Vehicle Crash Survivability

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Introduction

Automotive accidents result in over 30,000 fatalities in the United States annually [1]. The National Automotive Sampling System (NASS) provides a nationally representative sample of police reported collisions and is made available to researchers and the general public.

The research question for this project is to identify and quantify factors which impact the survivability of various crash types (rear-end, sideswipe, etc) using R, and create a web app using the shiny package to predict survivability for given inputs using regression.

The techniques will include web-scraping the publicly available data on the NASS website, parsing the resultant XML and data cleaning of real-world dataset, exploratory analysis to identify relevant factors, feature engineering, and regression.

The source code for this project is available on github at https://github.com/gmyrland/capstone_project.

References:

[1] World Health Organization. (2015). Global status report on road safety 2015. Accessed from http://www.who.int/violence_injury_prevention/road_safety_status/2015/TableA2.pdf?ua=1

Literature Review

Several publications were reviewed with emphasis being placed on determining potential factors which may have significant effects on vehicle crash survivability.

An Indiana University paper (2014) noted that vehicle inequalities (e.g., height, rigidity, weight) had a significant impact on survivability in head-on collisions. This driver survival risk factor study found that "the driver's chance of survival was increased by driving a vehicle with a higher mass, driving a newer vehicle, being younger, being a male, using a seatbelt and having the airbag deployed in the crash." [2]

Some studies examined the effect of vehicle age on survivability. For example, an Association for the Advancement of Automotive Medicine study (2006) showed decreases in the casualty rate for newer cars in frontal impacts. [3]

A 2014 conference paper examined the risk factors associated with the survival of drivers in head on collisions. In order to control for vehicle speed, vehicles involved in head-on collisions were paired and logistic regression was used to model the effect of other factors such as vehicle mass, vehicle age, and passenger demographics. [4]

Finally, the World Health Organization report on road traffic injury prevention (2004) identified speed as a key risk factor in road traffic injuries. Further, driver speed choice was found to be influenced by a number of factors, including: driver-related factors such as age, gender, alcohol level, and number of people in the vehicle; road and vehicle factors such as road layout, surface quality, vehicle power, and maximum speed; and traffic- and environment-related such as traffic density and composition, prevailing speed, and weather conditions. [5]

References:

[2] Indiana University. (2014). Car crash survival rates increase with being younger, male and driving a big vehicle. Accessed from http://www.eurekalert.org/pub_releases/2014-11/iu-ccs111814.php