Predicting road accidents with real time data

WeatherSafe

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The future of road safety research

NTUA Zografou Campus, Athens
Railways Amphitheatre of the Department of Transportation Planning and Engineering
Predicting road accidents with real time data

Correlation of road accidents with high resolution traffic and weather data

Post Doctoral Research
2017-2019

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Overview of the problem

- The exploitation of **real-time traffic and weather data** to understand crash mechanism (crash risk, crash frequency, crash severity)

- Data mainly come from **loop detectors** and meteorological stations

- Identify **crash precursors**

- **Proactive safety management** on freeways and major urban arterials
Some core findings—What we know so far

- **Main risk factors**: speed variation, speed difference, average traffic flow, variations in occupancy

- **Average speed** is associated with lower risk!

- For 1 unit increase in speed, **crash risk** decreases by about 5%!

- **Weather** effects: inconsistent findings (e.g. USA vs Mediterranean countries)
Open issues

• **Data** sources, quality and aggregation

• Temporal and spatial **precision**

• Crash and non-crash cases **ratio**

• Urban arterials, rural areas need further **exploration**

• **Extreme weather** events-climate change
Methodological challenges

• Overcome **aggregation bias**

• How to select the most appropriate **control-case ratio**?

• Explore all **non-crash cases**? What methods are appropriate?

• Overcome **correlation** among variables

• How to explore **time-series** of data

• Exploit **chaos** attributes of speed (fractals)
Solutions to implement

- **Alternative data sources** (drones, video cameras) identify manoeuvres, traffic composition

- Develop non-aggregation approach (e.g. Bayes theorem)

- **Map-matching** algorithms

- **Alternative models** (firth logistic, exact logistic, bias correction methods etc.)

- **Machine learning**
Future steps and emerging challenges

• **Black box** in vehicles (manoeuvres, difference between vehicle speed and average speed) or mobile app

• Detailed **spatio-temporal** information on crashes (GPS-police officers)

• **Autonomous vehicles**. How could this change real-time safety evaluation?

• **Big data** - Exploit mass information. More dynamic safety screening
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