

# ***Are U Query-ous? A Web-Based Platform for Democratizing Open Geospatial Data Access***

*From Queries to Maps, A New Way to See the World!*



Universitat Oberta  
de Catalunya

**Nicolas D'Alessandro Calderon**

Bachelor's degree in Techniques for  
Software Application Development

Localization Based Systems and  
Intelligent Spaces

**Project supervisor**

Joaquín Torres Sospedra

**Coordinating professor**

Antoni Perez-Navarro

**Date of submission**

April 01, 2025



This work is distributed under a  
Creative Commons [Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/3.0/) 3.0 license.

## SUMMARY OF THE FINAL PROJECT

<b>Title of the project:</b>	<i>Are U Query-ous? A Web-Based Platform for Democratizing Open Geospatial Data Access</i>
<b>Author name:</b>	<i>Nicolas D'Alessandro Calderon</i>
<b>Project supervisor:</b>	<i>Joaquín Torres Sospedra</i>
<b>Coordinating professor:</b>	<i>Antoni Perez-Navarro</i>
<b>Date of submission (MM/YYYY):</b>	<i>04/2025</i>
<b>Name of the degree:</b>	<i>Bachelor's degree in Techniques for Software Application Development</i>
<b>Topic of the final project:</b>	<i>Localization Based Systems and Intelligent Spaces</i>
<b>Language:</b>	<i>English</i>
<b>Keywords:</b>	<i>Geospatial Data, Open Data Visualization, Urban Analytics</i>
<b>Abstract</b>	
<p>This study explores the challenge of making open data more accessible to the general public, addressing the gap between the availability of geospatial information and its practical use. Are U Query-ous? is a web-based application designed to enable individuals, regardless of their technical background, to explore and interpret geographic and demographic data intuitively. By integrating interactive maps and user-friendly visualization tools, the platform allows users to analyze regions based on economic activity, population distribution, and local trends.</p> <p>Through a simplified interface, users can explore and filter publicly available data, identifying patterns relevant to their interests. The application is intended for individuals who are curious about urban development, seeking optimal locations for personal or professional activities, or analyzing demographic trends for research or decision-making. Additionally, the project examines the potential integration of artificial intelligence to facilitate data retrieval through natural language queries, further enhancing accessibility.</p> <p>The development and results of the analyses in this data scientific report are intended to address all the concepts targeted above, but the author also expects to describe some fundamental principles underlying web apps development and data science.</p>	

# Index

<b>01 INTRODUCTION.....</b>	<b>7</b>
1.1 Context and motivation.....	7
1.2 Goals .....	9
1.3 Sustainability, diversity, and ethical/social challenges.....	11
1.3.1 Sustainability.....	11
1.3.2 Ethical behaviour and social responsibility.....	11
1.3.3 Diversity, gender and human rights .....	11
1.4 Approach and Methodology.....	12
1.5 Schedule.....	13
1.6 Summary of the outputs of the project.....	17
1.7 Brief description of the remaining chapters of the report .....	20
<b>02 METHODS AND RESOURCES .....</b>	<b>21</b>
<b>03 RESULTS.....</b>	<b>22</b>
<b>04 CONCLUSIONS AND FUTURE WORK .....</b>	<b>23</b>
<b>05 GLOSSARY.....</b>	<b>24</b>
<b>06 BIBLIOGRAPHY .....</b>	<b>25</b>
<b>07 APPENDICES .....</b>	<b>26</b>

# List of figures

## 01 INTRODUCTION

Figure 1 1: Conceptual Representation of Project Summary.....	7
Figure 1 2: Key Motivations for the Project .....	9
Figure 1.3: Goals Breakdown .....	10
Figure 1 4: Process Diagram.....	13
Figure 1 5: Expected Outcome Visual Representation .....	17
Figure 1 6: Technology Stack Used .....	19

# List of Tables

## 01 INTRODUCTION

Table 1.1: Project Planning Phase.....	13
Table 1.2: Design Phase .....	14
Table 1.3: Implementation Phase .....	14
Table 1.4: final Product and Report .....	15
Table 1.5: Presentation Preparation Phase .....	15
Table 1.6: Defence Preparation Phase .....	16
Table 1.7: Ongoing Tasks Throughout the Project.....	16

## 1.1 Context and motivation

This final project focuses on developing an intuitive **geo-analytics platform** that simplifies the exploration of open data through **interactive maps**. Many open data sources provide valuable insights into **urban planning, demographics, and economic activity**, but non-experts often struggle to extract meaningful information from them.

**Are U Query-ous?** aims to solve this problem by creating a **user-friendly interface** that enables individuals to explore and analyze spatial data without requiring technical expertise.

Additionally, if time permits, the project will explore the integration of a natural language processing model, such as **those available from Hugging Face**, to enable users to interact with the data using natural language queries. **This feature is considered an enhancement rather than a core requirement and will be evaluated based on project timelines and feasibility.**

At the end of the project, the system will provide a **fully functional prototype** that allows users to:

- **Filter and visualize** location-based open data.
- Identify **regional patterns and trends** based on economic and demographic factors.
- Utilize **intelligent search capabilities** to access relevant insights more intuitively.

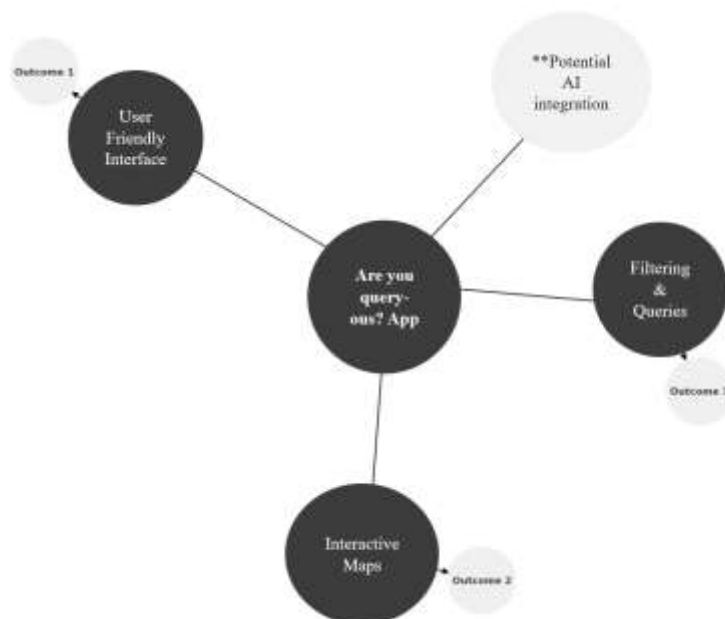


Figure 1 1: Conceptual Representation of Project Summary

## Scope of the Project

This project focuses on developing a web-based platform that allows users to explore and analyze open geospatial data in an intuitive way. The platform will integrate publicly available datasets from Barcelona and Madrid, two cities with well-structured open data portals that provide reliable and detailed information.

The scope includes the following key aspects:

- **Cities Covered:** The platform will use **open data from Barcelona and Madrid**, ensuring access to urban mobility, economic activity, and demographic datasets for meaningful analysis.
- **Data Integration:** The system will collect and process geospatial, economic, and mobility-related data, allowing users to filter and visualize insights interactively.
- **User Interaction:** The web application will feature an interactive map where users can explore regional trends, compare different areas, and extract useful insights without needing technical expertise.
- **Core Functionalities:**
  - *Mapping & Visualization:* Users will view geospatial data overlaid on maps, with filtering options.
  - *Urban & Economic Insights:* The system will present mobility trends, population density, and economic indicators based on selected areas.
  - *Accessibility & Usability:* The interface will be simple and user-friendly, ensuring that both professionals and non-experts can use it effectively.

By **limiting the project scope to Barcelona and Madrid**, the system will leverage well-organized open datasets while **maintaining a manageable level of complexity within the project timeline**. The structured data availability from these cities will support the development, testing, and validation of the platform, ensuring that it meets its intended objectives.



## Justification

Access to open data has grown exponentially, yet many users struggle to transform this data into actionable insights. While businesses and government entities benefit from sophisticated **geo-analytics tools**, individuals and small organizations often lack the resources or expertise to use these datasets effectively. This project is relevant because it seeks to **bridge this gap**, making open data truly accessible and usable for the **general public, students, researchers, and small businesses**.

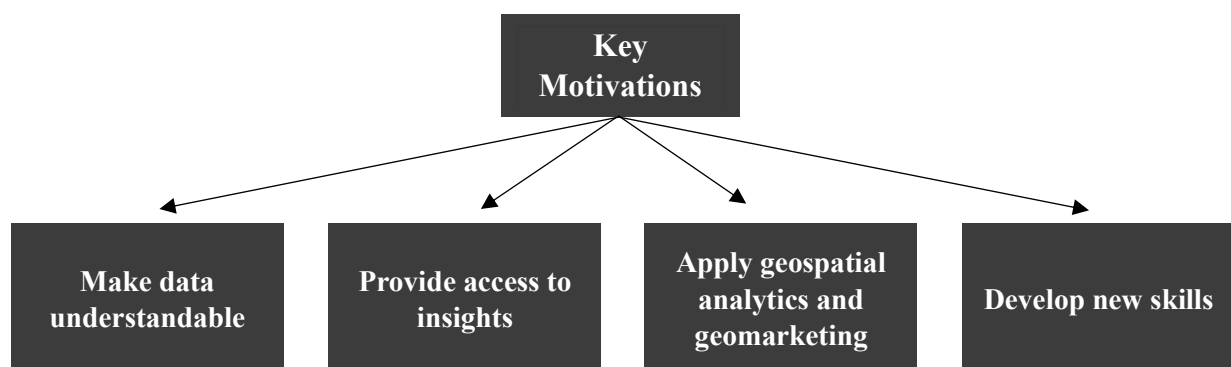
Moreover, the relevance of geospatial analysis has expanded in fields such as **smart cities, sustainable urban development, and socio-economic research**. By providing an easy-to-use tool, this project supports the broader goal of promoting **data-driven decision-making at all levels of society**.

## Motivation

In the past eight years I have been working and developing my professional career in the field of **data analysis**, so this project aligns with both academic and professional aspirations. The motivation for this project is coming from:

- A personal interest in **making complex data more understandable** for non-experts.
- A desire to provide **access to urban and economic and geomarketing insights** through intuitive visualization for the general public, students, researchers, and small businesses.
- The opportunity **to apply geospatial analytics in a real-world application**.

Additionally, the skills developed through this project, including data processing, backend development, frontend visualization, and user interface design, will be valuable in both academic research and professional settings.



*Figure 1 2: Key Motivations for the Project*

## 1.2 Goals

### Main Goal

- To develop a web-based app that enables users to intuitively explore, filter, and analyze open geospatial data, making location-based intelligence more accessible to a non-technical audience.

### Sub-Objectives

- **Develop an interactive mapping system** that allows users to visualize open data in an intuitive and engaging way.
- **Implement filtering and querying functionalities** to help users refine their search and extract relevant insights.
- **Ensure usability and accessibility** by designing a simple and intuitive user interface.
- **If time permits, experiment with integrating an NLP model** to allow natural language queries for filtering and searching data. This is considered a potential enhancement and not a primary project requirement.
- **Validate the effectiveness of the platform** through user feedback and iterative improvements.

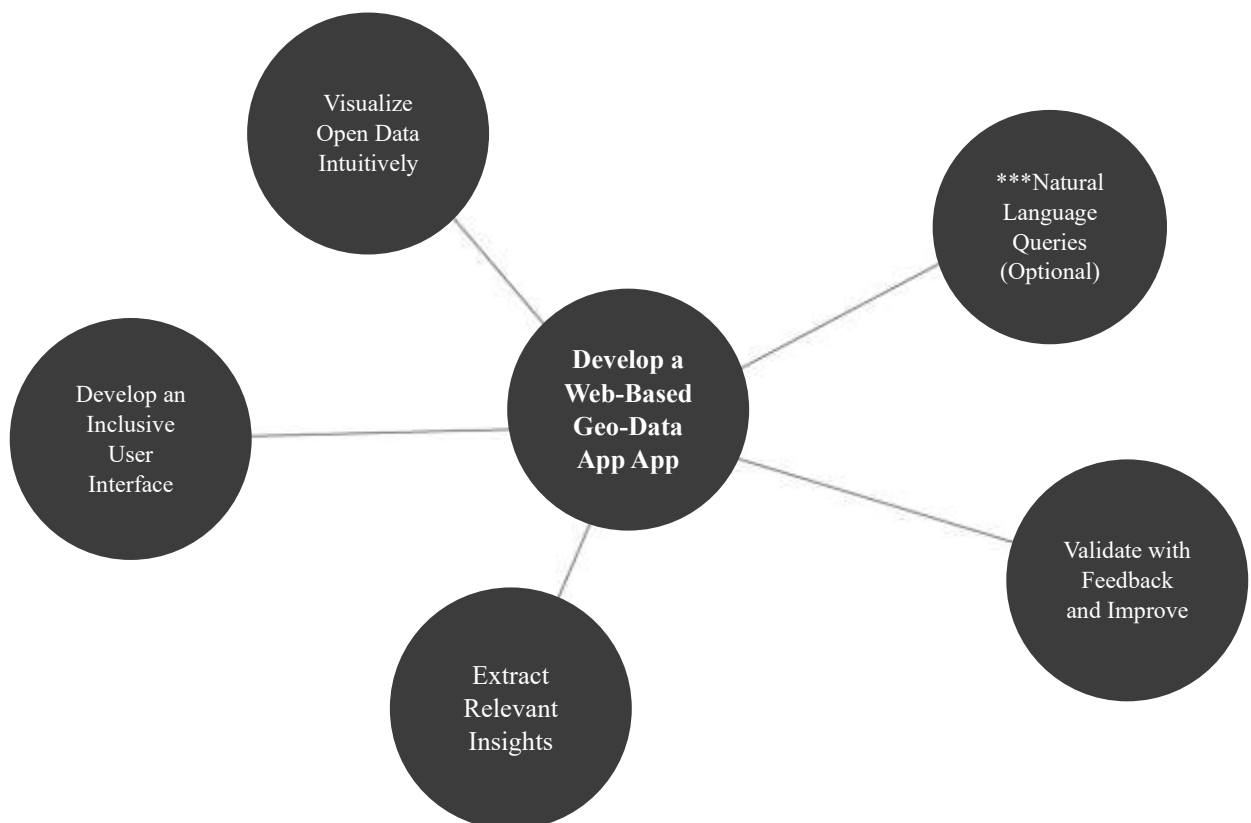


Figure 1.3: Goals Breakdown

## 1.3 Sustainability, diversity, and ethical/social challenges

### *1.3.1 Sustainability*

This project promotes sustainability by supporting the efficient **use of open data to improve urban and social planning**. By making geospatial information more accessible, individuals and organizations can make informed decisions about resource allocation, mobility, and land use, reducing unnecessary waste and inefficiencies. Additionally, the project aligns with the United Nations Sustainable Development Goals (SDGs), particularly [Goal 11 \(Sustainable Cities and Communities\)](#), by providing insights that encourage responsible urban development. The project has a minimal ecological footprint as it relies on existing digital infrastructure, avoiding additional resource consumption.

### *1.3.2 Ethical behaviour and social responsibility*

The project considers ethical principles by **ensuring data privacy and security**. Since the system processes **publicly available open data**, it does not involve personal or sensitive information. However, the potential risks of misinterpreting data or using insights unethically are acknowledged. To mitigate this, the platform will provide **transparent data sources and disclaimers to ensure users understand the limitations of the information**.

### *1.3.3 Diversity, gender and human rights*

The project is designed to be inclusive and accessible, allowing all individuals, regardless of background, gender, or technical expertise, to explore geospatial data. By offering a simple and user-friendly interface, it ensures that users with limited data experience can engage with geographic insights. Furthermore, **accessibility features will be considered**. The project aligns with the principle of equal access to information, promoting diversity and reducing barriers to data-driven knowledge.

## 1.4 Approach and Methodology

This project follows a structured development process **based on agile principles**, allowing for **iterative testing and feedback** throughout the semester. The key steps include:

### *Data Collection and Processing*

- **Identify and integrate open datasets** (demographic, economic, urban mobility, etc.).
- **Clean and preprocess data** to ensure usability in the application.

### *Backend Development*

- Build a **RESTful API** to serve geospatial data.
- **Store data in a database** optimized for efficient queries.

### *Frontend Development*

- **Design a responsive user interface** with map-based interaction.
- **Implement data visualization tools** for filtering and exploration.

### *Testing and Refinement*

- **Gather feedback** to enhance usability and features.

### *Project Management and Development Workflow*

To manage the development process efficiently, we will use a [Kanban dashboard in Trello](#). The board will include the following columns:

- **To Do:** List of all planned tasks and ideas.
- **Doing:** Tasks that are ready to be worked on.
- **Deferred:** Tasks that are postponed for later stages.
- **Done:** Completed tasks.

This dashboard will include all the detailed tasks from the previous planning (Task 02) and will be updated regularly to track progress and keep the project on schedule.

# 1.5 Schedule

A detailed **schedule with milestones** has been defined, ensuring that the development process is structured, manageable, and aligned with the semester timeline.

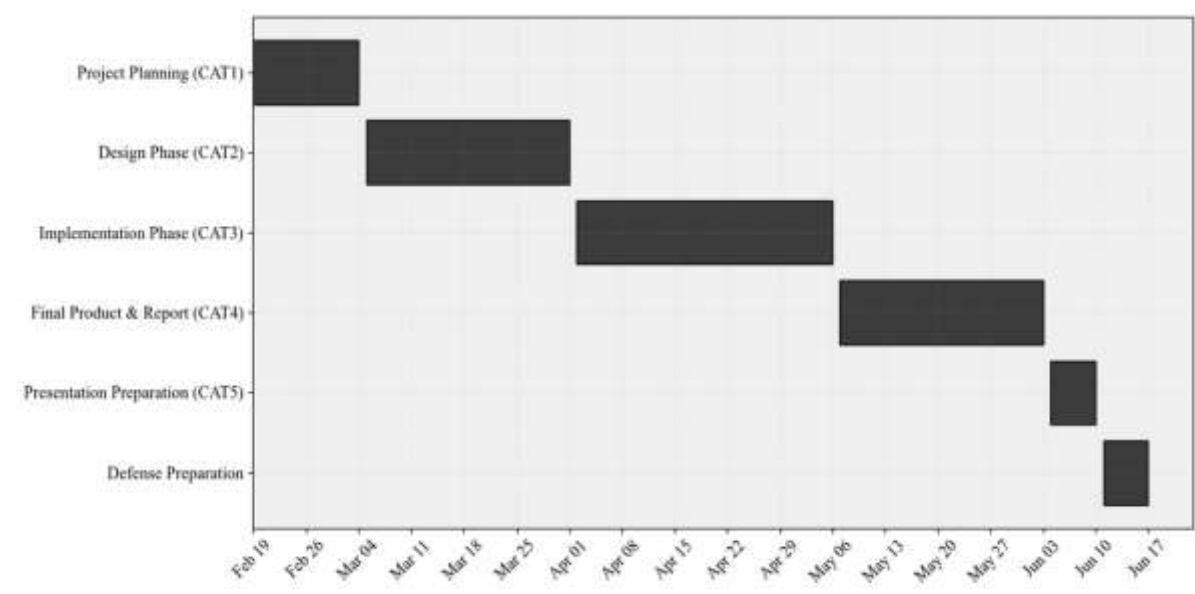


Figure 1 4: Process Diagram

## CAT1: Project Planning Phase (Feb 19 - Mar 04)

Task ID	Task Description	Week	Linked	Status
1.1	<div><div>- Define project scope, research open datasets, and identify visualization requirements.</div><div>- Define technology stack, assess integration challenges, and create a detailed timeline.</div></div>	Feb 19 - Feb 23	-	Done
1.3	Document sustainability considerations, set up development environment, and compile CAT1 documentation.	Feb 24 - Mar 02	1.1	Done
1.4	Review and finalize CAT1 documentation.	Mar 02 - Mar 03	1.1, 1.2	Done

Table 1.1: Project Planning Phase

## CAT2: Design Phase (Mar 05 - Apr 01)

Task ID	Task Description	Week	Linked	Status
2.1	Define user stories, database schema, and UI wireframes for the mapping interface.	Mar 03 - Mar 09	1.10	Done
2.2	Design system architecture, research filtering algorithms, and create frontend class diagrams.	Mar 10 - Mar 16	2.1	Done
2.3	Develop API endpoints, implement login screen, and document state of the art in geospatial data visualization.	Mar 17 - Mar 23	2.1	Done
2.4	Compile and review CAT2 documentation.	Mar 23 - Mar 31	2.1 - 2.3	Done

Table 1.2: Design Phase

## CAT3: Implementation Phase (Apr 02 - May 06)

Task ID	Task Description	Week	Linked	Status
3.1	Set up backend database and implement data ingestion pipelines for open data.	Apr 01 - Apr 06	-	To Do
3.2	Develop backend services, authentication, and frontend components for map visualization.	Apr 07 - Apr 13	3.1	To Do
3.3	Implement filtering, integrate Leaflet.js, and develop data visualization components.	Apr 14 - Apr 20	3.2	To Do
3.4	Conduct unit testing, perform integration testing, and deploy prototype.	Apr 21 - Apr 27	3.3, 3.4	To Do
3.5	Compile implementation documentation and finalize CAT3 documentation.	Apr 27 - May 05	3.1-3.4	To Do

Table 1.3: Implementation Phase

#### CAT4: Final Product & Report (May 07 - Jun 03)

Task ID	Task Description	Week	Linked	Status
4.1	Refine UI based on testing feedback.	May 07 - May 11	3.14	To Do
4.2	Implement advanced filtering, economic activity visualization, and optimize database queries.	May 12 - May 18	4.1	To Do
4.3	Implement (optional) NLP capabilities and conduct comprehensive system testing.	May 19 - May 25	4.1	To Do
4.4	Fix bugs, optimize performance, and prepare final deployment package. Create user documentation, write results and analysis, draft conclusions, and compile bibliography.	May 26 - Jun 01	4.1	To Do
4.5	Finalize and format the project report, then submit CAT4.	Jun 01 - Jun 03	4.1-4.4	To Do

Table 1.4: final Product and Report

#### CAT5: Presentation Preparation (Jun 04 - Jun 10)

Task ID	Task Description	Week	Linked	Status
5.1	<ul style="list-style-type: none"> <li>Create presentation outline, storyboard, and design slides.</li> <li>Prepare demonstration script, record key platform features, and create a narrated presentation video.</li> </ul>	Jun 04 - Jun 08	4.14	To Do
5.2	Review, finalize, and refine presentation based on feedback.	Jun 08 - Jun 09	5.1	To Do

Table 1.5: Presentation Preparation Phase

## Defence Preparation (Jun 11 - Jun 17)

Task ID	Task Description	Week	Linked	Status
6.1	<ul style="list-style-type: none"><li>- Prepare defence presentation based on feedback.</li><li>- Anticipate potential questions and prepare responses.</li><li>- Practice presentation delivery</li></ul>	Jun 11-Jun16	5.2	To Do
6.2	<b>Final defence presentation</b>	Jun 17	6.1	To Do

*Table 1.6: Defence Preparation Phase*

## Ongoing Tasks Throughout the Project

Task ID	Task Description	Week	Linked	Status
7.1	<b>Gant Planning updates</b>	Feb 19 - Jun 17	-	Ongoing
7.2	<b>Weekly supervisor check-ins</b>	Feb 19 - Jun 17	-	Ongoing
7.3	<b>Documentation updates</b>	Feb 19 - Jun 03	-	Ongoing

*Table 1.7: Ongoing Tasks Throughout the Project*

For a detailed breakdown of the project plan, tasks, and timeline, please refer to the attached **are-you-queryous-planning.xlsx** file.



## 1.6 Summary of the outputs of the project

By the end of the semester, the project will deliver:

- A functional web application where users can **explore and visualize geospatial data** interactively.
- An intuitive filtering system allowing users **to refine results based on key indicators**.
- A structured API serving **open datasets** with a focus on usability and efficiency.
- A research report detailing **the impact of accessible open data visualization**.

This project contributes to the broader goal of **making open data actionable and meaningful** for a **diverse audience**, reinforcing the importance of **geospatial intelligence in everyday decision-making**.

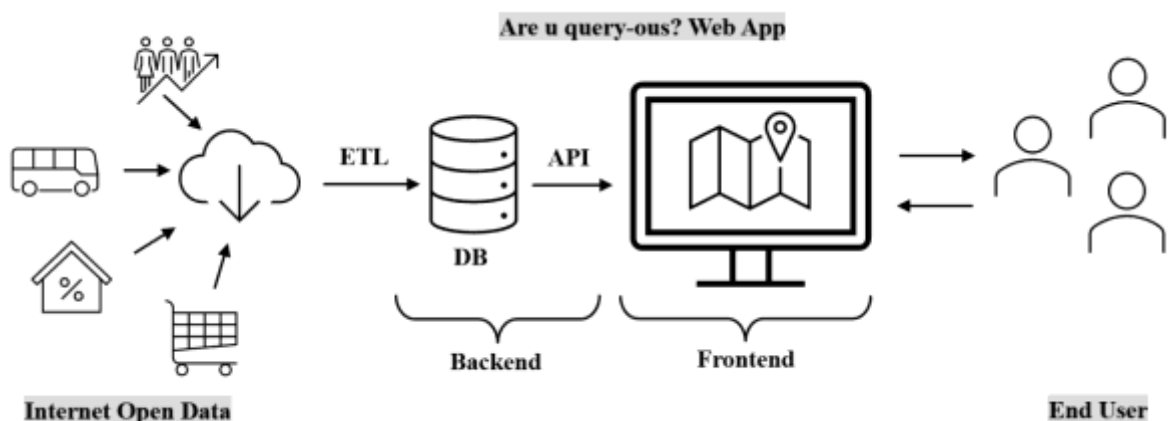


Figure 1 5: Expected Outcome Visual Representation

The project will leverage a modern web technology stack to ensure efficiency, scalability, and a seamless user experience. The core technologies include:

*Frontend:*

- **React.js** for building a dynamic and interactive user interface.
- **Leaflet.js** for mapping and geospatial visualization.

### *Backend:*

- **FastAPI** to handle API requests and serve processed geospatial data.
- **PostgreSQL/PostGIS** for storing and querying spatial data efficiently.

### *Data Processing & Integration:*

- **Python** and **Pandas** for data preprocessing and transformation.
- **GeoJSON** format to represent geospatial data and serve it dynamically.

### *Deployment & Hosting:*

- **Docker** for containerized development and deployment.
- **GitHub Codespaces** for cloud-based development and collaboration.
- **Vercel** for frontend deployment and **Fly.io** or **Heroku** for backend deployment.

### *Potential AI Integration (Time-Permitting Feature):*

- The project may experiment **with integrating a pre-trained NLP model from Hugging Face** to process natural language queries.
- If implemented, a small widget will allow users to enter queries in plain text (*e.g., "Show me the most populated districts in Madrid"*).
- This AI-based functionality is considered an exploratory addition, meaning it will only be developed if time and resources allow.

These technologies will enable the development of a robust and scalable application that can effectively serve users with varying levels of expertise in data analysis and geospatial exploration.

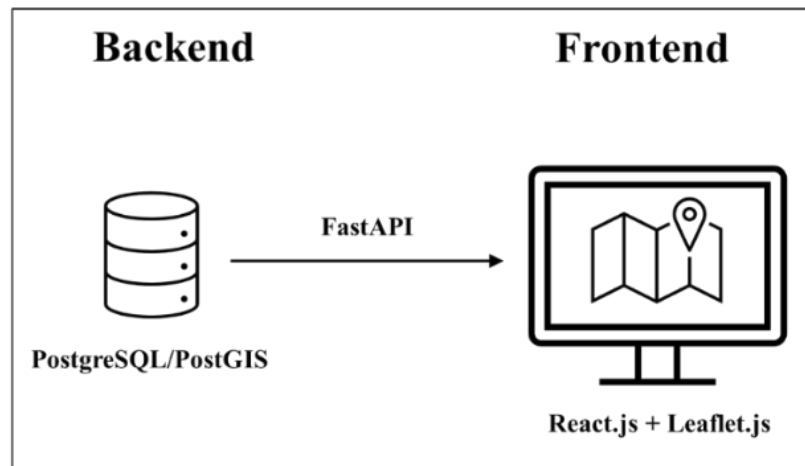
## Development Environment



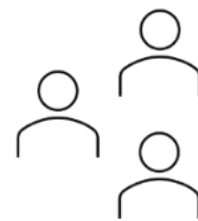
Docker + GitHub Codespaces

Are u query-ous?

Web App



## Production Environment



Vercel + Fly.io or Heroku

Figure 1 6: Technology Stack Used

## **1.7 Brief description of the remaining chapters of the report**

This section provides a short overview of the chapters that follow in this report:

### **Chapter 2: Methods and Resources**

This chapter describes the tools and technologies we used to build our web application. It explains our choice of React.js for the frontend, FastAPI for the backend, and PostgreSQL for the database. It also shows how we collected and processed the geospatial data from Barcelona and Madrid. This chapter covers our design decisions, development methodology, and includes an economic assessment of the project costs and viability.

### **Chapter 3: Results**

This chapter presents what we accomplished in our project. It shows how the final web application works and how users can explore maps and filter data without technical knowledge. It includes screenshots of the interface and examples of how it makes open data more accessible. This section demonstrates the practical outcomes achieved through our methodology.

### **Chapter 4: Conclusions and Future Work**

The final chapter looks at what we learned from this project and how well we met our goals. It discusses the challenges we faced and what we could improve in the future. It also suggests new features we could add later, like the natural language processing option for easier searching. This chapter evaluates our progress against our original timeline and objectives, and addresses sustainability, diversity, and ethical considerations.

Each chapter connects to the others to tell the complete story of how we created the "Are U Query-ous?" platform from start to finish.

*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*

## 03 RESULTS

*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*

## CONCLUSIONS AND FUTURE WORK

*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*

*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*



*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*

*This section will be further developed in future Continuous Assessment Tests (CATs) and project iterations. Additional details, refinements, and validations will be incorporated as the project progresses.*