Friedrich-Alexander-Universität
Technische Fakultät

Analyze different weather conditions and their impact on different types of vehicles involved in road accidents

Methods of Advanced Data Engineering

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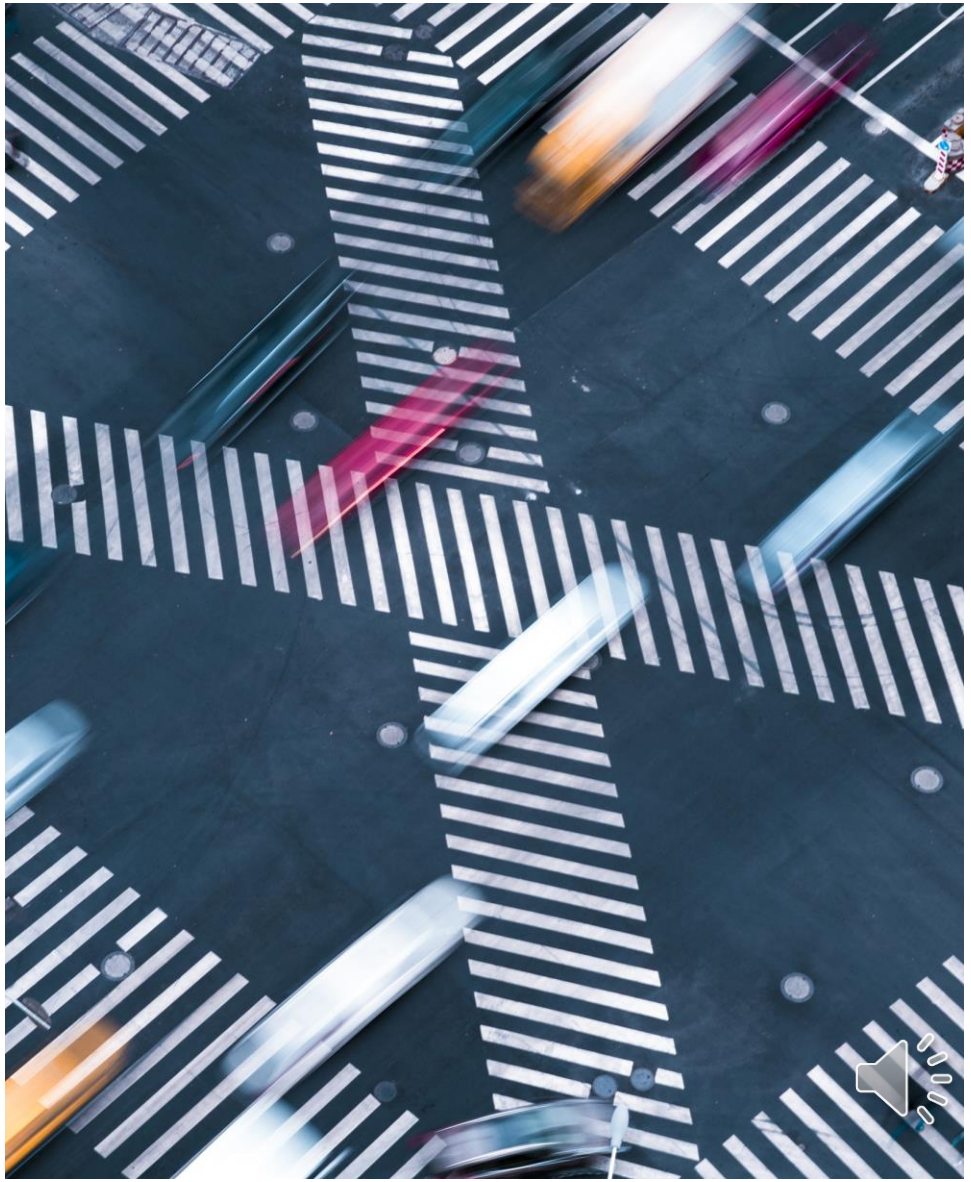
Contents

- Introduction
- Methods and Dataset
- Results
- Conclusion
- Limitations
- Outlook for Future Work



Introduction

Road accidents pose significant threats to public safety.

Understanding the factors influencing road accidents is crucial for developing effective safety measures.

One such factor of interest is weather conditions.

This study aims to investigate whether weather has an impact on the types of vehicles involved in road accidents.

Methods and Dataset

Dataset 1: Road Accident Dataset

This dataset provides detailed information on accident types, vehicle types, month-to-month road conditions, and other relevant factors.

URL: https://www.statistik-berlin-brandenburg.de/opendata/AfSBBB_BE_LOR_Strasse_Strassenverkehrsunfaelle_2019_Datensatz.csv

Cleaning:

1. All the unnecessary columns were removed from the dataset.
2. Column names were changed to English for easy understanding.
3. Month and road condition were changed from numerical to string values for better readability.

Methods and Dataset

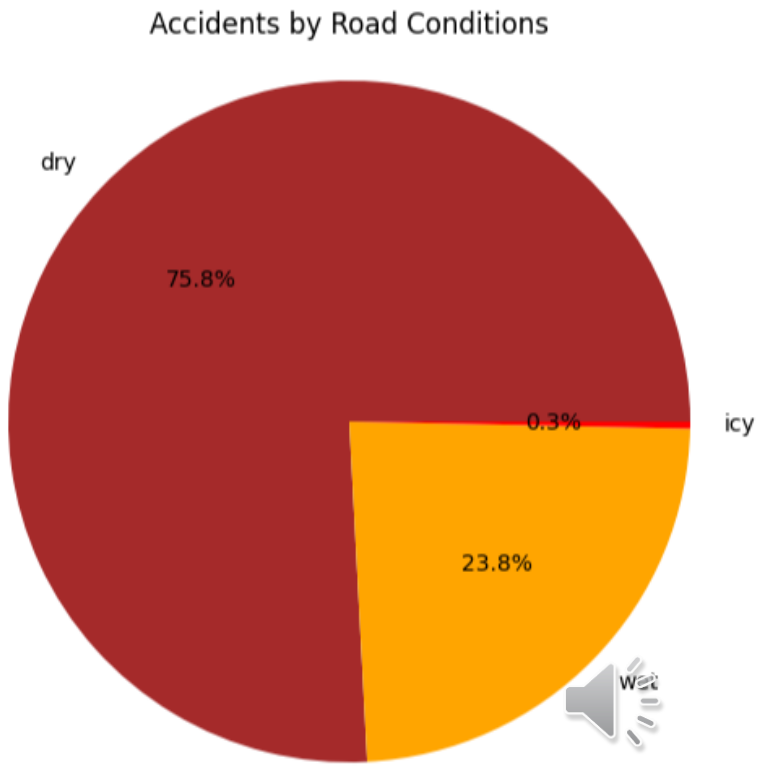
Dataset 2: Weather Dataset
The second dataset comprises weather data for all of Germany, which includes precision, air pressure, and other meteorological variables.
Data
URL: https://opendata.dwd.de/climate_environment/CDC/regional_averages_DE/monthly/precipitation/

Cleaning
1. Data converted from a TXT file to a CSV.
2. Read the data only for Berlin in 2019.
3. Combine the data from precision, air pressure and sunshine duration in one data frame, referring to the month column.

Results

Q1. Which road condition has the most impact on road accidents?

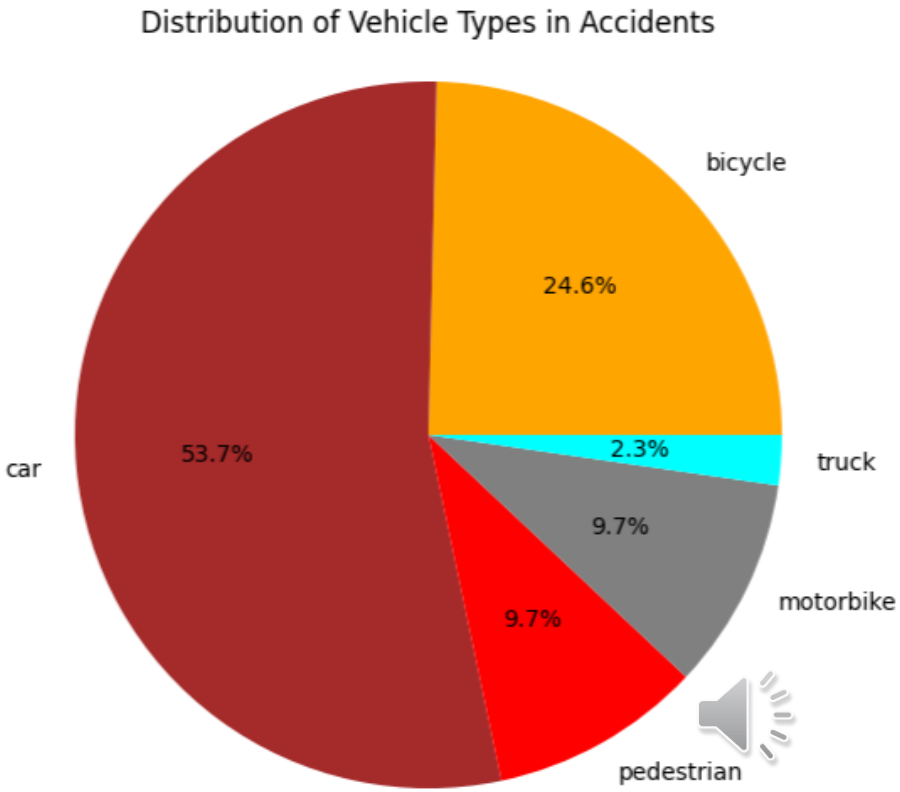
- Dry road conditions constitute the majority with 75.8% in total accidents.
- Wet road conditions contribute to 23.8% of accidents.
- Icy road conditions present the lowest risk of only 0.3% of the overall accident probability.



Results

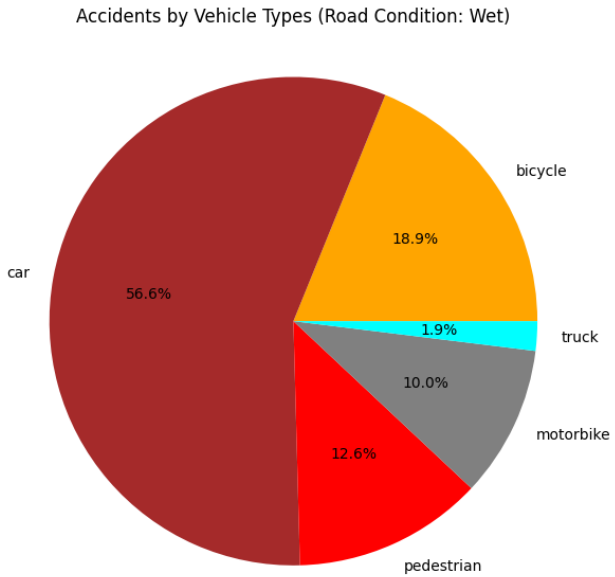
Q2. Which type of vehicle is most likely to be involved in an accident?

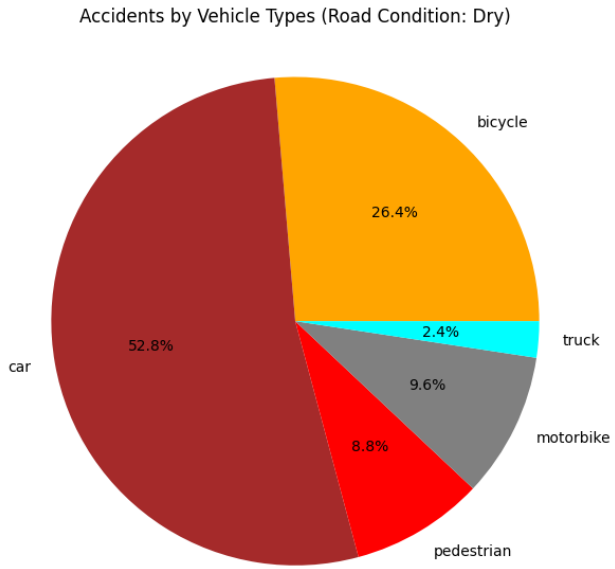
- On first, cars are the most frequently involved vehicle type in road accidents.
- Second, bicycles contribute significantly to accidents after cars.
- Third, both pedestrians and motorbikes share a similar likelihood.
- Fourth, trucks have a lower probability of involvement.

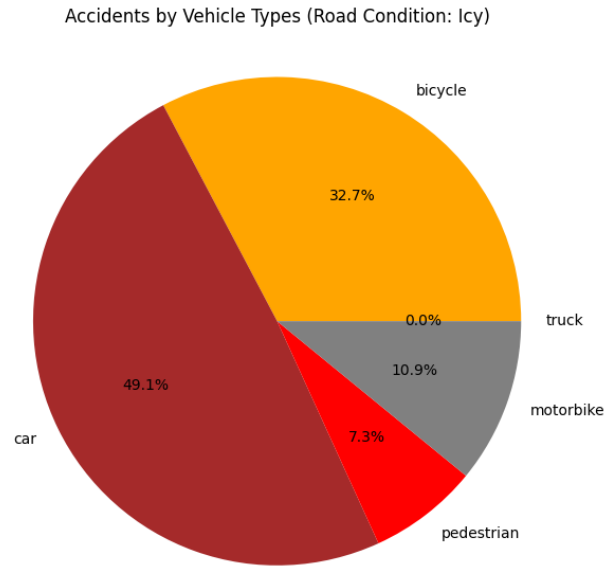


Results

Q3. How do different weather conditions impact the types of vehicles involved in accidents?





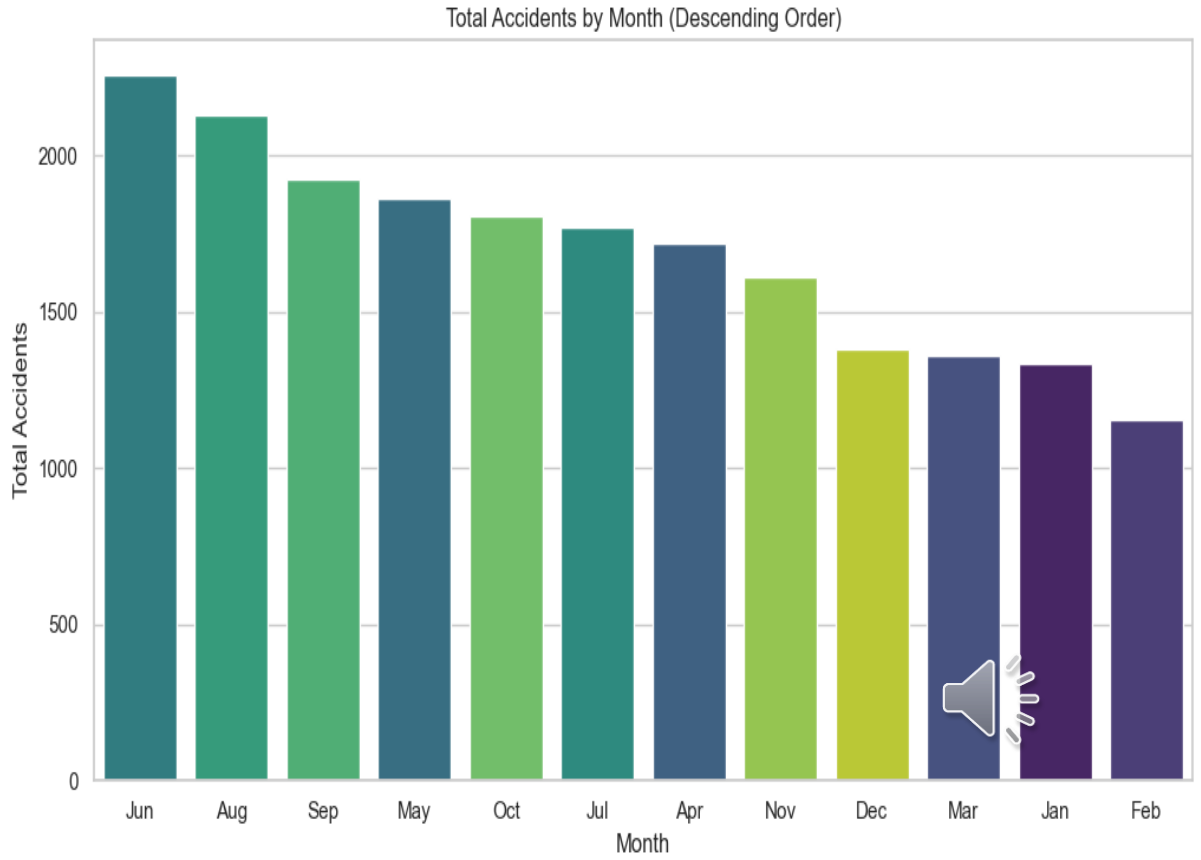


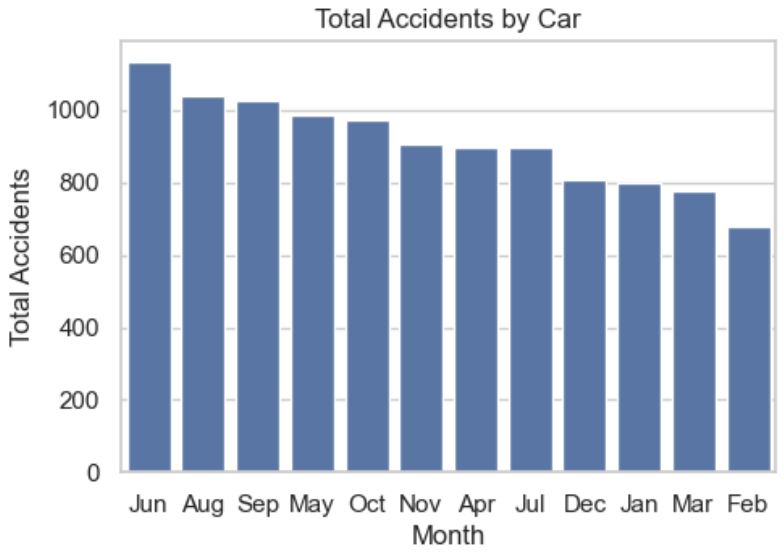
- Cars consistently leads in road accidents, with 56.6% in wet conditions, 52.8% in dry, and 49.1% in icy conditions.
- Bicycles rank second in accidents, with the highest risk in icy conditions (32.7%), followed by dry (26.4%) and wet conditions (18.9%).
- Pedestrian accidents peak in wet conditions (12.6%), followed by dry (8.8%), and icy conditions (7.3%).

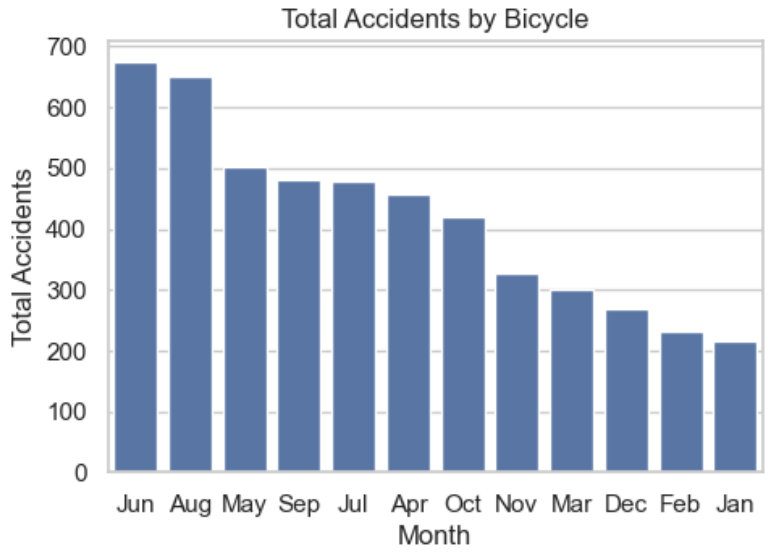
Results

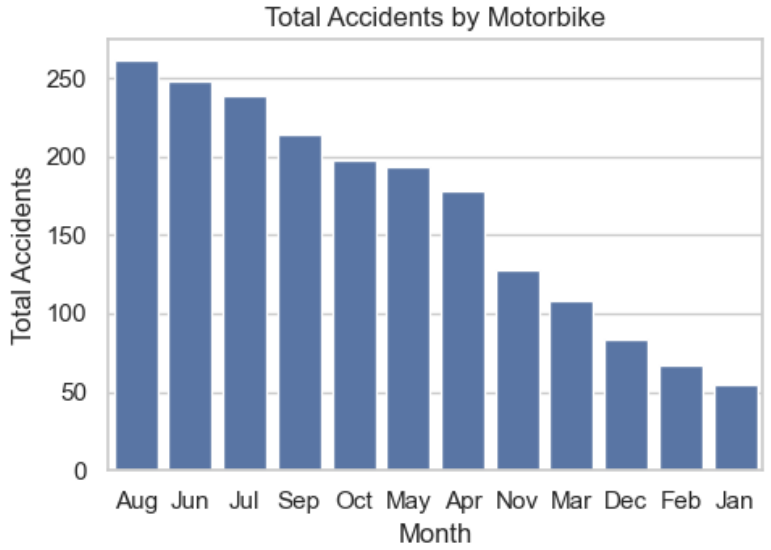
Q4. Is there any trend in vehicle accidents over the period of a year?

- Summer months, covering June to September, showcase the highest occurrence of road accidents
- Winter months, covering December to March, showcase the lowest occurrence of road accidents.




Total Accidents by Car
Total Accidents
0
200
400
600
800
1000
Jun Aug Sep May Oct Nov Apr Jul Dec Jan Mar Feb
Month


Total Accidents by Bicycle
Total Accidents
0
100
200
300
400
500
600
700
Jun Aug May Sep Jul Apr Oct Nov Mar Dec Feb Jan
Month


Total Accidents by Motorbike
Total Accidents
0
50
100
150
200
250
Aug Jun Jul Sep Oct May Apr Nov Mar Dec Feb Jan
Month

Total Accidents by Pedestrian
Total Accidents
0
50
100
150
200
Jan Nov Dec Oct Sep Apr Mar Aug Feb Jun May Jul
Month

Conclusion

- Dry road conditions has the highest risk of road accident.
- Cars, bicycles, and pedestrians has highest risk to get involved in accidents.
- All vehicles has higher vulnerability to wet conditions but only bicycles' susceptibility to icy environments.
- Distinct patterns emerge in monthly trends, with consistently higher risks during summer months for various vehicle types.

Limitations

Single-City Limitation: Dataset's focus on a single city, limiting generalization to areas with distinct traffic dynamics.

Limited Time Frame: The one-year timeframe of the dataset hinders the identification of long-term trends.

Monthly Weather Granularity: The availability of weather data on a monthly basis, rather than daily or hourly, limits the analysis's granularity.

Absence of Traffic Data: Lack of traffic data restricts the analysis's depth, as it is crucial for identifying specific risk factors associated with traffic patterns.

Outlook for future work:

- Aggregate road accident data from multiple cities.
- Extending the dataset timeframe beyond a year.
- Acquiring daily or hourly weather data for a robust analysis.
- Integrating comprehensive traffic-related information.

Thank you for your Attention