Reducing Accidents

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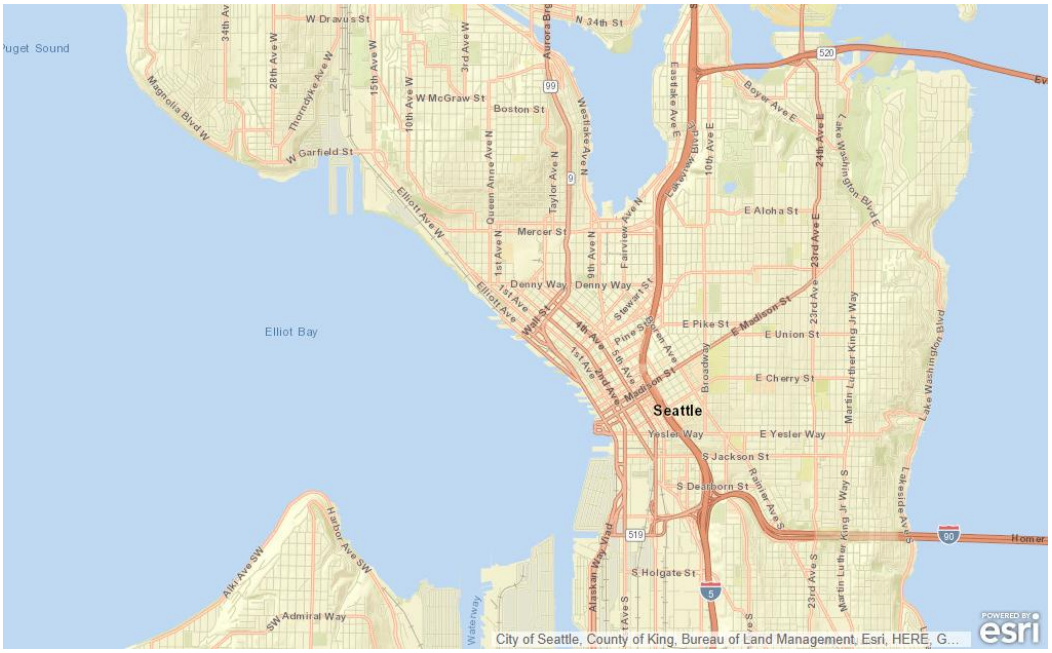
1. Introduction

1.1 Background

With the increase of population comes the need for increased transportation facilities. Fast paced lifestyle of public demands for shorter commute time. Governments however have constraints and may never be able to satisfy each an every one of its citizen on their travel needs each and every time a need arises. Having a personal vehicle is a straightforward and a quick fix to a flexible transport solution. Despite being expensive compared to public transport, it gives its owner round the clock service on any public road.

Developments in engineering and other technology along with increased affordability have exponentially increased the number of vehicles on road.

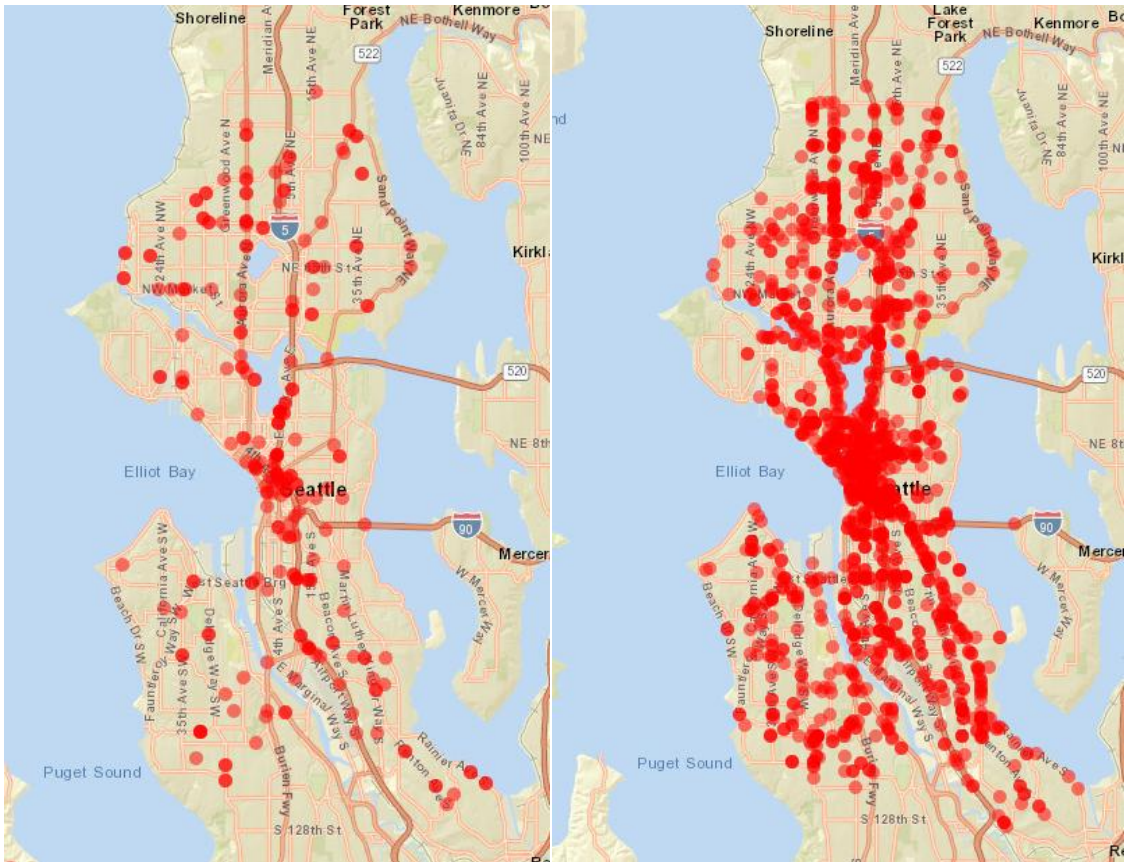
In this report we will be discussing about transport related issues in and around Seattle. We tried to see if we could identify underlying causes for increased number of accidents in certain areas compared to other areas.



Courtesy SDOT

1.2 Problem

Making roads safer for everybody has been a priority for the government and local authorities. We are trying to identify causes of accidents, and to reduce them continuously. We aim to make Seattle an accident free city in Five years time.



The first map shows the 244 fatal accidents that have taken place since January 2004. The second map shows the areas in which serious accidents have occurs during the same period. This clearly shows that certain areas are prone to more accidents and certain areas are relatively safer. There could be firm underlying explanations behind these patterns. Which is what we are trying to identify and address.

1.3 Interest

Seattle Department of Transport , Seattle Police department, Government , drivers, passengers and pedestrians will all would want to have an accident free city. Findings from this research upon verification shall be shared with all concerned parties.

2. Data acquisition and cleaning

2.1 Data sources

There are a number of publicly available datasets containing traffic and accident data. This analysis is based on a sample dataset provided by coursera, and the dataset can be found here and the metadata can be found here. The data contains details of collisions that took place in Seattle between 1st January 2004 and 20th May 2020.

	SEVERITYCODE	X	...	CROSSWALKKEY	HITPARKEDCAR
0	2	-122.323148	...	0	N
1	1	-122.347294	...	0	N
2	1	-122.334540	...	0	N
3	1	-122.334803	...	0	N
4	2	-122.306426	...	0	N
...	...	...	...	...	...
194668	2	-122.290826	...	0	N
194669	1	-122.344526	...	0	N
194670	2	-122.306689	...	0	N
194671	2	-122.355317	...	0	N
194672	1	-122.289360	...	0	N

[194673 rows x 38 columns]

	SEVERITYCODE	X	...	SEGLANEKEY	CROSSWALKKEY
count	194673.000000	189339.000000	...	194673.000000	1.946730e+05
mean	1.298901	-122.330518	...	269.401114	9.782452e+03
std	0.457778	0.029976	...	3315.776055	7.226926e+04
min	1.000000	-122.419091	...	0.000000	0.000000e+00
25%	1.000000	-122.348673	...	0.000000	0.000000e+00
50%	1.000000	-122.330224	...	0.000000	0.000000e+00
75%	2.000000	-122.311937	...	0.000000	0.000000e+00
max	2.000000	-122.238949	...	525241.000000	5.239700e+06

2.2 Data cleaning

The number of fields without data, were very high but this was expected as the data set contains incidents far back from 2004. Where means of data collection was very limited compared to what we have today. We can expect to reduce null values and have complete datasets in future to make better decisions.

ADDRTYPE	1926
INTKEY	129603
LOCATION	2677
EXCEPTRSNCODE	109862
EXCEPTRSNDESC	189035
SEVERITYCODE.1	0
SEVERITYDESC	0
COLLISIONTYPE	4904
PERSONCOUNT	0
PEDCOUNT	0
PEDCYLCOUNT	0
VEHCOUNT	0
INCDATE	0
INCDTTM	0
JUNCTIONTYPE	6329
SDOT_COLCODE	0
SDOT_COLDESC	0
INATTENTIONIND	164868
UNDERINFL	4884
WEATHER	5081
ROADCOND	5012
LIGHTCOND	5170
PEDROWNOTGRNT	190006
SDOTCOLNUM	79737
SPEEDING	185340
ST_COLCODE	18
ST_COLDESC	4904

All reference identity columns and lesser important fields have been excluded for ease of analysis. Such as

X
Y
COLDETKEY
INCKEY
COLDETKEY
REPORTNO
STATUS
INTKEY
EXCEPTRSNCODE
EXCEPTRSNDESC
SEVERITYCODE
SEVERITYDESC
INCDTTM
SDOT_COLCODE
SDOT_COLDESC
INATTENTIONIND
PEDROWNOTGRNT
SDOTCOLNUM
SEGLANEKEY
CROSSWALKKEY

2.3 Feature selection

17 Features were retained for analysis of the dataset. The features are given below.

```
Index(['SEVERITYCODE', 'ADDRTYPE', 'LOCATION', 'COLLISIONTYPE', 'PERSONCOUNT',
       'PEDCOUNT', 'PEDCYLCOUNT', 'VEHCOUNT', 'INCDATE', 'JUNCTIONTYPE',
       'UNDERINFL', 'WEATHER', 'ROADCOND', 'LIGHTCOND', 'SPEEDING',
       'ST_COLDESC', 'HITPARKEDCAR'],
```

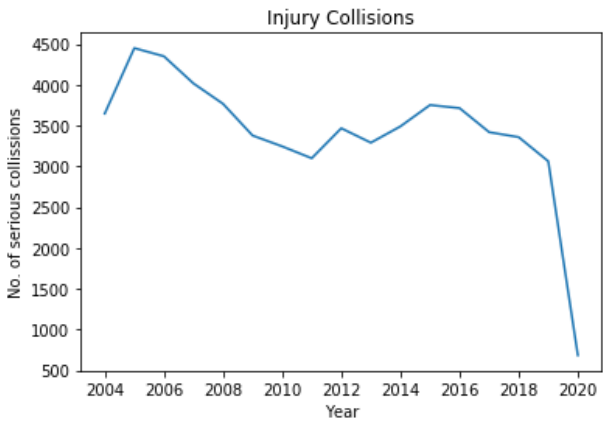
These fields contain the environmental variables such as location, timing of the day, weather, road condition. It also has details about the severity of those accidents. We will have to find a direct relationship between one or more environmental variables(Cause variables) and number of accidents.

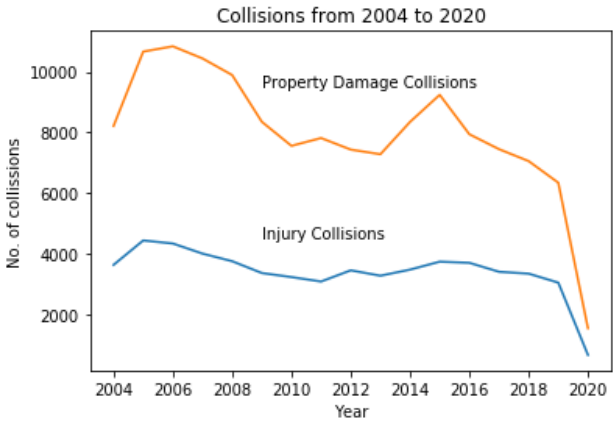
3. Exploratory Data Analysis

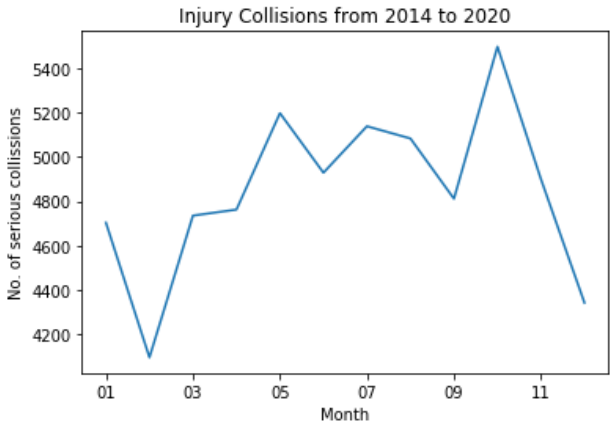
3.1 Basic Exploration

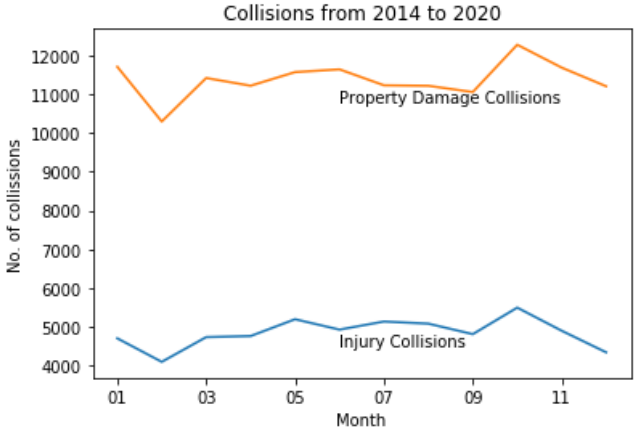
	SEVERITYCODE	PERSONCOUNT	PEDCOUNT	PEDCYLCOUNT	VEHCOUNT
SEVERITYCODE	1.000000	0.130949	0.246338	0.214218	-0.054686
PERSONCOUNT	0.130949	1.000000	-0.023464	-0.038809	0.380523
PEDCOUNT	0.246338	-0.023464	1.000000	-0.016920	-0.261285
PEDCYLCOUNT	0.214218	-0.038809	-0.016920	1.000000	-0.253773
VEHCOUNT	-0.054686	0.380523	-0.261285	-0.253773	1.000000

From the outset we could not see any linear relationships with the given dataset. We had to do a more detailed and in depth analysis to find what we were looking for.









To be continued… The remaining parts of this report will be uploaded by 27th of September 2020 as per requirement #3 of Coursera IBM capstone project on Data science