Learning from Experiences in Air Quality Mobile Deployment in Mexico City: Improvements and Data Analytics with MIT-Flatburn

URBAN SENSING & DATA TECNOLOGIES WORKSHOP

MICRO-RESEARCH POSTER
BACHELOR TESIS PROJECT

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(1) Urban statement problem

- Despite the presence of 40 monitoring stations, Mexico City's ground-level air quality data is scarce. The Flatburn sensor from MIT's Senseable City Lab offers solutions. However, it needs some improvements considering road, traffic, and economic urban conditions.

(2) Introduction

- The Flatburn sensor emerges as a pioneering tool to bridge this data gap, enhancing the granularity and precision of urban air quality assessments. The challenge lies in urban road conditions such as excessive vibration caused by speed bumps, potholes, and heavy traffic, as well as environmental conditions.

(3) Lessons from Flatburn Sensor deployment in CDMX

Poor road conditions generates vibrations

Adapting battery capacity for Mexico City's conditions.

Displacement of internal components

GPS issues due to low battery, limited sunlight, and adverse weather conditions.

Internal displacements compromised the SD memory.

Disconnection of the Sensor Module Due to Vibrations

Vibrations caused interference

https://urbandatalab.escom.ipn.mx/
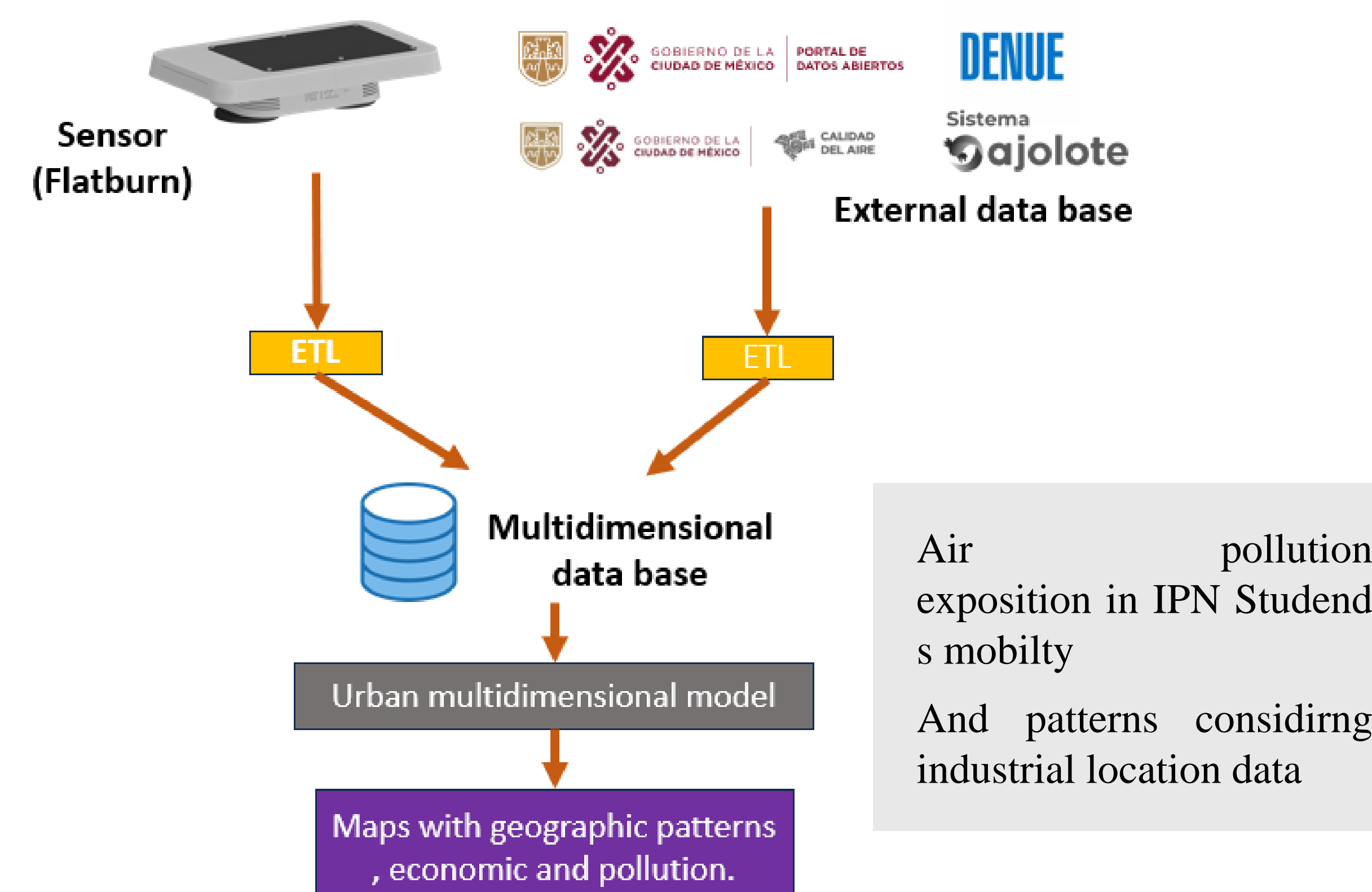
(4) Commuters and IPN Students mobility

People converge onto the city center from south and east. IPN Students are exposed to poor air quality conditions An analysis of emission measurements was obtained using Flatburn sensor on buses and vehicles:


IPN campus

Gustavo A. Madero

México City:
Conmuters routes
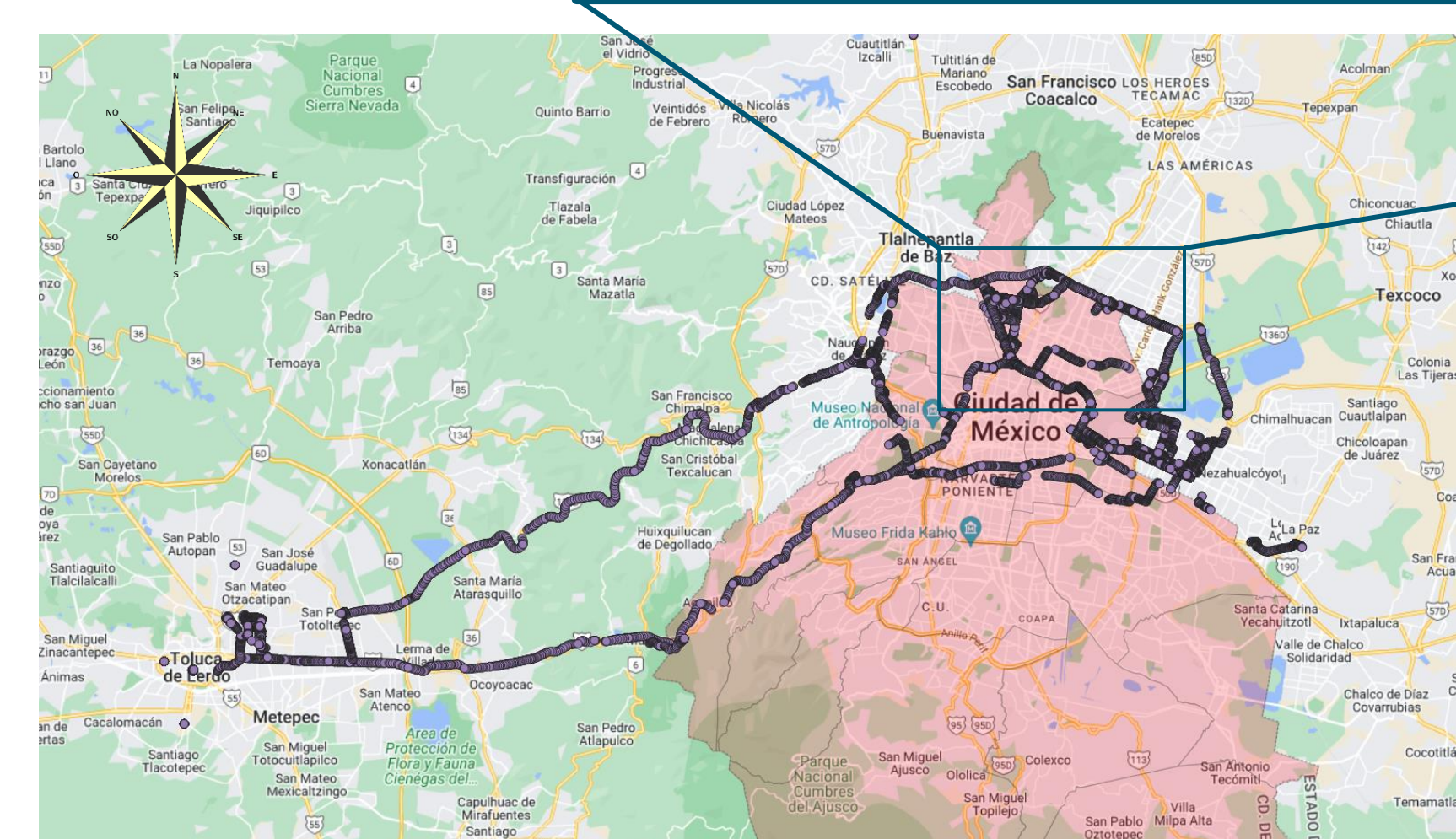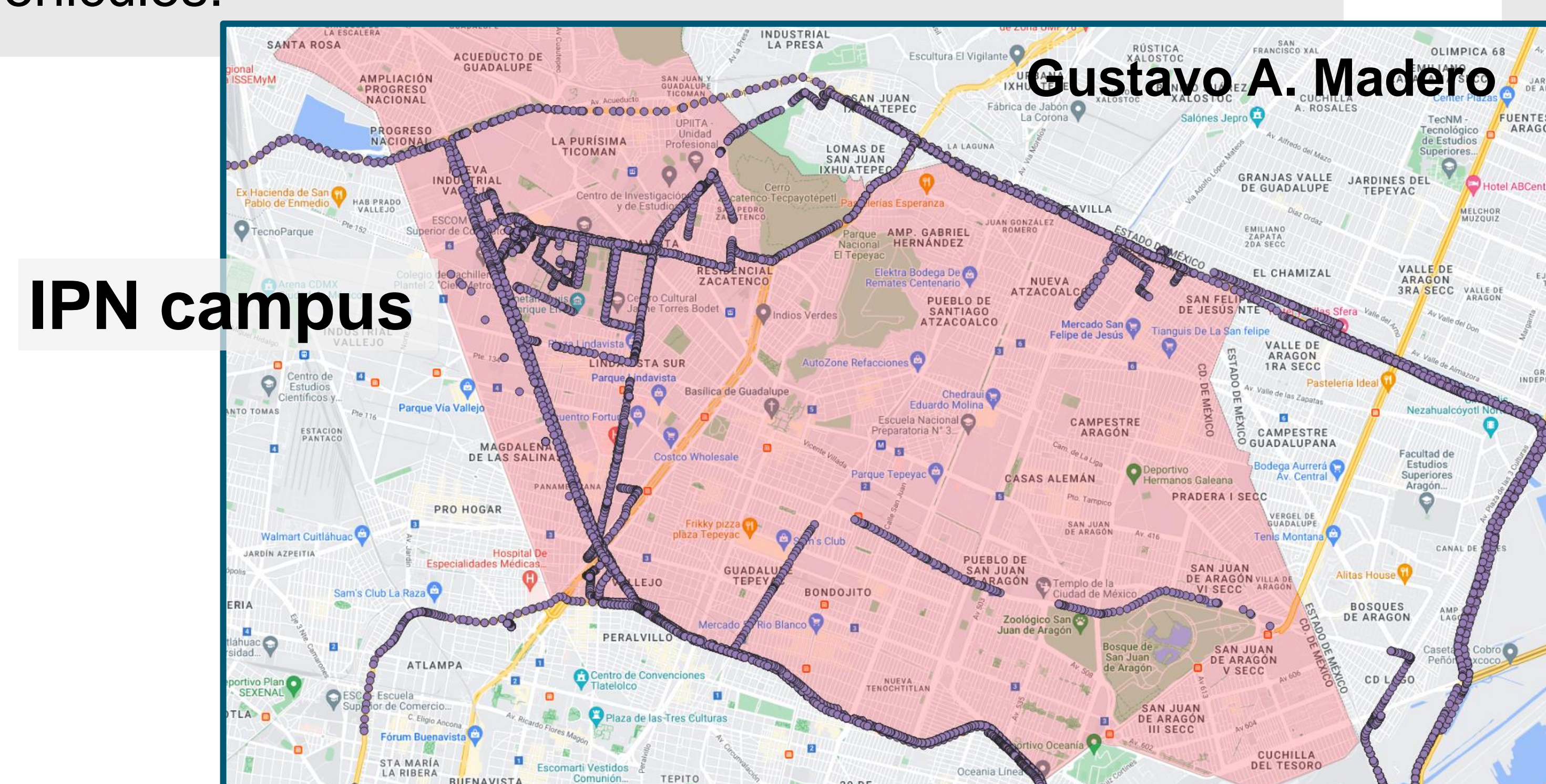
(5) Using emissions data to kwon

Sensor (Flatburn)

External data base

ETL   ETL

Multidimensional data base

Urban multidimensional model

Maps with geographic patterns , economic and pollution.

Air pollution exposition in IPN Studend s mobilty

And patterns considirng industrial location data

(6) Preliminary results

- 22,339 rows from April to November.
- At ESCOM (IPN-CAMPUS):
  - Proximity to 20 industries within a 500-meter radius, with the nearest being 100 meters away.
- In the spring-summer period, a correlation between ambient temperature and particulate matter concentrations (PM10 and PM2.5).
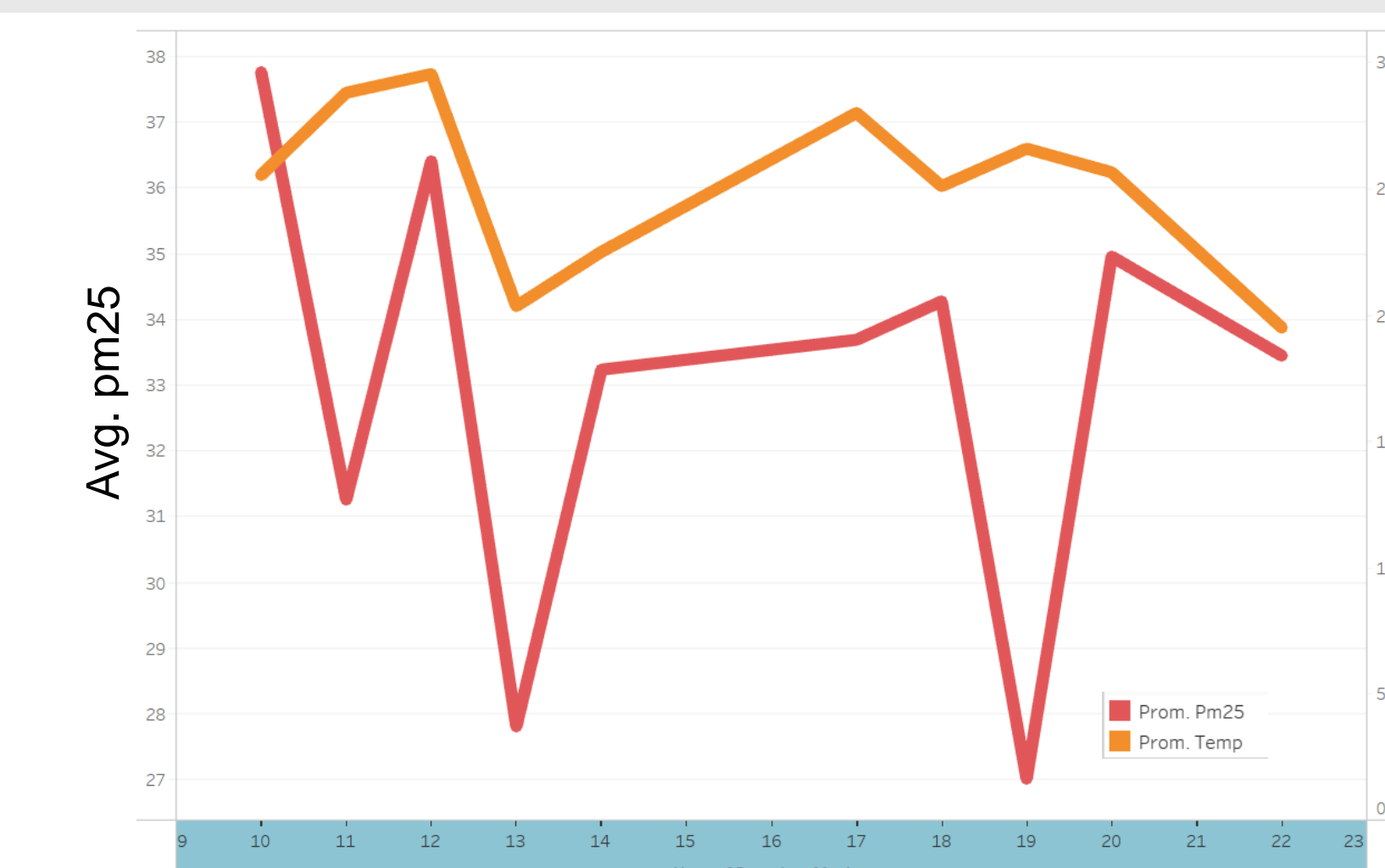
Improvements:

- A redesign will address mechanical-electronic interactions, ensuring resilience against vibrations and electrical interference.
- Advanced mesh screens will be integrated to safeguard against wildlife intrusion without compromising sensor sensitivity.
- The next-generation sensor will feature an optimized power management system, robust against the city's climatic fluctuations.
- Reinforced construction will be prioritized to endure the stresses from Mexico City's diverse road conditions.
- Enhanced securing mechanisms for memory components will be implemented to ensure reliable data storage even under duress.
- The new sensor will boast a dynamic calibration process that adjusts to temperature variations for accurate readings.

(7) Conclusions: Who is it useful for?

The Flatburn sensor's ground-level data in Mexico City enlightens on air quality, aiding residents to understand pollution's health effects, supports researchers with detailed environmental data, and equips policymakers with evidence for targeted clean-air strategies. This initiative bridges the gap between data and actionable insights for improved urban living.