Car Accident Severity Analysis:

Seattle, Washington

(Applied Data Science Capstone)

The project aims to understand the factors of severity of car accidents in Seattle.

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Introduction

Background

Seattle, also known as the Emerald city, is Washington State's largest city, with home to a large tech industry with Microsoft and Amazon headquartered in its metropolitan area. As of 2020, it has a total metro area population of 3.4 million (www.macrotrends.net). The total number of personal

vehicles in Seattle in the year 2016 hit a new high of nearly 444,000 vehicles. In one South Lake Union census tract, the car population has more than doubled since 2010 (www.seattletimes.com). The

increase in car ownership rates can lead to higher numbers of accidents on the road because of a simple probability. Worldwide, approximately 1.35 million people die in road crashes each year, on average 3,700 people lose their lives every day on the roads and an additional 20-50 million suffer non-fatal injuries, often resulting in long-term disabilities.

Worldwide situation:

Car accidents turns out in a very serious situation, bring to reality a lot of issues, example, deaths health conditions, a financial struggle to the insurance companies, governments and population. According to 2017 WSDOT data, a car accident occurs every 4 minutes and a person dies due to a car crash every 20 hours in the state of Washington. The Seattle Severity Car Accident project pretends to predict how severity of accidents can be reduced based on a few factors.

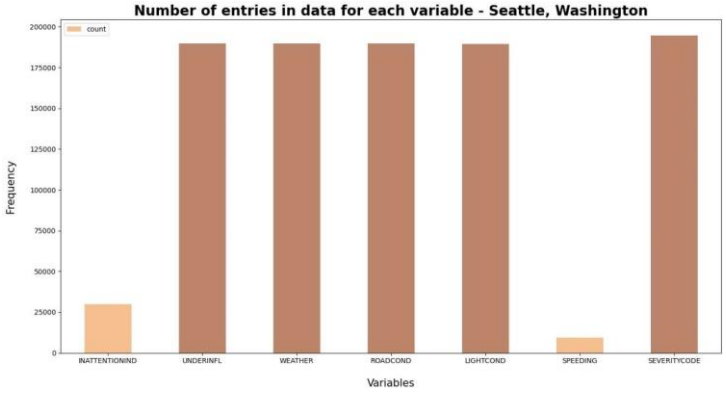
Stakeholders

The reduction of accidents can be beneficial to the Public Development Authority of Seattle which works towards improving those road factors and the car drivers themselves who may take precaution to reduce the severity of accidents.

Understanding Data

There are a lot of problems with the data set keeping in mind that this is a machine learning project which uses classification to predict a categorical variable. The dataset has total observations of 194673 with variation in number of observations for every feature. First of all, the total dataset was high variation in the lengths of almost every column of the dataset. The dataset had a lot of empty columns which could have been beneficial had the data been present there. These columns included pedestrian granted way or not, segment lane key, cross walk key and hit parked car.

The models aim was to predict the severity of an accident, considering that, the variable of Severity Code was in the form of 1 (Property Damage Only) and 2 (Injury Collision) which were encoded to the form of 0 (Property Damage Only) and 1 (Injury Collision). Furthermore, the Y was given value of 1 whereas N and no value was given 0 for the variables Inattention, Speeding and Under the influence. For lighting condition, Light was given 0 along with Medium as 1 and Dark as 2. For Road Condition, Dry was assigned 0, Mushy was assigned 1 and Wet was given 2. As for Weather Condition, 0 is Clear, Overcast is 1, Windy is 2 and Rain and Snow was given 3. 0 was assigned to the element of each variable which can be the least probable cause of severe accident whereas a high number represented adverse condition which can lead to a higher accident severity. Whereas, there were unique values for every variable which were either 'Other' or 'Unknown', deleting those rows entirely would have led to a lot of loss of data which is not preferred.



In order to deal with the issue of columns having a variation in frequency, arrays were made for each column which were encoded according to the original column and had equal proportion of elements as the original column. Then the arrays were imposed on the original columns in the positions which had 'Other' and 'Unknown' in them. This entire process of cleaning data led to a loss of almost 5000 rows which had redundant data, whereas other rows with unknown values were filled earlier.

Feature Selection

A total of 5 features were selected for this project along with the target variable being Severity Code.

Feature Variables	Description
INATTENTIONIND	Whether or not the driver was inattentive (Y/N)
UNDERINFL	Whether or not the driver was under the influence (Y/N)
WEATHER	Weather condition during time of collision (Overcast/Rain/Clear)
ROADCOND	Road condition during the collision (Wet/Dry..)
LIGHTCOND	Light conditions during the collision (Lights On/Dark with light on)
SPEEDING	Whether the car was above the speed limit at the time of collision (Y/N)

Methodology

The dataset used for this project is based on car accidents which have taken place within the city of Seattle, Washington from the year 2004 to 2020. This data is regarding car accidents the severity of each car accidents along with the time and conditions under which each accident occurred.

Exploratory Analysis

Considering that the feature set and the target variable are categorical variables with the likes of weather, road condition and light condition being an above level 2 categorical variables whose values are limited and usually based on a particular finite group whose correlation might depict a different image then what it actually is. Generally, considering the effect of these variables in car accidents are important hence these variables were selected. A few pictorial depictions of the dataset were made in order to better understand the data.

Disputation:

Weather, Light and Road conditions

There are more occurrences of severe collisions during daylight whereas during the night with the lights on, accidents tend to be less risky. The reason for this, may be related to a more cautious driving during the night which predispose car users to an aware state. Dusk and dawn tend to be related to more severe collisions, maybe because of the visibility reduction while facing the sun directly in the vision zone.

Conclusion

Extremely dangerous weather and road conditions do not produce a quite significant accident rate, such as snow and ice. However, caution have to be taken with rainy weather and wet roads, since after clear days and dry roads, these are the following conditions in order of importance.

Based on the data on collisions in Seattle from 2004 to the present, there are no relationship between bad weather conditions and wet road conditions that affected collisions. From the data, we see that there were a lot more collisions that happened on dry roads and clear weather conditions. There are much less collisions that happen when weather and road conditions are not that great.

. References

https://s3.us.cloud-object-storage.appdomain.cloud/cf-courses-data/CognitiveClass/DP0701EN/version-2/Metadata.pdf