**A line art of two cars

AI-generated content may be incorrect.**

**U.S. Traffic Accidents – Temporal, Environmental, and Spatial Insights**

**Overview**

This project analyzes U.S. traffic accident data to uncover **temporal patterns, environmental impacts, and urban–rural differences** that can guide targeted safety measures.  
**Bottom Line Up Front (BLUF):** Accidents concentrate along the East and West Coasts, peak during winter months, and show increased severity in early-morning weekend hours. Environmental factors like rain, low temperatures, and reduced visibility raise severity risks, but many accidents still occur in fair weather, pointing to behavioral and infrastructure drivers.

**Business Understanding**

The analysis addresses three key questions:

1. **Temporal & Spatial Patterns:** When and where are accidents most frequent and severe?
2. **Environmental Impacts:** How do visibility, precipitation, and temperature affect frequency and severity?
3. **Urban–Rural Differences:** What infrastructure and location-based patterns suggest the need for tailored safety measures?

The goal is to provide **data-driven, actionable insights** for stakeholders including transportation departments, emergency responders, insurers, and policymakers.

**Data Understanding**

Data includes accident records with timestamps, location coordinates, severity levels, infrastructure presence, and environmental conditions (visibility, temperature, humidity, precipitation, weather description). The dataset covers diverse U.S. regions and seasons, enabling analysis of temporal trends, spatial clusters, and environmental correlations.

A screenshot of a computer code

AI-generated content may be incorrect.

Skylearn libraries was also imported because it was calculated the “best model”

**Data Preparation**

Data cleaning involved removing irrelevant columns, standardizing weather variables, handling missing values, and creating derived fields (e.g., **Hour**, **Time of Day Category**). Spatial coordinates were retained for mapping in Tableau, while numerical and categorical variables were reformatted for temporal and environmental analysis.

**Analysis**

**Temporal/Spatial:**

* East & West Coasts show the highest accident density.
* Peak accident counts occur November–January.
* Severity is highest during early-morning weekend hours.

**Environmental:**

* Rain increases severity-3 accidents; temperatures below 60°F correlate with higher severity.
* Visibility worsens in darker months, wind peaks and humidity its lowest in spring.
* Many severe accidents happen in fair or clear weather.

**Urban–Rural:**

* Junctions show elevated severity-3 cases; stop signals reduce severe accidents.
* Urban infrastructure density is higher, speed bumps more common in rural mid-country.

**Evaluation**

**Business Insight / Recommendation 1**  
Target early-morning weekend hours with enhanced patrols, especially in clear or cloudy pre-dawn conditions and winter.

**Business Insight / Recommendation 2**  
Visibility, rain, and temperature all influence accident severity in similar ways; however, large share of crashes occurs in fair weather. This suggests that driver behavior and road design play a critical role in accident prevention, even when environmental conditions appear safe.

**Business Insight / Recommendation 3**  
Urban and rural accident patterns show notable differences, requiring tailored prevention measures to address the distinct risk factors and infrastructure needs of each setting.

Tableau Link

<https://github.com/alejandroiq/US_traffic_accidents/tree/main/Images>

[Capstone1 | Tableau Public](https://public.tableau.com/app/profile/alejandro.silva7211/viz/Capstone1_17545975568270/Intro?publish=yes) (This link is not working properly)

[Capstone1.twb](https://1drv.ms/u/c/d12d51d4faa6b51a/EcdjPpV84oBJgyq-jJZsjWABHYZ3clvXmqA7nZQjQIQMcQ?e=CS9wso) (Link to my OneDrive)

**Conclusion and Next Steps**

The study confirms that time of day, season, and location significantly influence accident severity, and environmental factors—while important—are not always the primary triggers.  
Next steps include:

* **Forecasting** severity-4 probabilities using machine learning.
* **Calculating break-even thresholds** (e.g., at what visibility level severity risk jumps).
* **Normalizing accident counts per 100k residents** for fairer state comparisons.
* Enhancing the dashboard with **scenario simulations** so stakeholders can model interventions in real time.