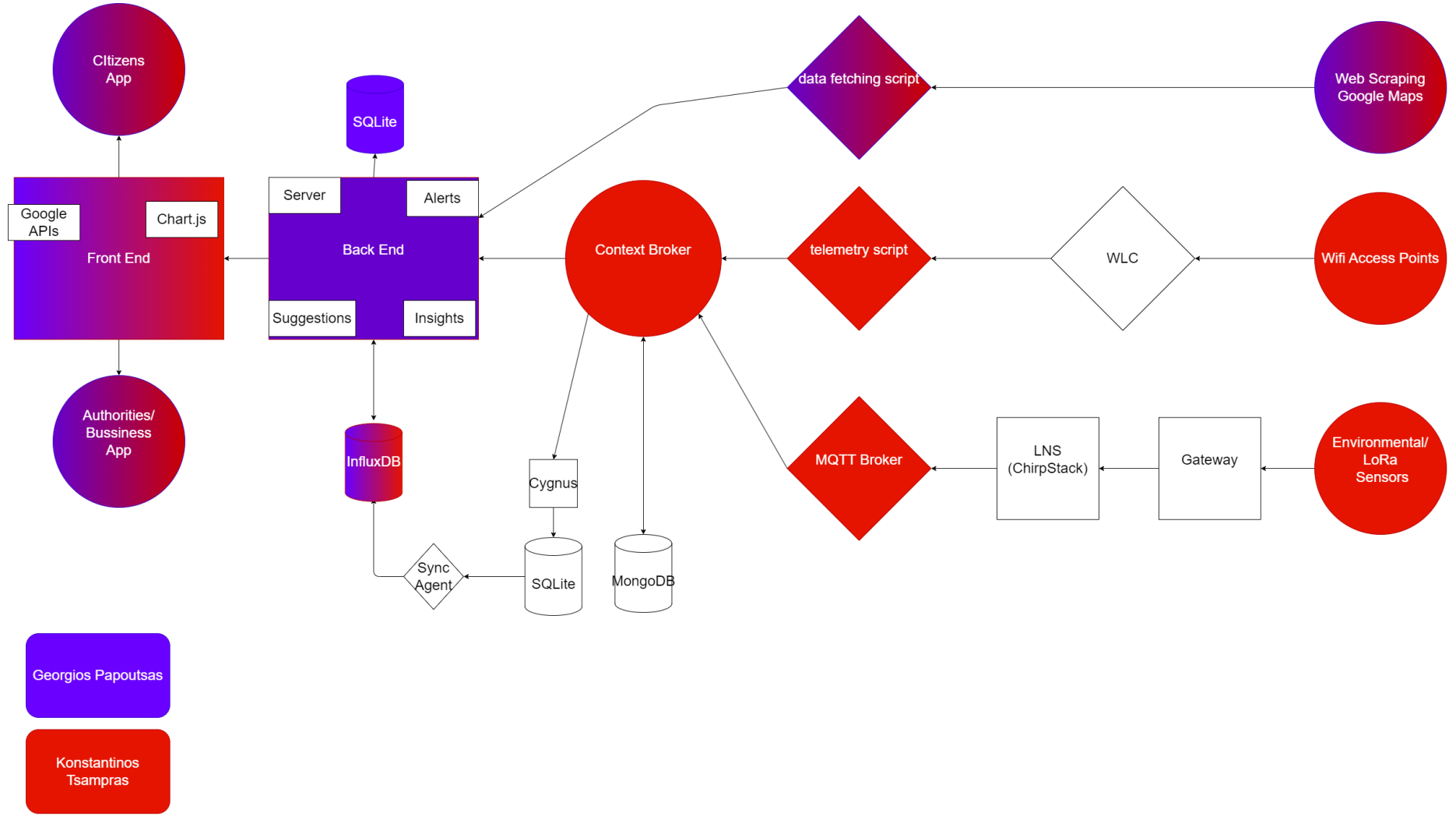
Crowd Estimations and Predictions

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

Using the number of connected users or the concentration of CO_2, 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!