

Project Proposal: Interactive Data Visualisation

NYC 311 Service Requests Analysis

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1 Introduction

In modern urban environments, large volumes of data are generated daily through public services, citizen reporting systems, and administrative processes. While this data has the potential to provide valuable insight into how cities operate, its scale and complexity often make meaningful interpretation difficult without effective analytical tools.

Data visualisation plays a crucial role in transforming raw datasets into understandable patterns, trends, and relationships. Interactive visualisations, in particular, allow users to explore data dynamically rather than relying on static summaries. This approach is especially valuable for civic datasets, where understanding service demand, operational efficiency, and citizen behaviour is essential.

This project focuses on the analysis of **NYC 311 Service Requests**, a comprehensive dataset that records non-emergency complaints and service requests submitted by residents of New York City. The project aims to design and deploy an interactive data visualisation system that enables users to explore complaint activity across time, geography, and service performance dimensions.

Rather than producing a static analytical report, the project delivers insights through interactive dashboards, allowing users to investigate patterns, compare categories, and derive conclusions through direct interaction with the data.

2 Project Objectives

The primary objectives of this project are outlined below:

- To analyse long-term and short-term temporal trends in NYC 311 service requests.
- To examine how complaint volumes and types vary across different boroughs of New York City.
- To assess complaint status and service resolution behaviour to evaluate operational performance.
- To identify behavioural patterns such as peak reporting hours and seasonal effects.
- To design interactive dashboards that support exploratory data analysis and visual storytelling.

These objectives directly align with the project rubric, which emphasises temporal visualisation, interactivity, and the ability to extract insights from complex datasets.

3 Dataset Description

The dataset used in this project is the **NYC 311 Service Requests dataset**. This dataset is publicly available and contains detailed records of non-emergency service complaints submitted by residents through the NYC 311 system.

3.1 Dataset Characteristics

The dataset exhibits the following characteristics:

- **Data Domain:** Civic and urban services
- **Granularity:** Individual service request level
- **Temporal Coverage:** Multi-year historical data
- **Scale:** Large dataset with numerous records and attributes

3.2 Key Attributes

Key attributes used in this analysis include:

- Complaint creation and closure timestamps
- Complaint types and descriptive categories
- Borough and location-related information
- Responsible city agencies
- Complaint status such as open, closed, assigned, or pending

The diversity of attributes allows the dataset to support both descriptive analysis and deeper exploratory investigation.

4 Data Preparation and Cleaning

Prior to analysis, the dataset required preparation to ensure consistency and usability within the visualisation environment. Data cleaning was performed within Tableau to address missing values, inconsistent formatting, and date-time parsing issues.

Key preparation steps included:

- Conversion of timestamp fields into standard date and time formats.
- Handling of missing closure dates by distinguishing open and unresolved complaints.

- Creation of derived temporal fields such as year, month, and hour.
- Selection of relevant attributes to support analytical objectives.

These steps ensured that the data was suitable for temporal analysis and interactive filtering.

5 Methodology and Analytical Approach

This project adopts an **Exploratory Data Analysis (EDA)** methodology combined with **interactive visual storytelling**. EDA focuses on uncovering patterns, anomalies, and relationships within the data without imposing predefined assumptions.

The analytical workflow consisted of the following stages:

1. Initial exploration of complaint distributions and attribute completeness.
2. Temporal aggregation to identify trends and seasonal behaviour.
3. Geographic comparison across boroughs.
4. Performance analysis using complaint status and resolution time indicators.
5. Iterative dashboard refinement to improve clarity and interpretability.

Interactive dashboards allow users to control filters and explore alternative views, supporting deeper engagement with the data.

6 Dashboard Design and Structure

The visualisation system is organised into three primary dashboards, each addressing a distinct analytical perspective.

6.1 Dashboard 1: Temporal Patterns of Complaints

The first dashboard focuses on temporal analysis. It examines how complaint volumes change over time, highlighting long-term trends, periodic fluctuations, and differences between boroughs and complaint categories.

This dashboard provides an overall understanding of complaint behaviour and serves as the foundation for further analysis.

6.2 Dashboard 2: Geographic Distribution and Status Analysis

The second dashboard explores the spatial dimension of NYC 311 service requests. It compares complaint volumes across boroughs and analyses complaint status to evaluate service demand and operational workload.

This view supports identification of geographic disparities and differences in service response.

6.3 Dashboard 3: Behavioural Patterns and Seasonality

The third dashboard investigates behavioural and seasonal patterns in complaint reporting. It analyses reporting activity by hour of day and month, as well as resolution time distributions for closed complaints.

This dashboard provides deeper insight into how citizens interact with the 311 system and how efficiently services are delivered.

7 Key Performance Indicators

To support quick interpretation, the project includes key performance indicators (KPIs) such as:

- Total number of service requests
- Percentage of closed complaints
- Average complaint resolution time
- Most frequently reported complaint type

These KPIs summarise system performance and update dynamically based on user-selected filters.

8 Tools and Technologies

The following tools and technologies were used in the development of this project:

- **Tableau Public** for interactive dashboard creation and data exploration.
- **Streamlit** for building a web-based application to host the dashboards.
- **Python** for application integration and interface development.
- **GitHub** for version control and deployment.

This combination of tools supports both analytical robustness and professional presentation.

9 Video Walkthrough

In accordance with the project requirements, a video walkthrough accompanies the dashboards. The walkthrough demonstrates dashboard navigation, use of interactive filters, and key analytical insights derived from the visualisations.

The video focuses on functionality and insight rather than formal narration.

10 Conclusion

This project demonstrates the value of interactive data visualisation in analysing large-scale civic datasets. By exploring NYC 311 service requests across temporal, geographic, and performance dimensions, the project provides meaningful insight into urban service demand and operational behaviour.

The use of interactive dashboards enables flexible, user-driven exploration and supports effective communication of complex patterns. Overall, the project illustrates how data analytics and visual storytelling can contribute to better understanding of urban systems and service delivery.