Flooding-Related Traffic Crashes: Findings from Association Rules

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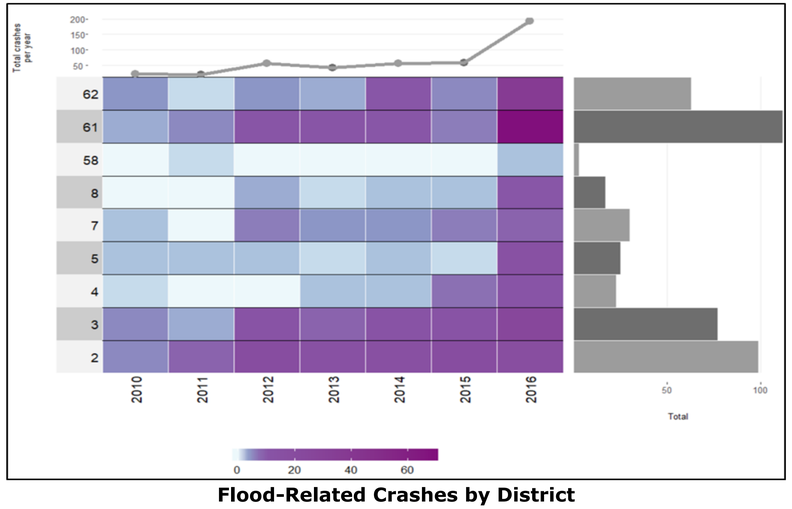
Abstract

- Louisiana's geographic location places the state in a unique position to receive both frontal tropical hurricanes and large air masses, which may result in high air moistures in almost any direction and drop rain with heavy intensity.
- In 2016, 12 percent of flooding-related crashes occurred in Louisiana. During 2010–2016, flooding resulted in a total of 449 crashes in Louisiana with a total of 22 fatalities.
- This study collected seven years (2010–2016) of flooding-related crash data to identify the key contributing factors by using association rules mining.



Flood-Related Crashes by District

Methodology

- The dataset of the current study is police-reported crashes in Louisiana from 2010 to 2016.
- To identify the flooding-related crash database, the research team applied a text mining algorithm to distinguish the flooding-related crashes. Three terms were used to identify the flooding-related crashes: flood, flooding, and flooded.
- In seven years, 449 crashes in Louisiana occurred due to the flooding.
- Researchers performed variable importance to identify the key variables.
- Researchers also applied association rules mining to identify the hidden trends in the data.

Conclusions

- Violation of rules has been found in many of the rules. Other studies also show that many drivers underestimate the depth and speed of the water flooding over the roadway and enter the flooded road.
- Rules with high lift values are associated with fatal or injury crashes.
- Two-lane roadways with no separation are also present in several rules.
- Some suggested countermeasures: safety campaigning like "If it's Flooded, Forget it," roadway marking and other retroreflective markers in the centerline and edge line.

2-itemset Rules

Rule No.	Antecedent	Consequent	Support	Confidence	Lift
Rule_2I01	Cond=Others	DrInj=KABC	0.134	0.736	2.801
Rule_2I02	Season=Winter	CollTyp=Single	0.051	0.412	1.720
Rule_2I03	RdTyp=2-way with Sep	CollTyp=Rear End	0.105	0.507	1.601
Rule_2I04	CollTyp=Rear End	RdTyp=2-way with Sep	0.105	0.332	1.601
Rule_2I05	Age=55-64	DrInj=KABC	0.053	0.391	1.489
Rule_2I06	Age=15-24	CollTyp=Single	0.069	0.329	1.373
Rule_2I07	RdTyp=2-way with Sep	PSL=40-50	0.085	0.408	1.339
Rule_2I08	CollTyp=Single	Cond=Inattentive	0.085	0.354	1.324
Rule_2I09	Cont=Movement Prior To Crash	PSL=25-35	0.098	0.573	1.295
Rule_2I10	PSL=40-50	CollTyp=Rear End	0.123	0.402	1.269
Rule_2I11	DrInj=KABC	Cont=Violations	0.196	0.744	1.220
Rule_2I12	Cont=Violations	DrInj=KABC	0.196	0.321	1.220
Rule_2I13	Cont=Roadway Condition	DrInj=PDO	0.091	0.899	1.219
Rule_2I14	Age=25-34	Cond=Inattentive	0.079	0.323	1.210
Rule_2I15	RdTyp=2-way with Sep	Cond=Normal	0.131	0.634	1.209
Rule_2I16	CollTyp=Other	PSL=25-35	0.079	0.535	1.209
Rule_2I17	CollTyp=Right Angle	Cont=Violations	0.051	0.729	1.195
Rule_2I18	RdTyp=2-way with Sep	Int=Yes	0.077	0.373	1.195
Rule_2I19	CollTyp=Rear End	Cont=Violations	0.231	0.728	1.193
Rule_2I20	Cont=Violations	CollTyp=Rear End	0.231	0.378	1.193

3-itemset Rules

Rule No.	Antecedent	Consequent	Support	Confidence	Lift
Rule_3I01	PSL=25-35, DrInj=KABC	Cond=Others	0.076	0.605	3.313
Rule_3I02	Cont=Violations, Cond=Others	DrInj=KABC	0.099	0.829	3.156
Rule_3I03	Cond=Others, PSL=25-35	DrInj=KABC	0.076	0.800	3.044
Rule_3I04	Int=No, Cond=Others	DrInj=KABC	0.104	0.789	3.002
Rule_3I05	RdTyp=2-way no Sep., DrInj=KABC	Cond=Others	0.107	0.545	2.985
Rule_3I06	RdTyp=2-way no Sep., Cond=Others	DrInj=KABC	0.107	0.760	2.894
Rule_3I07	Int=No, DrInj=KABC	Cond=Others	0.104	0.522	2.861
Rule_3I08	CollTyp=Rear End, Season=Summer	RdTyp=2-way with Sep	0.055	0.418	2.014
Rule_3I09	RdTyp=2-way with Sep, Season=Summer	CollTyp=Rear End	0.055	0.623	1.966
Rule_3I10	Cont=Violations, RdTyp=2-way with Sep	CollTyp=Rear End	0.082	0.609	1.921
Rule_3I11	CollTyp=Single, Cont=Violations	Cond=Inattentive	0.053	0.500	1.872
Rule_3I12	RdTyp=2-way with Sep, Int=No	CollTyp=Rear End	0.073	0.562	1.773
Rule_3I13	RdTyp=2-way with Sep, Cond=Normal	CollTyp=Rear End	0.073	0.556	1.754
Rule_3I14	CollTyp=Rear End, Cont=Violations	RdTyp=2-way with Sep	0.082	0.354	1.710
Rule_3I15	CollTyp=Rear End, Cond=Normal	RdTyp=2-way with Sep	0.073	0.347	1.675
Rule_3I16	RdTyp=2-way with Sep, VehTyp=Car	CollTyp=Rear End	0.051	0.530	1.674
Rule_3I17	CollTyp=Rear End, DrInj=PDO	RdTyp=2-way with Sep	0.088	0.347	1.673
Rule_3I18	Cont=Weather, DrInj=PDO	Cond=Normal	0.054	0.841	1.605
Rule_3I19	Cont=Violations, RdTyp=2-way with Sep	PSL=40-50	0.066	0.489	1.603
Rule_3I20	Cont=Violations, Cond=Normal	CollTyp=Rear End	0.146	0.508	1.602