



ANALYZING THE IMPACT OF SEASONAL DAY-TO-NIGHT TRANSITIONS ON NYC VEHICLE CRASHES



TDSP RESEARCH PROJECT



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VEHICLE TYPES INVOLVED

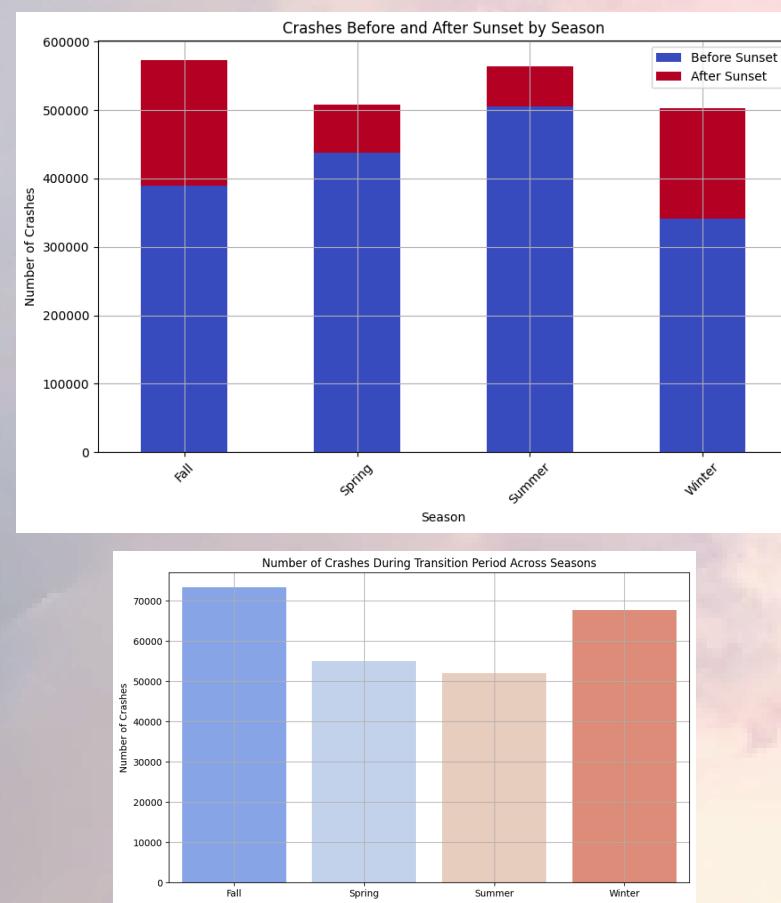
- SEDANS & SUVs: INVOLVED IN 70% OF ALL CRASHES
- TRUCKS: FEWER CRASHES, BUT HIGHER SEVERITY PER CRASH
- MOTORCYCLES: MOST NIGHTTIME FATALITIES DUE TO LOW VISIBILITY
- CYCLISTS/PEDESTRIANS: HIGHER RISK DURING FALL & WINTER NIGHTS
- SMALLER PERSONAL VEHICLES DOMINATE CRASH STATISTICS, WITH COMMERCIAL VEHICLES HAVING A LOWER, BUT MORE SEVERE IMPACT.

RESEARCH QUESTION

HOW DOES THE SEASONAL TRANSITION FROM DAY TO NIGHT AFFECT THE NUMBER OF CAR CRASHES IN NYC?

IMPORTANCE

UNDERSTANDING CRASH TRENDS BASED ON DAYLIGHT VARIATIONS CAN HELP IMPROVE ROAD SAFETY POLICIES, STREET LIGHTING, AND TRAFFIC REGULATIONS.



INTRODUCTION

- NYC HAS DRAMATIC SEASONAL DIFFERENCES IN SUNSET TIMES, WHICH MIGHT IMPACT DRIVING CONDITIONS.
- THE TRANSITION FROM DAYLIGHT TO DARKNESS AFFECTS VISIBILITY, REACTION TIME, AND DRIVER BEHAVIOR.
- OBJECTIVE: TO ANALYZE CRASH PATTERNS BEFORE AND AFTER SUNSET ACROSS DIFFERENT SEASONS AND SUGGEST DATA-DRIVEN SAFETY IMPROVEMENTS.

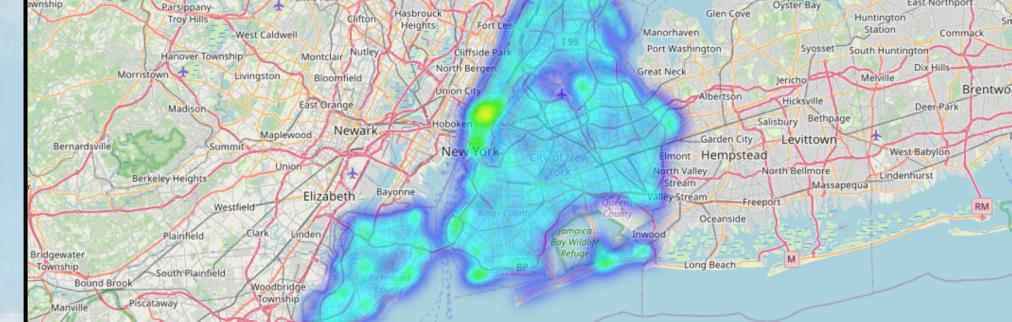
DATA & METHODOLOGY

- Dataset: NYC Motor Vehicle Collisions dataset (DOT)
- Time Period Analyzed: Multiple years of crash data
- Key Variables: Date, Time, Number of Crashes, Season, Sunset Time
- Analysis: Time-series plots, heatmaps, and bar charts were used to explore crash frequency before and after sunset across seasons.

RESULTS/FINDINGS

- Seasonal Variations in Crashes Before and After Sunset
 - Fall and Winter: Higher crash rates after sunset due to shorter daylight hours and increased darkness during rush hours.
 - Spring and Summer: More crashes occur during daylight, as longer days reduce the proportion of night crashes.
- Borough-wise Nighttime Crash Hotspots
 - Brooklyn & Queens: Highest crash densities after sunset.
 - Manhattan: Concentrated crashes in high-traffic intersections.
- Most Common Crash Types
 - Car-to-Car Collisions: Majority of incidents, peaking in winter nights.
 - Pedestrian and Cyclist Crashes: Increased at dusk, especially in fall and winter.

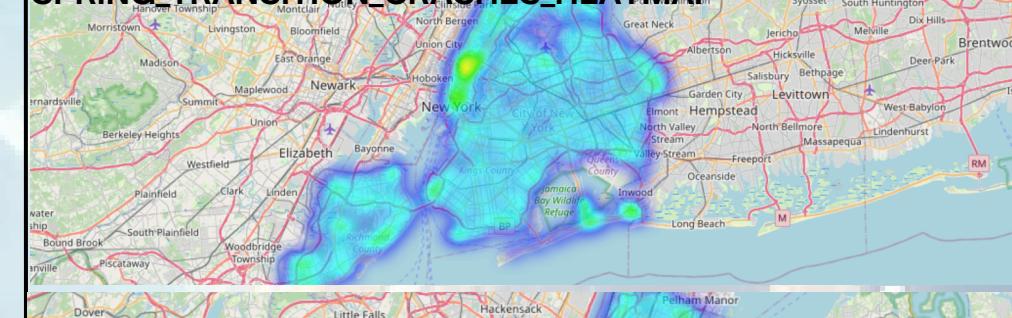
WINTER_TRANSITION_CRASHES_HEATMAP



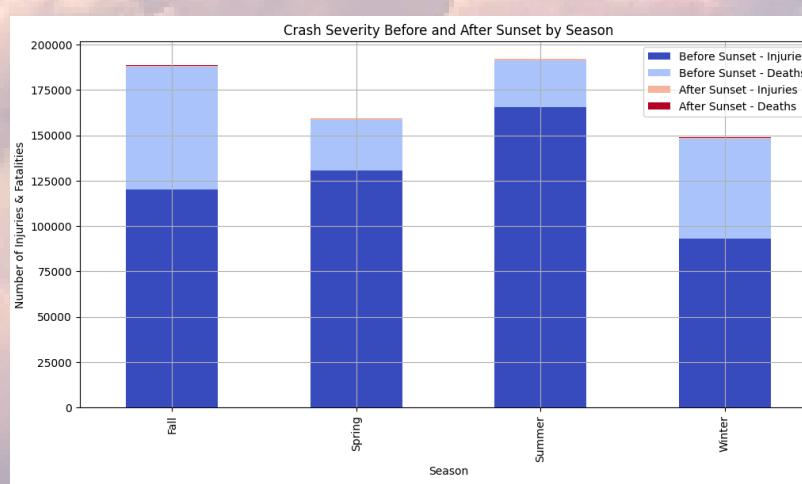
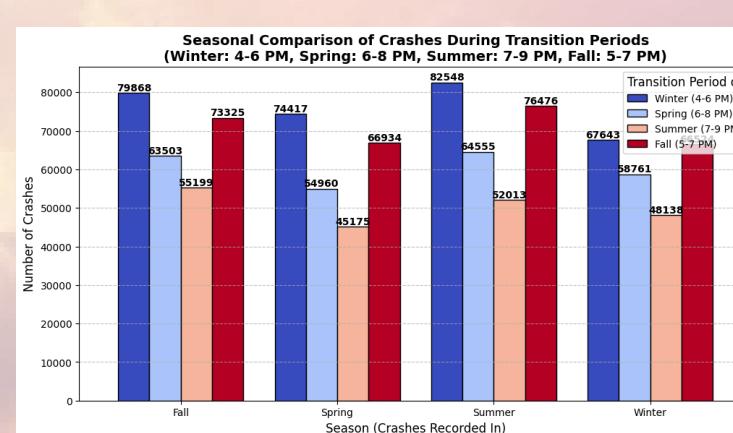
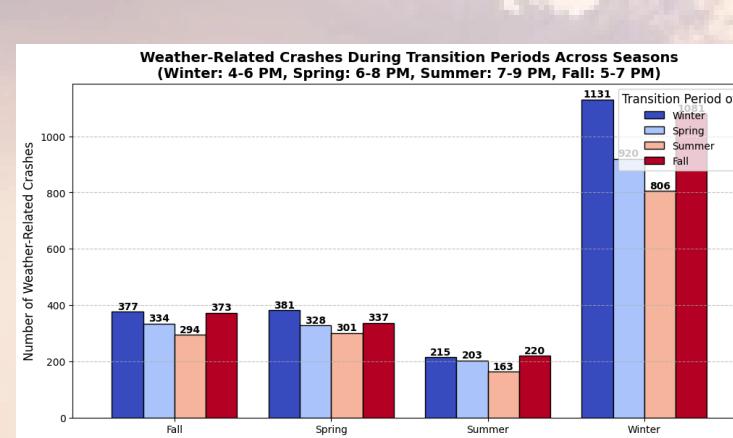
SUMMER_TRANSITION_CRASHES_HEATMAP



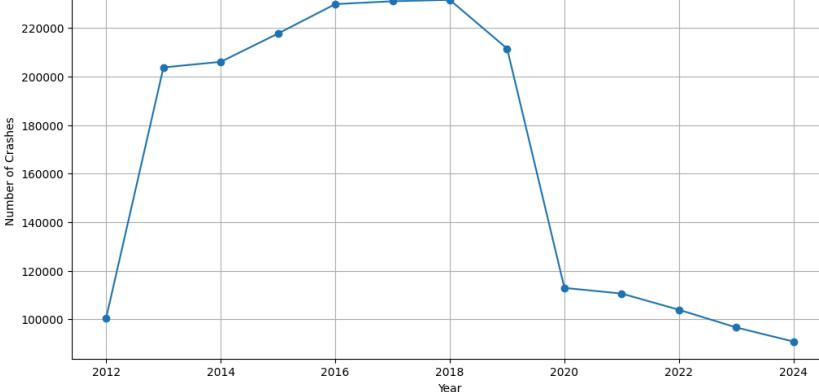
SPRING_TRANSITION_CRASHES_HEATMAP



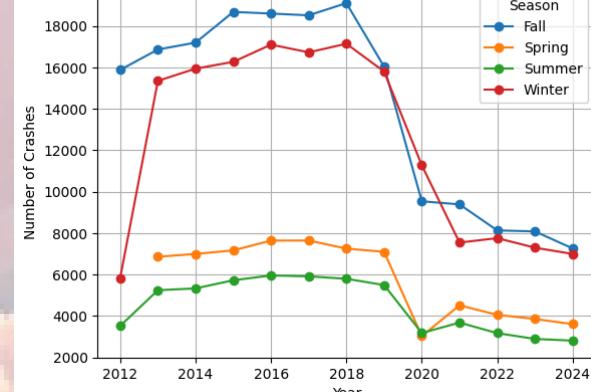
FALL_TRANSITION_CRASHES_HEATMAP



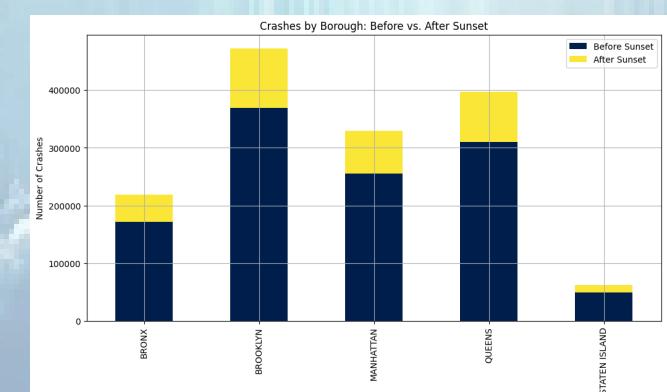
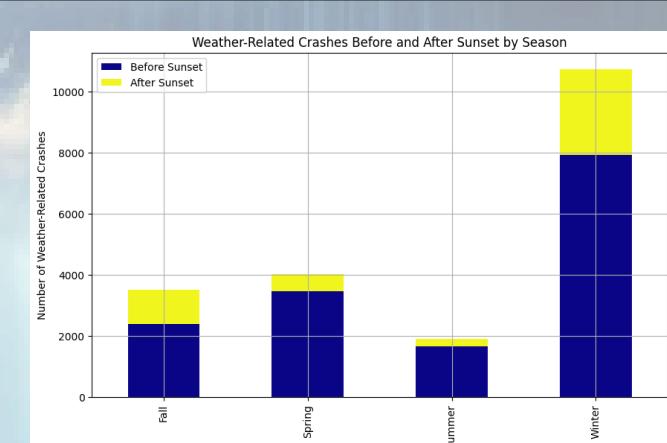
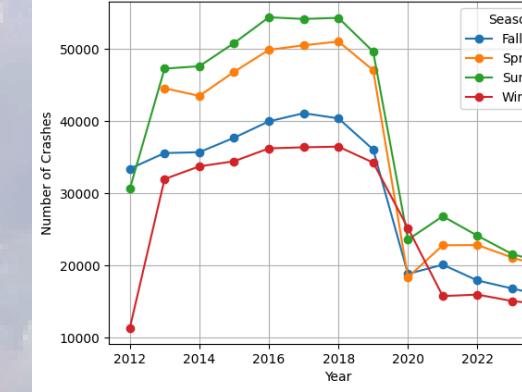
Total Number of Crashes Per Year in NYC



Nighttime Crashes Per Year by Season



Daytime Crashes Per Year by Season



RECOMMENDATIONS

Recommendations for Safer Roads

- Enhanced Street Lighting: Increase lighting in high-crash zones, especially in Brooklyn & Queens.
- Nighttime Speed Limits: Introduce lower speed limits after sunset in high-risk areas.
- Pedestrian Visibility Programs: Encourage use of reflective gear and install more crosswalk lights.
- AI-Based Traffic Monitoring: Use machine learning to analyze crash-prone intersections and deploy real-time safety alerts.

CONCLUSION

- Understanding how daylight transitions affect crashes can lead to policy changes, infrastructure improvements, and public safety campaigns.
- Final Takeaway: Enhancing nighttime road safety measures, especially in fall & winter, can reduce overall crash rates in NYC.

ACKNOWLEDGMENTS

- DATA SOURCE: NYC OPEN DATA – MOTOR VEHICLE COLLISIONS
- MENTORS & TDSP RESEARCH TEAM

KEY FEATURES USED:

- CRASH DATE & TIME: EXTRACTED HOUR, DAY, SEASON, AND SUNSET IMPACT
- GEOLOCATION (LAT/LONG): FOR HEATMAP ANALYSIS
- SEVERITY METRICS: NUMBER OF INJURIES AND FATALITIES
- CONTRIBUTING FACTORS: DRIVER BEHAVIOR, ROAD CONDITIONS, EXTERNAL INFLUENCES