

Behavioral and Social Data Science | Phoebe Wang

## INTRODUCTION

This research examines a dataset from NYC OpenData: Motor Vehicle Collisions - Crashes, which contains detailed information on all police-reported motor vehicle collisions in New York City. The study aims to identify patterns and variations in contributing factors of crashes (e.g., backing up unsafely, unsafe lane changing, etc.) across different times and levels of crash severity.

## RESEARCH QUESTION

What are the contributing factors to crashes, and how do they vary across time and crash severity?

To explore this question, the study addresses the following sub-questions:

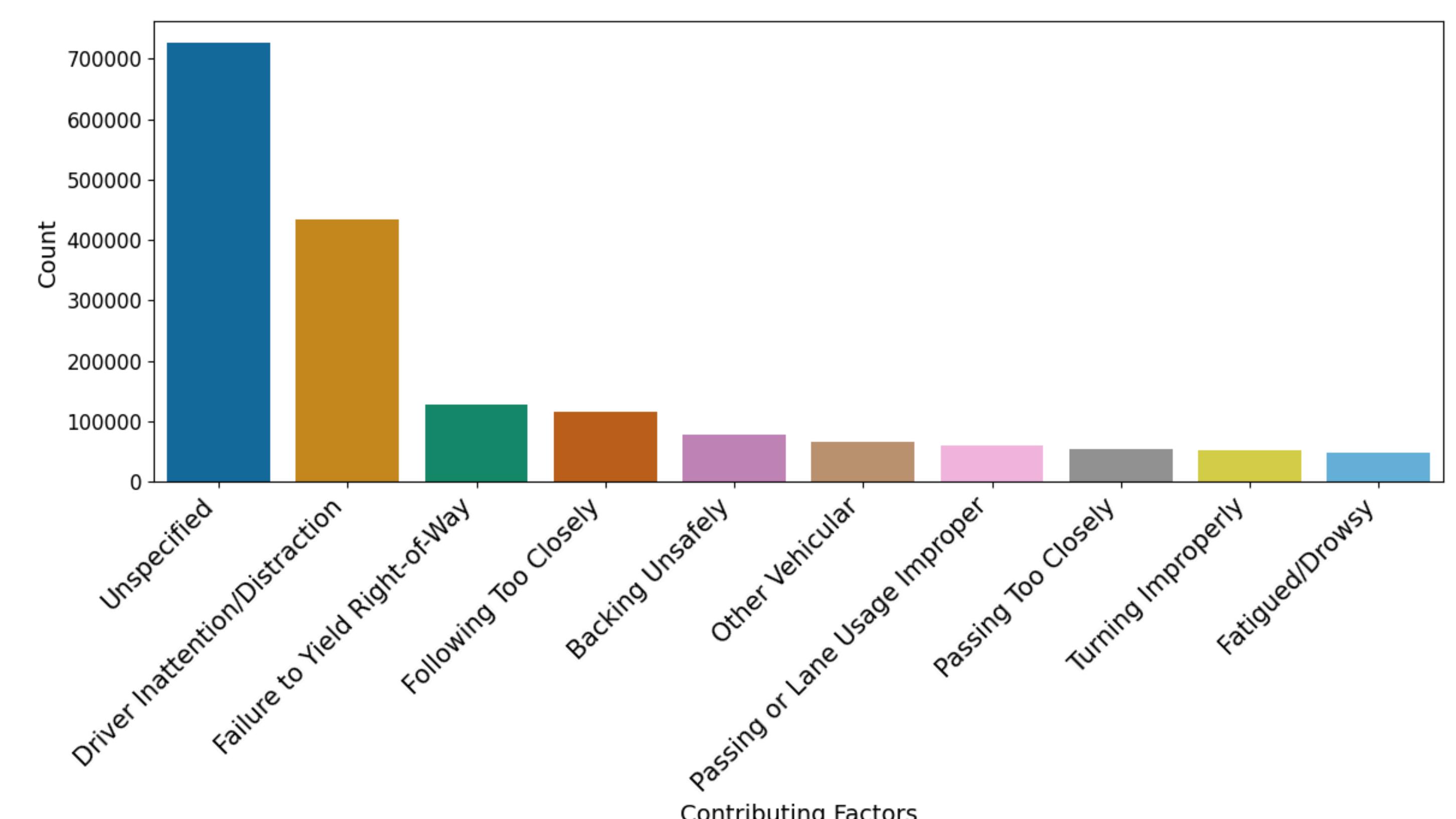
1. What are the most common contributing factors to crashes?
2. How do factors like driver inattention/distraction vary by time of day and week?
3. How do the top contributing factors relate to crash severity?

## METHODS

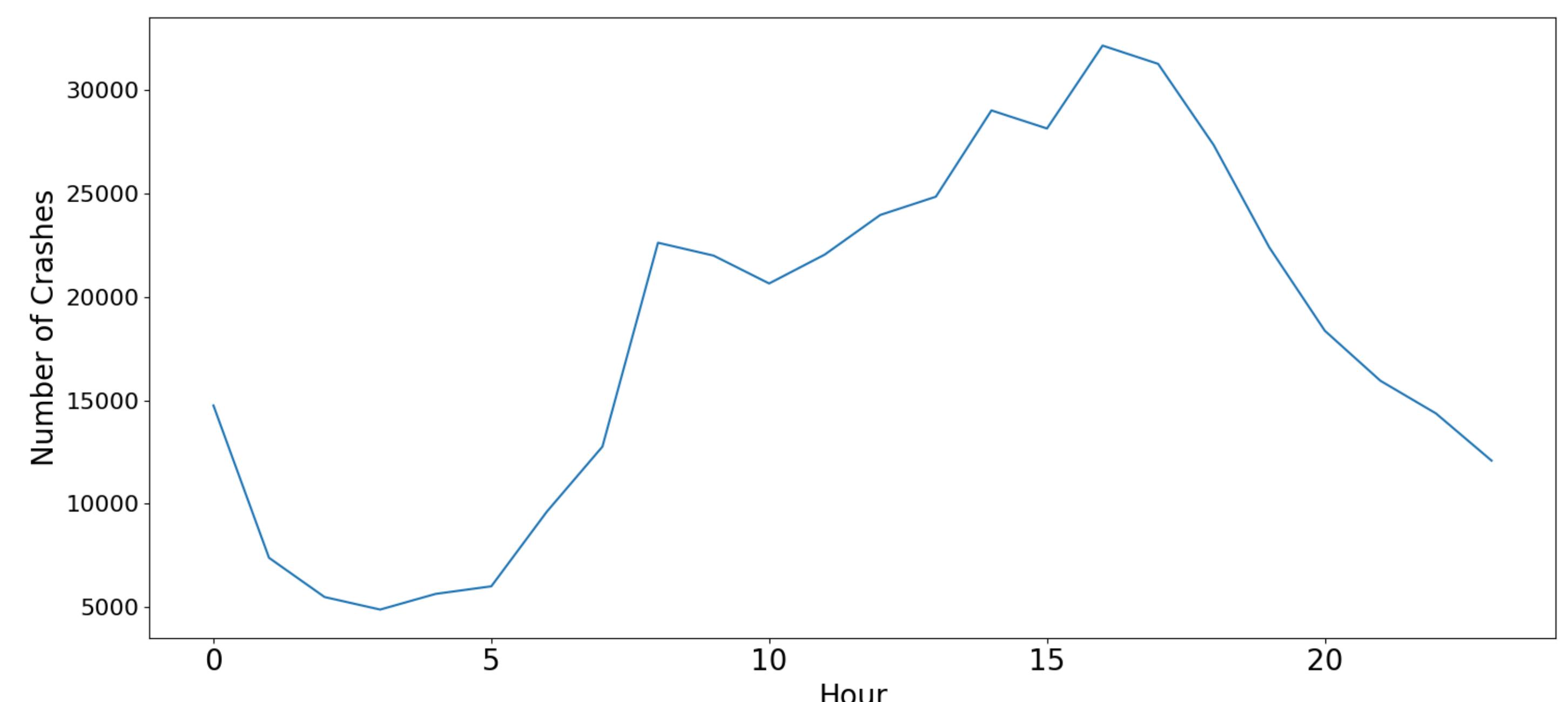
Time series analysis was conducted to assess temporal patterns in the most significant contributing factors, driving inattention/distraction, across different times of day and days of the week.

## ANALYSIS

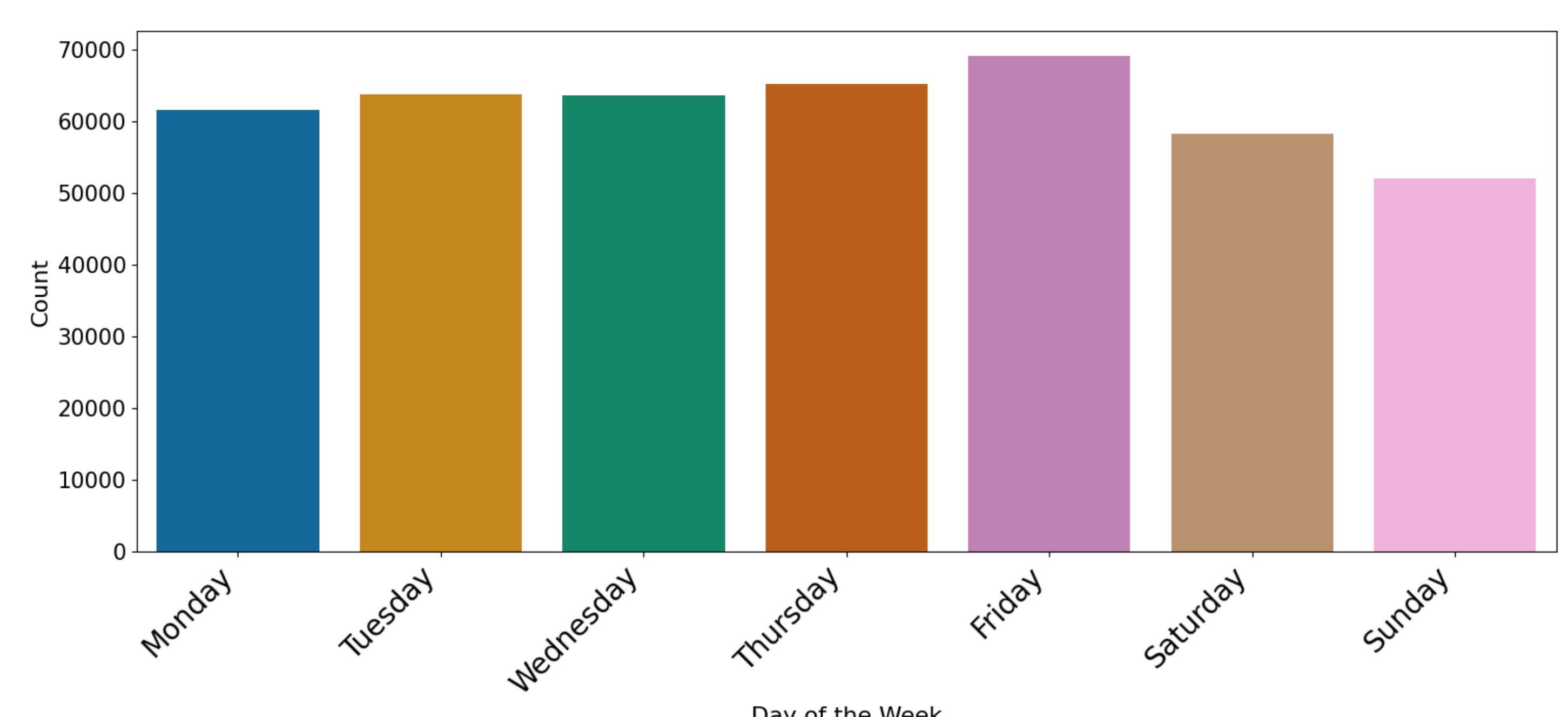
**Figure 1. Top 10 Contributing Factors to Crashes**



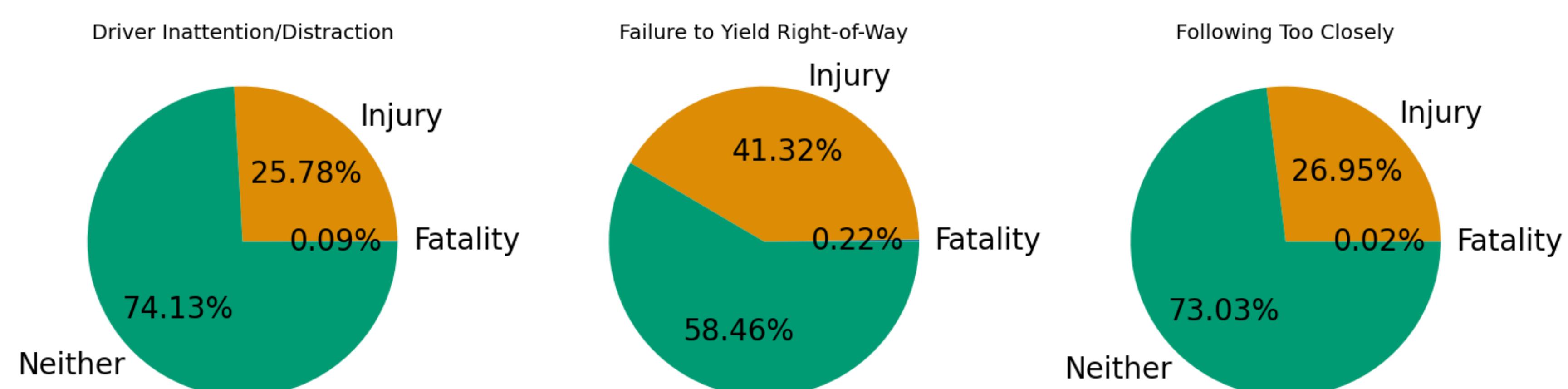
**Figure 2. Number of Inattentive/Distracted Driving Crashes per Hour**



**Figure 3. Number of Inattentive/Distracted Driving Crashes by Day of the Week**



**Figure 4. Crash Severity Distribution Across the Top 3 Contributing Factors**



## RESULTS

1. **Top Contributing Factors:** Driver inattention/distraction, failure to yield right-of-way, and following too closely are the three most common contributing factors to crashes.
2. **Time Patterns:** Crashes due to inattentive/distracted driving peak in the afternoon (around 3–5 PM) and are least frequent in the evening and early morning.
3. **Day of the Week:** Friday has the highest frequency of inattentive/distracted driving crashes, while Sunday has the lowest. Crash frequency is fairly evenly spread across all days of the week, with an average of around 60,000 incidents.
4. **Crash Outcomes:** More than half of crashes result in neither injuries nor fatalities, yet more than 25% of crashes caused by the top three factors result in injuries. Failure to yield right-of-way leads to the most injuries, with 41.32% of these crashes causing injuries.

## DISCUSSION

- The three most common contribution factors suggest that human error and decision-making play a significant role in vehicle crashes.
- The peak in crashes caused by distracted driving between 3-5 PM aligns with typical afternoon rush hours, where higher traffic volumes and commuter fatigue might increase the likelihood of crashes.
- The higher frequency of crashes on Fridays may result from increased traffic volume at the end of the workweek, along with possible distractions related to weekend plans or fatigue from the workweek.
- Limitations include potential underrepresentation of less severe incidents due to reliance on police reports and the "Unspecified" category in contributing factors reducing analysis precision.
- Future research could explore the relationship between weather, road infrastructure, and contributing factors and investigate interventions for high-risk periods and behaviors.

## RECOMMENDATIONS

Automated enforcement tools like red-light and speed cameras can help control risky driving behaviors. Increasing traffic patrols and safety measures during peak crash hours in the afternoon can address rush-hour risks. Additionally, promoting in-vehicle technologies such as driver monitoring and collision avoidance systems can help reduce driver errors.

## CONCLUSION

Understanding the key factors contributing to crashes - particularly human errors and decision-making - is crucial for developing effective interventions and improving road safety. By addressing these errors through targeted strategies, such as driver education and policy changes, and incorporating findings into practice, we can reduce accident frequency, mitigate risks, and ultimately save lives.