Beyond the Numbers: Analyzing NYC's Traffic Collision Patterns (2014-2024)

AUTHOR

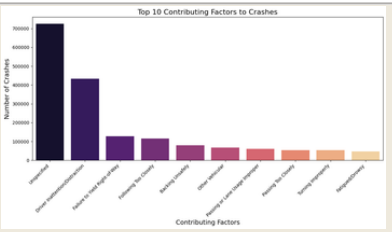
Chaitanya Mishra - Binghamton University (SUNY)
Nayanpreet Chhabra - Binghamton University (SUNY)

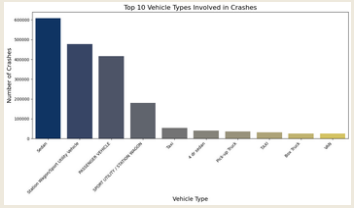
BINGHAMTON UNIVERSITY
STATE UNIVERSITY OF NEW YORK

U.S Department of Transportation Federal Highway Administration | Northeast Big Data Innovation Hub (NEBDHub) | National Student Data Corps (NSDC)

ACKNOWLEDGMENTS & REFERENCES

- *Data Source: NYC OpenData - Motor Vehicle Collisions*
- *Acknowledgments: National Student Data Corps (NSDC), Professors & Mentors*
- *References: NSDC Resources, NYC OpenData, Traffic Safety Research*





Introduction

Our comprehensive analysis of NYC traffic crash data from 2014-2024 reveals striking trends in collision causes and locations. By examining over a decade of data, we identified critical patterns that could transform road safety improvements.

Key Research Question:

- How do time, location, and contributing factors impact NYC traffic crashes, and what safety improvements can be made?

Objective

The goal of this research is to analyze NYC motor vehicle collisions from 2014 to 2024 to:

- Identify trends and contributing factors to crashes.
- Determine high-risk locations using geospatial analysis.
- Provide data-driven recommendations for improving road safety.
- Assist policymakers in reducing fatalities & injuries among road users.

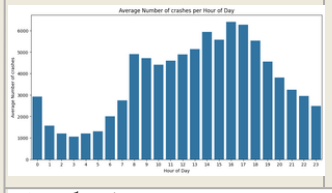
Recommendations for the Department of Transportation

- Reducing High-Severity Crashes:
- Implement speed restrictions & traffic-calming measures in high-risk zones.
- Improve street lighting & pedestrian crossings for safer walkways.
- Addressing Leading Crash Factors:
- Awareness campaigns targeting distracted driving and failure-to-yield violations.
- Stricter penalties for reckless driving in crash-prone areas.
- Post-Pandemic Adjustments:
- Assess remote work's impact on traffic flow and reallocate safety resources.

Methodology

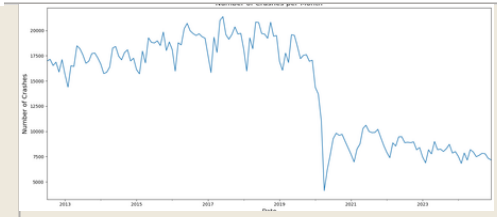
Our analysis leveraged data cleaning, statistical modeling, time series, and geospatial techniques to uncover key insights. The methodology involved:

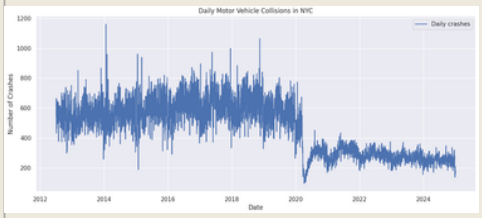
- Data Cleaning & Standardization: NYC OpenData - Motor Vehicle Collisions dataset.
- Time Series Analysis: Identified long-term trends in crashes.
- Geospatial Analysis: Used heatmaps & severity mapping to highlight high-risk areas.



Key Findings

1. Time-Based Crash Trends:
   - Peak crash times are during evening rush hours (3-5 PM).
   - Sharp decline in crashes during COVID-19, suggesting long-term changes in traffic behavior.
2. Crash Distribution by Borough:
   - Brooklyn records the highest number of crashes, followed by Queens and Manhattan.
   - Staten Island has the lowest crash rates.
3. Top Contributing Factors:
   - Driver Inattention/Distraction, Failure to Yield, Following Too Closely.
   - Socioeconomic factors influence crash reporting & frequency.
4. Geospatial Insights:
   - Crash hotspots found at high-traffic intersections and business districts.
   - Fatal crashes are concentrated in specific high-risk areas.





Analysis

1. Temporal Analysis (Time-Based Trends)
   - Peak crash times: Evening rush hours (3-5 PM) experience the most crashes.
   - Seasonal variation: Winter months show a slight increase in crashes, likely due to hazardous conditions.
   - Impact of COVID-19: There was a sharp decline in crashes post-2020, followed by a lower sustained level of crashes.
2. Spatial Analysis (Crash Distribution by Borough)
   - Brooklyn has the highest number of crashes, followed by Queens and Manhattan.
   - Staten Island records the lowest number of crashes, likely due to lower population density.
   - Heatmap analysis identifies high-risk intersections and accident-prone corridors.
3. Contributing Factors & Severity Analysis
   - Top causes of crashes:
     - Driver Inattention/Distraction
     - Failure to Yield Right-of-Way
     - Following Too Closely
   - Severity Insights:
     - Most crashes involve minor injuries, but certain hotspots show higher fatality rates.
     - Motorist injuries are more frequent than pedestrian or cyclist injuries.
4. Socioeconomic & Environmental Considerations
   - Under-resourced neighborhoods may have fewer reported crashes due to underreporting.
   - Road infrastructure quality impacts crash severity (poorly lit areas & unmarked crosswalks contribute to pedestrian risk).
   - Drunk driving & reckless behavior show correlations with night-time accidents.

Conclusion

Findings highlight the need for targeted safety interventions at crash hotspots, improved pedestrian safety measures, and stricter enforcement strategies to prevent distracted and reckless driving.