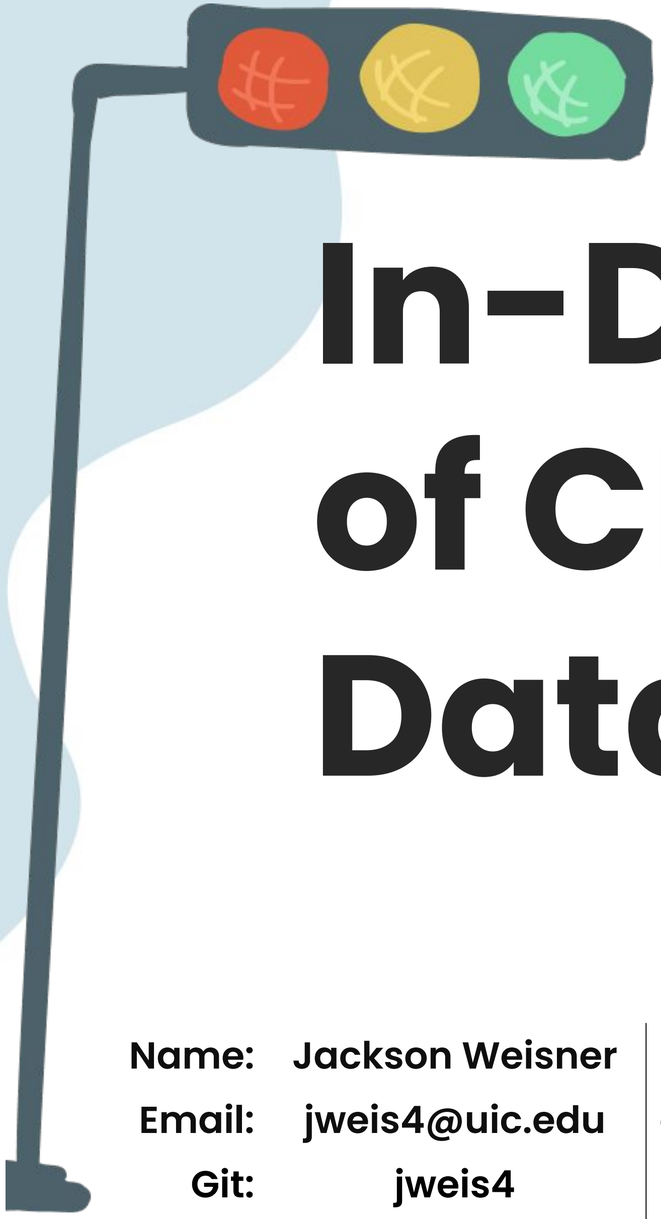

In-Depth Analysis of Chicago Traffic Data

Providing insights to improve road safety

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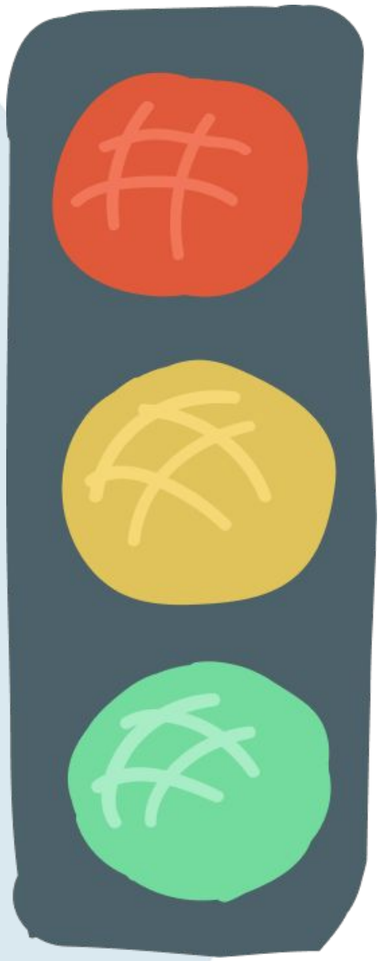
Introduction

- Our project is a comprehensive analysis of chicago traffic collisions
- We changed the scope to just Chicago, instead of three cities
- Our findings will help drivers know the risks of being on the road, and will help keep the community safe



Data

01

Traffic Crashes - Crashes

General information about the crash

02

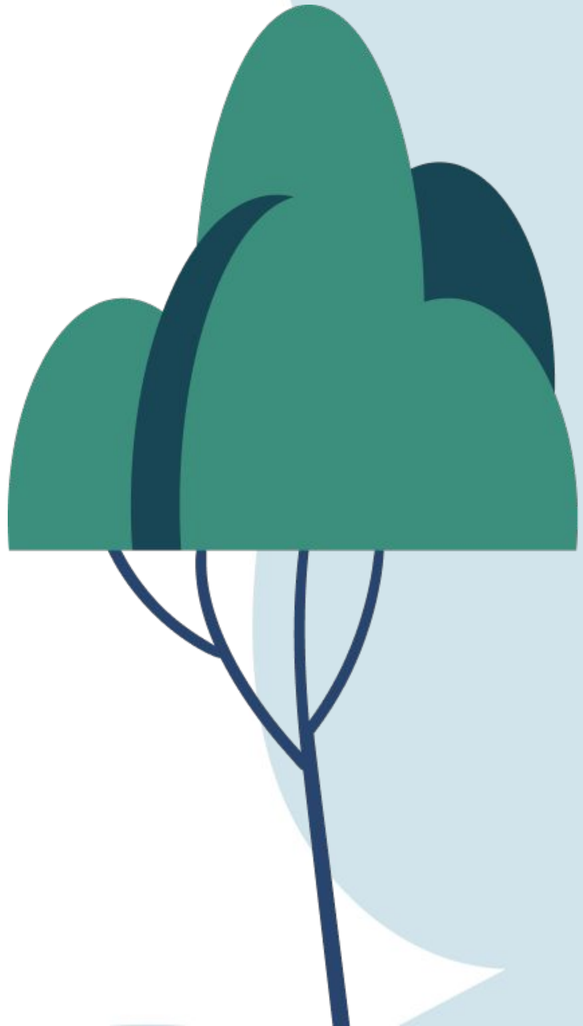
Traffic Crashes - People

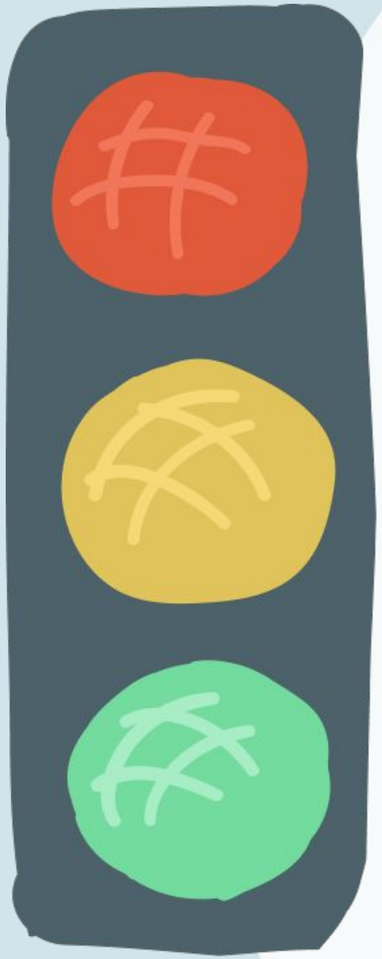
Details about the people involved in a crash

03

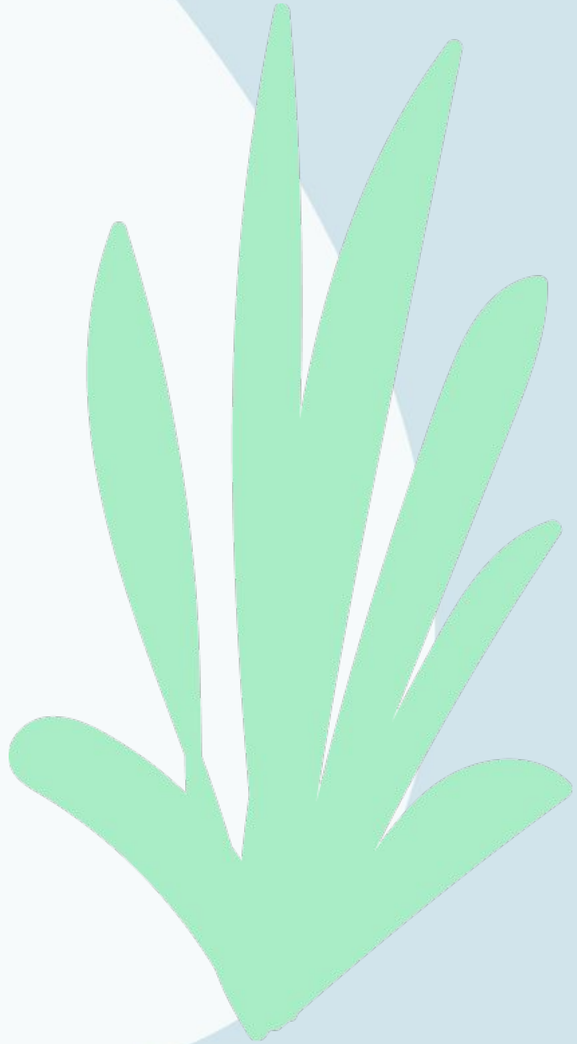
Traffic Crashes - Vehicles

Information about vehicles and damage

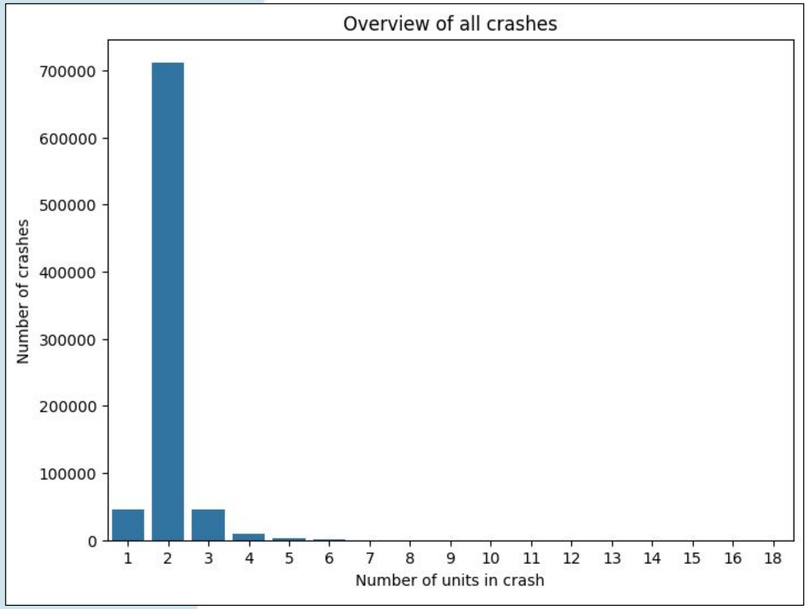


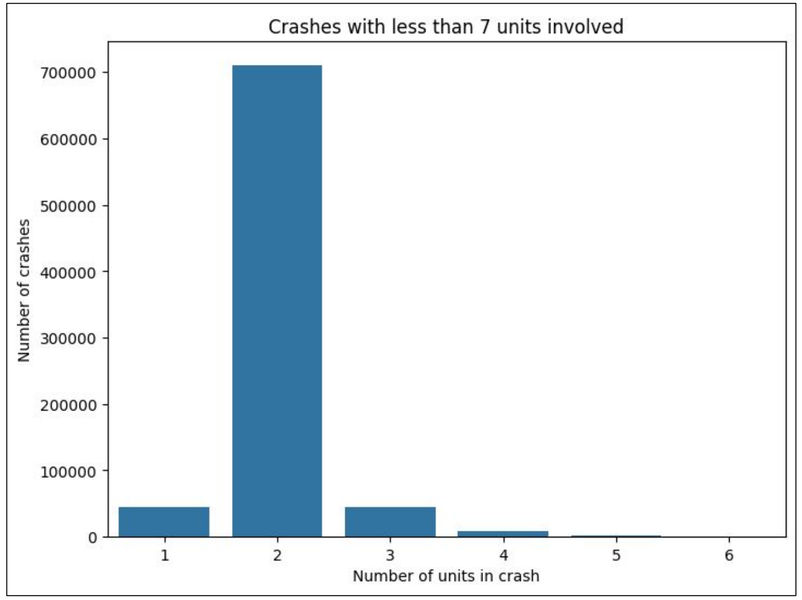


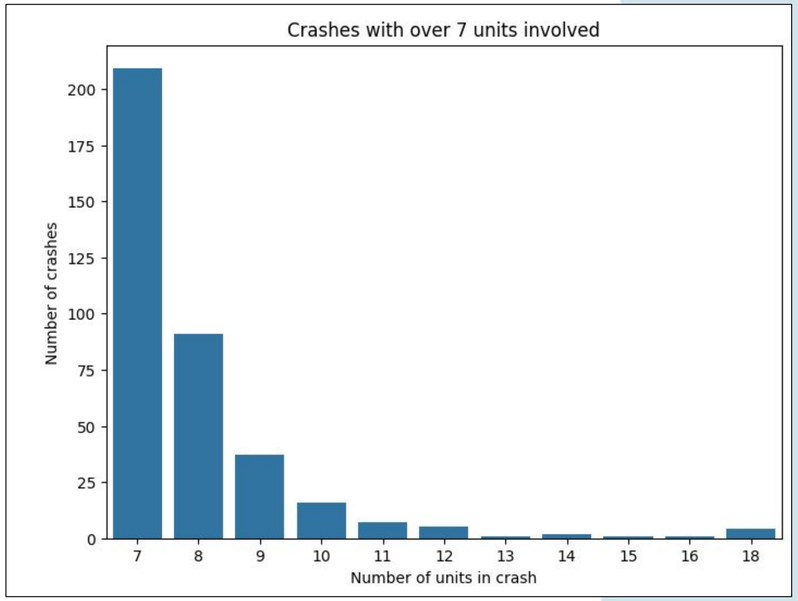
EDA



EDA - Jackson

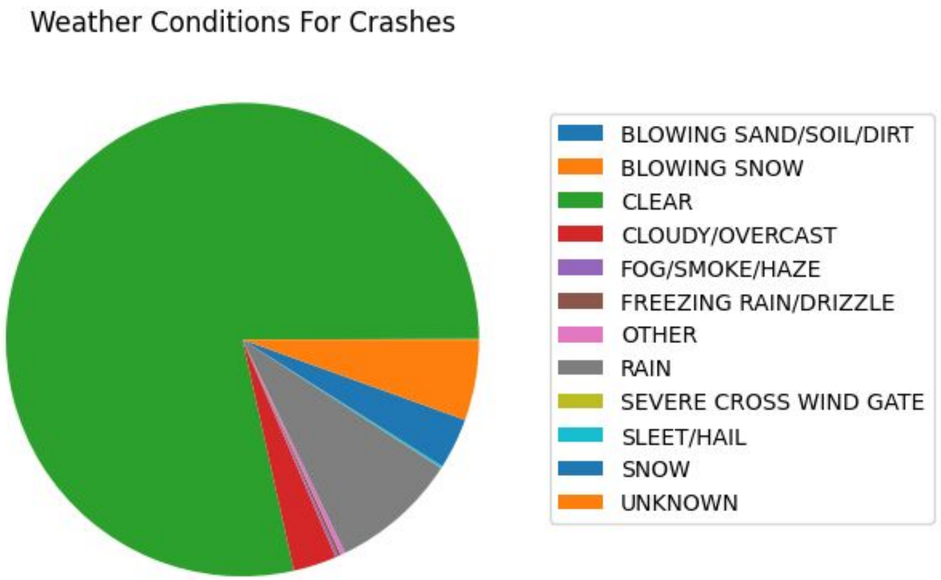


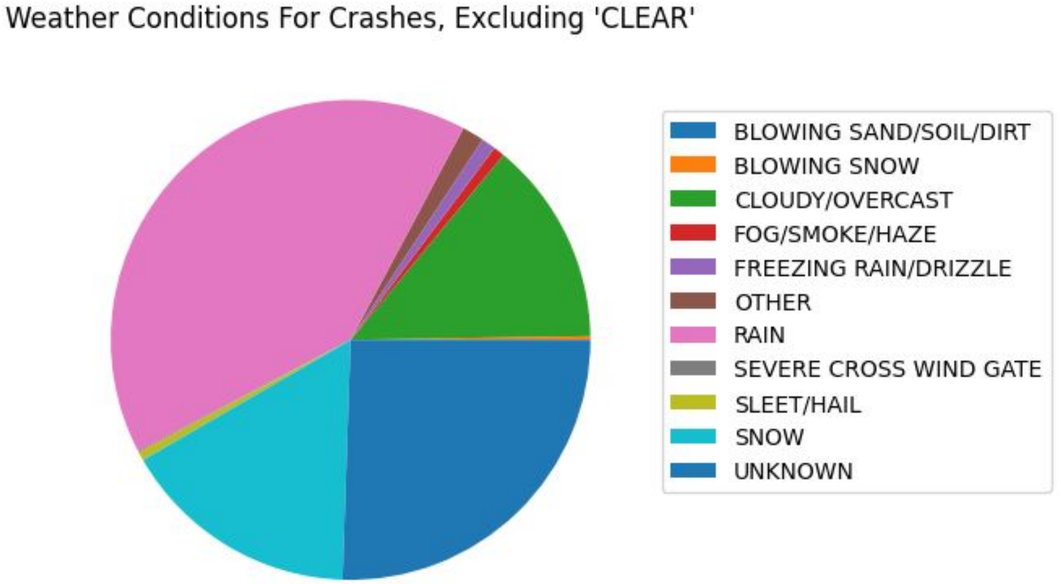




- **Majority of crashes have 2 units involved**
- **1 and 3 units are around the same number**
- **The number of crashes with over 3 units gets lower with each number**

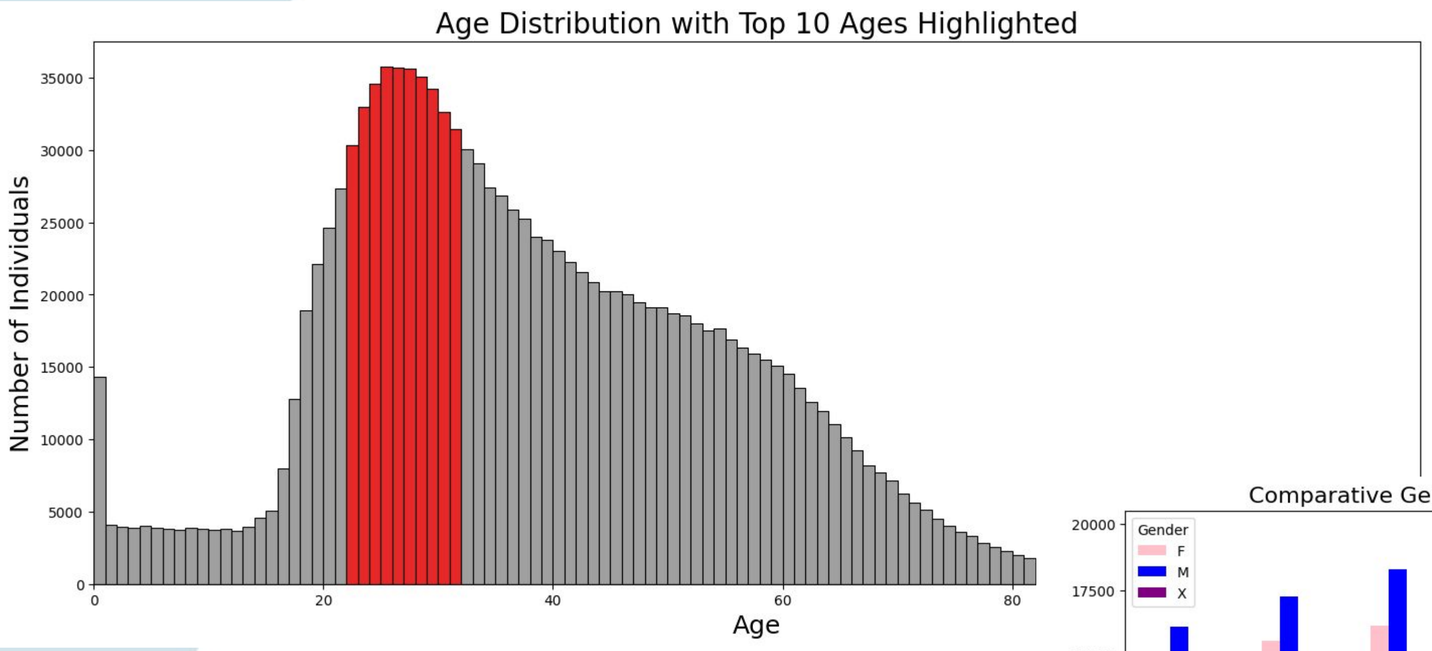
EDA - Jackson

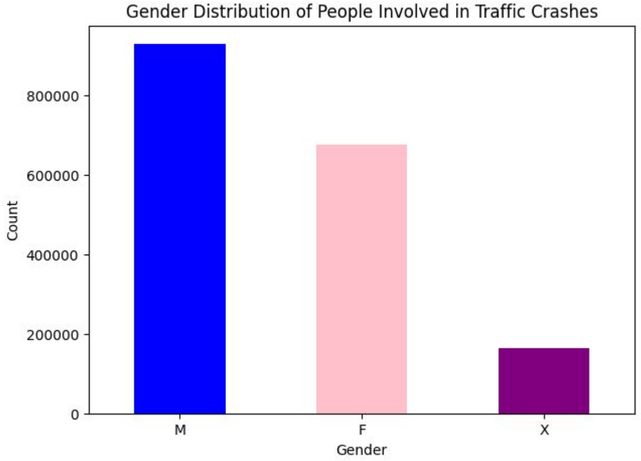


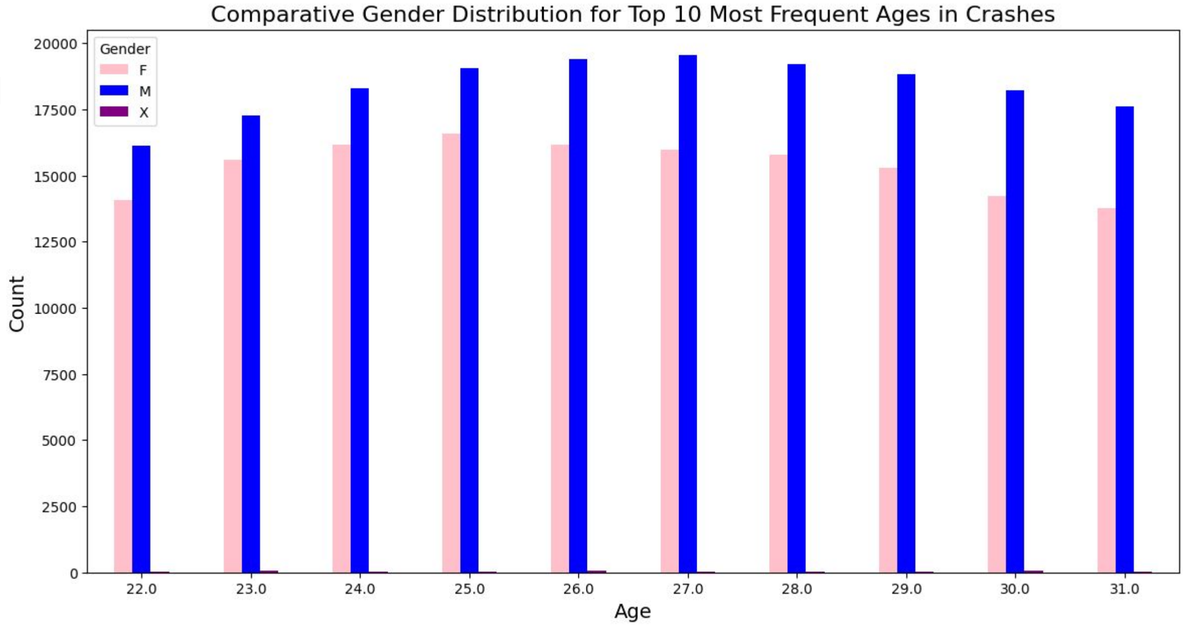


- **Majority of crashes were in clear weather**
- **The second most common weather condition was rain**

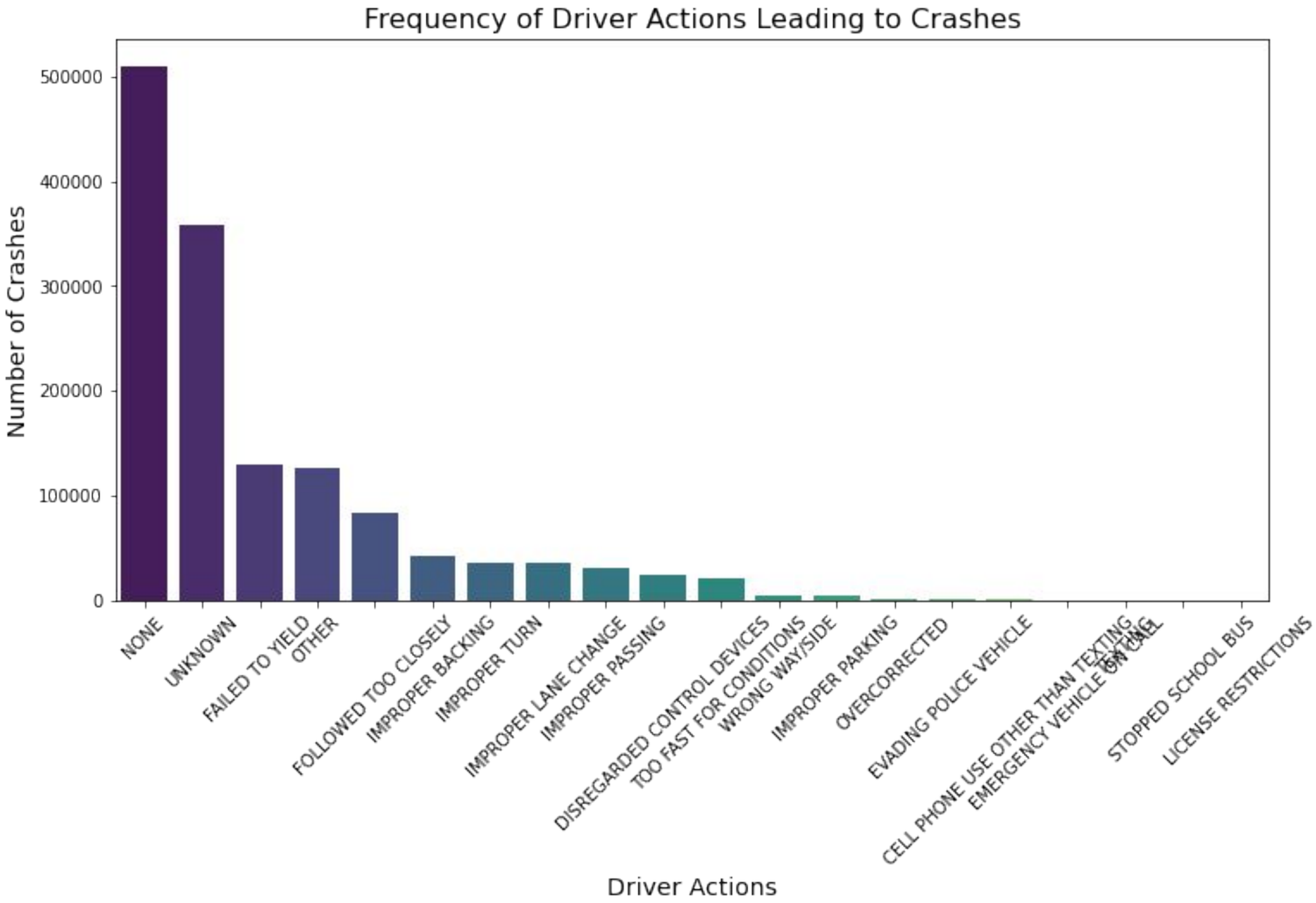
EDA - Erica


Age Distribution with Top 10 Ages Highlighted
Number of Individuals
Age
0
5000
10000
15000
20000
25000
30000
35000
0
20
40
60
80

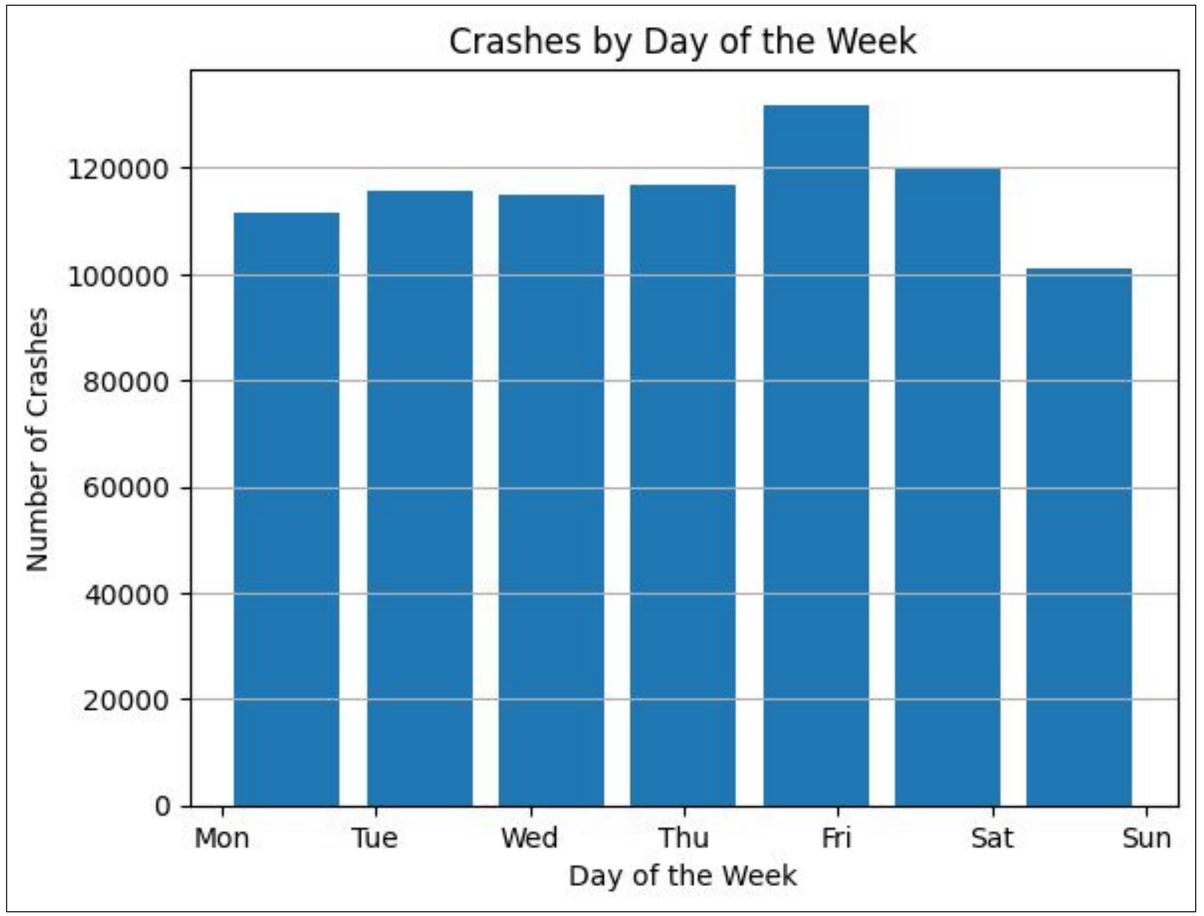

Gender Distribution of People Involved in Traffic Crashes
Count
Gender
0
200000
400000
600000
800000
M
F
X


Comparative Gender Distribution for Top 10 Most Frequent Ages in Crashes
Gender
F
M
X
Count
Age
0
2500
5000
7500
10000
12500
15000
17500
20000
22.0
23.0
24.0
25.0
26.0
27.0
28.0
29.0
30.0
31.0

EDA - Erica

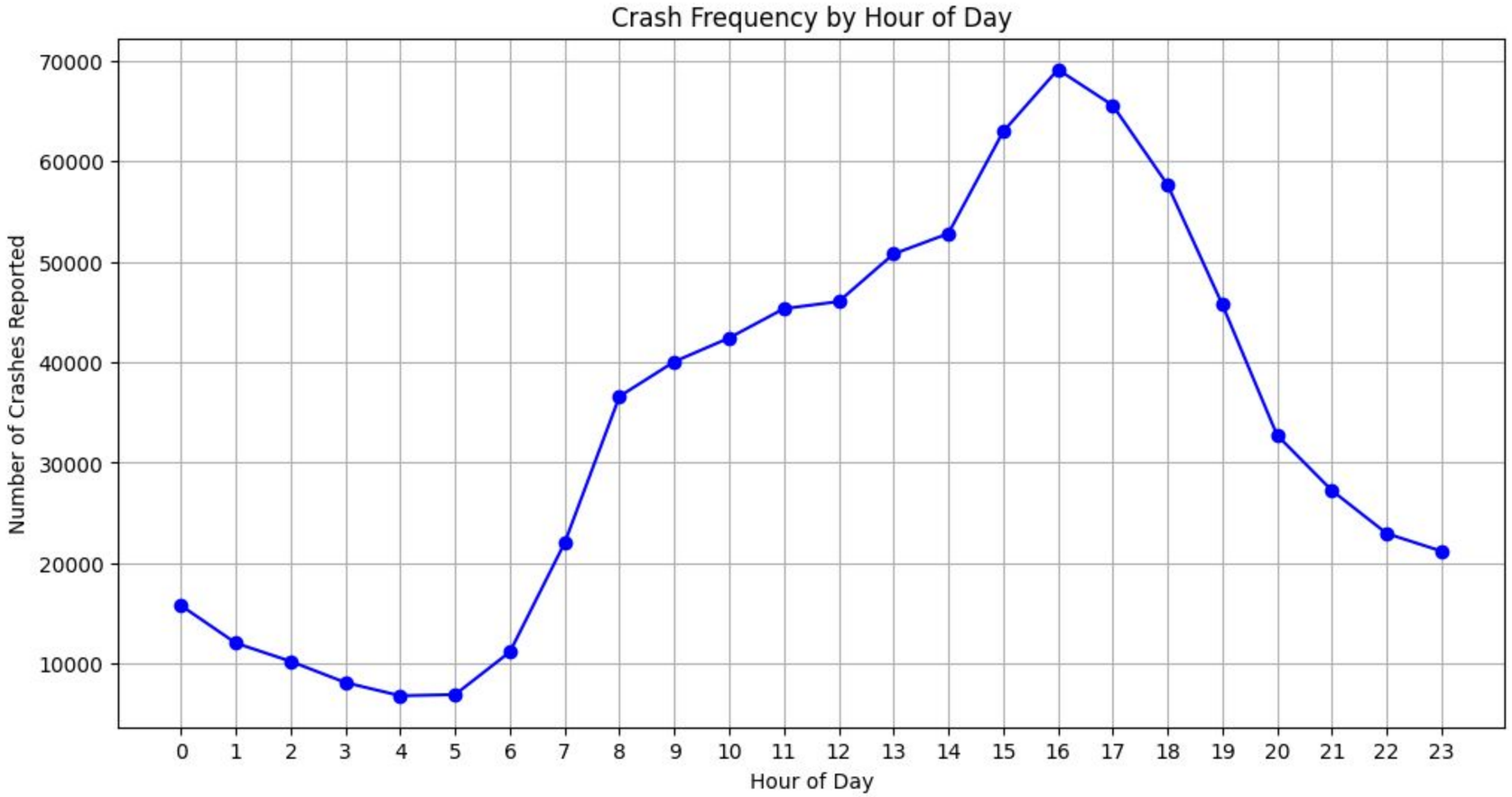

Frequency of Driver Actions Leading to Crashes
Number of Crashes
500000
400000
300000
200000
100000
0
NONE
UNKNOWN
FAILED TO YIELD
OTHER
FOLLOWED TOO CLOSELY
IMPROPER BACKING
IMPROPER TURN
IMPROPER LANE CHANGE
IMPROPER PASSING
DISREGARDED CONTROL DEVICES
TOO FAST FOR CONDITIONS
WRONG WAY/SIDE
IMPROPER PARKING
OVERCORRECTED
EVADING POLICE VEHICLE
CELL PHONE USE OTHER THAN TEXTING
STOPPED SCHOOL BUS
LICENSE RESTRICTIONS
Driver Actions

EDA – Mohammed



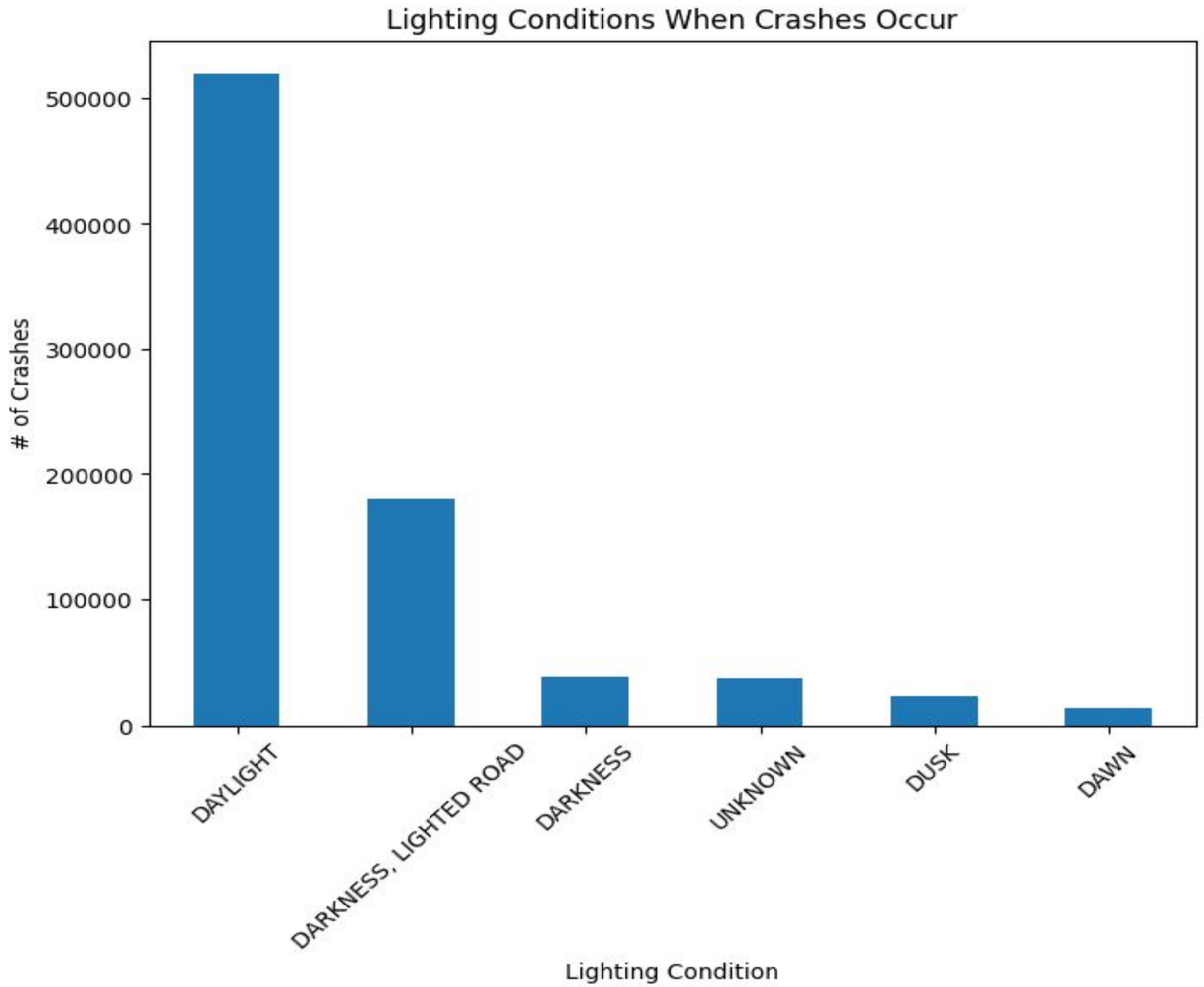
- **Increases steadily, peaking on Friday, with the exception of a slight dip on Wednesday**
- **Sunday has the lowest rate of accidents, with a strong dip**

EDA - Junha

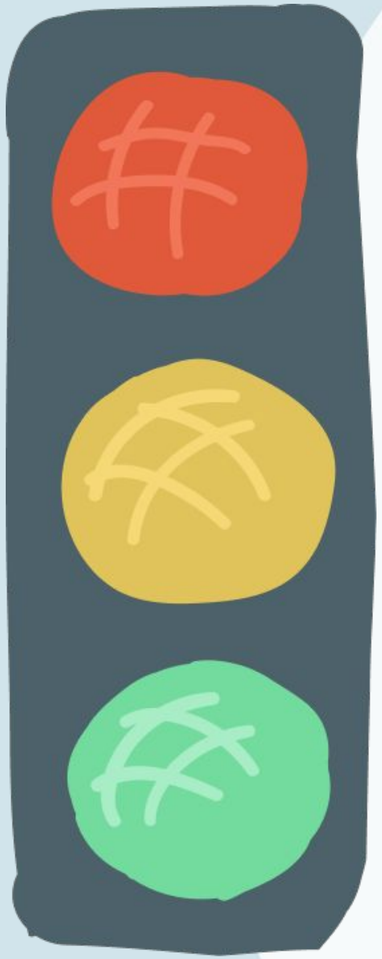


- **Rising sharply from early morning**
- **Peaking between 3 pm - 5 pm**
- **Declining during the night**

EDA - Prit

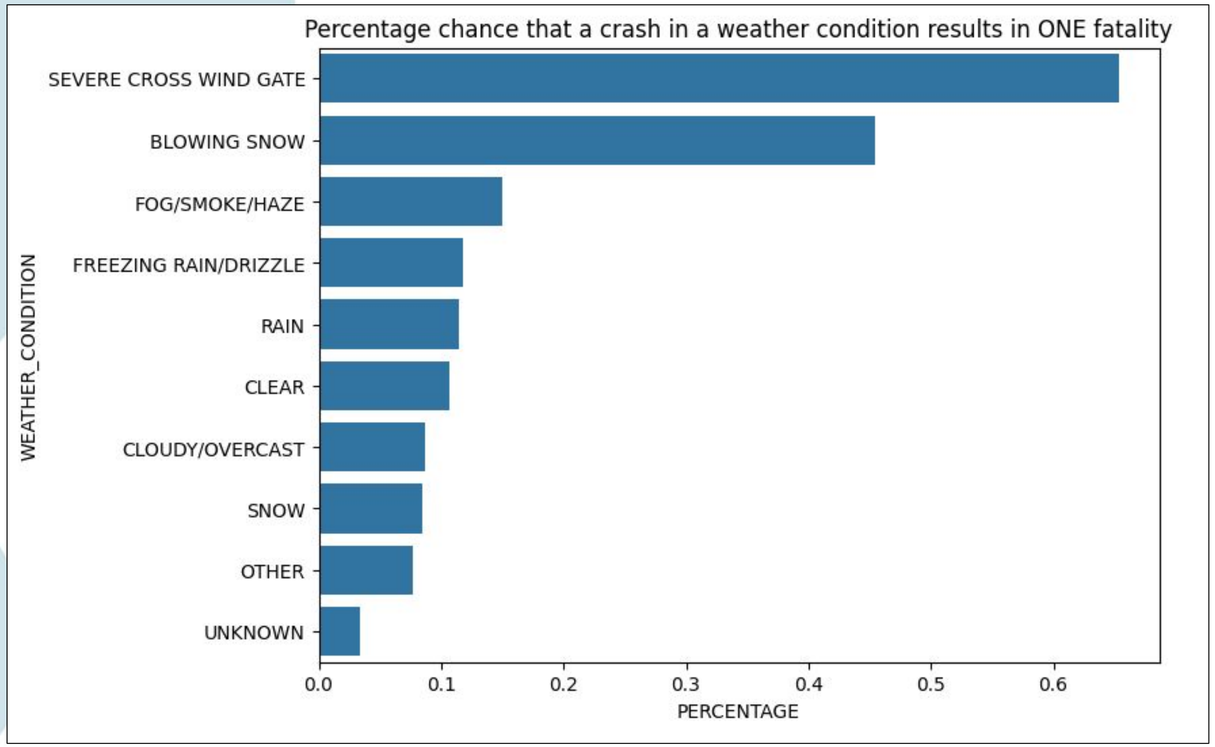


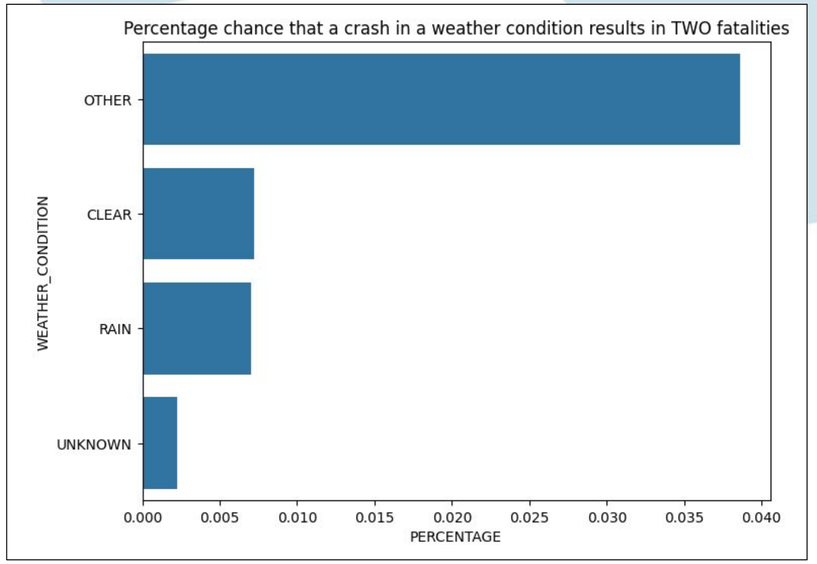
- Majority of all crashes happen in the daylight which is expected as a large percentage of people drive in the daylight
- Darkness accounts for almost the rest of the crashes
- Dusk and dawn are in last with small percentages of crashes

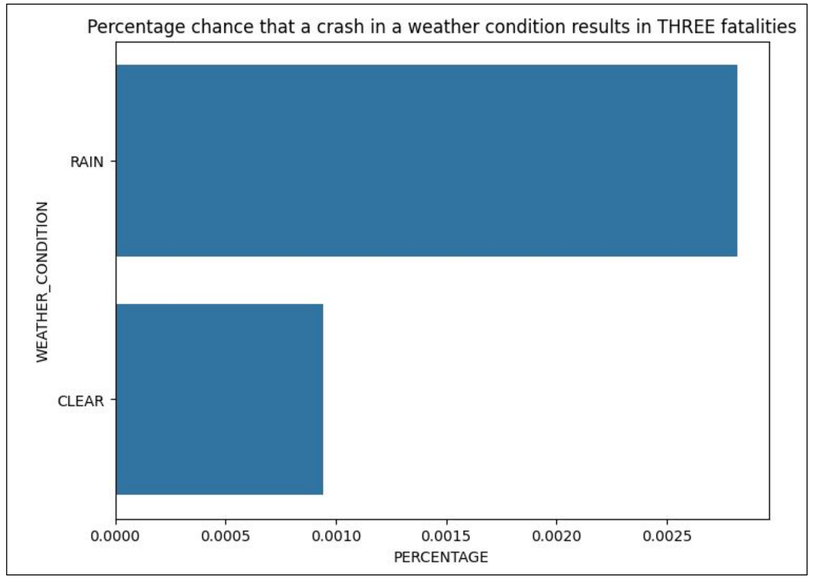


Hypotheses

Hypothesis - Jackson



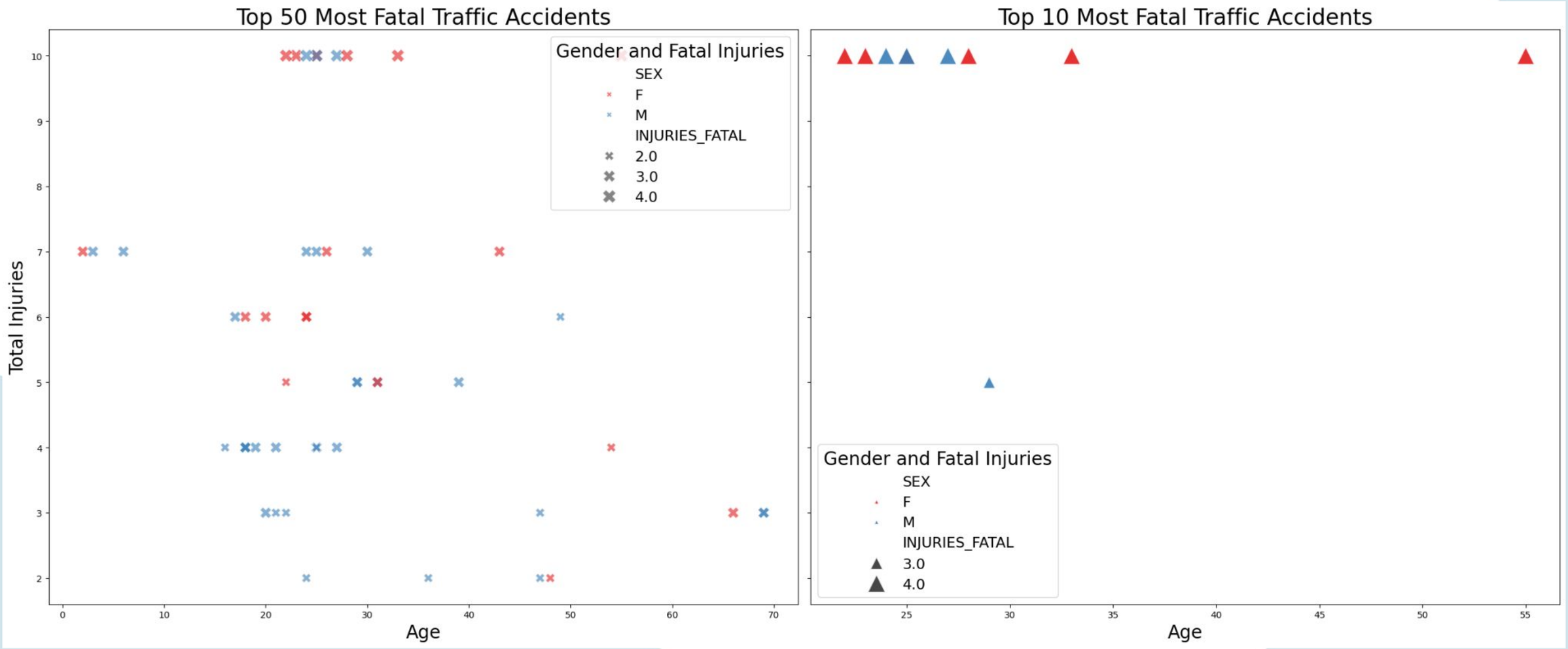




- **Percent chance that a weather condition will result in a certain fatality number**
- **Overall low chance of dying**
- **Highest was “Severe Cross Wind Gate” and “Blowing Snow” for one fatal injury**

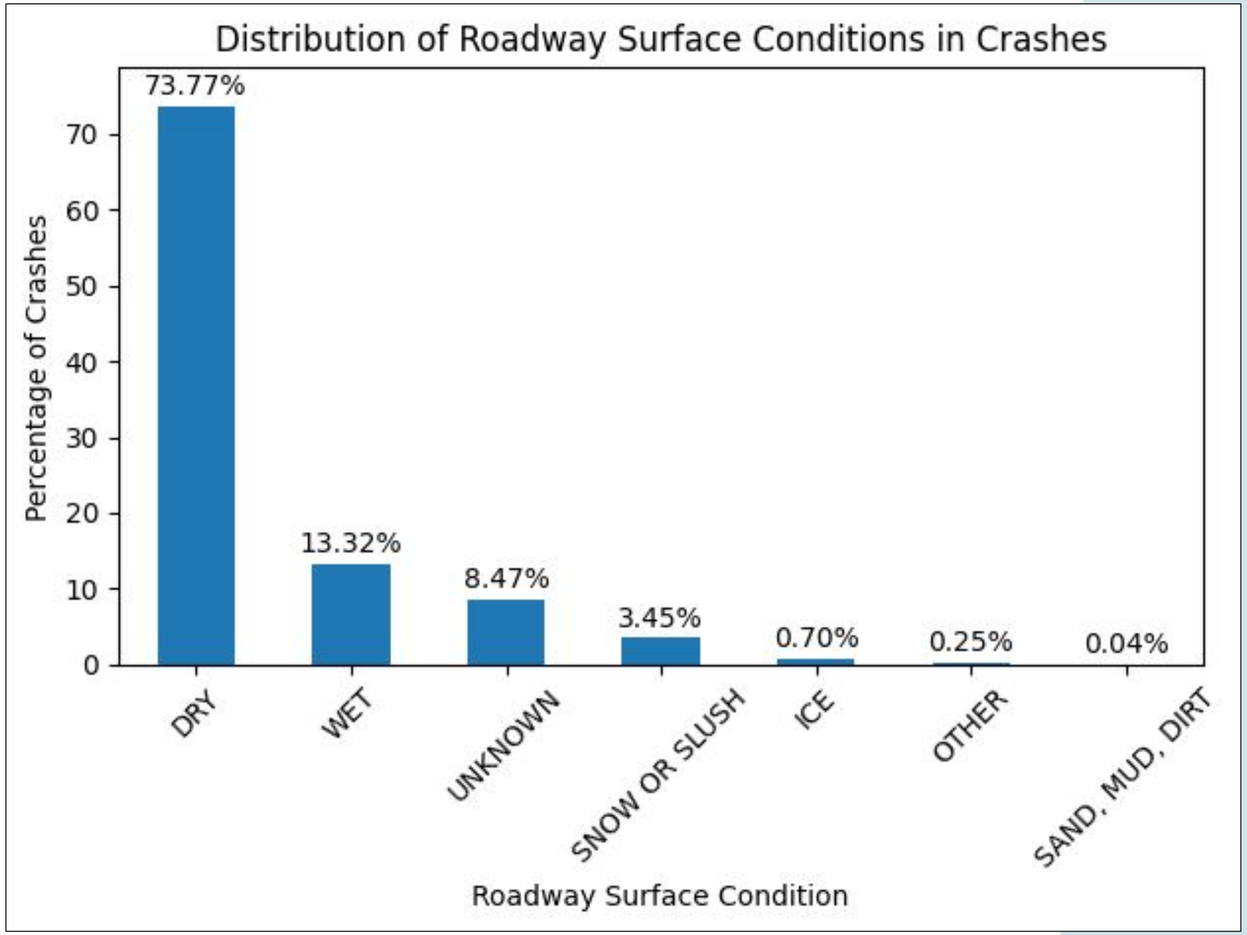
Hypothesis - Erica

Men between the ages of 22 and 31 are the most likely to be involved in the greatest number of fatal accidents.

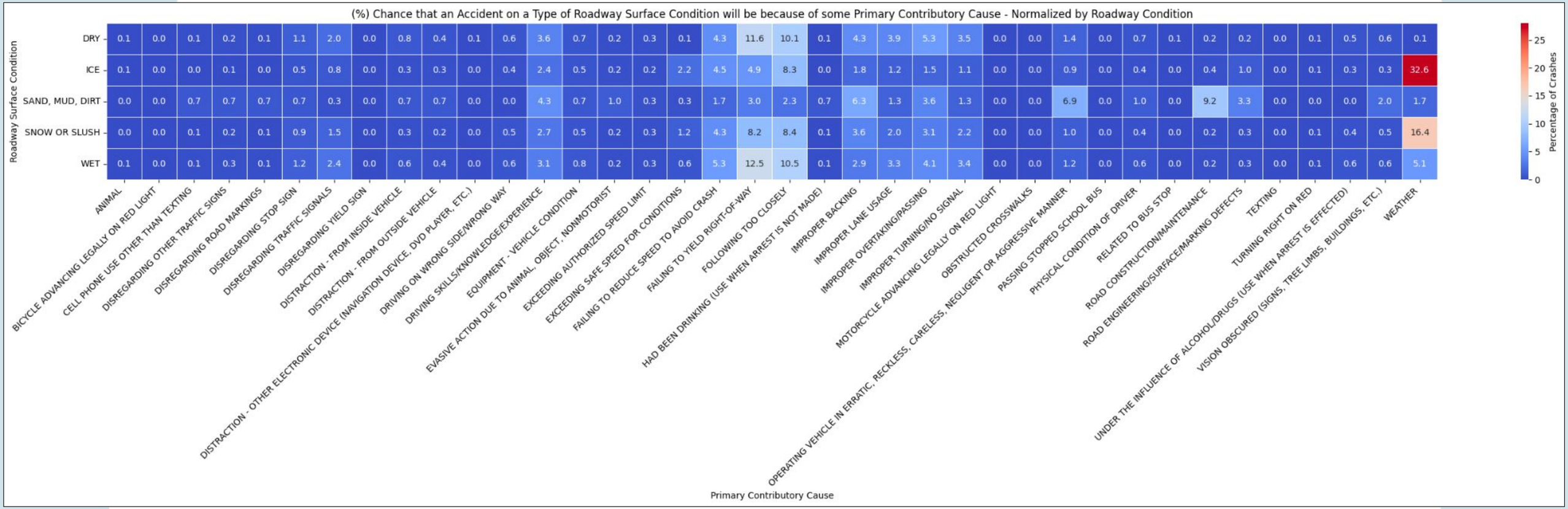


Hypothesis - Mohammed

- **Hypothesis: Adverse roadway conditions will increase the likeliness that an accident takes place due to some primary contributing cause**
- **Majority of incidents take place in dry conditions**
  - **Normalized by road condition**
- **Conclusion: The data supports that some primary contributing causes of traffic accidents are in fact more frequent in certain roadway surface conditions**

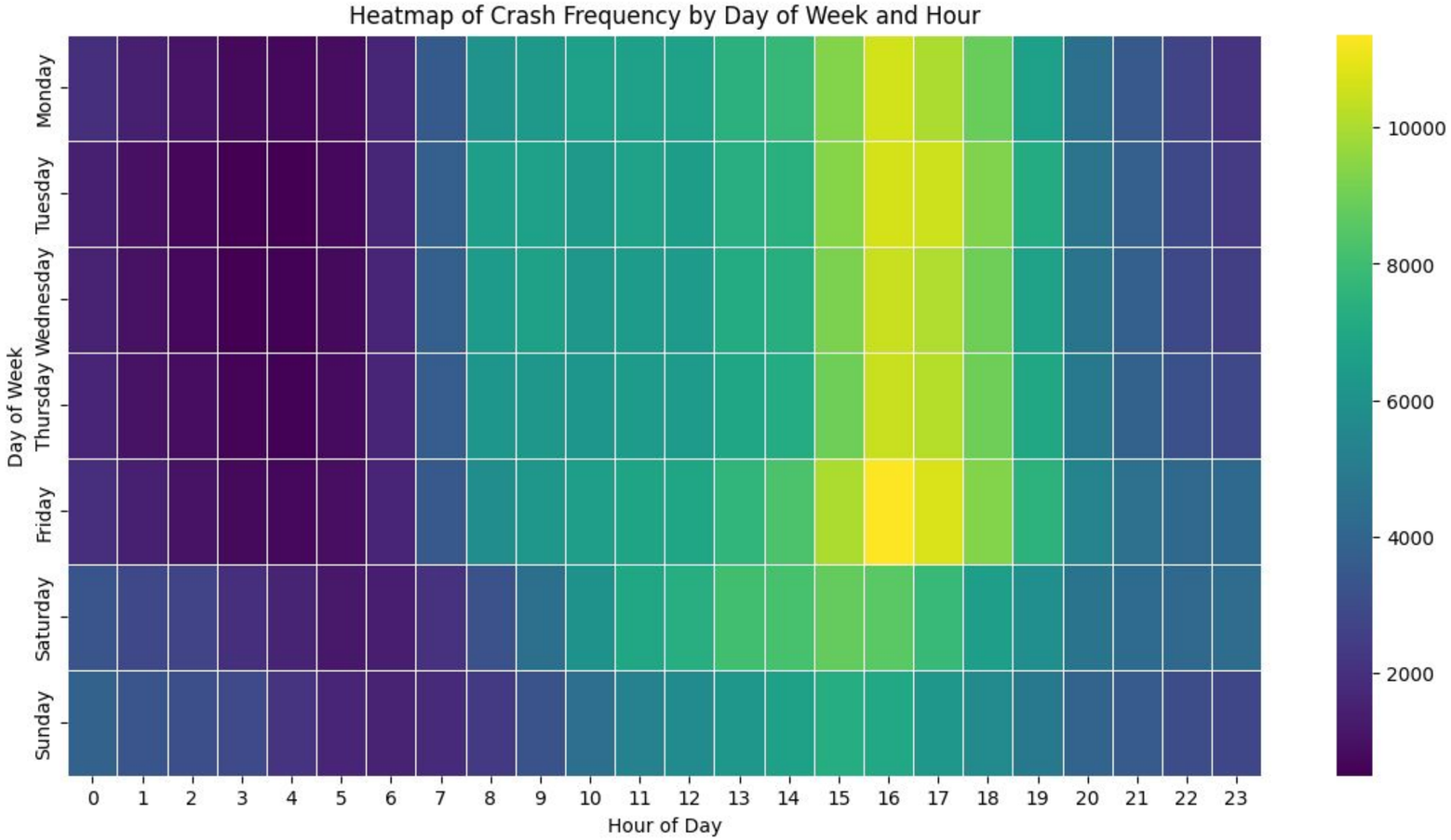


Hypothesis - Mohammed



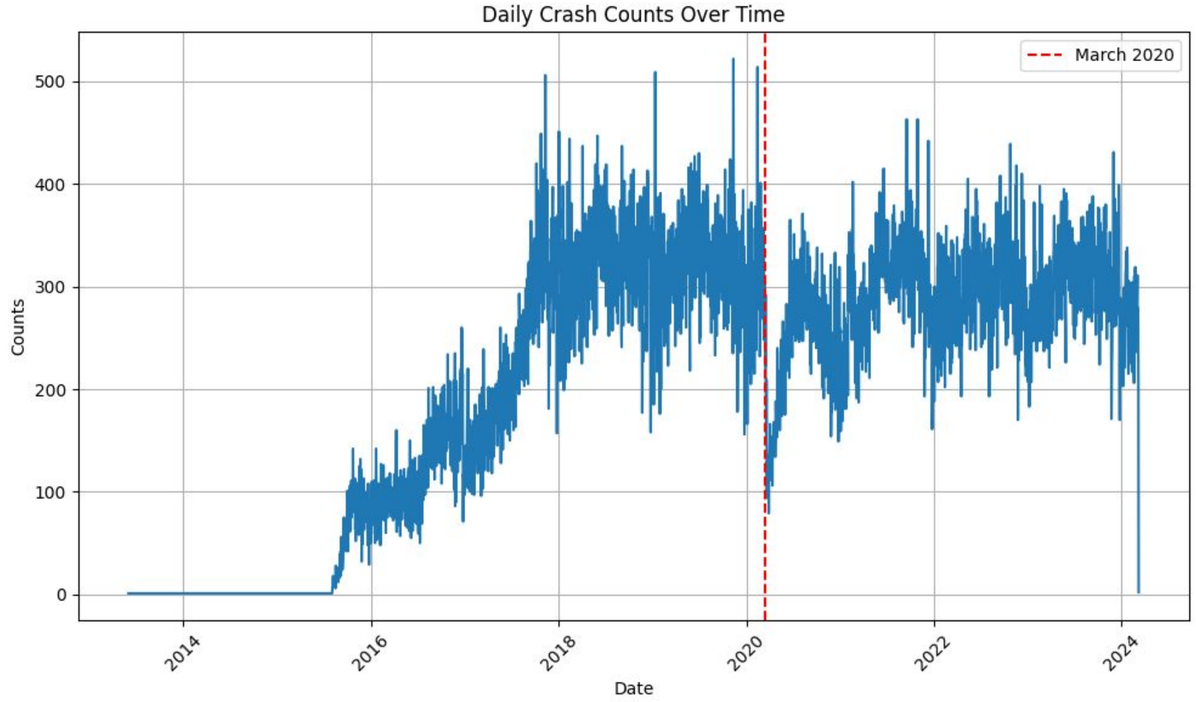
The analysis confirms my hypothesis, where some primary contributing causes to accidents are increased in adverse conditions.
For example, failure to reduce speed, following too closely, and failing to yield right of way are all more likely to cause an accident in wet conditions, rather than dry.

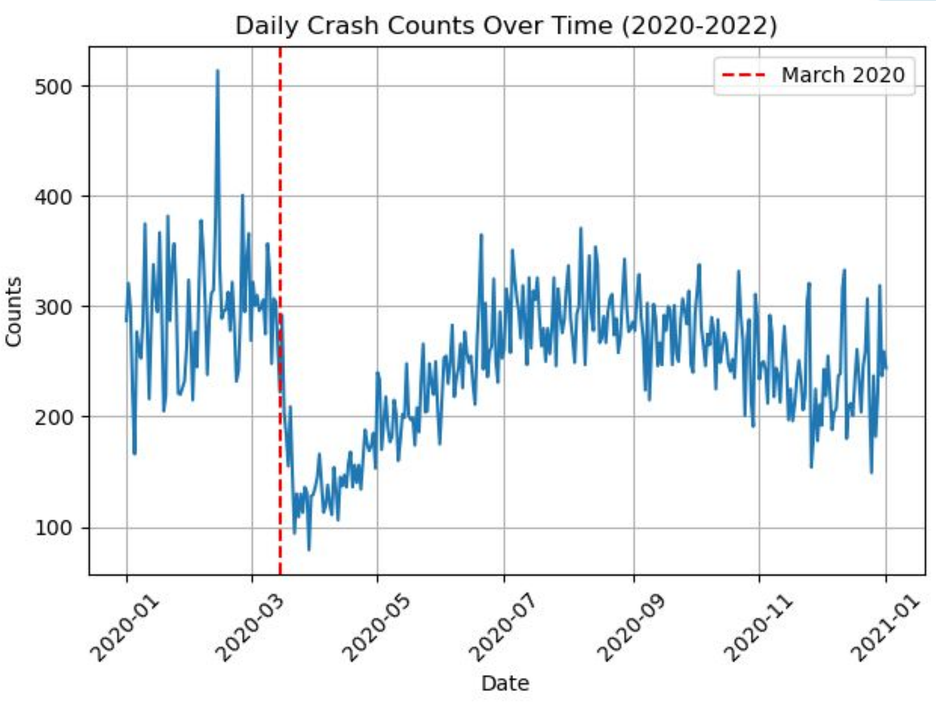
Hypothesis - Junha



- **Peaking on Weekday near 4 pm**
- **Early mornings across all days show the lowest frequencies**

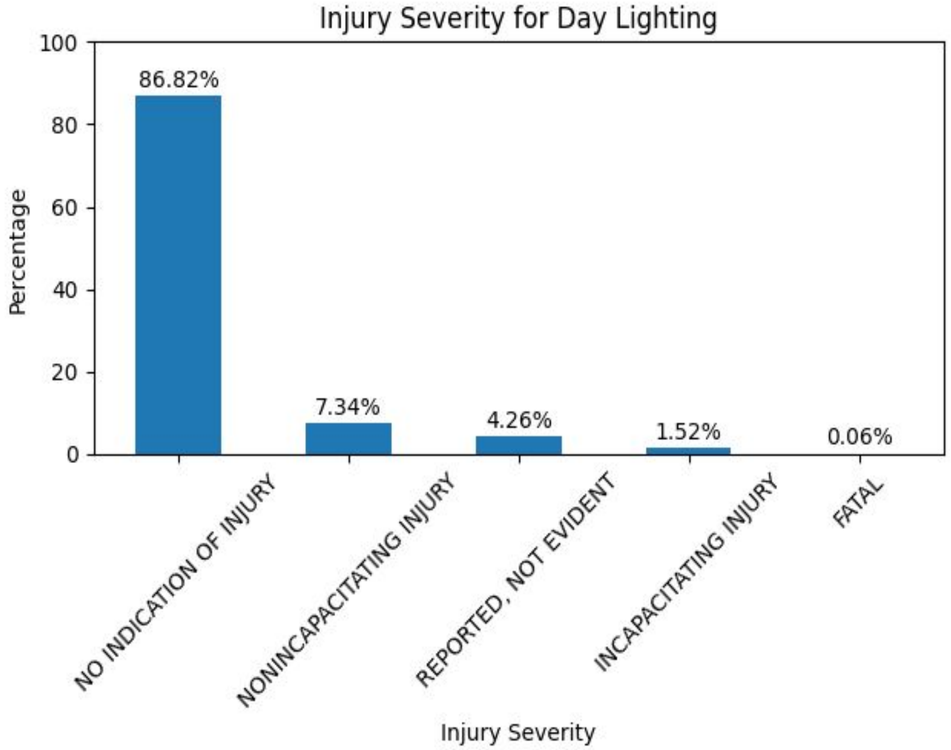
Hypothesis - Junha

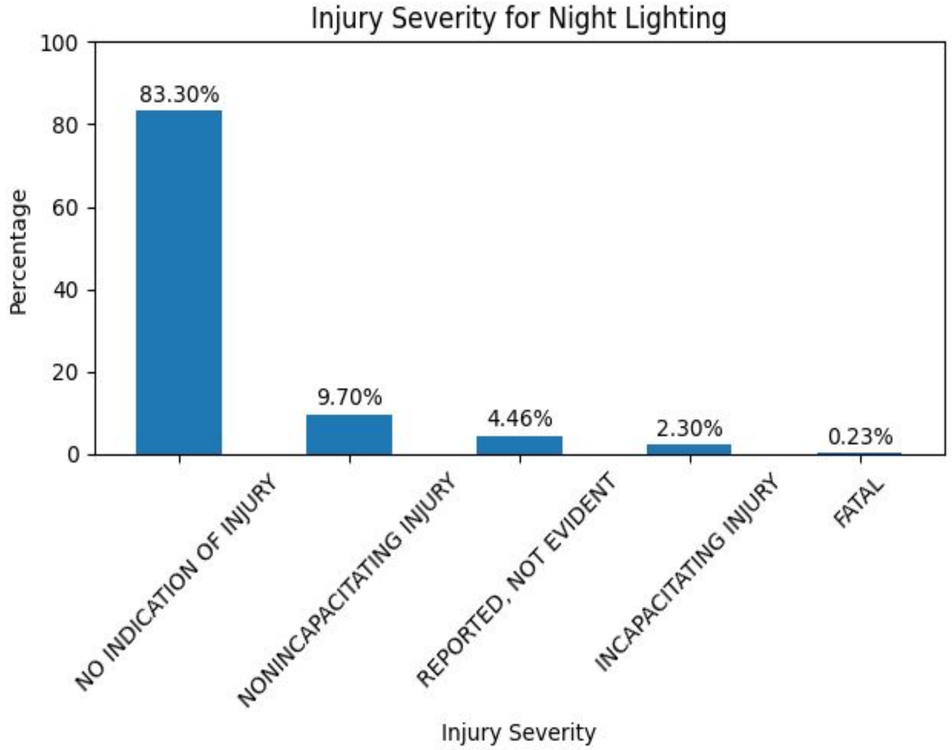




- **Significant decrease in traffic crashes around March 2020 (COVID-19 shutdown)**
- **The COVID-19 pandemic led to a global shift towards remote work and reduced travel, resulting in fewer traffic collisions**

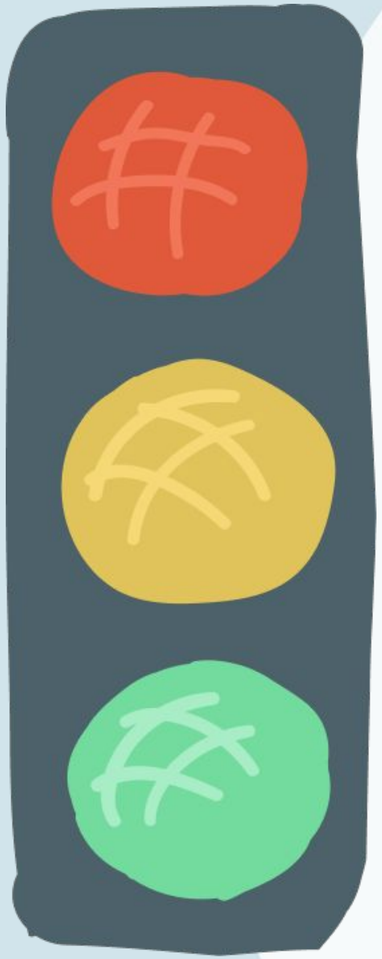
Hypothesis – Prit



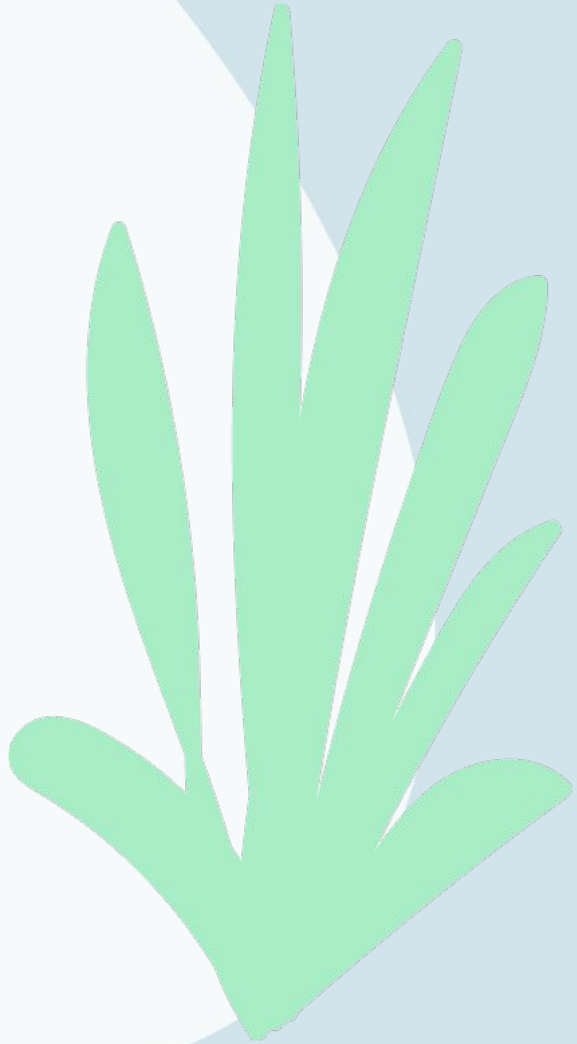


Hypothesis: Collisions occurring in **night light** conditions result in **more severe injuries** compared to collisions during daylight hours.

- Injury severity **rises** in the night lighting.
- Fatal crashes are almost **4 times more likely** in the dark compared to day lighting.
- Incapacitating injury is **2 times more likely.**

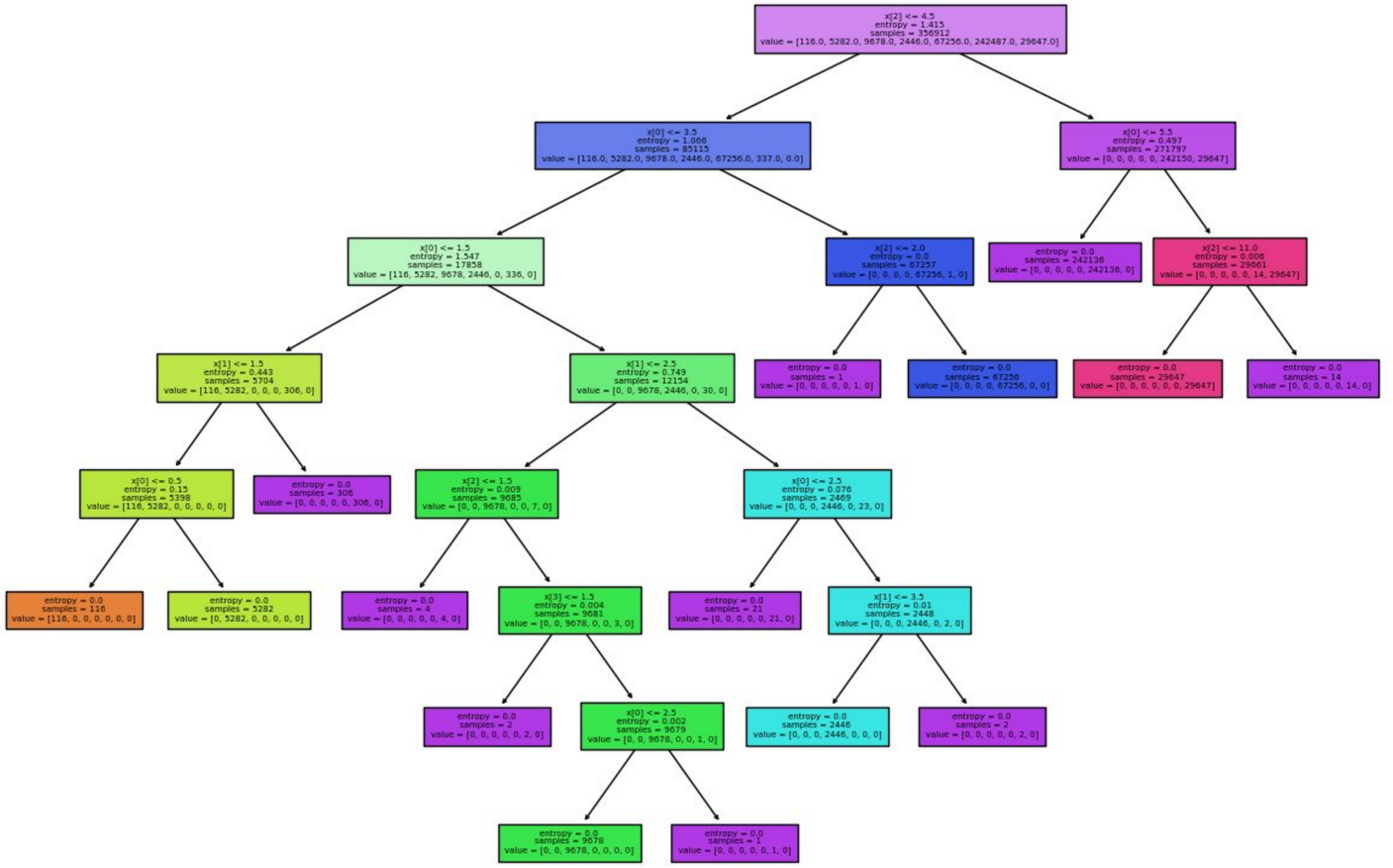


Machine Learning Analyses



Machine Learning Analysis - Jackson

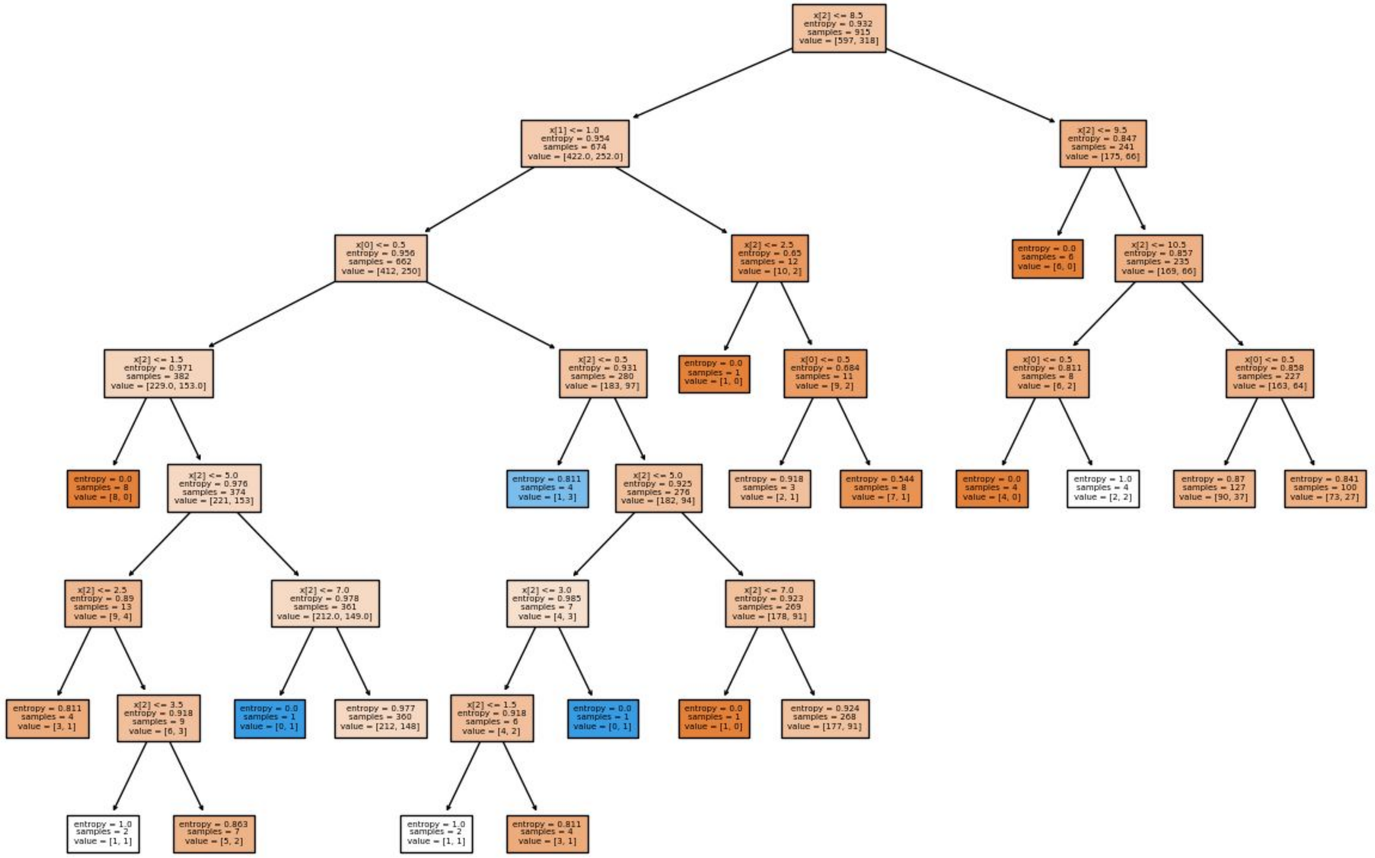
- Decision tree classifier
- Features
  - Total injuries
  - Number of units
  - Crash hour
  - Lane count
- Class (7 classes)
  - Air bag status
    - 'DEPLOYED OTHER (KNEE, AIR, BELT, ETC.)', 'DEPLOYED, COMBINATION', 'DEPLOYED, FRONT', 'DEPLOYED, SIDE' 'DEPLOYMENT UNKNOWN', 'DID NOT DEPLOY', 'NOT APPLICABLE'



99% Accuracy

Machine Learning Analysis - Jackson

- Decision tree classifier
- Features
  - Blood alcohol result value
  - Physical condition
  - Sex
- Class
  - Cell phone use



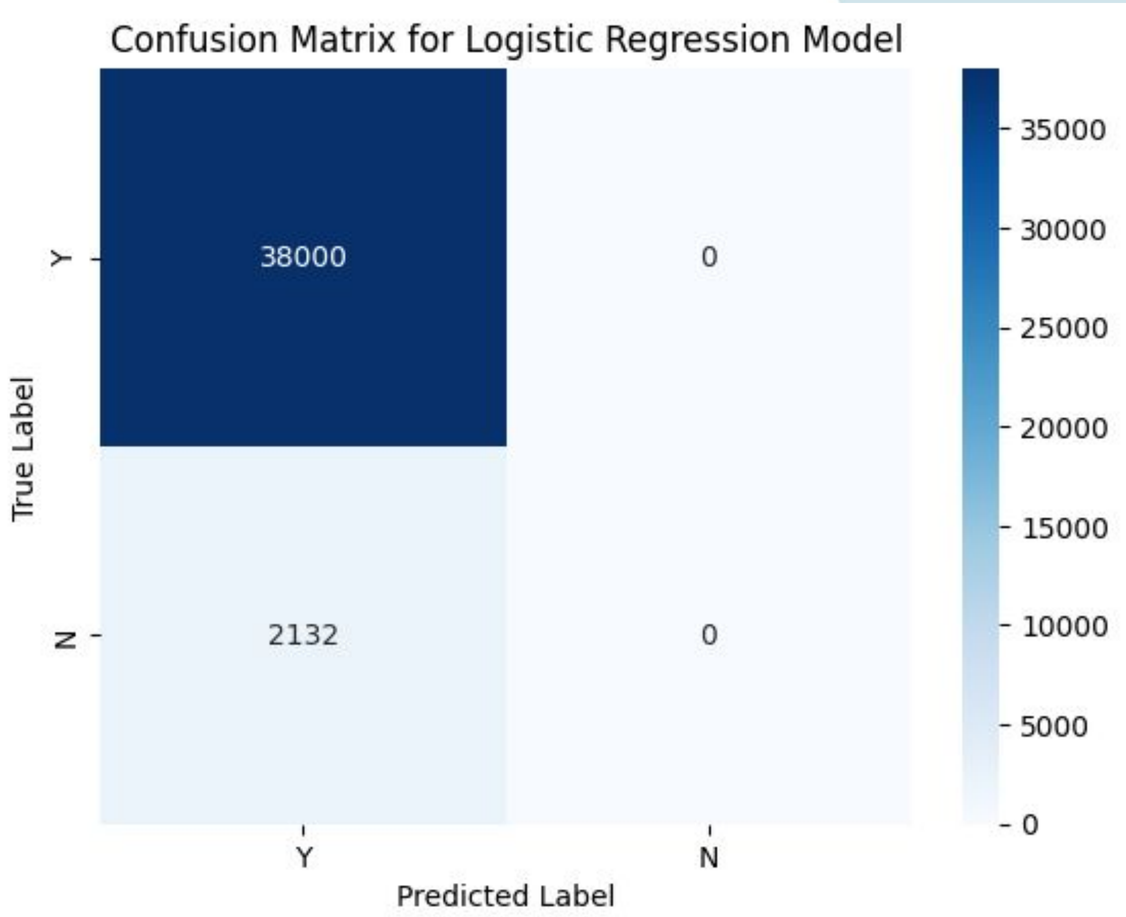
- ~62% accuracy score
- Majority of leaves were classified as “Yes”

62% Accuracy

Machine Learning Analysis - Jackson

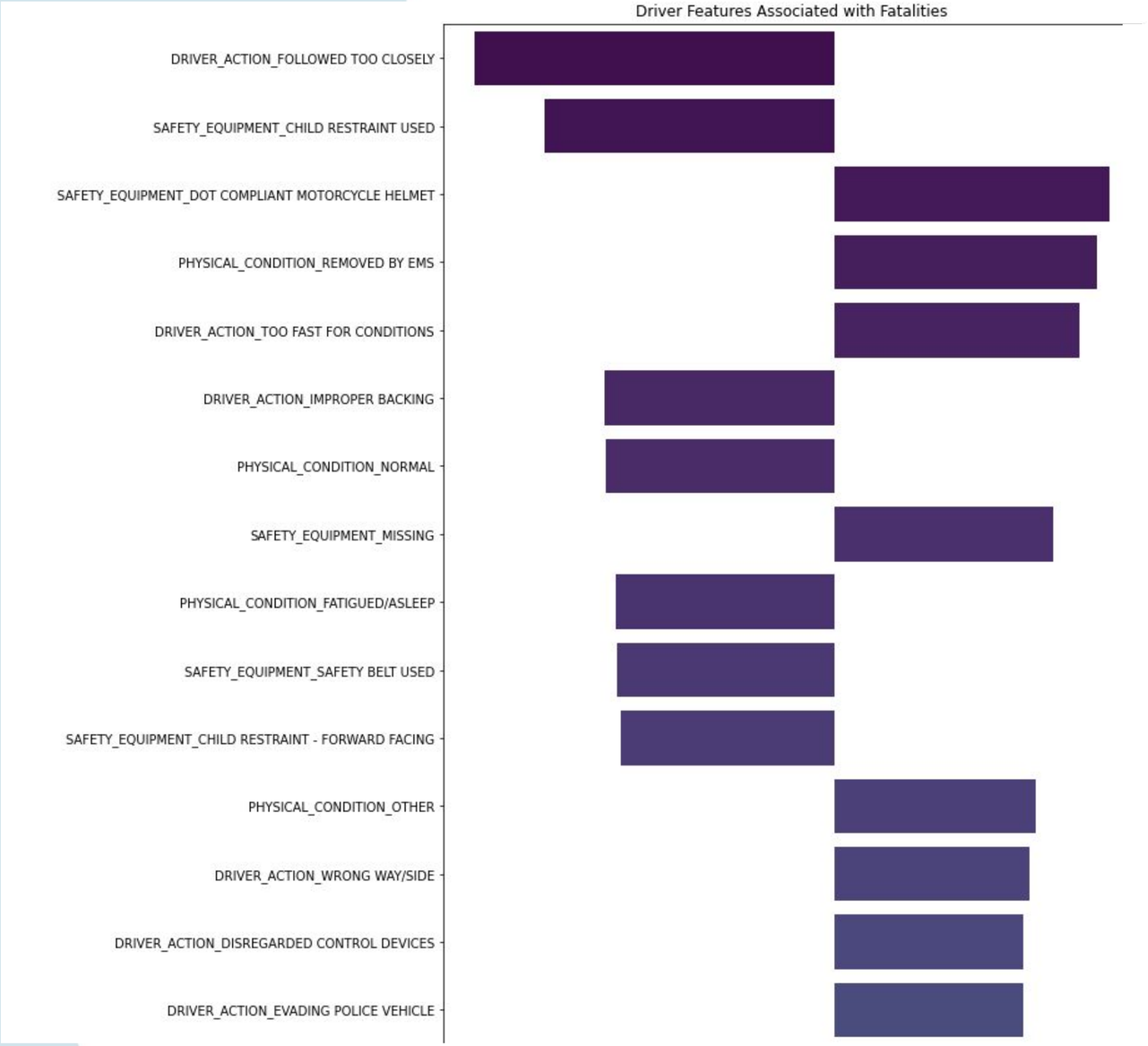
- **Logistic regression**
- **Feature: Vehicle year**
- **Class: Was towed?**

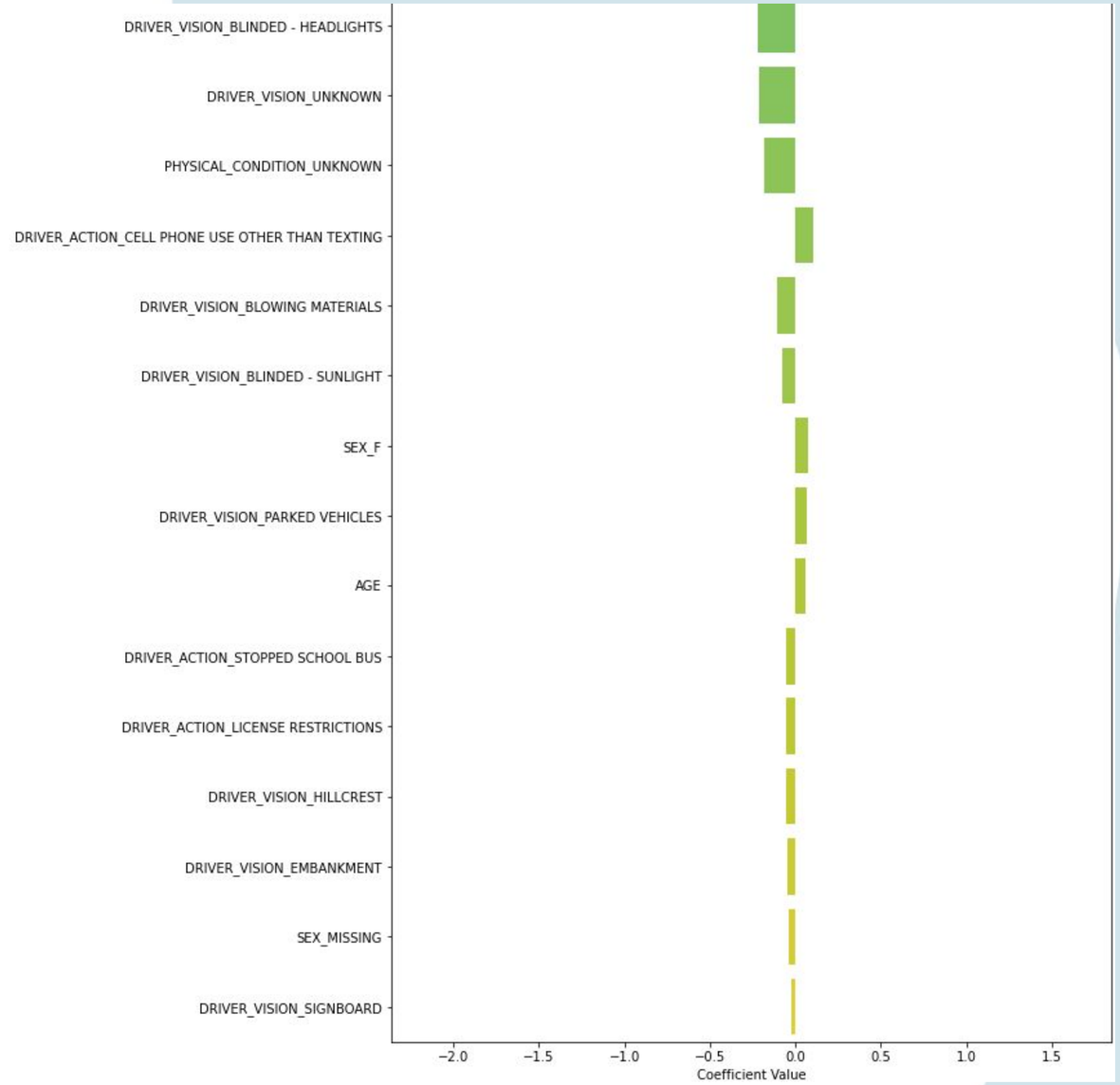
- **~94% accuracy score**
- **Only 5% are false positives**
- **Majority of vehicles were towed**



94% Accuracy

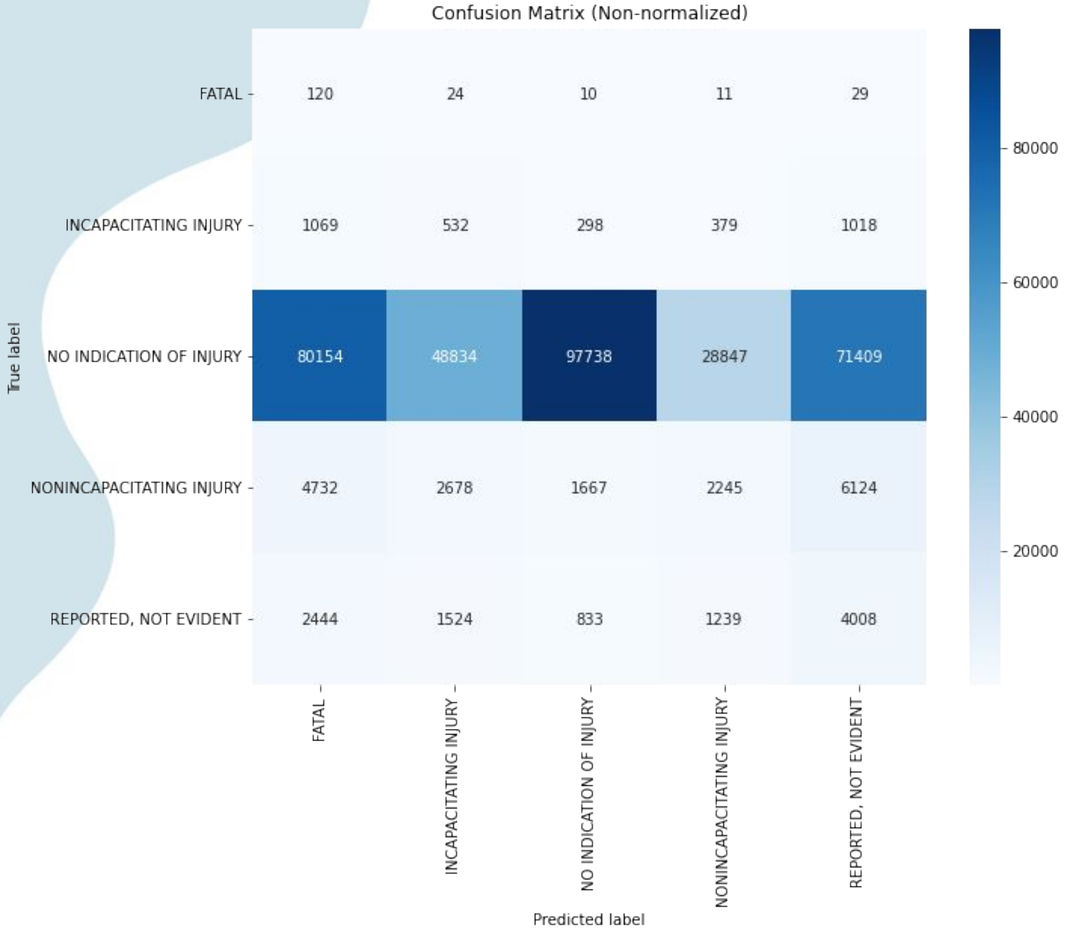
Machine Learning Analysis - Erica



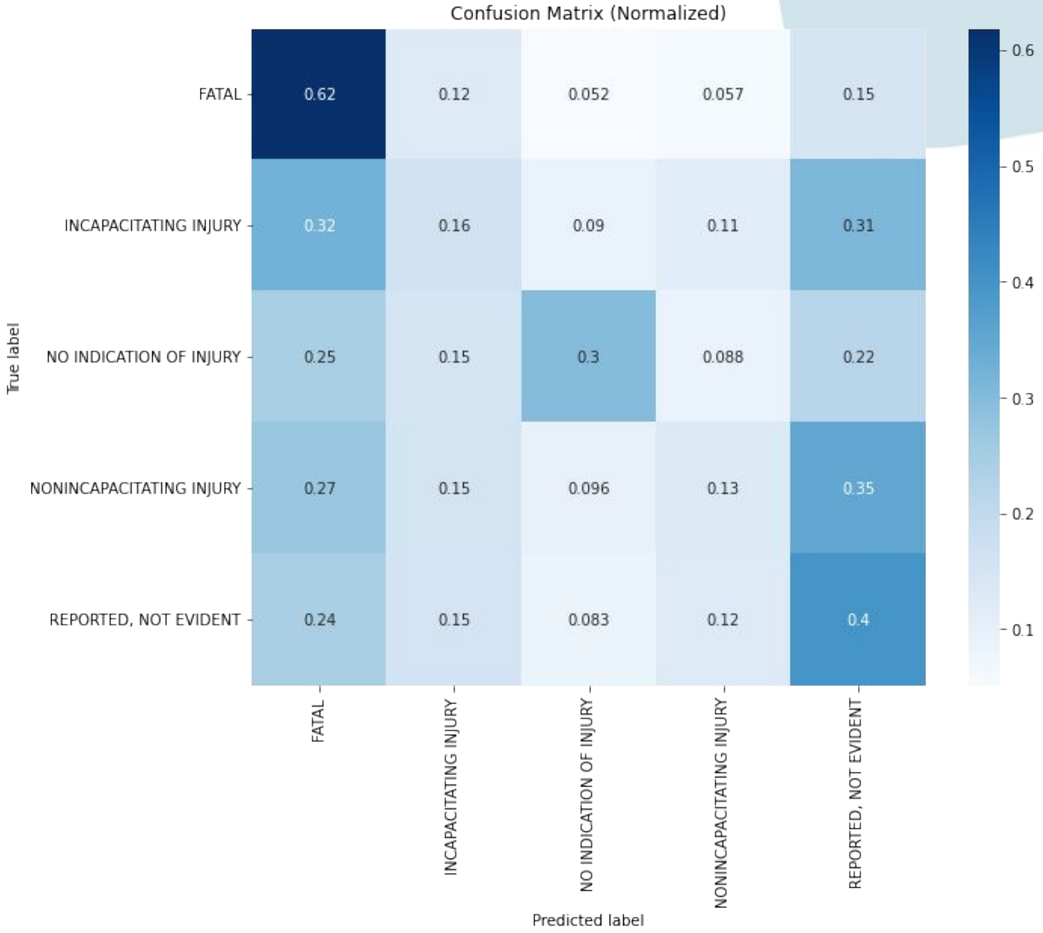


Confusion Matrix

Non-normalized

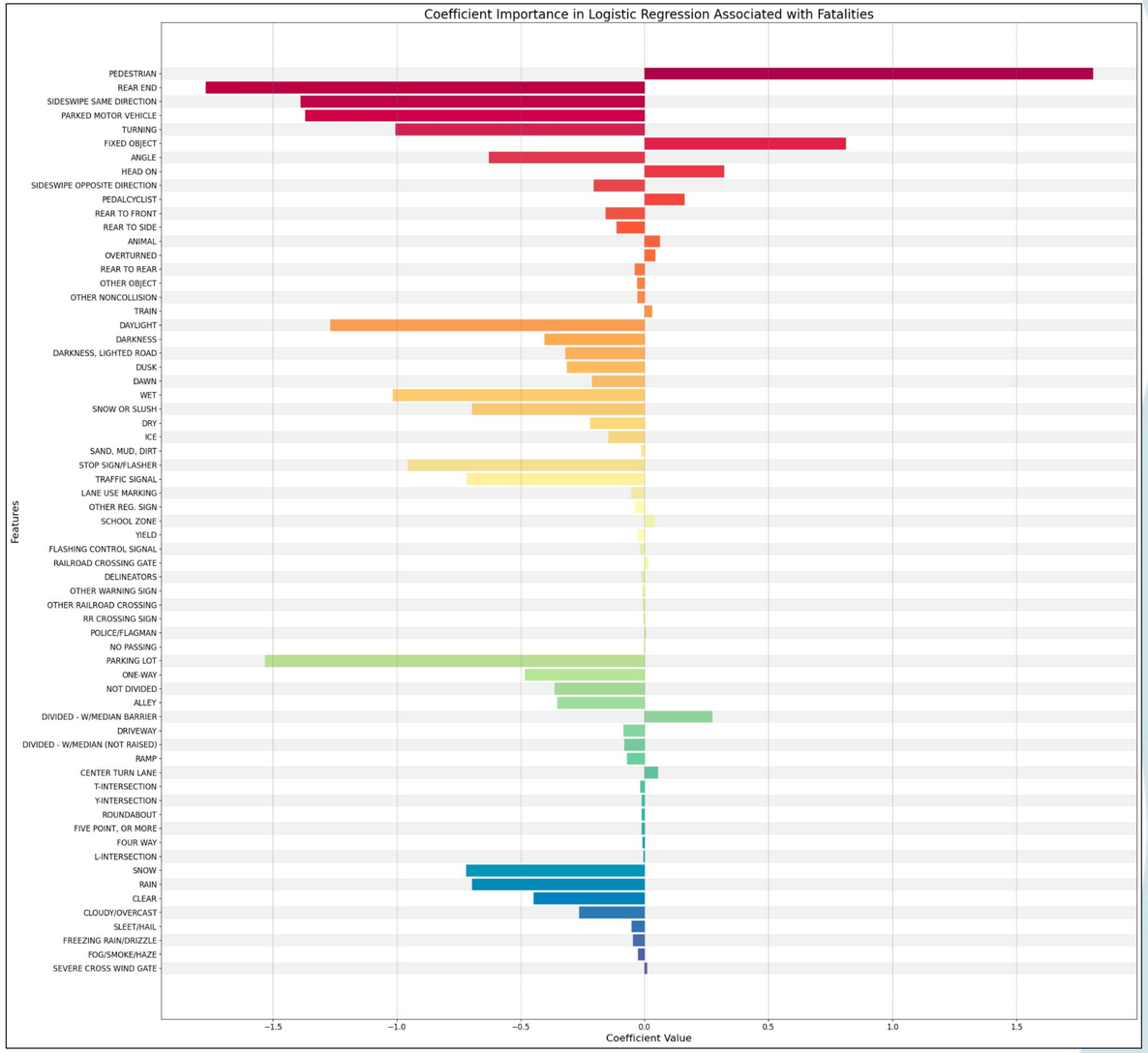


Normalized



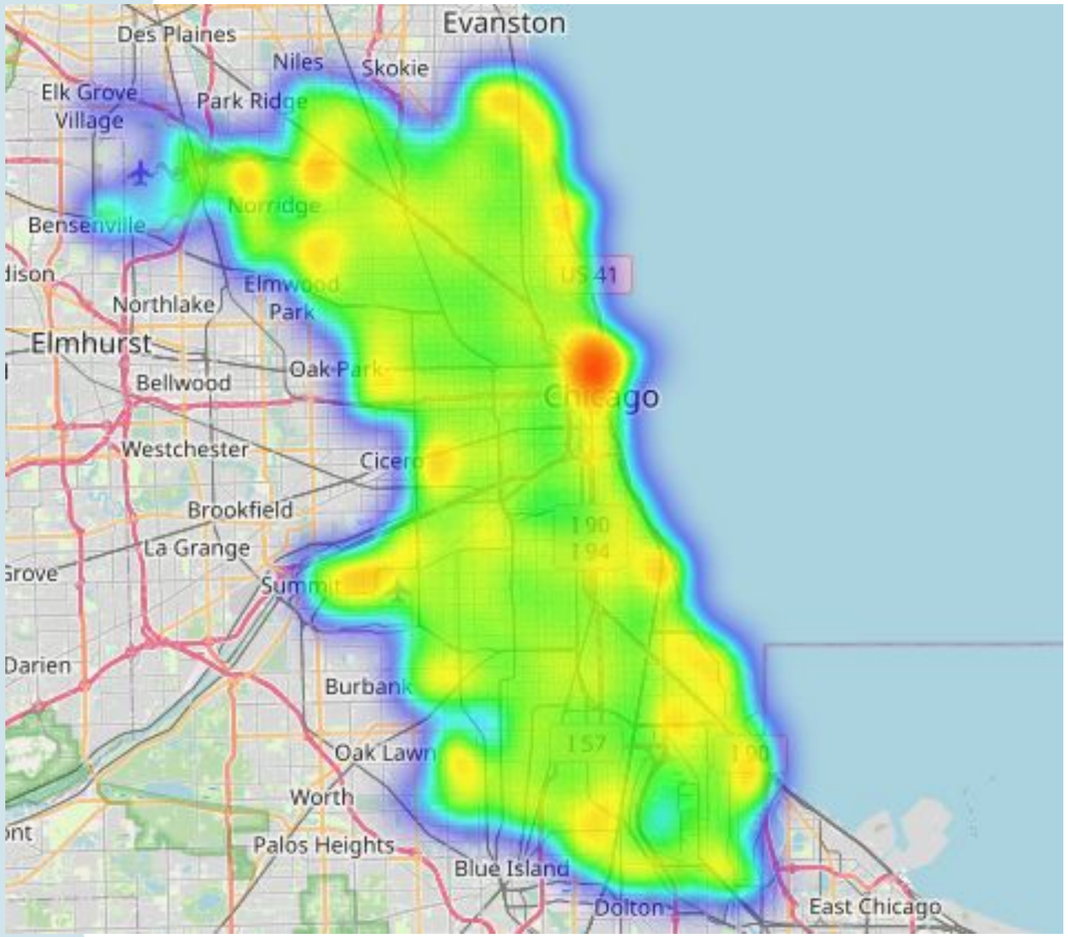
Machine Learning Analysis - Mohammed

- **Hypothesis: Certain features are strongly correlated with fatal outcomes than others**
- **Logistic regression on what features are associated with fatal outcomes**
- **Conclusions:**
  - **Any accident involving a pedestrian is highly likely to produce a fatal outcome**
    - **Lower risk for pedalcyclist**
  - **Hitting a fixed object is second most likely to lead to a fatality**
  - **A head-on collision is positively correlated with a fatality, where rear-end accidents are significantly negatively correlated with a fatality**
  - **Parking lots are statistically safe**
  - **Severe cross wind gates are the only weather-related condition to have a positive correlation with fatalities**



Machine Learning Analysis - Junha

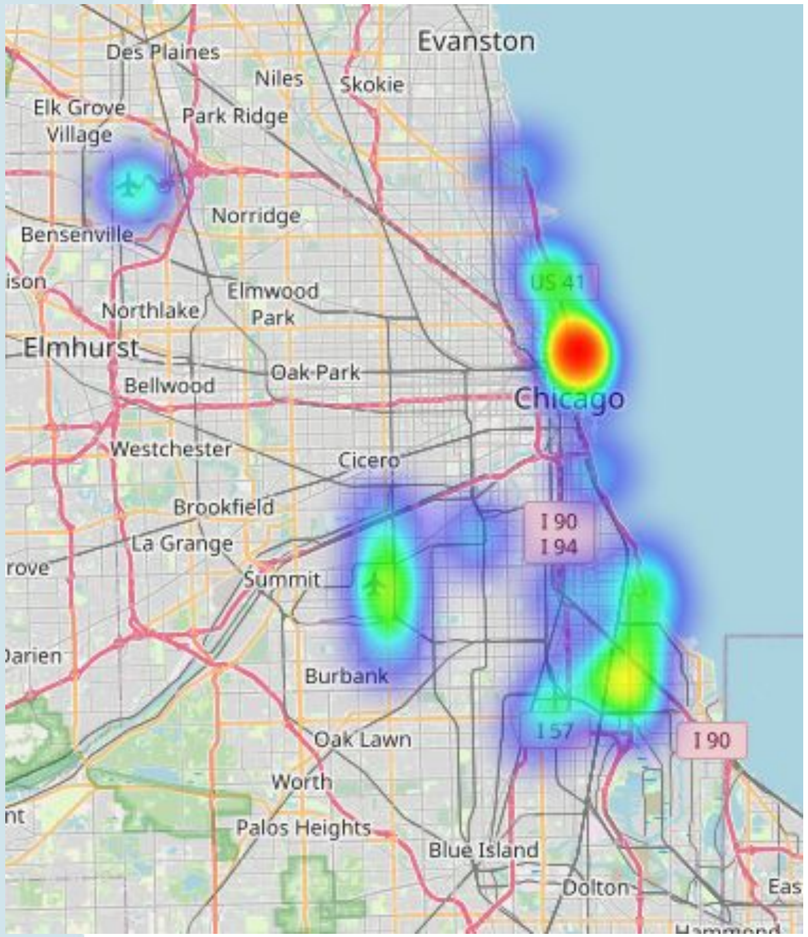
Traffic Crash Hotspots in Chicago



- **Used Geographical data (latitude and longitude)**
- **Our goal is to find traffic crash areas with high density**
- **DBSCAN**
  - **Unsupervised Learning Algorithm**
  - **Density-based algorithm**
  - **It groups together points that are close to each other**
    based on density
  - **Clustering algorithm**
  - **Used it to find areas with high concentration**
    by removing as many noise points as possible

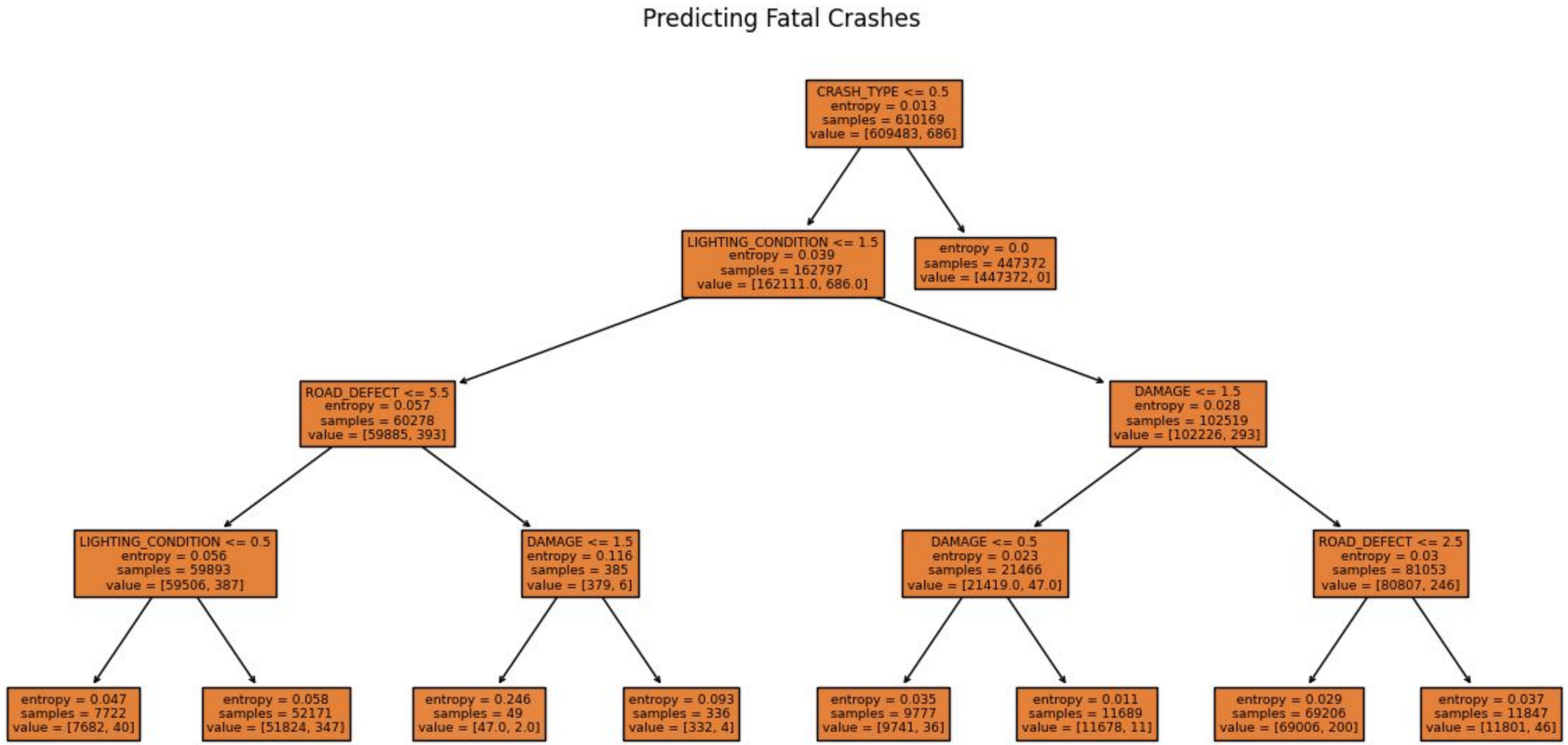
Machine Learning Analysis - Junha

Traffic Crash Hotspots in Chicago



- **Significant traffic incidents around major landmarks and areas**
  - **O'Hare Airport**
  - **Midway Airport**
  - **South Side of Chicago**
  - **Downtown**
  - **North Side Area (Magnificent Mile and Navy Pier)**
- **High traffic volumes and urban density contribute to the increased crash occurrences**
- **It highlights urban planning interventions are needed to mitigate crash risks**

Machine Learning Analysis - Prit



Will the collision result in a fatal or non-fatal injury?

Deciding Factors:

- **'LIGHTING_CONDITION'**
  - **Daylight**
  - **Darkness**
- **‘WEATHER_CONDITION’**
  - **Snow**
  - **Rain**
- **'CRASH_TYPE'**
  - **Tow Required**
- **'ROAD_DEFECT'**
  - **Debris**
  - **Potholes**
  - **Shoulder**

Accuracy Score: 99%+

Takeaways

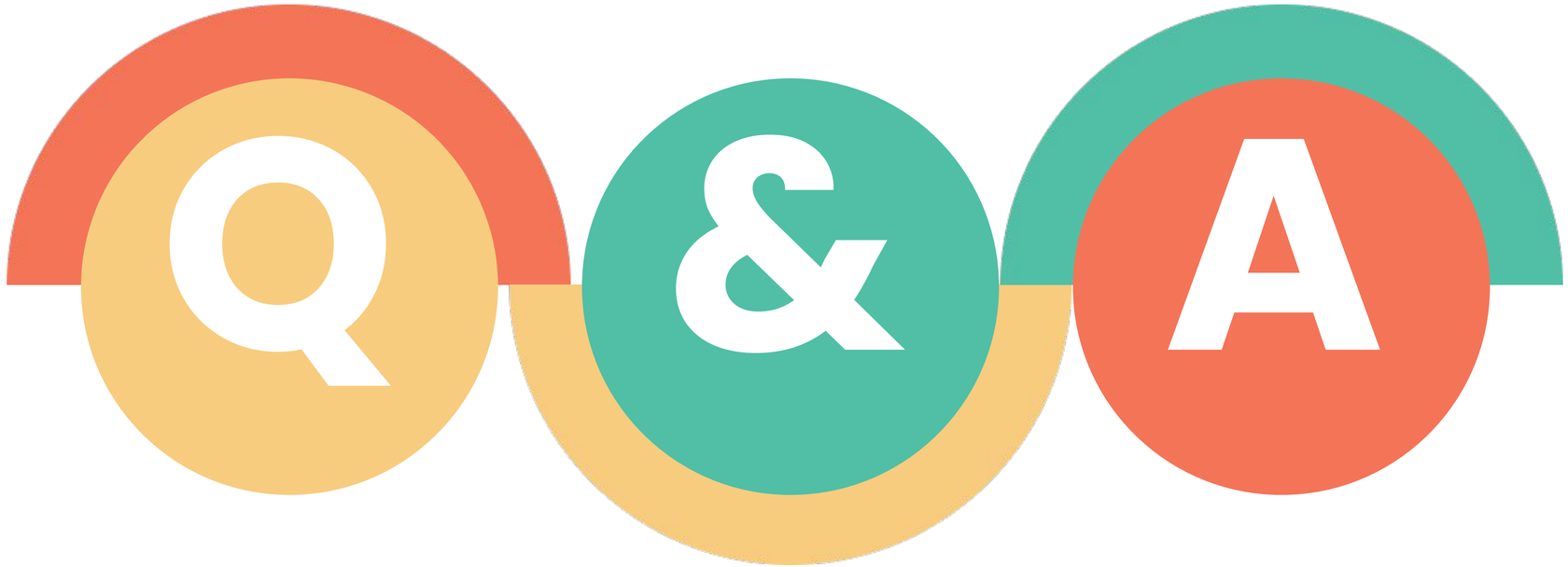
- We uncovered some interesting insights from our project
- Learned how to use ML and other techniques to analyse large datasets

What went well

- Team communication
- Amount of work completed

Challenges

- Challenging to work with large data
- Challenging to decide what to do our analyses on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