

US Traffic Accident Analysis Report (2023)

1. Project Overview

This project analyzes traffic accident patterns across the United States using data extracted from the US Accidents dataset. The objective is to understand accident frequency, severity trends, and contributing factors such as weather, time of day, visibility, and geographic distribution. The analysis was conducted using Python for data exploration, SQL (BigQuery) for structured querying, and Tableau for dashboard visualization. These insights help support data-driven decision-making to improve road safety.

2. Dataset Summary

- **Original Data Source:** *US Accidents (2016–2023)* from Kaggle
- **Python Phase:** used the **full dataset (2016–2023)** for initial cleaning, exploration, and understanding overall trends.
- **SQL & BigQuery Phase:** created a filtered dataset containing only accidents from the year 2023..
- **Total Records in 2023 subset:** 235,304
- **Key Columns:** state, city, severity, hour, day_of_week, weather_condition, visibility_mi, temperature_category, wind_speed_category, is_weekend, day_night

3. Exploratory Data Analysis Using Python

Using pandas and exploratory methods: Loaded dataset and explored structure with `.info()` and `.describe()`.

Cleaned missing values and standardized data types.

Created time-based fields such as hour, day, and AM/PM.

Verified weather distributions, visibility ranges, and severity levels.

4. Data Analysis Using SQL

BigQuery SQL queries were used to extract insights:

- States with the Highest Accident Counts

Row	state ▼	total_accidents ▼
1	CA	71611
2	FL	21487
3	TX	13377
4	VA	10751
5	NY	10615
6	PA	9386
7	NC	8827
8	MN	8717
9	SC	8257
10	GA	8037

• Top Cities with Severe Accidents

Row	city ▼	high_severity_acc...
1	Atlanta	144
2	Chicago	48
3	Asheville	46
4	Philadelphia	40
5	Charlotte	39
6	Pittsburgh	38
7	Orlando	38
8	Detroit	34
9	Fredericksburg	33
10	Griffin	32

• Peak Accident Hours

Row	hour ▼	accidents ▼
1	15	17503
2	16	17208
3	7	16418
4	17	16275
5	14	15158
6	8	14593
7	18	13302
8	6	12677
9	13	12500
10	12	11100

• Weather Conditions Causing Most Accidents

Row	weather_condition ▼	total_accidents ▼
1	Fair	95485
2	Cloudy	46602
3	Mostly Cloudy	25621
4	Light Rain	15919
5	Partly Cloudy	13286
6	Light Snow	11866
7	Fog	5474
8	Rain	4934
9	Wintry Mix	1828
10	Fair / Windy	1805

• Average Visibility During Severe Accidents

Row	avg_visibility
1	8.511298224127...

• Weekend vs Weekday Accidents

Row	is_weekend	total_accidents
1	true	48461
2	false	186843

• Wind Speed and Temperature Categories

Row	wind_speed_category	total_accidents
1	low	172018
2	moderate	56331
3	high	6955

Row	temperature_category	total_accidents
1	Moderate	150843
2	Cold	68086
3	Hot	16375

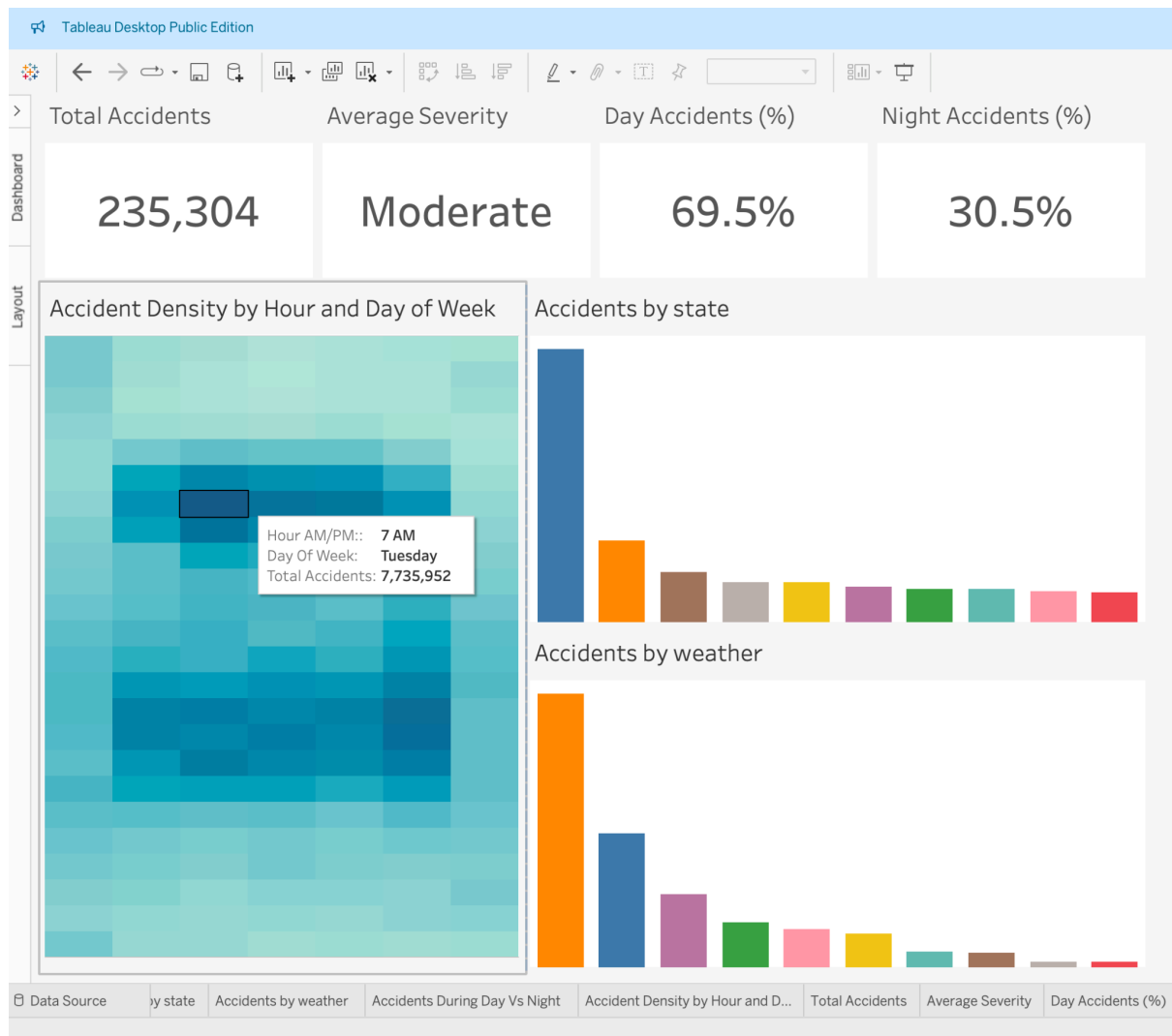
• Severity by Day/Night

Row	day_night	avg_severity	total_accidents
1	night	2.076247721612...	71871
2	day	2.046404336945...	163433

5. Tableau Dashboard

A multi-chart interactive dashboard was created featuring:

- Key Performance Indicators (Total Accidents, Average Severity, Day vs Night Percentages)
- Heatmap showing Accident Density by Hour and Day of Week
- Bar charts for Accidents by State and Accidents by Weather



6. Key Insights

- Accident concentration is highest during morning and evening commute hours.
- Certain states show significantly higher accident counts than others.
- Poor weather conditions (rain, fog, snow) contribute heavily to accident numbers.
- Reduced visibility is strongly correlated with higher accident severity.
- Weekend accidents are lower in volume but tend to have slightly higher severity.
- Daytime accidents account for roughly 70%, while nighttime accounts for about 30%.

7. Business & Safety Recommendations

- Increase public awareness campaigns during peak commute hours.
- Enhance visibility measures in high-risk areas (better lighting, reflective signage).
- Improve infrastructure and maintenance in states with high accident counts.
- Deploy weather-responsive warnings and highway alerts.
- Prioritize enforcement during nighttime hours when severity trends upward.

This project demonstrates end-to-end data analysis skills across Python, SQL, and Tableau, and offers actionable insights for improving road safety nationwide.