U.S. Car Accidents Factors Analysis

Team 119

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9 Heilmeier Questions

1. What are you trying to do? Articulate your objectives using absolutely no jargon.

   This paper looks into major cities in the U.S. and compares their road designs to determine if they are good to lower the rate of car accident.

2. How is it done today; what are the limits of current practice?

   Almost every literature review so far suggests that car accidents are results from factors of two types: environmental (Cools, Moons, & Wets, 2010) and human-related (. & Pai, 2016). Namely, weather changes like wind, dust (Bhattachan, Okin, Zhang, Vimal, & Lettenmaier, 2016), light (Erenler & Gümüş, 2019), precipitations (Tamerius, Zhou, Mantilla, & Greenfield-Huitt, 2016), and even Covid-19 (Yasin, Grivna, & Abu-Zidan, 2021) are considered environmental factors. Meanwhile, characteristics of a road user like the age, use of seat belt, time of day on road (Mohammadi, 2009), and even intake of alcohol (Cotti & Walker, 2010) and drugs are considered human-related factors.

   However, little have these papers pointed out that road design is equally important in reducing the car accidents and fatalities concerned. Unlike papers with results from data for environmental or human-related factors, we could only found papers with qualitative studies on how road design might affect the road safety, papers studying on only one road-design-related factor (Mohamed & Ibrahim, 2022) at only one facility (Sharma, Bhatt, & Damodariya, 2016), or papers actually include road-design-related data as one of many features in models (Marcillo, Valdivieso Caraguay, & Hernández-Álvarez, 2022). Therefore, we are inspired to do a quantitative research on how road design might affect safety for all road users, and how is it going to change conditioning environmental factors.

3. What's new in your approach? Why will it be successful?

   In terms of:

   (1) Model, it will mainly focuses on features about road designs, including where they are placed, how clear they inform the road users, etc., with greater granularity. It will further consider these road-design-related features conditioning the weather features to examine their efficiencies in different environment. Later on, it will fit into cities from the U.S. to find any similarities or differences.

(2) UI, it will visualize the road design in each corner of the city given different environmental conditions through visualization tools like Tableau or Power BI.

Here we use datasets with road-design-related features from both U.S. (Moosavi, Samavatian, Parthasarathy, & Ramnath, 2019) (Moosavi, Samavatian, Parthasarathy, Teodorescu, & Ramnath, 2019), which ensures our model to have enough data coverage by amount, the number of features, and the quality of model and final output.

4. Who cares?

   Everyone shall care. Right of way shall be fundamental for all passengers in all sorts of means of transportation in the modern society. Therefore, it shall be carefully assessed to ensure all passengers have equal rights and bear no risks to move on the streets.

5. If you're successful, what difference and impact will it make, and how do you measure them (e.g., via user studies, experiments, ground truth data, etc.)?

   The project is considered "successful" if it can point out deficiencies in current road design and inspire the authorities concerned to modify the current transportation law and especially, more actions and budgets to redesign or even re-construct the road. An instant and intuitive measure for the success of the project will be a lower risk of fatalities from car accidents after the re-design of the road.

6. What are the risks and payoffs?

   Risks include, just to name a few:

   (1) Data without granularity: there are several features about road design in the current dataset, but chances are that we need to get more information in detail to explain the significance/insignificance of a feature but there's little or none to employ.

   (2) Underlying correlations within features: road design is a huge topic encompasses several facilities to work together and keep the road functioning well.

   (3) Unexpected outcome from the model: we assumed the correlation between car accidents and road design in advance, but the result might not turns out to be similar to our assumptions.

   Several other risks include inaccurate data, imbalanced data when it comes to certain condition, etc. Moreover, payoffs include a lower rate of car accidents or fatalities concerned, a higher coverage of road users' awareness on road design and safety, etc.

7. How much will it cost?

   $0.

8. How long will it take?

   A 4-month period is estimated to complete the project.

9. What are the midterm and final "exams" to check for success? How will progress be measured?

Milestones	Assignees	References	Start	End	Progress
Team Formation					
Find Group Member	Tsai, Ya-Hsin		2023-08-21	2023-09-22	100%
Project Proposal					
Dataset Explorations	Everyone		2023-09-23	2023-09-30	100%
Literature Reviews	Everyone		2023-10-01	2023-10-07	100%
Proposal Documentation	Tsai, Ya-Hsin		2023-10-08	2023-10-13	100%
Proposal Slides & Videos					
Proposal Slides	Lou, Tsun-Man		2023-10-08	2023-10-13	100%
Proposal Videos	Lou, Tsun-Man		2023-10-08	2023-10-13	100%
Progress Report					
Data Collection	Lin, Weihan, Hu, Zehao		2023-10-14	2023-11-03	0%
Data Cleansing	Kok, Chun Shen, Hu, Zehao		2023-10-14	2023-11-03	0%
Exploratory Data Analysis	Lin, Weihan, Tsai, Ya-Hsin		2023-10-14	2023-11-03	0%
Basic Map Visualization	Lou, Tsun-Man		2023-10-14	2023-11-03	0%
Progress Report	Kok, Chun Shen		2023-10-14	2023-11-03	0%
Final Report					
Feature Selection	Hu, Zehao, Kok, Chun Shen		2023-10-14	2023-12-01	0%
Final Model	Tsai, Ya-Hsin, Lin, Weihan		2023-10-14	2023-12-01	0%
Model Ouput to Map	Lou, Tsun-Man , Hu, Zehao		2023-10-14	2023-12-01	0%
Final Report	Tsai, Ya-Hsin		2023-10-14	2023-12-01	0%
Poster Presentation Video					
Poster Presentation Video	Kok, Chun Shen		2023-10-14	2023-12-01	0%

All team members have contributed a similar amount of effort.

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