

Does Weather has an significant impact on the number of highway traffic accidents?

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Summary and Rationale

- ▶ Analysis of weather events on German highways and accidents in 2018-19.
- ▶ It analyses whether highway segments that are particularly exposed to extreme weather events result in more car crashes than usual.

Datasources

Highway Weather Data

- ▶ Metadata: URL
- ▶ Data: URL
- ▶ Data Type: CSV
- ▶ Description: Weather events on specific routes were studied using reanalysis data from all of Germany from Dec. 1, 2017-Nov. 30, 2019. The weather values of 3160 points with 1 km distance were read from the data and averaged or summed up, depending on the parameter. The values were normalized and the highest was given the value 100, the lowest the value 0.

CrashData

- ▶ Metadata: URL
- ▶ Data: 2017 2018 2019
- ▶ Data Type: ZIP/CSV
- ▶ Description: Road traffic accident data of 2017 to 2019 of Germany.

Transformations

1. Preprocessing of the weather data
 - ▶ Give each weather measure point a unique ID
 - ▶ As the measure points are distributed one kilometer apart from each other, each points gets an kilometer marker
2. Preprocessing of the crash data
 - ▶ Dropping rows with irrelevant data (turn accidents, bike accidents, etc.)
 - ▶ Drop columns with irrelevant data
3. Connect the crash data with the weather data
 - ▶ For each crash, find the closest weather measure point (Treshold: 600m)
 - ▶ Drop rows where no point is within the treshold
 - ▶ If there are multiple points within the treshold, select the one closest
 - ▶ Merge crash data to the weather data
4. Normalize the combined data

Overview of all routes

Map of all the routes



Strecke

- Aschaffenburg_Fuessen
- Hamburg_Schwieberdingen
- Karlsruhe_Muenchen
- Koeln_Dresden
- Muenchen_Garmisch_Parttenkirchen
- Muenchen_Nuernberg
- Muenchen_Salzburg
- Nuernberg_Suhl
- Wuerzburg_Berlin
- Wuppertal_Kassel

Crashes of all routes

Map of all the crashes along the routes

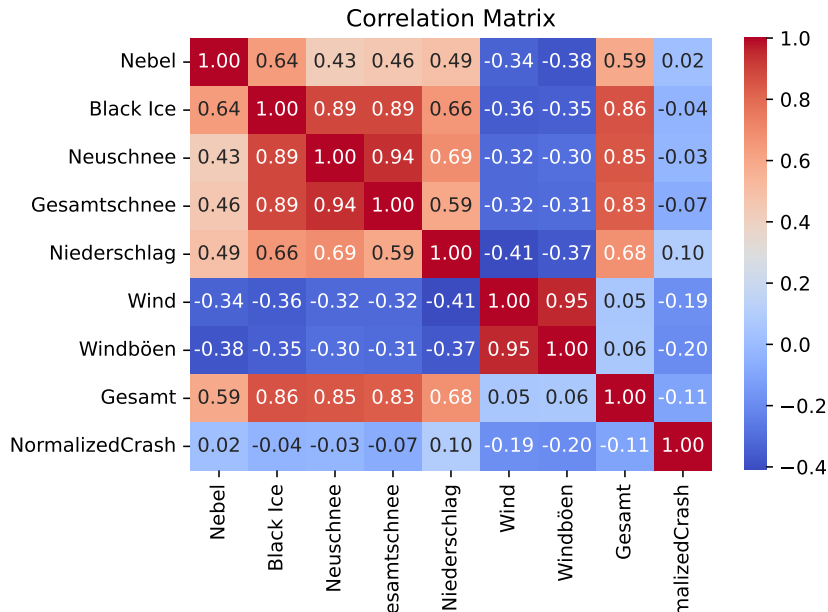


Weather of all routes

Map of the weather events combined along the routes

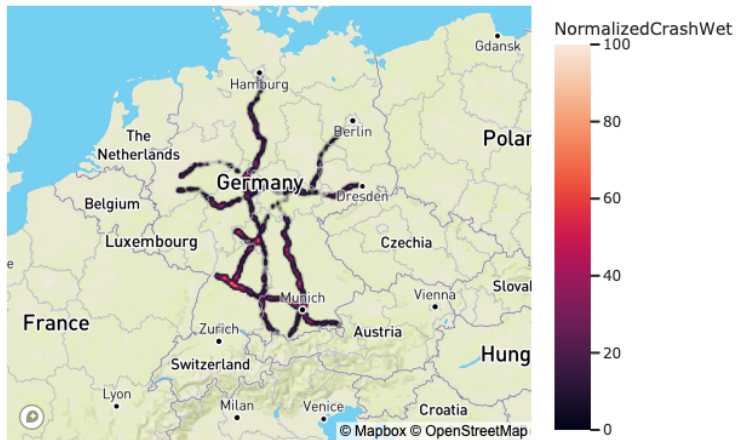


Correlation Analysis



Analysis of crashes during precipitation

Map of all the crashes in the Wet along the routes



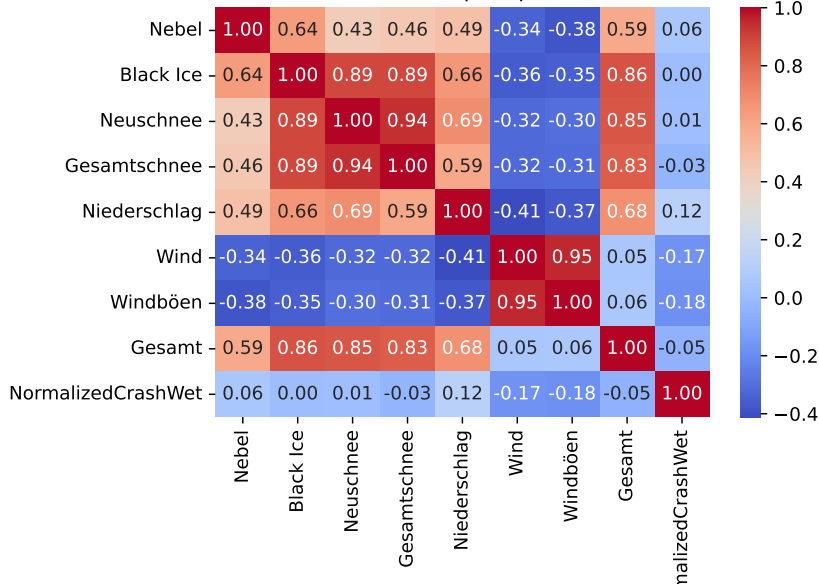
Precipitation Map

Map of the precipitation along the routes



Correlation Analysis of wet weather crashes

Correlation Matrix of precipitation crashes



Conclusion

The analysis investigates whether highway segments exposed to extreme weather events lead to more car crashes. Here are the key findings:

1. Initial Analysis:

- ▶ The number of crashes is higher in the south of Germany, where severe weather events also occur more frequently.

2. Correlation Analysis:

- ▶ The correlation between the number of crashes and weather events is not strong.
- ▶ Wind-related events are negatively correlated with crashes, indicating that more wind on the highway is associated with fewer crashes.
- ▶ 'Niederschlag' (precipitation) shows a positive correlation, meaning that more precipitation leads to more crashes.

3. Analysis of Wet Conditions:

- ▶ Areas with more precipitation tend to have more crashes, but the correlation is not strong.

Summary

In summary, the analysis does not strongly support the hypothesis that highway segments exposed to extreme weather events result in more car crashes. The correlation analysis suggest that weather events may not be the main contributing factor to the observed crashes.