Modelling crash modification factors globally

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Together with:
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The i-safemodels project

- **Title:**
  International Comparative Analyses of Road Traffic Safety Statistics and Safety Modeling

- **Partners:**
  - NTUA Department of Transportation Planning & Engineering (www.nrso.ntua.gr)
  - OSeven Telematics (www.oseven.io)
  - Tongji University (https://en.tongji.edu.cn)
  - 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
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.
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)

- 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: www.nrso.ntua.gr/i-safemodels/
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 decision-making tool for road safety.
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