

Data fusion of traffic, behavior & infrastructure for holistic driver assistance - IVORY

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**Artificial Intelligence
for Road Safety and Mobility Workshop**

8th UN Global Road Safety Week

Athens, 15 May 2025



DECADE OF ACTION FOR
ROAD SAFETY
2021 - 2030



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The IVORY project



➤ IVORY:



"AI for Vision Zero in Road Safety"
ivory-network.eu

➤ Partners:

- 4 Universities
- 8 Non-academic partners
- 13 Associated Partners
- 10 Countries

➤ Duration of the project:

48 months (November 2023 – October 2027)

➤ Framework Program:

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101119590



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the European Union



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PhD Goals



- To exploit multi-parametric data for the creation of **a holistic AI framework** for road safety-related driver evaluations
- Define appropriate **traffic, behavior** and **infrastructure** parameters
- **Final Goal:** A functional AI framework to be integrated into telematics-based applications



Data Collection



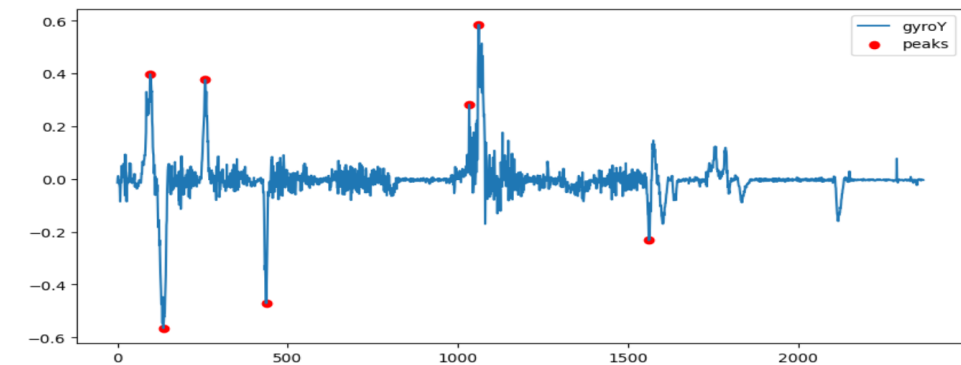
- OSeven Telematics data from **drivers' smartphones**
 - GPS speed
 - Accelerometer data
 - Gyroscope data
- Infrastructure data from **OpenStreetMap**
 - Speed limit
 - Number of lanes
 - Length
- Traffic data
 - **TomTom** API and other related sources



Harsh Cornering Case (1/2)



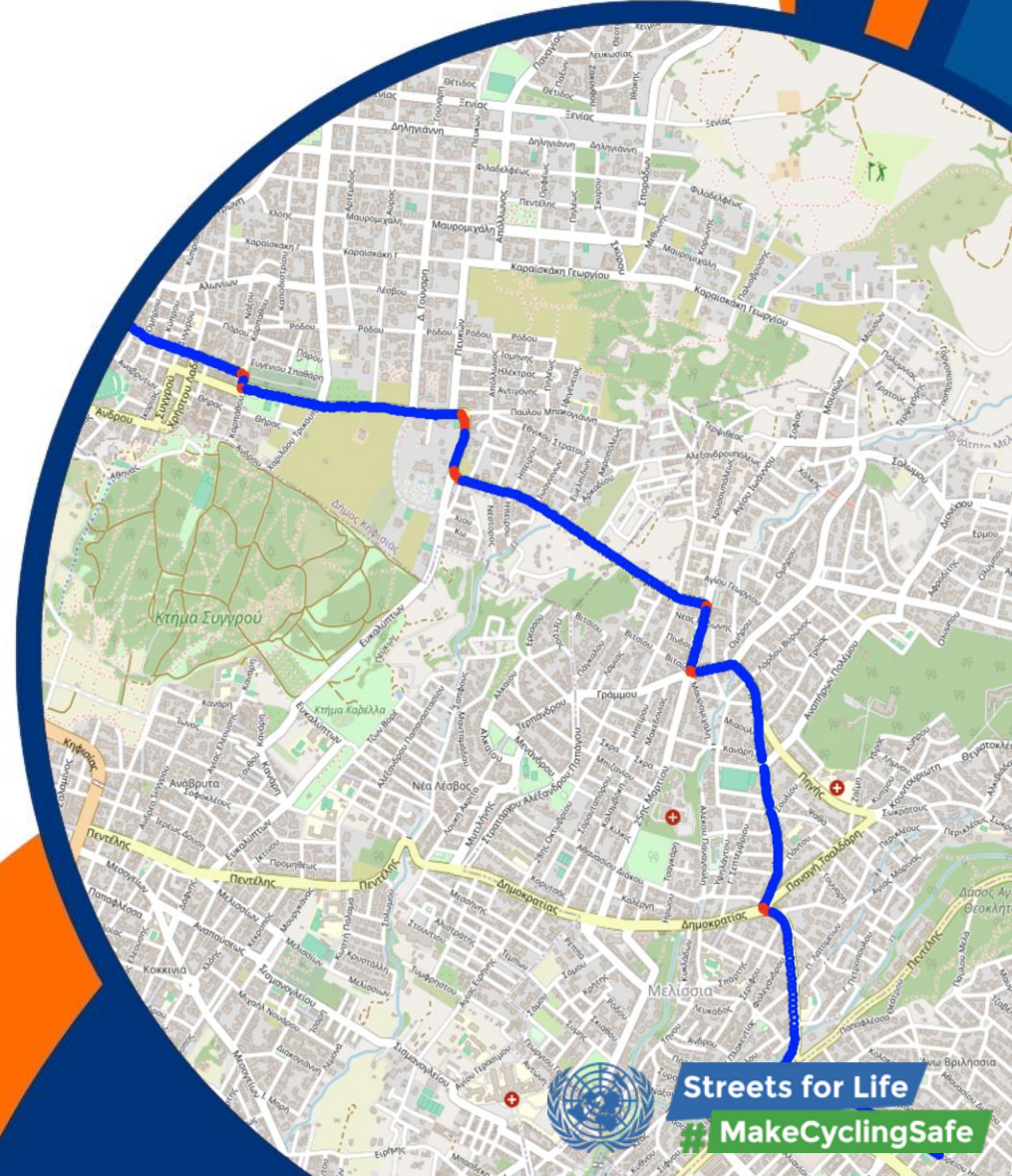
- Defining a new surrogate measure in our framework: **harsh cornering event**
- Definition: **high-lateral-acceleration** turn indicating aggressive or unsafe cornering behavior
- Developed a solution for detecting harsh cornering events using telematics data from a **mounted** smartphone



Harsh Cornering Case (2/2)



- Developing a solution for detecting harsh cornering events tailored for **OSeven's** telematics data
- Identified harsh events as those that have a **deviation** from typical cornering events patterns
- **Unsupervised** Anomaly Detection across diverse driving environments
- Integrate **infrastructure** data (speed limits, intersections) into the pipeline



Discussion



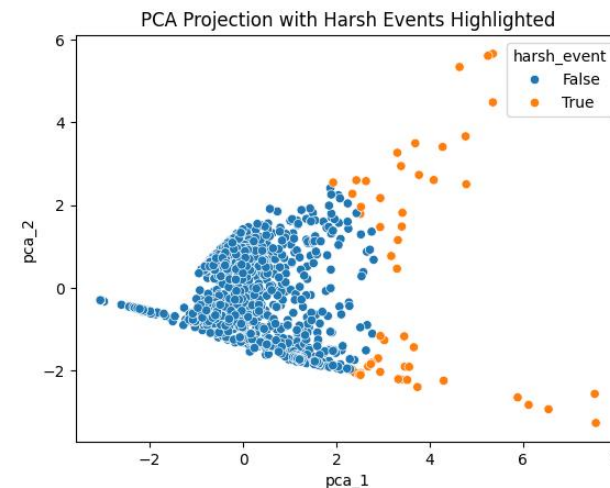
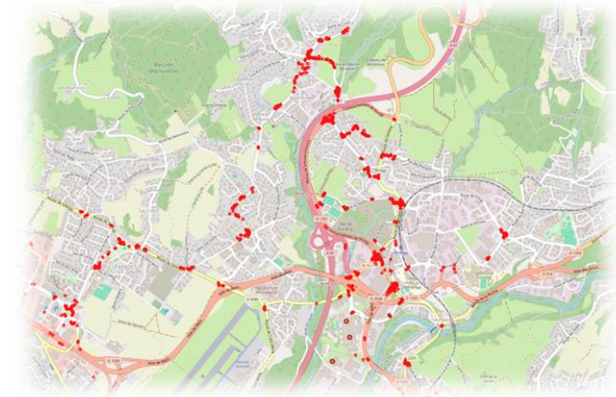
- Smartphones can vary in **orientation** during driving, making it harder to interpret the sensor data
- The use of **unsupervised learning** eliminates the need for large labeled datasets
- Harsh cornering can serve as a **surrogate safety indicator** for aggressive driving behaviors and help reduce vehicle rollovers



Results So Far



- **Calibration method** to map mobile phone's coordinates to the vehicle's coordinates system
- Achieved an accuracy of **84%** on detecting harsh cornering events with a mounted mobile device
- Implemented an **unsupervised method** to define harsh cornering events



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- The research output will deliver a new **AI framework** to enable better driver behavior, reducing the risk of severe crashes overall
- Advancing **UN SDG Target 3.6** and **Vision Zero** by developing scalable AI framework for multi-level road safety
- The implemented holistic framework will be tested in **real conditions** and **new networks** to ensure **global road safety** improvements



Scientific and Social Impact



- Detecting **harsh events** contributes to more accurate profiling of driver aggressiveness and responsiveness, essential for adaptive driver assistance systems (ADAS)
- Provides a **measurable indicator** for evaluating strategies and the effectiveness of road design on reducing dangerous driving patterns.
- Insurers will gain from data-driven risk assessments, enabling fairer premiums and encouraging **proactive safety measures**



Future Challenges



- Addressing **ethical concerns** in the development and deployment of AI for road safety
- Balancing the integration of AI with **data protection standards** and **ethical considerations**
- Ensuring the developed AI framework is **scalable** and **adaptable** across diverse regions and road systems



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