



National Technical University of Athens  
Road Safety Observatory [www.nrso.ntua.gr](http://www.nrso.ntua.gr)

Workshop:  
**Digitalisation  
and Road Safety  
Research**

Friday  
**17**  
May  
2019  
at 14:00

**FIFTH UNITED NATIONS GLOBAL ROAD  
SAFETY WEEK**

6-12 May 2019



**Save Lives**

**# SpeakUp**

# Driver-vehicle-environment interactions and safety tolerance

iDREAMS

## Virginia Petraki

Transportation Engineer, Research Assistant

Together with:  
George Yannis

# The i-DREAMS project

## ➤ 13 Project partners:

- **National Technical University of Athens**

Universiteit Hasselt, Loughborough University, Technische Universität München, Kuratorium für Verkehrssicherheit, Delft University of Technology, University of Maribor, OSeven Telematics, DriveSimSolutions, CardioID Technologies, European Transport Safety Council, POLIS Network, Barraqueiro Transportes S.A.

## ➤ Duration of the project:

- 36 months (May 2019 – May 2022)

## ➤ Framework Program:

- Horizon 2020 - The EU Union Framework Programme for Research and Innovation – Mobility for Growth



Virginia Petraki, Driver-vehicle-environment interactions and safety tolerance - i-DREAMS



# Background

- Rapid steps in **transport automation** transform the operator/vehicle/environment interactions, and require **increased understanding** of the operator **human factors**
- Definition, development, testing and validation of a context-aware '**Safety Tolerance Zone**' through:
  - measurement of **risk-related, driver-related** and **driving environment** indicators
  - implementation **safety** and **driver comfort** related **interventions**





# Research Questions

- Which are the critical vehicle and operator state characteristics to **evaluate coping capacity**?
- How does task complexity **influence** coping capacity and vice-versa in safety critical events?
- Which task and coping capacity characteristics can identify **safety risk**?
- Under which conditions are **interventions** mitigating safety critical events?
- Is there a difference in the performance of interventions **between different countries**?
- How can active and passive interventions be evaluated in **real-time**?



# Methodological Challenges

## ➤ Analysis of risk factors

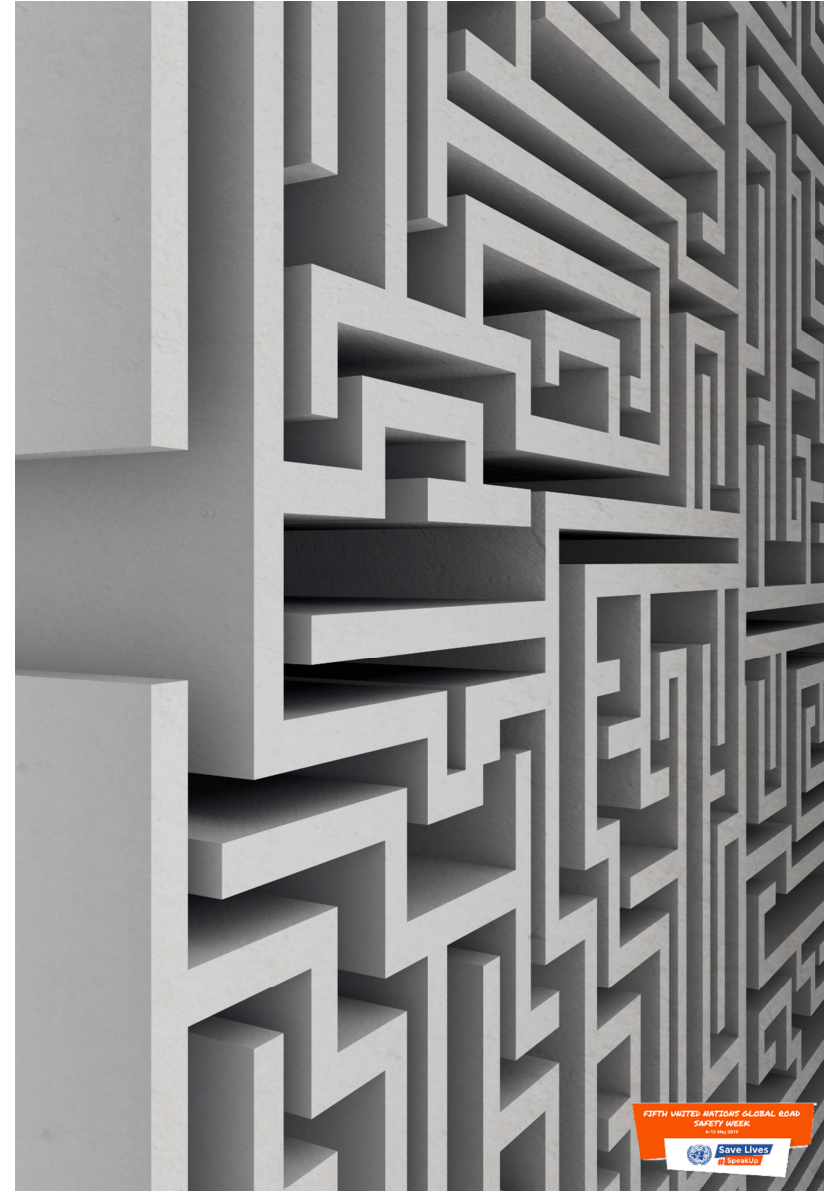
- Identification of safety-relevant relationships and contexts from the data
- Assessment and prediction of risk

## ➤ Recruitment of 600 operators for the experiment

- 4-stage 5-country experiment across 4 transport modes (car, bus, truck, train)
- Requirements for big data handling and processing

## ➤ Intervention selection and testing

- Real-time effectiveness on driving behaviour (safety critical events, near misses etc.) and driver state (where relevant)



# The i-Dreams Experiment

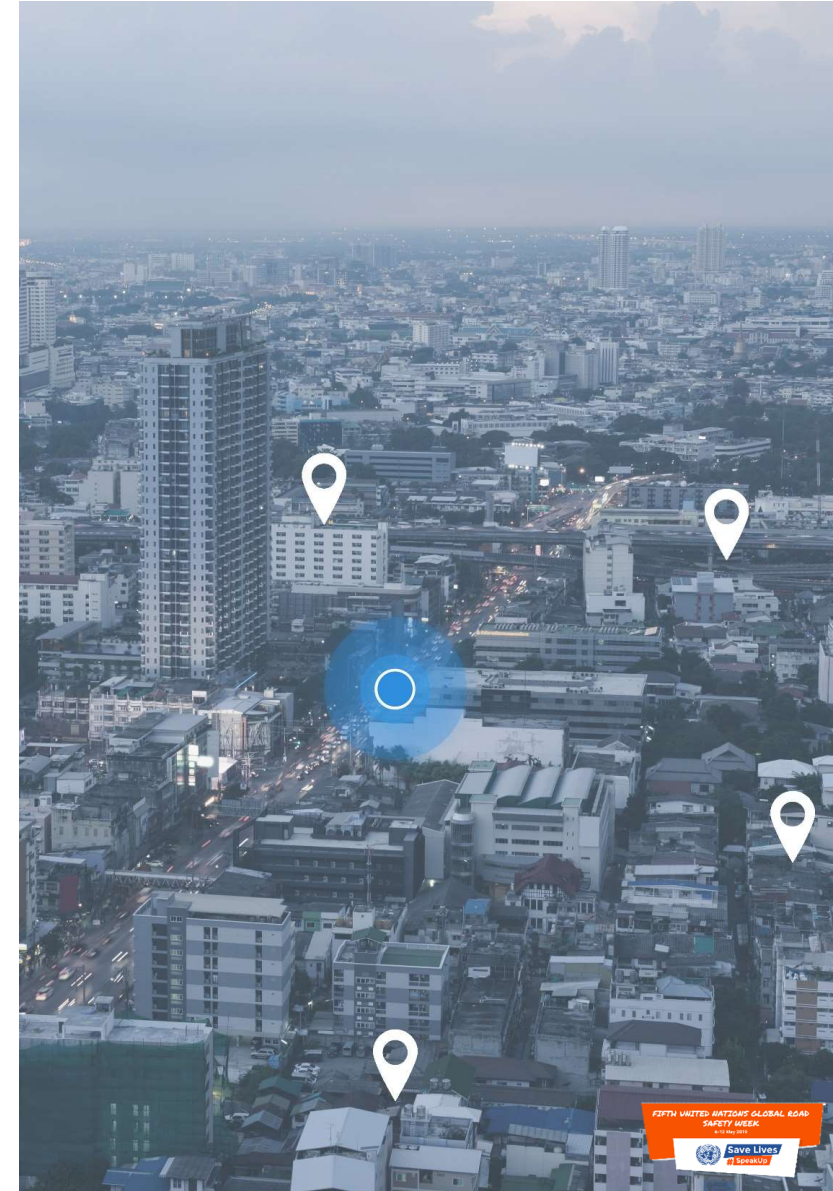
- A 600-operator experiment
  - 12 Months
  - 5 countries (BE,EL,DE,UK,PT)
  - 4 Modes (Car, Bus, Truck, Train)
  - 4 stages (Simulator, Pilot field trial, Baseline field trial, Field trial with interventions)
- Personalized in-vehicle interventions and post-trip feedback interventions
- Highly detailed data recording using:
  - OBD II device
  - Smartphones
  - CardioWheel
  - Mobileye





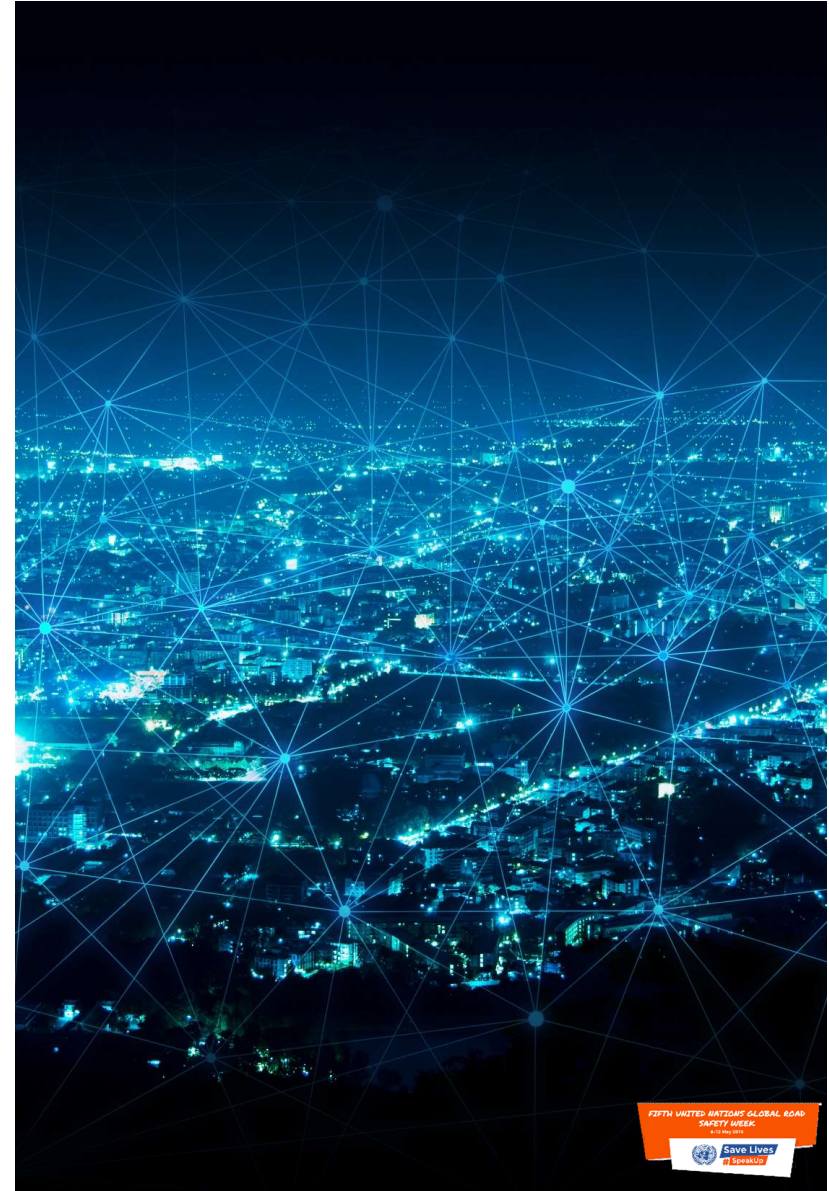
# The “Safety Tolerance Zone”

- Raw **time-series** sensor data and driver background data are transformed into **indicators**
- Indicators are used for a **multi-dimensional assessment** of driving context and crash risk prediction
- Appropriate intervention actions (real-time or post-trip) take place to **recall** driver back into a **safe area** if needed



# Impacts

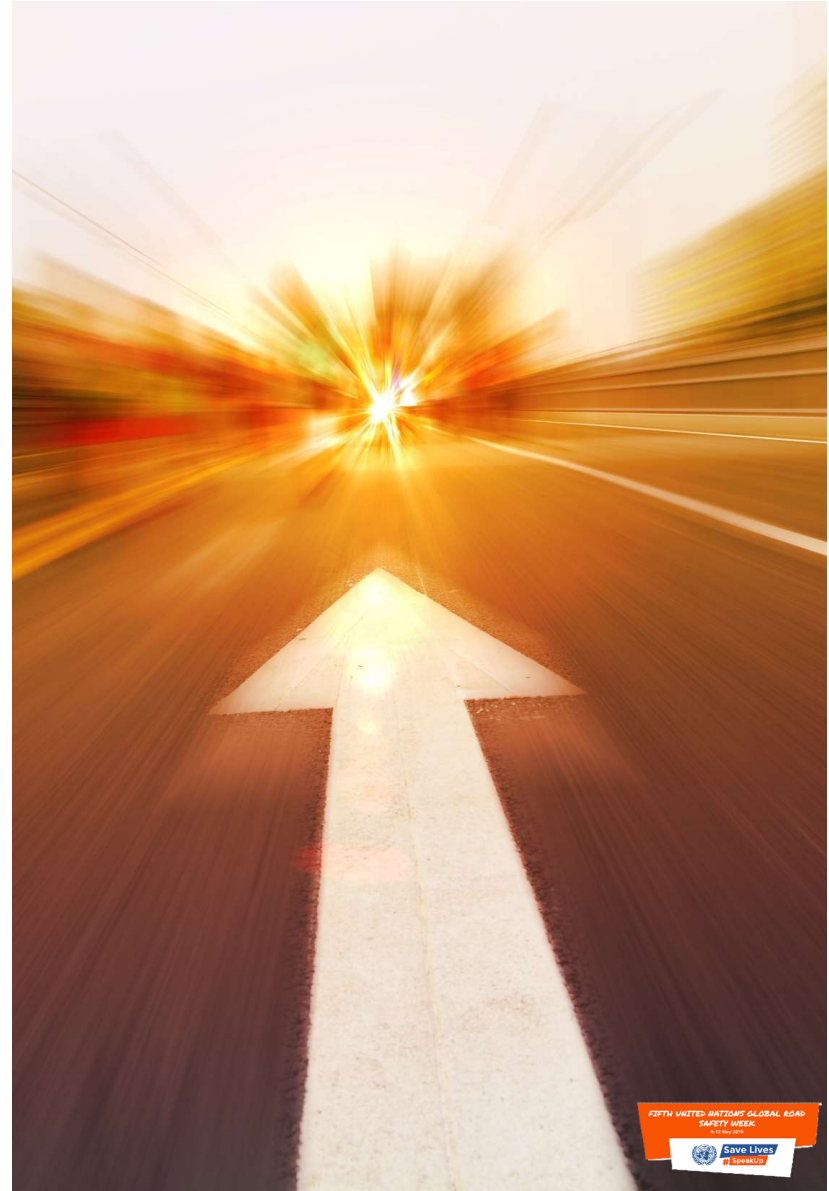
- A significant step towards a **safer transport system** by taking advantage of increasing automation
- **Enhanced road safety** for a diverse demographic by increasing consideration of human factors within designs and transport operation means
- Improved **selection and training** of operators
- Enhanced **international cooperation** concerning human factors in traffic safety





# Future Challenges

- **Expansion of the safety tolerance zone** to other modes and users (PTWs, Cyclists, Pedestrians)
- **Enhancement of data collection approach** with more sensors due to rapid technological advancement
- Modification of safety tolerance zone for **higher automation vehicles**
- **Privacy, security and ethical clearance** of the data utilized for operator monitoring





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