



#### National Technical University of Athens Road Safety Observatory



# Modelling crash modification factors globally

### Katerina Deliali

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Together with: George Yannis, Anastasios Dragomanovits, Alexandra Laiou, Katerina Folla, Dimitris Nikolaou, Ourania Basta



### The i-safemodels project

> Title:

International Comparative Analyses of Road Traffic Safety Statistics and Safety Modeling

- > Partners:
  - NTUA Department of Transportation Planning & Engineering (<u>www.nrso.ntua.gr</u>)
  - OSeven Telematics (<u>www.oseven.io</u>)
  - Tongji University (<u>https://en.tongji.edu.cn</u>)
  - Third country partners: University of Central Florida (US), Purdue University (US), Loughborough University (UK), German Aerospace Center, DE
- Duration of the project:
   36 months (October 2019 October 2021)
- Operational Programme:

"Competitiveness, Entrepreneurship and Innovation" (EPAnEK) of the National Strategic Reference Framework (NSRF): Greece - China Joint R&D Projects









European Union European Regional Development Fund







ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

EPANEK 2014-2020 OPERATIONAL PROGRAMME COMPETITIVENESS•ENTREPRENEURSHIP•INNOVATION





# Background

- Linking of road safety indicators and road safety outcomes at a global level is a challenging research question that involves various levels, pillars, and modelling relationships.
- At a more microscopic level, Accident Prediction Models (APMs), including Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) are essential tools for transport decision makers, to quantitatively predict crashes, analyze injury severity, identify hotspots, and assess safety countermeasures.
- There is imperative need for international scientific cooperation at both macroscopic and microscopic level to fully understand crash risk factors and identify respective countermeasures.



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### **Objective & Research Questions**

### > Objective:

Propose international comparative analyses of road traffic safety statistics and safety modeling at both macroscopic (e.g., country, region) and microscopic level (roadway segments/ sites)

#### Research Questions:

- Which are the factors that mostly influence crash frequency and severity at macroscopic and at microscopic level, and how can this influence be modeled?
- How can hazardous locations be best identified, and appropriate countermeasures selected?
- Can accident prediction models be effectively transferred to conditions different from the ones they were developed for (e.g., in other countries)?





#### Methodological Challenges (1/2) Fatalities per population i-SafeModels Global Road Safety Platform Fatalities per population Methodological Challenges

#### Extensive reviews of international literature on:

- risk factors and safety countermeasures (WP1)
- macroscopic road safety modelling (WP2)
- meso-/microscopic road safety modelling (WP3)
- identification & treatment of hazardous locations (WP4)
- safety prediction models transferability (WP5)

#### Road safety data collection and management:

- macroscopic indicators (internationally),
- microscopic data (Greece): detailed crash data, traffic volumes, traffic synthesis, road geometry
- smartphone data (Greece and internationally)

#### Online data platform development: "i-SafeModels Global Road Safety Platform"

### Available at: <u>www.nrso.ntua.gr/i-safemodels/</u>

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### Methodological Challenges (2/2)

#### Model development

- macroscopic (aggregate data, e.g., at country level)
- meso/ microscopic (roadway geometry and traffic data)
- hazardous locations identification

#### > Advanced statistical techniques

besides traditional regression models, such as:

- propensity score matching,
- cusp catastrophe model, etc.

### Transferability assessment

Do the developed models perform adequately in different conditions (e.g. in other countries)?





### Model Development

#### Macroscopic models

Analyze crashes at aggregate spatial levels (e.g. country, region, census block) with demographic, socio-economic, built environment, traffic attributes, roadway characteristics and other safety related indicators

#### Microscopic models

- Identify relations between road crashes and injuries, and road infrastructure characteristics and traffic
- Focus on Elefsina-Korinthos-Patra Motorway (data provided by Olympia Odos SA)
- Parallel use of smartphone app data (OSeven Telematics)

#### Hazardous locations

Methods for identification and methods for selection of treatments

#### Transferability assessment

Comparative assessment of prediction performance of transferred models vs. locally developed models





## Scientific and Social Impact

- Consideration of road safety on a global level
  - Address knowledge gaps in the generalization of road safety research results
- Improvement of decision-making practices
  - Development of models to be used as quantitative tools in decision making
  - More effective exploitation of available funds for road safety, e.g., selection of more promising countermeasures
- Reduction of road casualties
  - Improved road infrastructure safety management





### **Future Challenges**

- Enhance the integration of accident prediction modeling techniques at various levels (macro-, meso-, and micro-scopic) to enable advanced road safety modelling internationally.
- Improve road safety data collection and management in Greece, particularly at the microscopic level.
- Encourage Road Authorities and Operators to use Accident Prediction Models as a decisionmaking tool for road safety.





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