DATA 607-FINAL PROJECT

ANALYZING 311 SERVICE REQUESTS

PROJECT SOPE

This project analyzes NYC 311 service request patterns to identify geographic disparities in complaint types and response times across boroughs, using statistical analysis, Random Forest modeling, and an interactive Shiny dashboard to support data-driven municipal decision-making.

Problem & Big Picture

- Rising Service Demand: Public demand for non-emergency services has grown annually since 2019, reaching over 3.4 million requests in 2024, with a heavy concentration on quality-of-life issues such as illegal parking and noise.
- Addressing Data Limitations: Because raw data can be skewed by a small number of individuals making high-volume repeat requests, the new NYC311 Monitoring Tool analyzes trends at a neighborhood level to isolate genuine areas of high demand.
- Uneven Distribution of Issues: The bigger picture reveals that service needs are not distributed evenly; specific neighborhoods experience disproportionately high rates of complaints regarding housing maintenance and street conditions.
- Shifting to Targeted Solutions: City agencies could use geographic hotspot analysis and complaint frequency modeling to proactively allocate resources and address root causes before repeat complaints occur.
- Aligning Resources with Need: Thisdata-informed framework allows officials and the public to better align fiscal resources and operational planning with the specific, localized needs of New York City residents.

Problem & Big Picture

Problem Scale

NYC received over 3.4 million 311 requests in 2024, driven by quality-of-life issues like illegal parking, noise, and housing maintenance.

Disparity

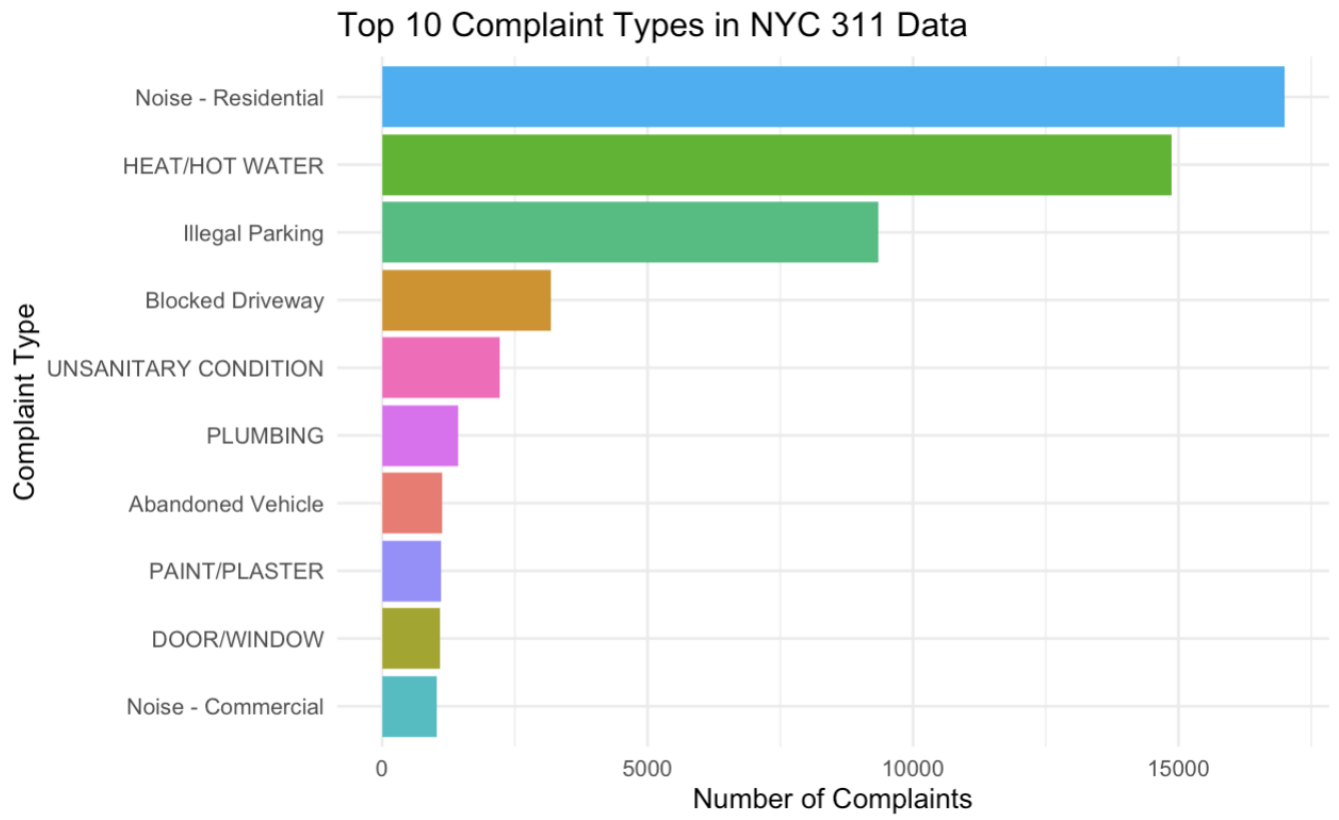
Per-capita, neighborhood-level analysis reveals uneven service needs—communities in the Bronx and Downtown Brooklyn face disproportionately high rates of housing and street-related complaints.

Shift Needed

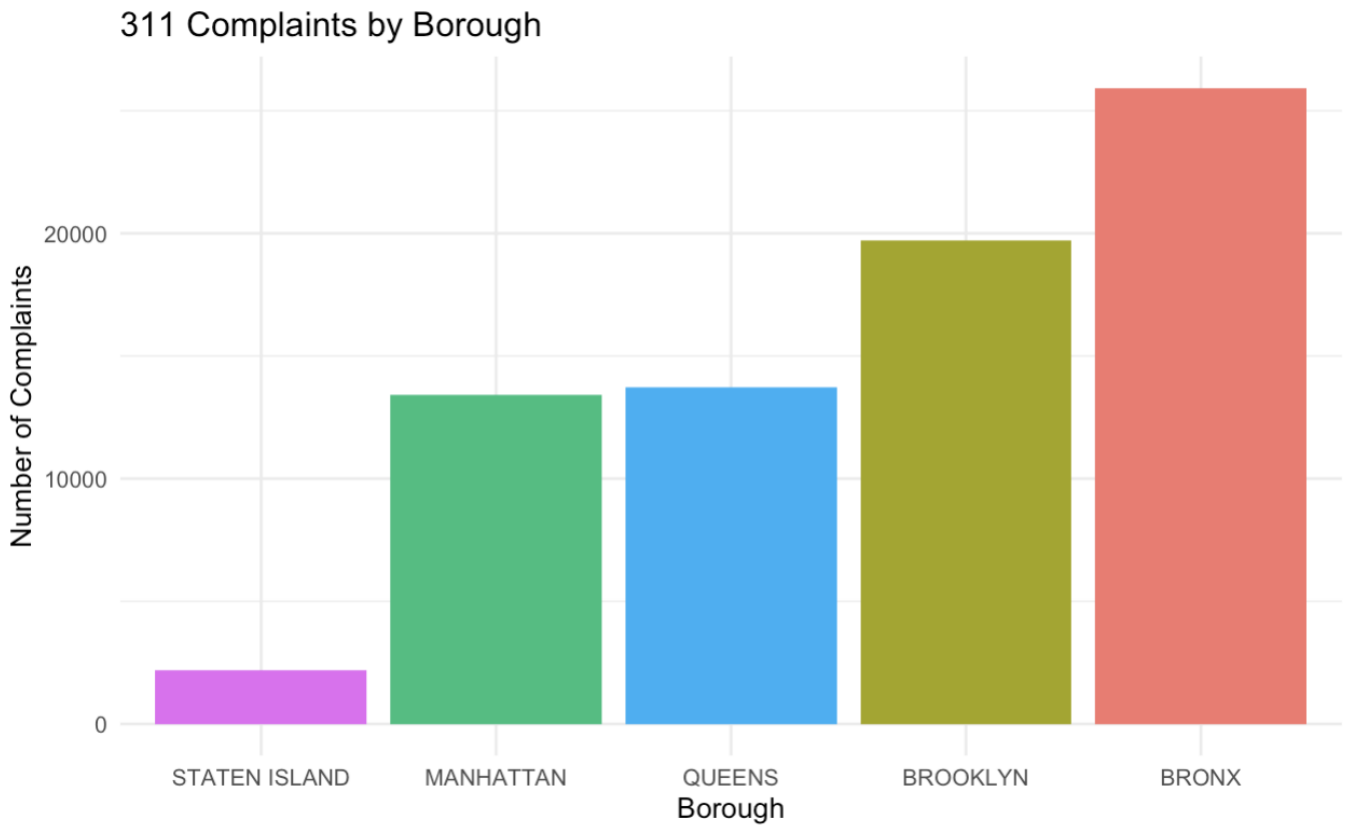
Moving from reactive complaint processing to targeted, data-informed resource allocation can address root causes in the most affected areas.

USING VISUALIZATIONS TO UNDERSTAND 311 DATA

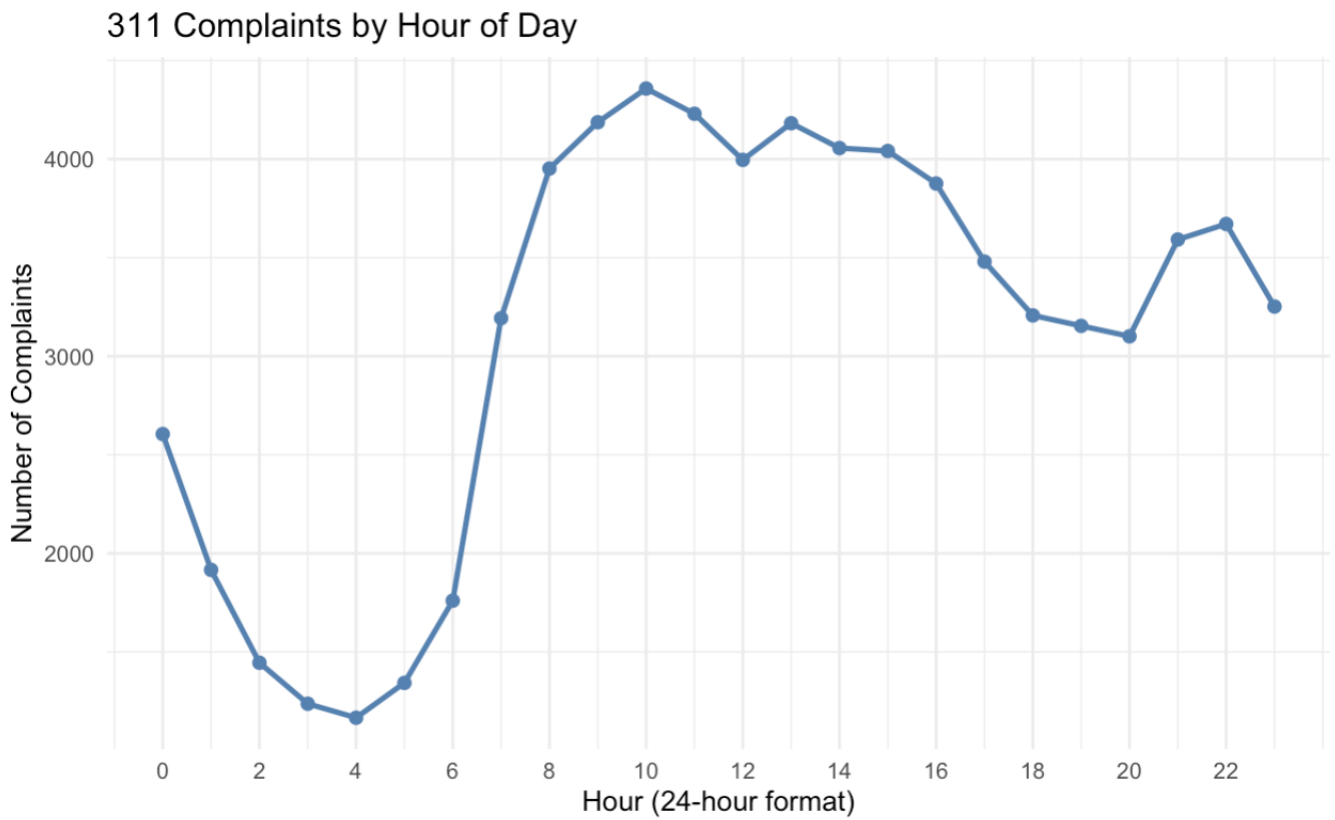
Top 10 Complaint Types



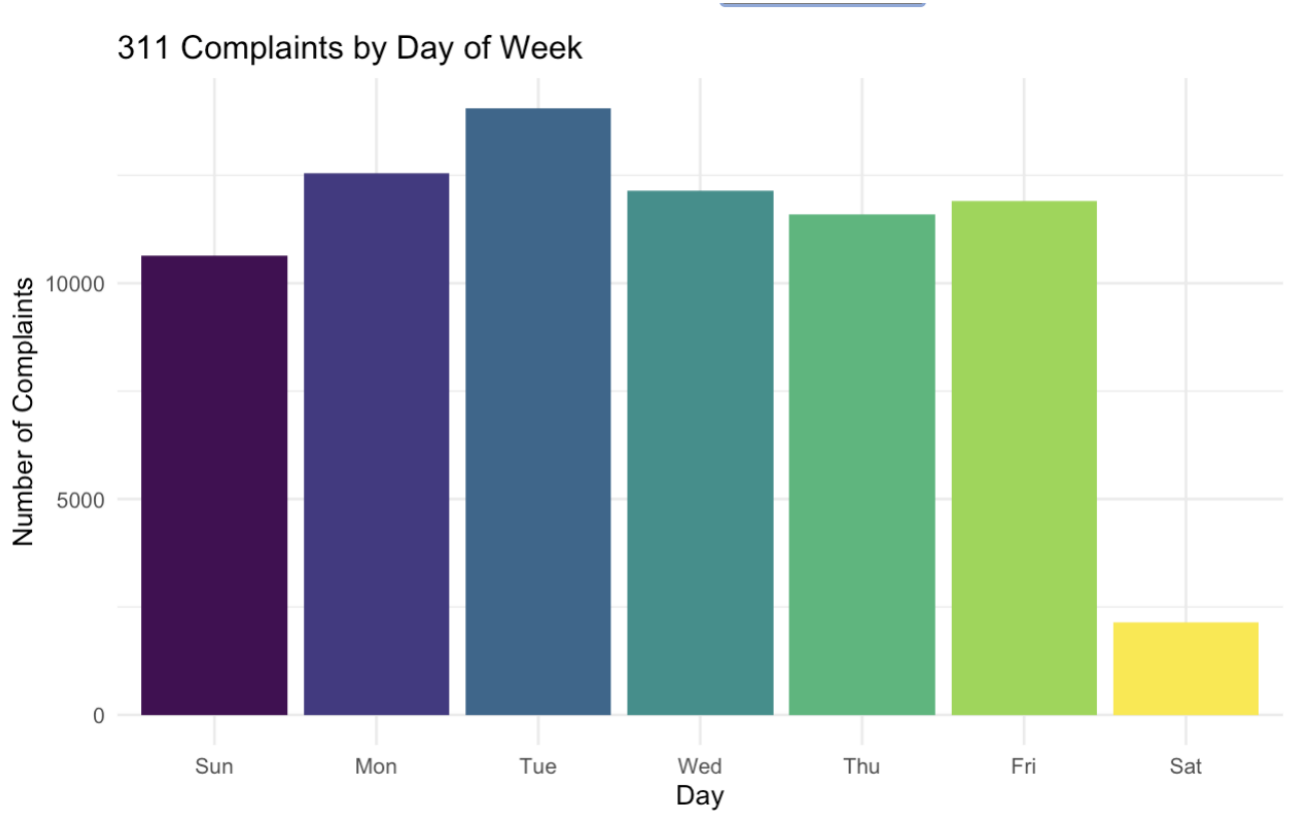
311 Complaints by Borough



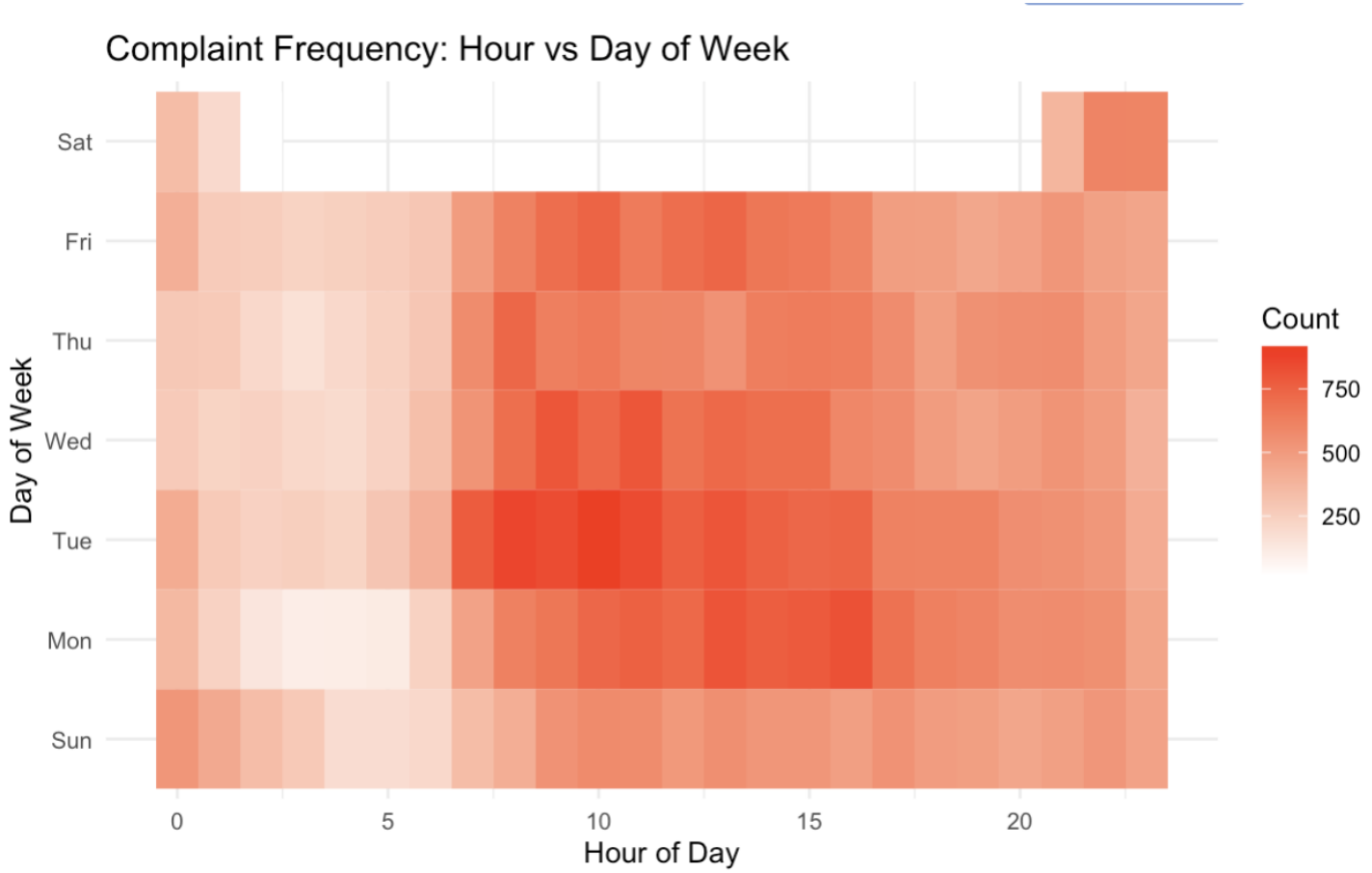
311 Complaints by Hour



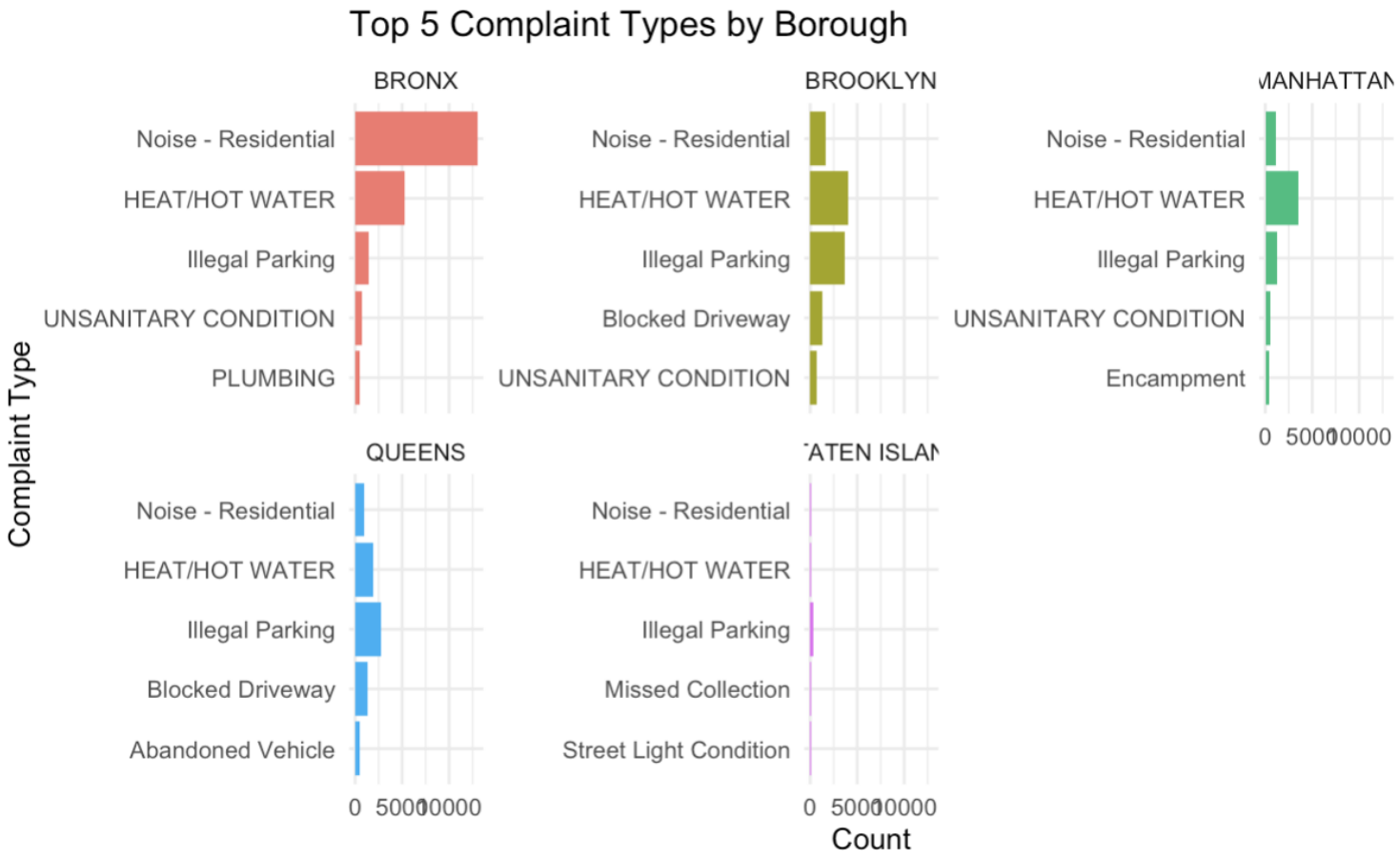
311 Complaints by Day of Week



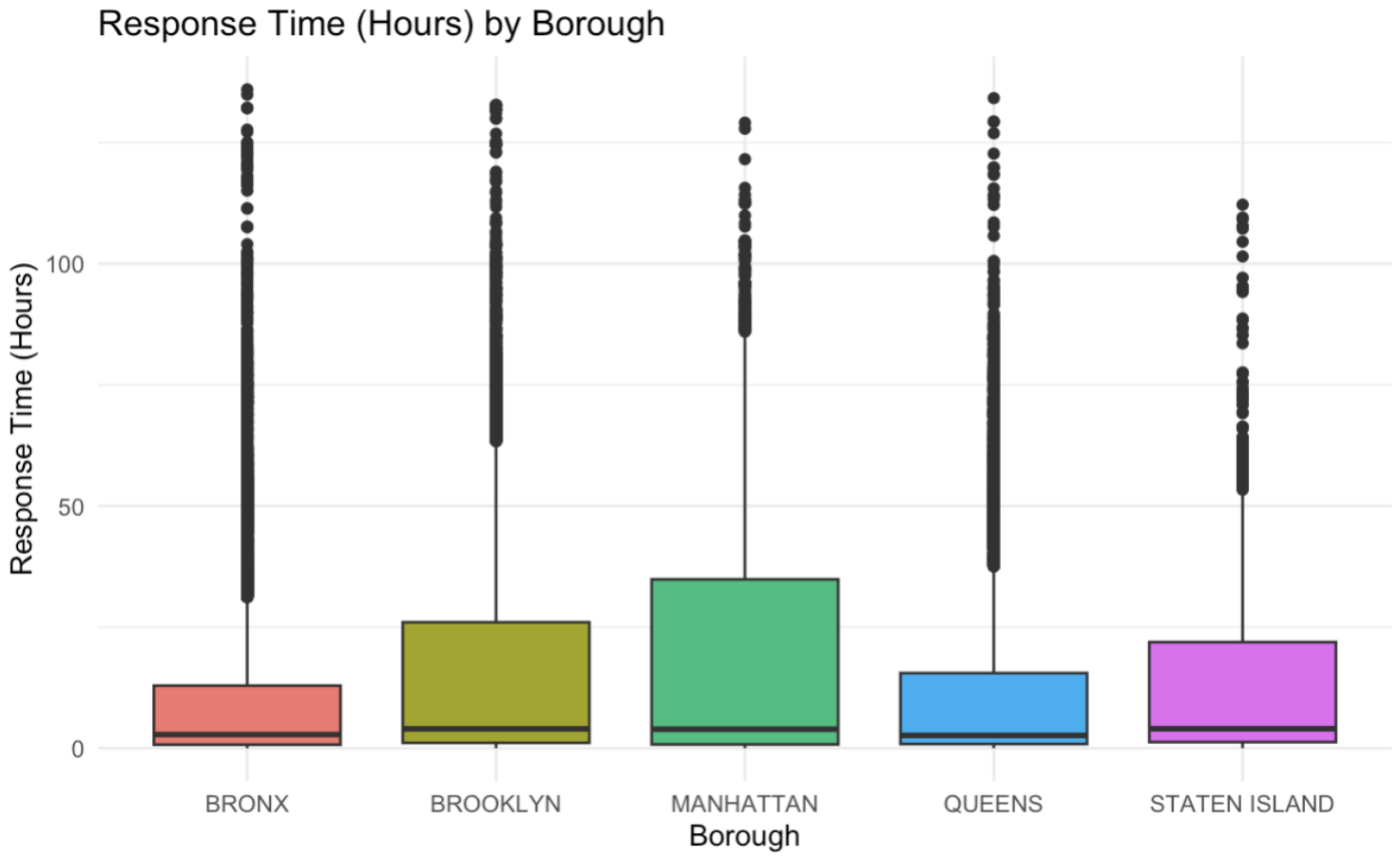
Complaint Frequency Analysis by Day & Hour



Top 5 Complaints by Borough



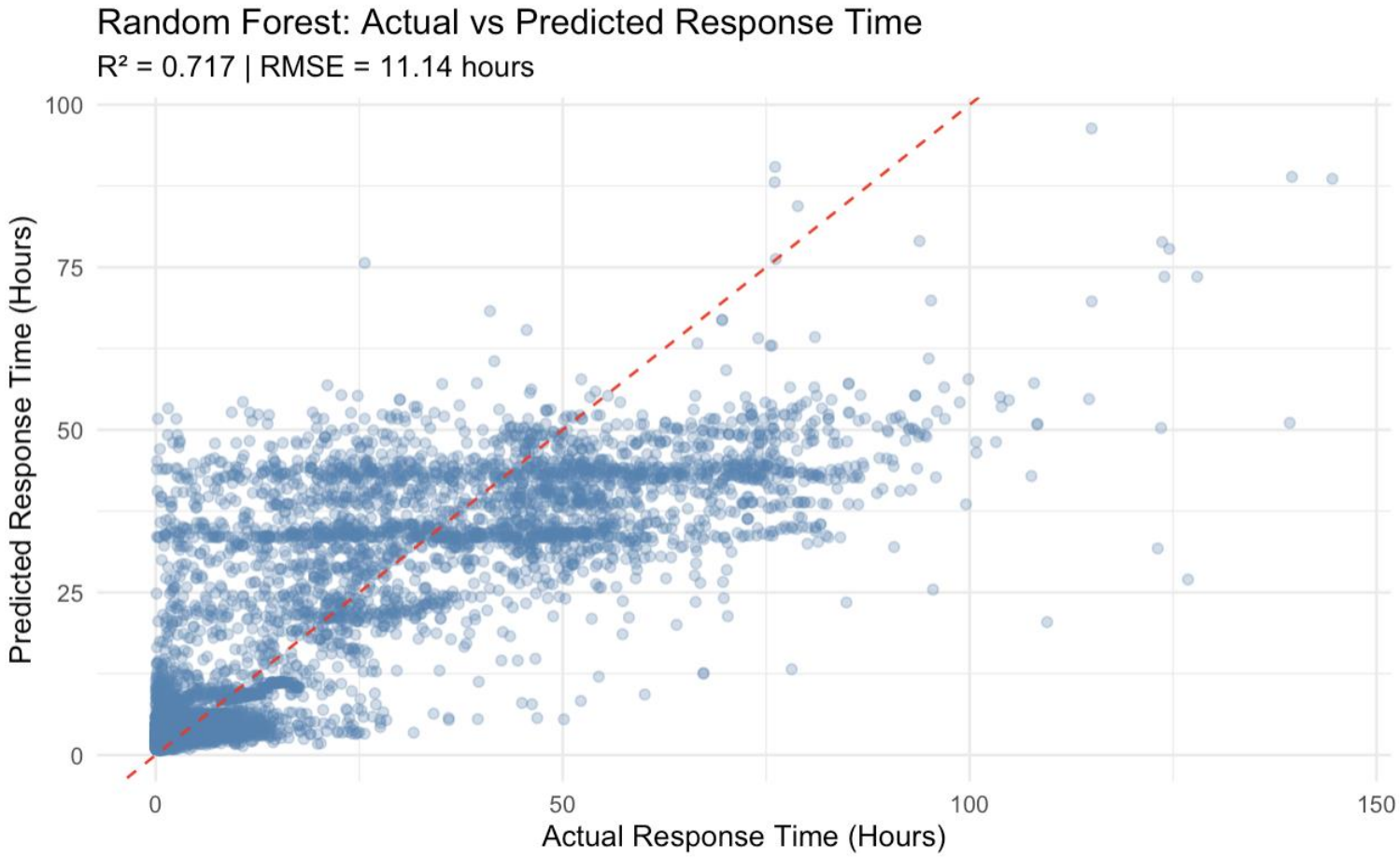
Response Time by Borough



Response Time by Borough

- Across all boroughs, NYC 311 requests are typically resolved within a few hours. However, substantial variability exists—particularly in Manhattan and Brooklyn—where a subset of cases experience significantly longer response times. This suggests that while average service levels are strong, targeted interventions may be needed to reduce extreme delays and improve consistency.

Analyzing Random Forest Data



Predicting Response Time with Machine Learning

R^2 = 0.71

71% of the variation in response time can be explained by my model's predictors (complaint type, borough, hour, day of week, month).

An R^2 of 0.71 is strong for real-world municipal data. The remaining 29% of unexplained variance comes from factors not in your dataset

RMSE = 11.14 hours

Predictions are accurate within approximately 0.46 days(about half a day) sufficient for operational triage and resource planning.

Biggest Challenge

- The biggest challenge I had in completing. This code was learning how to build, update and modify a Shiny app. The process felt similar to developing a User Experience(UX) application which is quite a challenging feature.

- My second challenge was developing meaningful insight from the data. I used three API's in this project and only one from NYC open data allowed me to get a max of 80000 data points. Since 311 gather thousands of service calls in a day, 80,0000 data pints approximates to a few data of data. With the variety of visualizations, I was able to with trial and error develop meaningful plots.

311 SHINY APP

An interactive look at important 311 with a borough focused analysis

References

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