Introduction/Business Problem

Background

Every year car accidents cause hundreds of thousands of deaths worldwide. According to a study conducted by the World Health Organization (WHO), in 2016 there were 1.35 million road traffic fatalities worldwide, while another million suffered serious injuries and lived with long-term health problems. Road traffic accidents are the most common cause of death among young people between 15 and 29 years of age worldwide. Road traffic injuries are currently estimated to be the eighth leading cause of death worldwide in all age groups and are expected to increase further by 2030. A comprehensive analysis to predict road traffic accidents and their severity, using the tools and information available today, would significantly reduce the number of fatalities and contribute to the well-being of society. By analyzing a variety of factors, including weather conditions, location, type of road and lighting, an accurate prediction of accident severity can be made, and the planning and execution of local hospital operations can be supported. This type of information could be used by emergency services to send exactly the required equipment to the scene of an accident, so that more resources are available for accidents and can act more quickly. Therefore, road safety should be a prior interest for governments, local authorities and private companies investing in technologies that can help reduce accidents and improve overall driver safety. Here we can make the first investigations based on a local example and thus come closer to the goal of preventing and combating road traffic fatalities.

Problem

The data that could help determine the probability of a possible accident event includes information about previous accidents, such as road conditions, weather conditions, the exact time and location of the accident, the type of vehicles involved in the accident, information about the users involved in the accident, and of course the severity of the accident. This project aims at predicting the severity of the accident based on previous information that could be given by a witness who informs the emergency services.

Stakeholders

Governments should have a strong interest in accurate predictions of the severity of accidents in order to reduce the time of arrival and use resources more quickly, thus saving a significant amount of people each year. Other interested parties could be private companies that invest in technologies to improve road safety and new technologies that further support this project.

Unterstanding Data

Data cleaning

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. Thedataset has total observationsof 194,673 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.

There are many problems with the data set, considering that this is a machine learning project that uses classification to predict a categorical variable. The data set contains all observations of 194,673, with the number of observations varying for each attribute. First, the total data set was a high variation in the length of almost every column of the data set. The data set contained many empty columns, which unfortunately would have given us another advantage if the data had been available there. These columns included pedestrians with or without right of way, segment lane keys, cross lane keys and hit parked cars.

The goal of the model is to predict the severity of an accident, since the variable of severity was coded as 1 (only property damage) and 2 (injury collision) in the form of 0 (only property damage) and 1 (injury collision).

In addition, the Y was given the value 1, while Nan and no value 0 was given for the variables inattention, speed and under influence.

For the light status Light was given as 0, Medium as 1 and Dark as 2, for the road status Dry as 0, Mushy as 1 and Wet as 2. For the weather condition 0 is clear, overcast 1, windy 2 and rain and snow 3. 0 was assigned to the element of each variable that can be the least likely cause of a serious accident, while a high number represents an unfavorable condition that can lead to a higher accident severity.

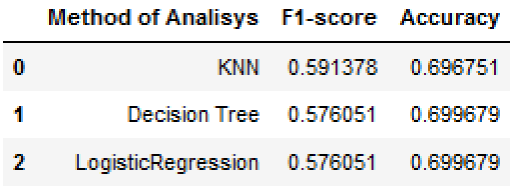
While there were unique values for each variable, which were either "Other" or "Unknown", the complete deletion of these lines would have resulted in a large loss of data, which is not desirable.

To solve the problem of columns with different frequencies, arrays were created for each column, which were coded according to the original column and had the same proportion of elements as the original column. Then the arrays were imposed on the original columns at the positions with the elements "Other" and "Unknown". This entire process of data cleansing resulted in the loss of nearly 5000 rows containing redundant data, while other rows were filled with unknown values earlier.

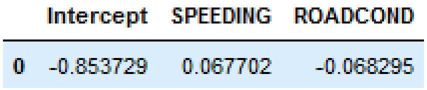
Feature Section

Then, I began choosing columns to use from the dataframe that I created. The columns that I chose were SEVERITYCODE, which assigns a crash a value of 1, which means no injury, and 2, indicating injury, COLLISIONTYPE, which describes the type of crash, WEATHER, which describes the weather at the time of crash, ROADCOND, which describes the condition of the road at the time of crash, LIGHTCOND, which describes the light conditions at the time of crash, INATTENTIONIND, which describes whether the driver was distracted, and UNDERINFL, which describes whether the driver was under the influence.

Results



	Method of Analisys	F1-score	Accuracy
0	KNN	0.591378	0.696751
1	Decision Tree	0.576051	0.699679
2	LogisticRegression	0.576051	0.699679



	Intercept	SPEEDING	ROADCOND
0	-0.853729	0.067702	-0.068295

After selection of the methods: Tree Model, Logistic Regression and KNN methodology and trained them and by looking at the results obtained in comparison, it is understood that speed and road condition influence the severity of traffic accidents.