**Topic: Car Crashes and Road Safety**

Car crashes pose significant risks to drivers, passengers, and pedestrians, making road safety a priority for governments, transportation authorities, and city planners. By analyzing crash data, we can identify patterns and risk factors that contribute to accidents, enabling informed decision-making to improve road safety. Visualization of crash trends across time, locations, and contributing factors can help prevent future accidents and enhance traffic management.

Problem Space Exploration

Car crashes exhibit strong temporal patterns. Analyzing accident trends by hour, day, or season can reveal when crashes are most frequent—such as peak traffic hours, weekends, or adverse weather conditions. Over time, changes in accident rates can indicate the effectiveness of new traffic policies, road improvements, or driver education campaigns.

Geospatial analysis is crucial in identifying high-risk roads, intersections, and accident-prone zones. Mapping crash locations can highlight areas where design improvements, better signage, or speed enforcement are needed. Analyzing road type and conditions—such as urban vs. rural roads or highways vs. residential streets—can provide deeper insights into where accidents occur most frequently.

Linguistic analysis of police reports, driver statements, and social media discussions can offer qualitative insights into accident causes. Reports may reveal common reasons such as distracted driving, speeding, or weather-related hazards. Sentiment analysis from public discussions can also gauge public perception of road safety and identify areas of concern.

Network analysis can help understand relationships between different crash factors. For example, analyzing how weather, vehicle type, and driver behavior contribute to accident severity can provide actionable insights for policy makers. Additionally, examining connections between road networks and traffic volume can help predict congestion-related accidents.

Stakeholders and Their Needs

Several key groups benefit from car crash data analysis. Transportation authorities and city planners need insights into accident hotspots and risk factors to improve road infrastructure and traffic signals. Law enforcement agencies require data on accident patterns to optimize patrols and enforcement strategies. Insurance companies use crash data to assess risk and adjust policies accordingly. Drivers and pedestrians can benefit from real-time accident reports and safety recommendations for specific locations.

Each stakeholder has different visualization needs. City planners may rely on interactive crash density maps to prioritize infrastructure improvements. Law enforcement might need dashboards tracking accident severity and response times. Insurance companies may analyze accident risk scores based on various contributing factors. The general public would benefit from user-friendly applications displaying safe routes and accident alerts.

Data Sources

A variety of datasets can provide valuable information for car crash analysis. The U.S. National Highway Traffic Safety Administration (NHTSA) Crash Data  offers comprehensive accident reports. The Fatality Analysis Reporting System (FARS) provides detailed data on fatal crashes. City-level traffic crash datasets, such as New York City and Chicago, allow for localized analysis. There is also Kaggle website that can have sources of similar information.

Additional data sources can enhance the study. Weather data from the NOAA Climate Data can be integrated to analyze weather-related crashes. Traffic volume data from city transportation departments can help assess congestion-related accidents. Social media data, such as accident mentions on Twitter, can provide real-time insights into public concerns and road conditions.

Challenges in data integration include privacy restrictions on accident reports and the need for preprocessing to merge datasets from different sources. However, combining structured crash data with external factors like weather and road conditions can significantly improve predictive modeling and visualization quality.