The study of severity of accidents

Final Report - Coursera capstone assignment

Table of Contents

1. Introduction

1.1 Background/ Problem Statement

Road accidents often lead to loss of property and life. This analysis is an attempt to understand the factors that increase the likelihood of accidents.

1.2 Potential Application

This analysis can have multiple potential applications. For example:

1. An app that will prompt the drivers to be more careful depending on the weather and road conditions on any given day

2. A way for the police to enforce more safety protocols.

2. Data

2.1Data Source(s)

This is an extensive data set from the Seattle Police Department, with over 190,000 observations collected over the last 15+ years.

2.2 Data Required and Description

In order to build a model to prevent future accidents and/or reduce their severity, we will require the following data attributes

1. ADDRTYPE

2. WEATHER

3. ROADCOND

4. VEHCOUNT

5. PERSONCOUNT.

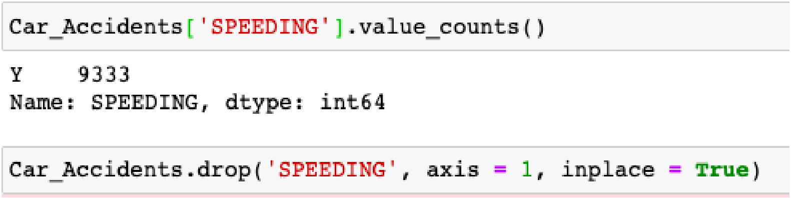
3. Methodology

3.1 Method Required

Jupyter Notebooks was used to conduct that analysis and imported all the necessary Python libraries like Pandas, Numpy, Matplotlib, and Seaborn. The data was mostly categorical so I stuck to graphical representation to see correlation between various variables.

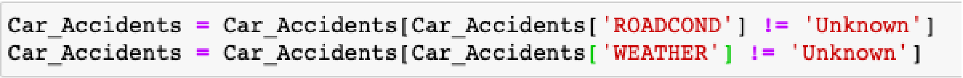
3.2 Analysis

Fust step was importing the csv file and to prepare the data, I dropped the columns we do not need from the dataset, i.e., columns that do not have values or where the values are unknown. Even though this is an important factor, I dropped Speeding entirely because it is missing over 180,000 values and this can hamper the results.



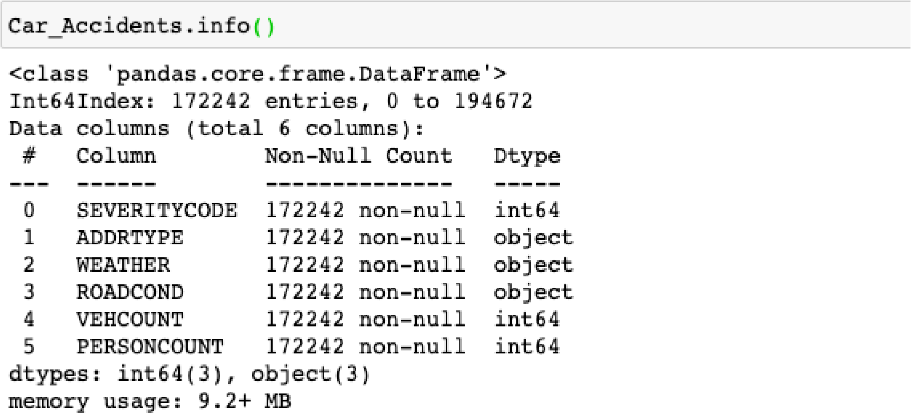
```
Car_Accidents['SPEEDING'].value_counts()

Y    9333
Name: SPEEDING, dtype: int64

Car_Accidents.drop('SPEEDING', axis = 1, inplace = True)
```

Upon further inspection, I found out that ROADCOND and WEATHER have unknown values. This will again hamper the analysis therefore I dropped the values where there is no information.



```
Car_Accidents = Car_Accidents[Car_Accidents['ROADCOND'] != 'Unknown']
Car_Accidents = Car_Accidents[Car_Accidents['WEATHER'] != 'Unknown']
```

Once again I checked the data and now the data is clean and ready to be analyzed.

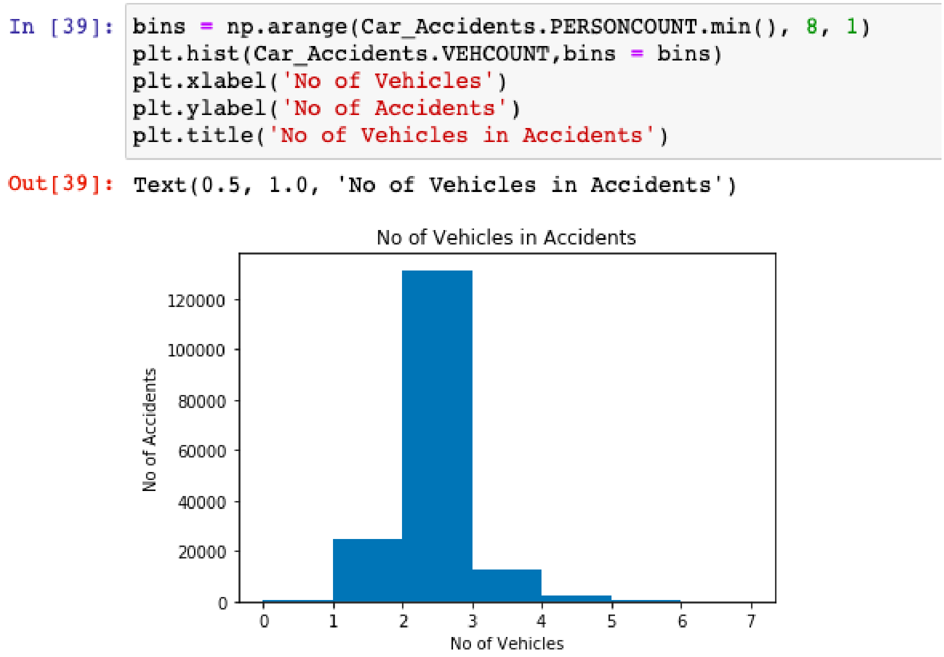


```
Car_Accidents.info()

<class 'pandas.core.frame.DataFrame'>
Int64Index: 172242 entries, 0 to 194672
Data columns (total 6 columns):
 #   Column        Non-Null Count   Dtype 
---  ------        --------------   ----- 
 0   SEVERITYCODE  172242 non-null  int64 
 1   ADDRTYPE      172242 non-null  object
 2   WEATHER       172242 non-null  object
 3   ROADCOND      172242 non-null  object
 4   VEHCOUNT      172242 non-null  int64 
 5   PERSONCOUNT   172242 non-null  int64 
dtypes: int64(3), object(3)
memory usage: 9.2+ MB
```

The above shows us that the data is now ready for use and we can begin our analysis

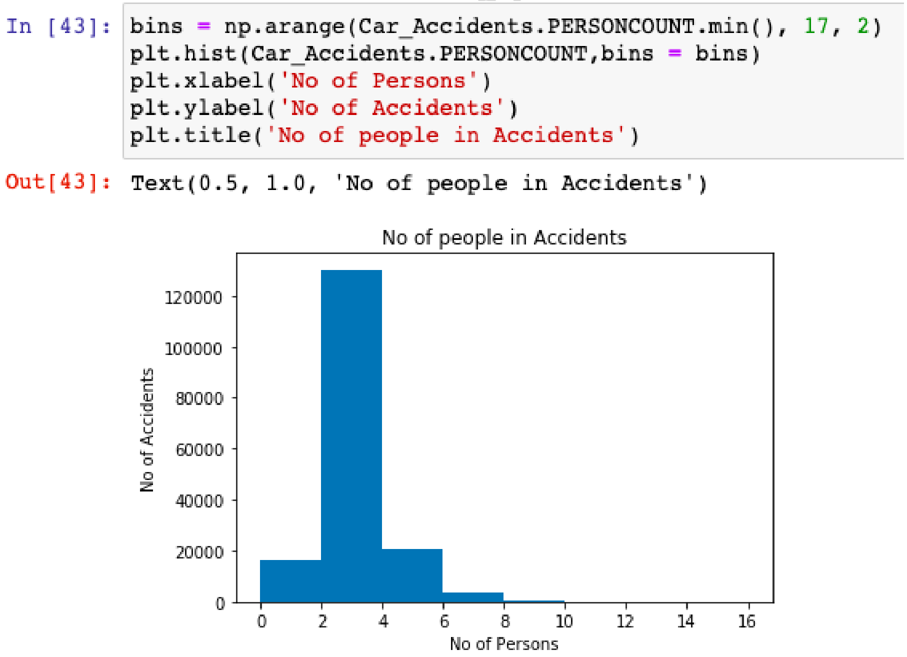
4. Result

I imported matplotlib and seaborn libraries to conduct graphical analysis. First I checked the number of vehicles involved in most accidents. I found out that most accidents included 2–3 vehicles at once.



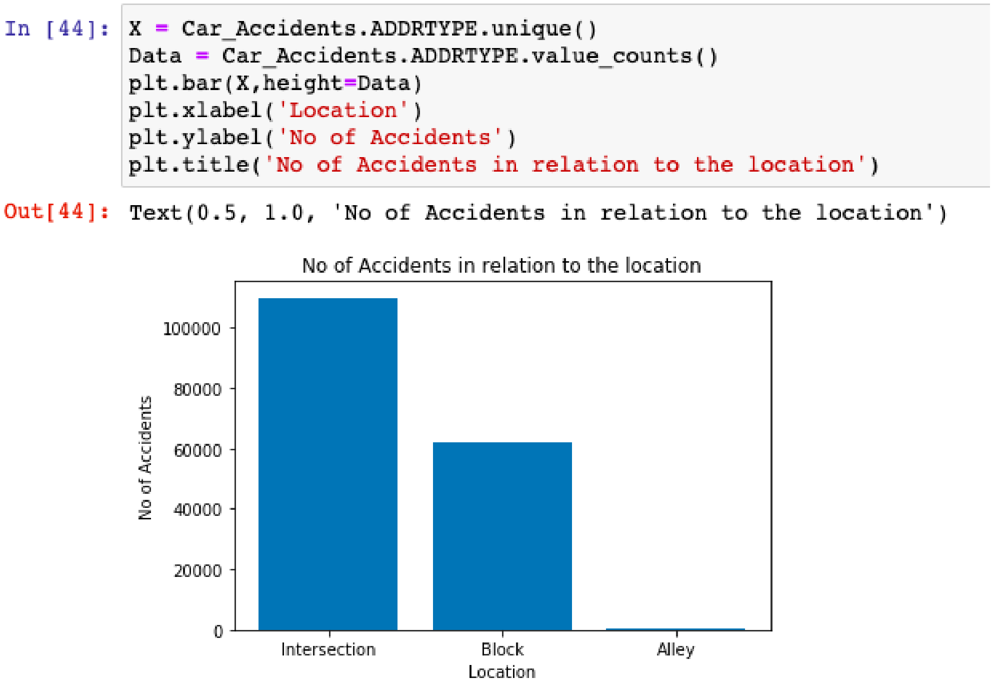
```
In [39]: bins = np.arange(Car_Accidents.PERSONCOUNT.min(), 8, 1)
         plt.hist(Car_Accidents.VEHCOUNT,bins = bins)
         plt.xlabel('No of Vehicles')
         plt.ylabel('No of Accidents')
         plt.title('No of Vehicles in Accidents')

Out[39]: Text(0.5, 1.0, 'No of Vehicles in Accidents')
```

Next I checked for the number of people involved in these accidents at any given time. Most accidents included two people (95,947). This can tell us that maybe solo drivers cause more accidents because they are speeding, or maybe they are distracted.



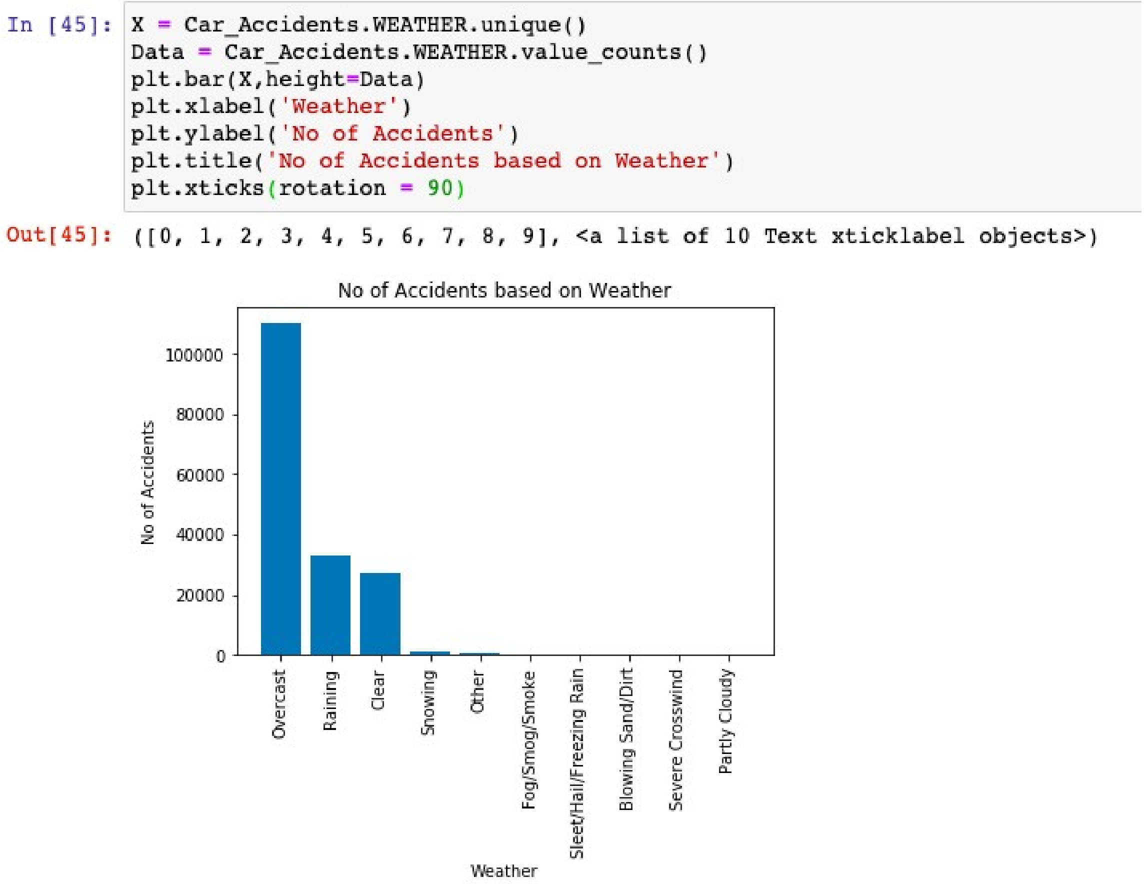
```
In [43]: bins = np.arange(Car_Accidents.PERSONCOUNT.min(), 17, 2)
         plt.hist(Car_Accidents.PERSONCOUNT,bins = bins)
         plt.xlabel('No of Persons')
         plt.ylabel('No of Accidents')
         plt.title('No of people in Accidents')

Out[43]: Text(0.5, 1.0, 'No of people in Accidents')
```

It is also important to find out where most accidents take place. Upon analyzing the data, it turned out that intersections are the most common accident zones. This could be because drivers don't heed the stop sign, or maybe some intersections can use more stop signs, or maybe there need to be more pedestrian crossings. In any case, this should be an area to look into more in-depth.



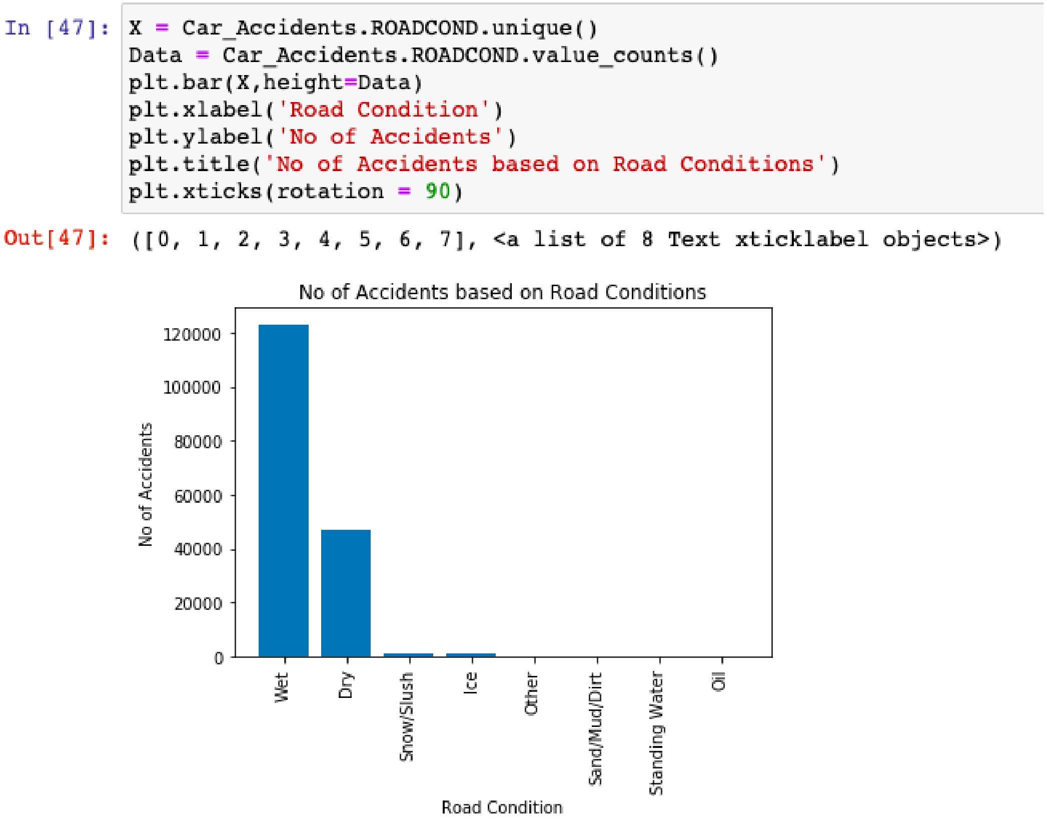
```
In [44]: X = Car_Accidents.ADDRTYPE.unique()
         Data = Car_Accidents.ADDRTYPE.value_counts()
         plt.bar(X,height=Data)
         plt.xlabel('Location')
         plt.ylabel('No of Accidents')
         plt.title('No of Accidents in relation to the location')

Out[44]: Text(0.5, 1.0, 'No of Accidents in relation to the location')
```

Next in my analysis, I wanted to check how the weather conditions affect the accidents. To my surprise, overcast conditions cause most accidents, rather than rainy or snowy conditions.



```
In [45]: X = Car_Accidents.WEATHER.unique()
         Data = Car_Accidents.WEATHER.value_counts()
         plt.bar(X,height=Data)
         plt.xlabel('Weather')
         plt.ylabel('No of Accidents')
         plt.title('No of Accidents based on Weather')
         plt.xticks(rotation = 90)

Out[45]: ([0, 1, 2, 3, 4, 5, 6, 7, 8, 9], <a list of 10 Text xticklabel objects>)
```

Lastly, I checked for the impact of road conditions on accidents. As expected, wet roads cause more accidents. This is also somewhat in contrast with our previous findings and could be looked into more.



```
In [47]: X = Car_Accidents.ROADCOND.unique()
         Data = Car_Accidents.ROADCOND.value_counts()
         plt.bar(X,height=Data)
         plt.xlabel('Road Condition')
         plt.ylabel('No of Accidents')
         plt.title('No of Accidents based on Road Conditions')
         plt.xticks(rotation = 90)

Out[47]: ([0, 1, 2, 3, 4, 5, 6, 7], <a list of 8 Text xticklabel objects>)
```

Next, I moved on to understand the severity of accidents based on our chose variables. I noticed the severity of accidents is higher (level 2 — injury) on an intersection whereas most non-severe accidents (level 1 — property damage) occur on blocks. I also found that most severe accidents occur at intersections and involve 2–3 people.

5. Discussion and Recommendation

At the start of our analysis, I was trying to figure out the severity and frequency of road accidents based on weather conditions, road conditions, and other factors. Even though our data was a good size, there were a number of missing elements and we needed to clean the data in order to get a good result. We had to drop 'SPEED' because there were too many missing elements but I think that is an important factor that should be considered. From the analysis, it is clear that most accidents involve solo drivers, on wet roads, bad weather, at intersections, and are minor in nature. This could be helpful to the police department in understanding where to install more stop signs, or maybe adding cameras to intersections to compel people to slow down. We also live in a technologically friendly world so maybe we can develop some inbuilt technology in our cars that warn us when the road and weather conditions are bad, or the car is approaching a stop sign.

6. Conclusion

Although this analysis has given us some good insight, there needs to be a closer inspection of certain other variables. It seems like a lot of these accidents are minor and avoidable. Having said that there is still a considerable amount of loss of property and these findings can be helpful to the Seattle PD in enforcing some new measures to prevent future accidents.