HADRIAN

Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

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Artificial Intelligence for Road Safety and Mobility Workshop

8th UN Global Road Safety Week

Athens, 15 May 2025

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The HADRIAN project

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- **HADRIAN**:

  "Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs"
  hadrianproject.eu

- **Partners:**

  16 partners from 9 EU countries involving National Technical University of Athens

- **Duration of the project**:

  42 months (December 2019 - May 2023)

- **Framework Program**:

  This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875597

Co-funded by the European Union

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Background

- The HADRIAN project investigated and defined the driver role for automated vehicles using a holistic user centered approach that addresses shortcomings of current development and design processes to achieve high impact and wide-reaching acceptance of automated vehicles.
- Consortium performed 22 empirical studies in driving simulators across Europe and Turkey with overall 863 participants.
- Demonstrated HADRIAN innovations on test tracks and open road environment.

Driving Simulators

Demonstrators

Objectives

- NTUA led and contributed in accomplishing a holistic Safety and Impact Assessment.
- The purpose of this Assessment was to evaluate the improvements achieved through the HADRIAN Human-Machine Interfaces (HMIs).
- An "HADRIAN-tailored" safety and impact assessment methodology was developed using special Key Performance Indicators (KPIs) as a basis.
- Special focus was given to Take-Over Requests (TORs) and transitions between AD levels.

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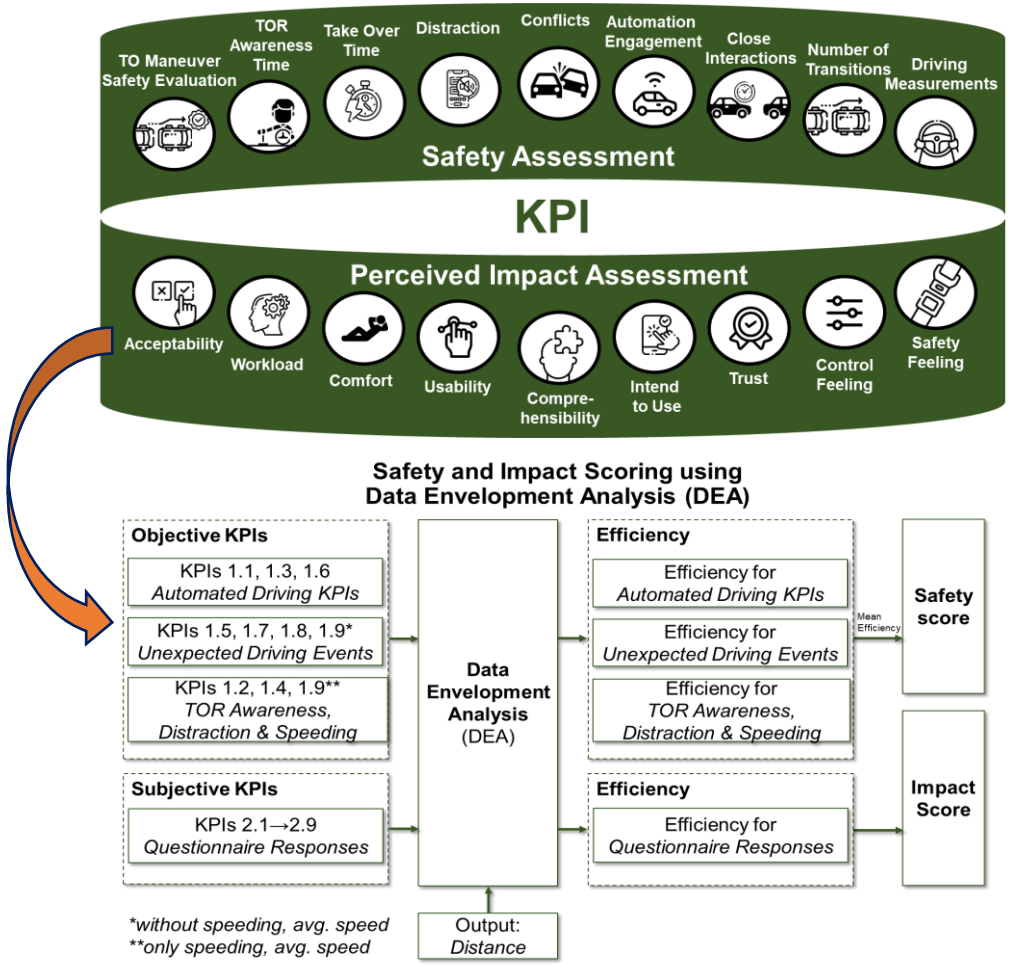
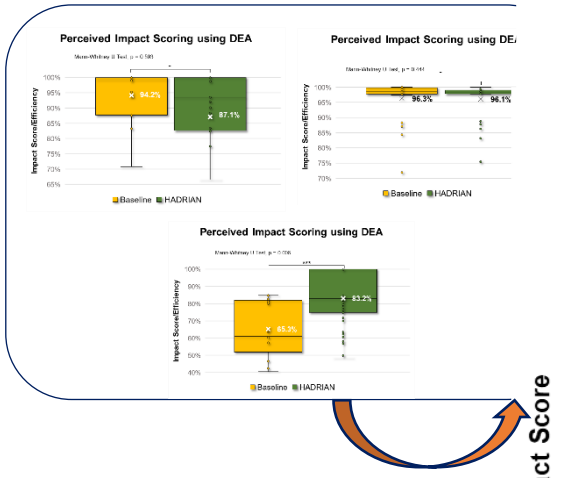
Assessment Method

- This KPI-based assessment consists of:
  - 9 KPIs related to safety and driving performance
  - 9 KPIs related to the impact on the drivers' perspectives
- The KPIs were estimated through driving, eye-tracking metrics, and subjective measurements obtained during the HADRIAN simulator studies.
- Data Envelopment Analysis (DEA) was applied to obtain scores based on KPIs for both the "Baseline" and HADRIAN HMIs.



Results

- The DEA scores of overall safety and perceived impact applied on 225 observations of 3 studies and are presented in boxplots:
  - The HADRIAN overall weighted safety score was improved by 3.40% compared to baseline HMI.
  - The HADRIAN safety score was revealed to have a statistically significant higher safety performance.
  - The overall weighted perceived impact score was improved by 3.46% with the HADRIAN HMI.



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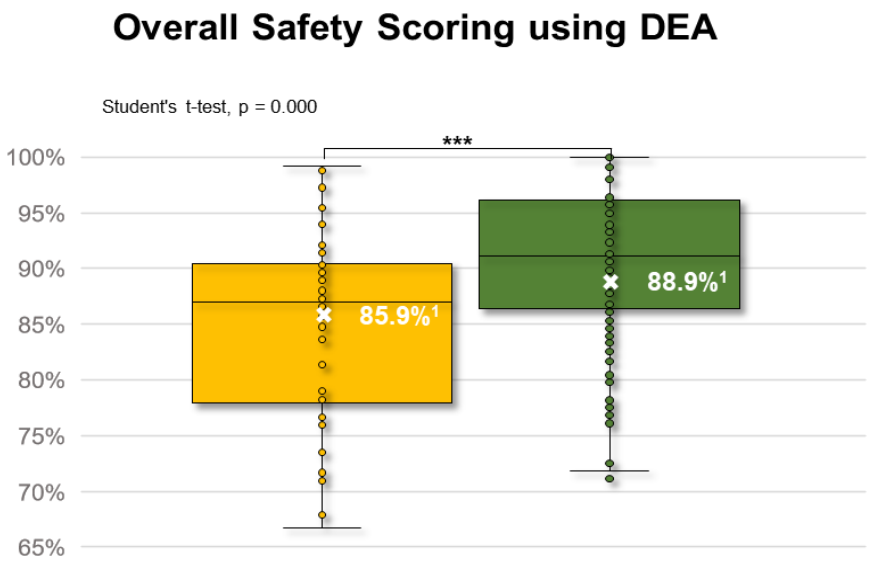

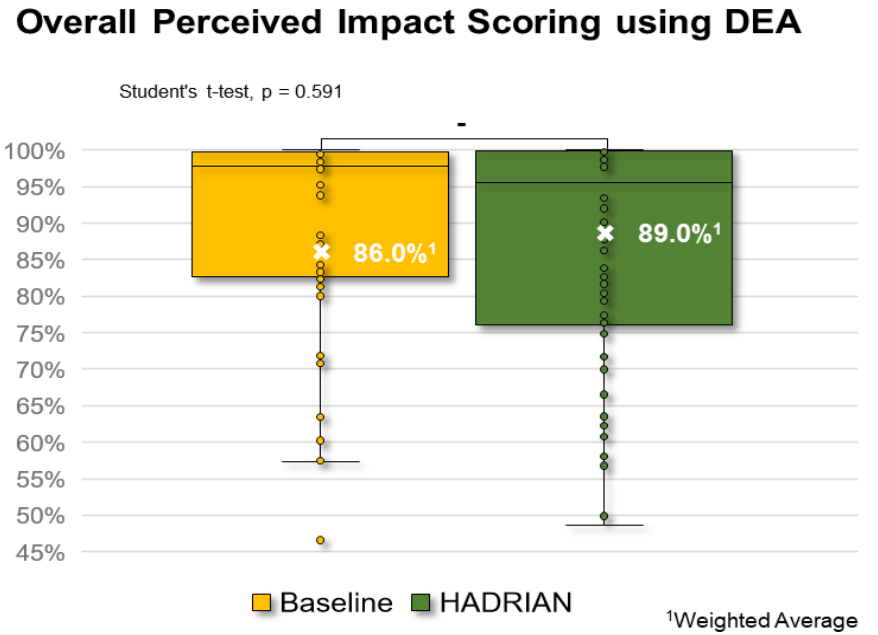

[1]Weighted Average

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- **Safety and impact assessment** of emerging AD systems can guide and optimize future urban road safety efforts.
- **Human-centered design** in AD development, such as the innovations introduced by HADRIAN, can foster more intuitive, safe, and user-friendly autonomous driving experiences in cities.
- HADRIAN contributes to shaping **clear safety policies** by providing evidence-based guidelines and recommendations for AV manufacturers, regulators, and policymakers, ensuring the responsible deployment of automated driving technologies.

Marios Sekadakis, The HADRIAN project

Scientific and Social Impact

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- Contributed to the understanding and evaluation of safe human-machine interactions in highly automated driving, with a focus on controlled and safe transitions between automation levels.
- Provided safety and impact assessment methods that can be adopted by HMI and AD stakeholders to evaluate both objective safety and perceived user interaction with various HMI configurations.
- Supported the Vision Zero goal by promoting human-centered automated driving development aimed at reducing road crashes and minimizing human error.

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Future Challenges

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- Establishing concrete guidelines and regulations for integrating human-centered design and interaction into autonomous vehicles to enhance driving safety.
- Developing smart and safe vehicles capable of adapting to the complexity and dynamics of real-world traffic environments.
- Placing special emphasis on transitions between automation levels, with adaptability to the driver's state.
- Investigating road infrastructure and smart communication systems to support drivers during automation level transitions.

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