

National Technical University of Athens
Road Safety Observatory

Online
workshop
in the framework of

6TH UN GLOBAL ROAD SAFETY WEEK
17 - 23 May 2021



Streets for Life



Thursday
20 May
2021

Love30

Innovation in Road Safety Research

Driver needs and behavior in automated traffic

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Associate Professor

Together with:
Foteini Orfanou, George Yannis



The Drive2theFuture project

- **Full project name:**
Needs, wants and behaviour of "Drivers" and automated vehicle users today and into the future
- **Partners:**
31 participants from 13 countries
- **Duration of the project:**
36 months (May 2019 – April 2022)
- **Operational Program:**
H2020 "Smart, Green and Integrated Transport" Work programme 2018-2020MG-3.3-2018: "Driver" behaviour and acceptance of connected, cooperative and automated transport; Research and Innovation Action (RIA)

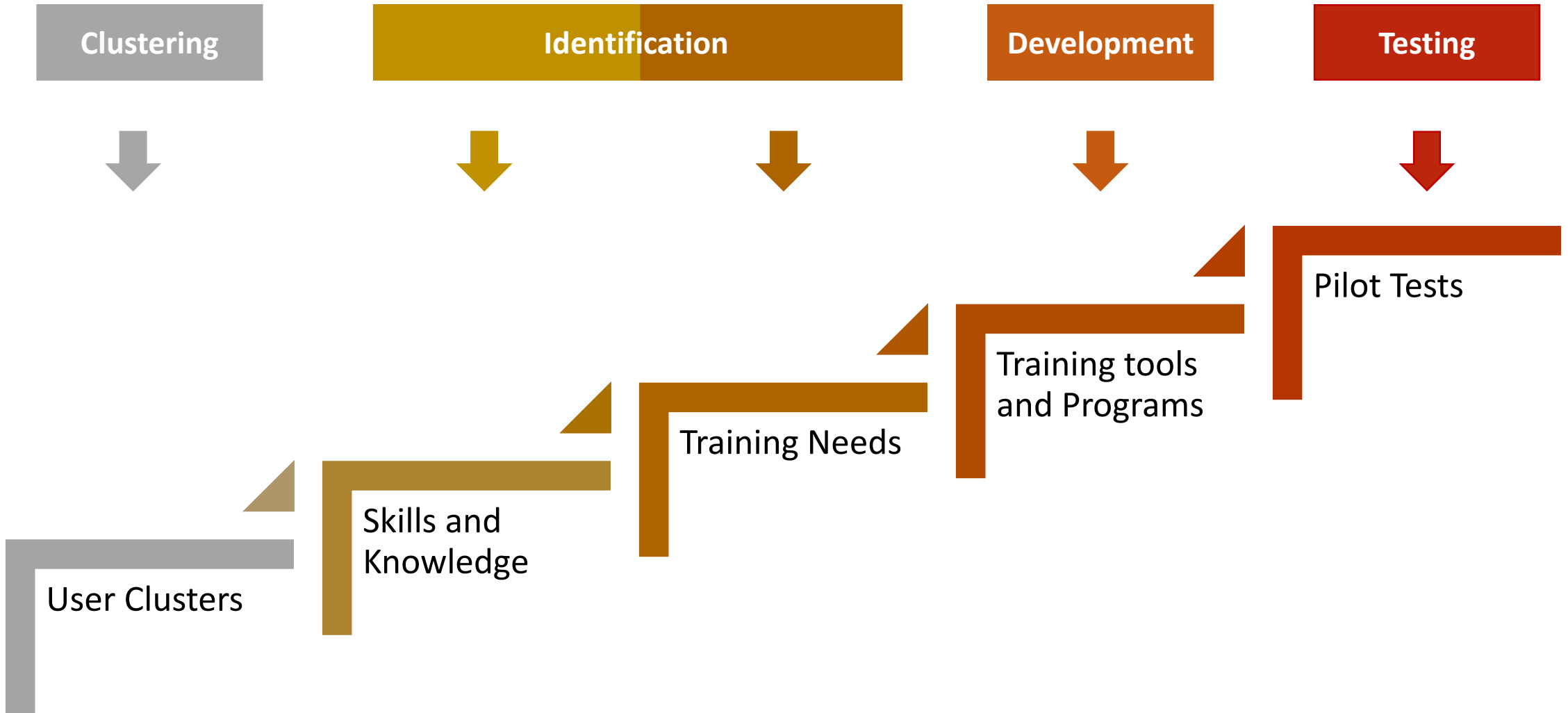


Background

- Automation brings **revolution** to the transportation systems
- **All transport modes** are moving towards the era of automation
- **Penetration rate** of autonomous vehicles depends on:
 - **User acceptance**
 - **HMI compliance to user needs**
 - **Safe behavior and interaction with other road users**
 - **Efficient training of AV operators**

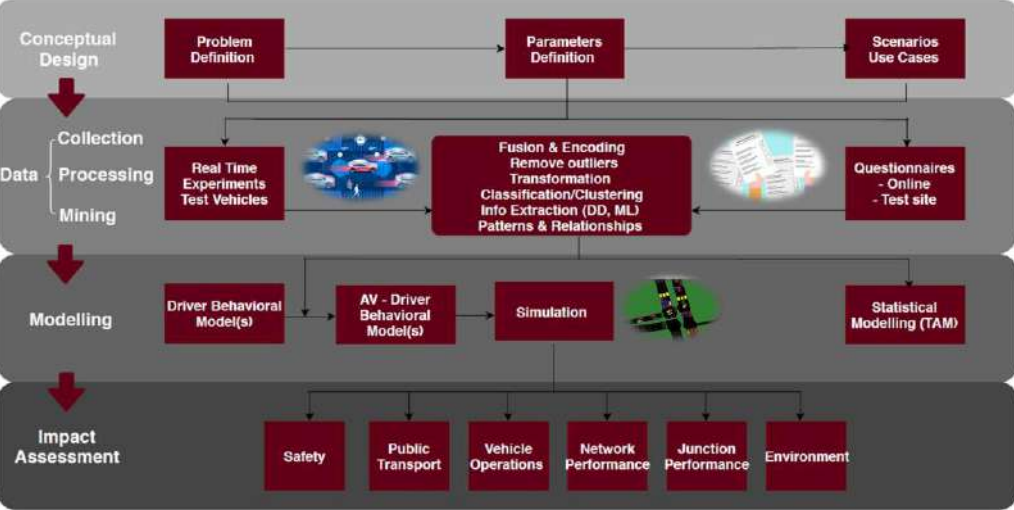


From skills to training programs

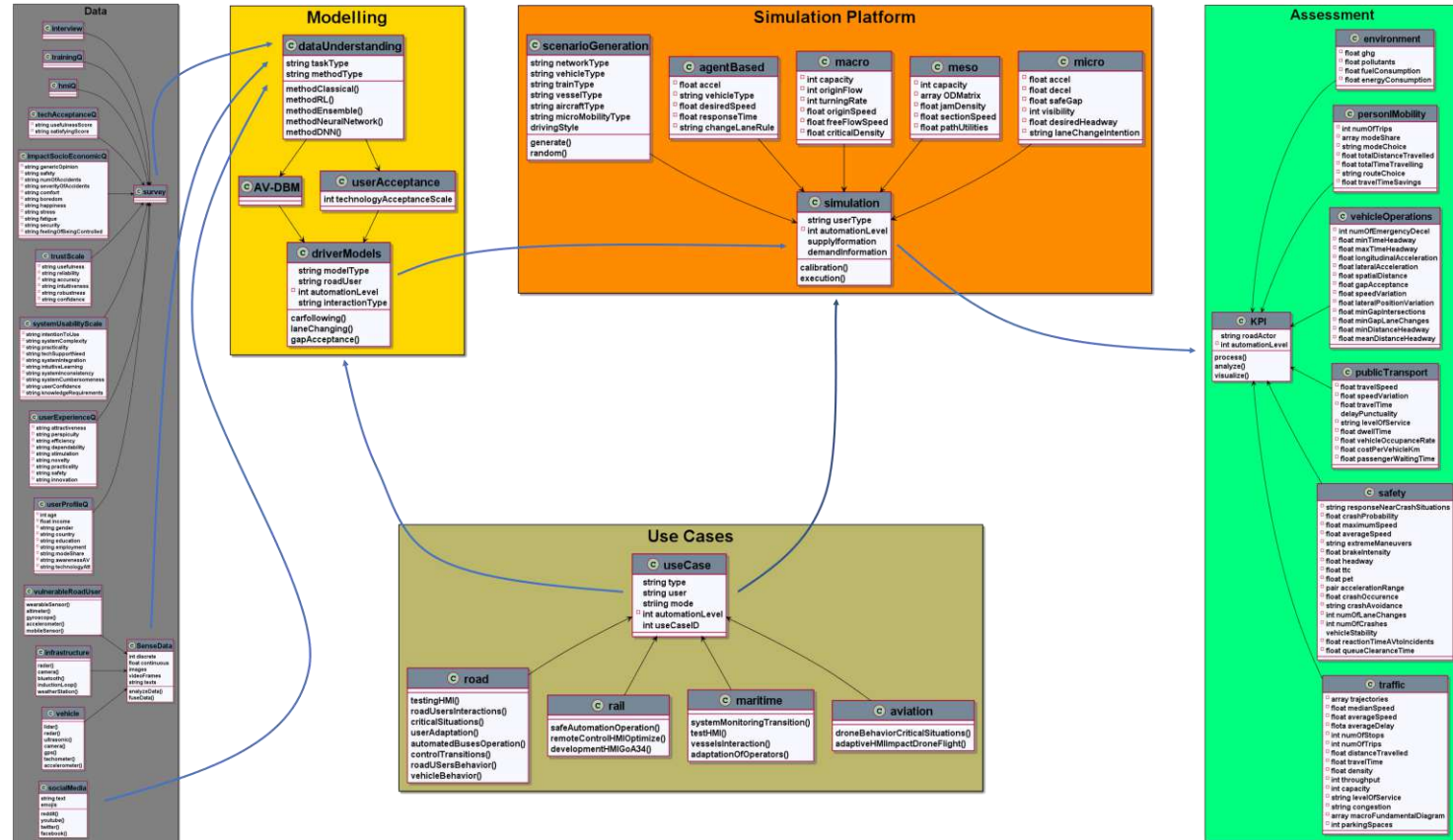


Modeling and Impact Assessment

Methodological framework



Platform

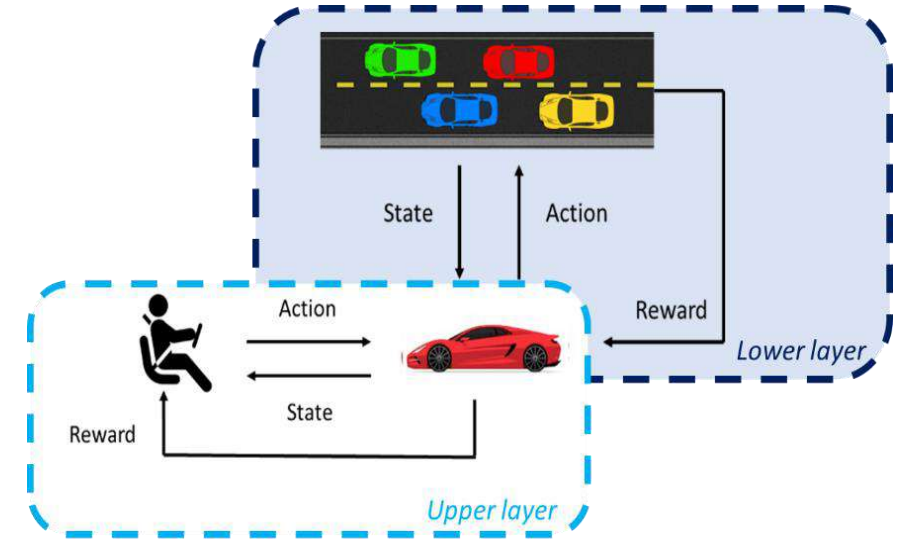


Behavioral Traffic Modelling

- Two- layer microscopic AV behavioral model
 - **Upper layer**: interaction between the driver/user and the vehicle
 - **Lower layer**: interaction of the vehicle with the road environment

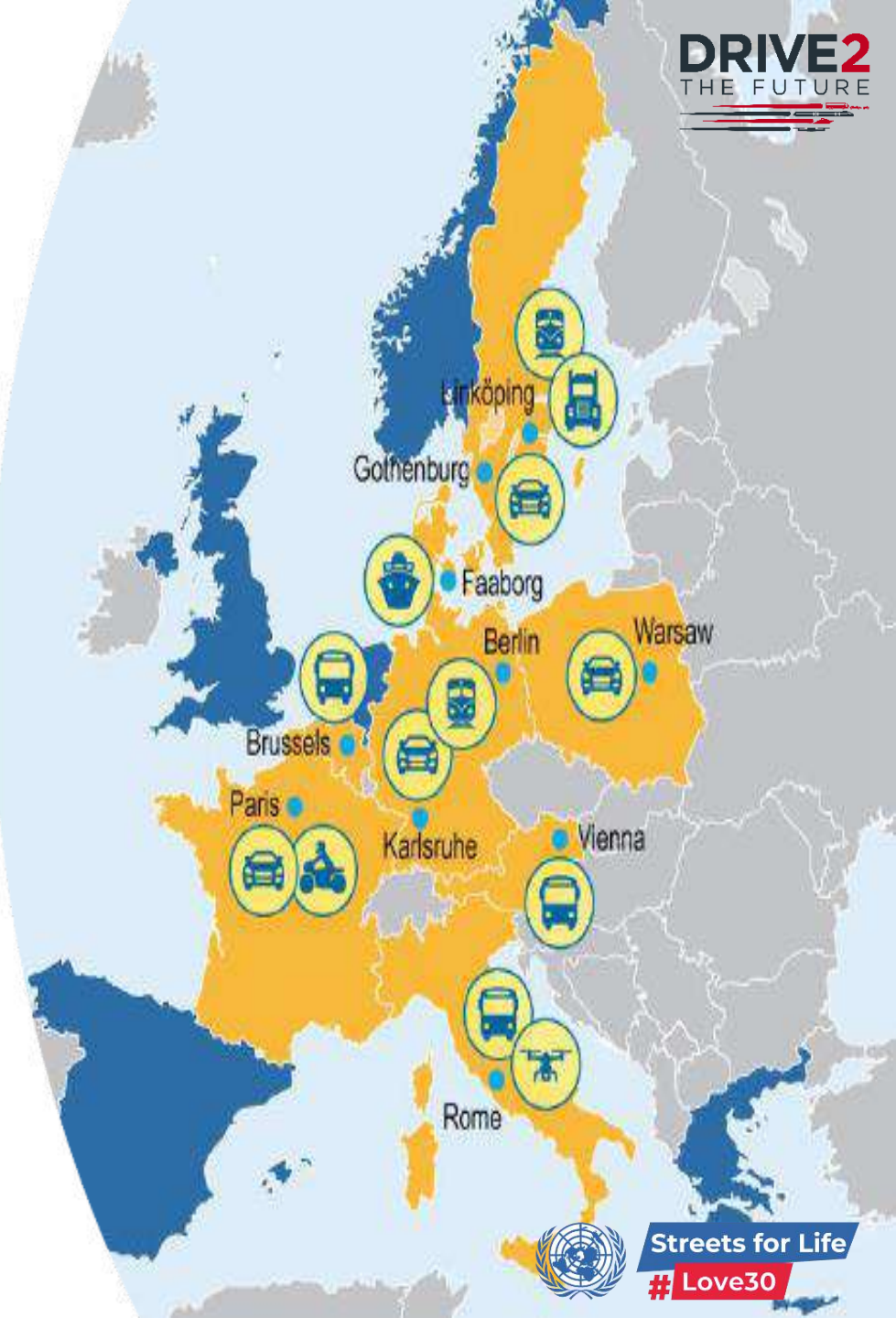
- Interaction between vehicle and the surrounding traffic:
 - **Reinforcement learning algorithm**
 - Real **human driving trajectories** collected via unmanned aerial vehicles (drones) in urban environment (city of Athens)
 - Quantification of **safe driving profiles** parameters

- Interaction between vehicle and pedestrian:
 - **Inverse Reinforcement Learning algorithm**
 - **Automated** vehicle (Level 3) and pedestrian
 - Data collected from **virtual experiment** (FZI pilot in Germany)



Pilots

- Development of **3 pilot phases**:
 - Phase I: Setting the scene
 - Phase II: Iterative development, verification and optimization, initial demonstrations
 - Phase III: Final, wide-scale demonstrations and training pilots across Europe
- Development of HMIs tested during the pilots
- **All transportation sectors and modes**
- Interaction with **non equipped vehicles** and **vulnerable road users**
- **Different levels of automation**
- **Assessment** of AV's behavior and experience of the users and the participants
 - User surveys – Questionnaires, Interviews
 - Direct observations
 - Sentiment Analysis



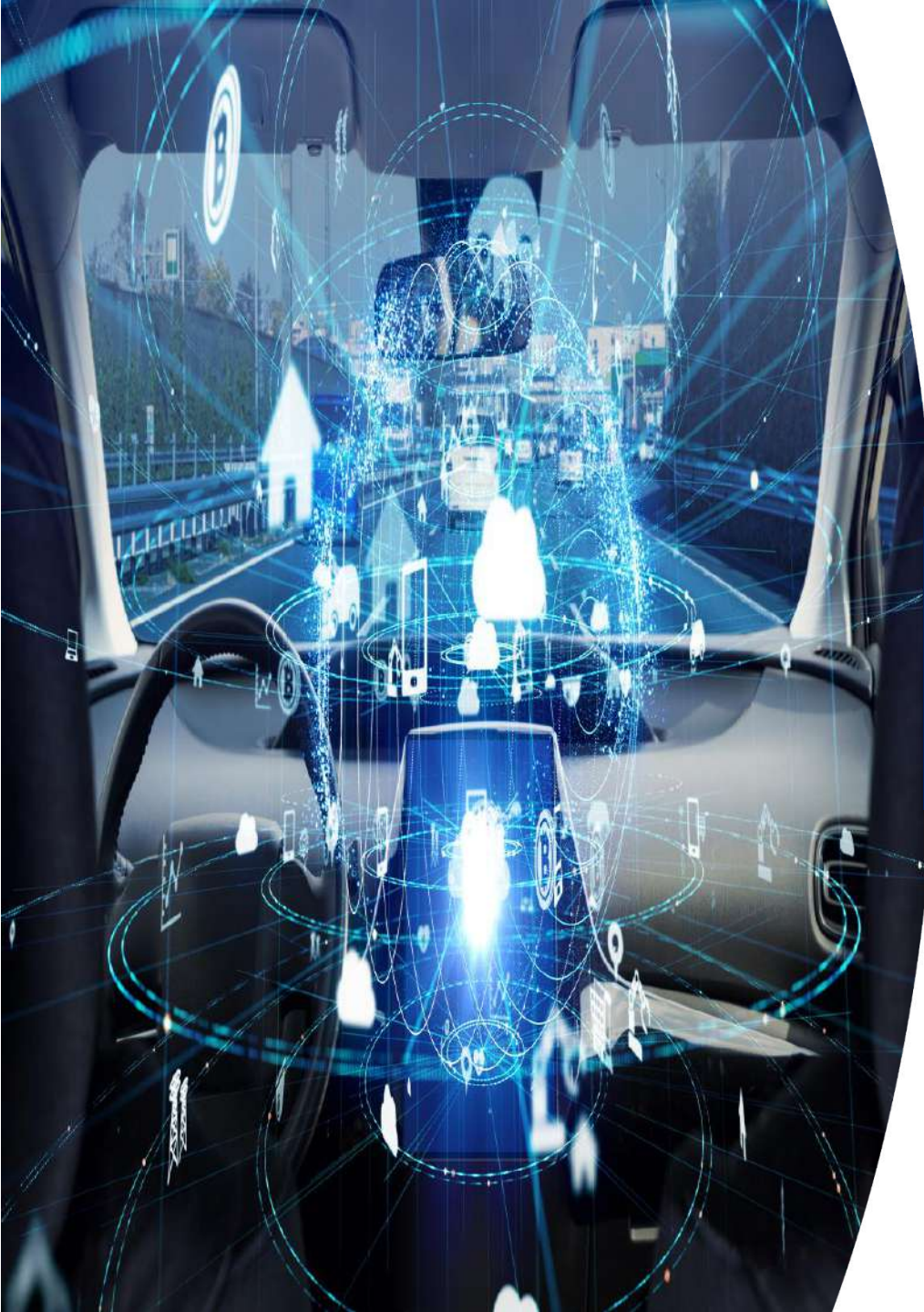
Scientific and Social Impact

- **Humanizing AVs** through the formulation of safe and accepted driving profiles during the interaction with other road users
- Development of a **complete simulation suite**, incorporating a number of innovative tools
- Development of **HMI toolkit**, including a variety of tools → a **holistic solution for HMI** development tested in the pilots
- Identification of **skills and knowledge** for an AV operation result in designing targeted **training programs** for all sectors and modes
- Raise **public acceptance and market take up** of automation services based on the pilot outcomes

Future Challenges

- Enhanced **AV behavioral models** to include diverse roadway conditions and driving profiles
- **Extension** of the models and simulation from passenger cars to **other transport modes**
- Development of **HMI**s capable of handling any **emergency situation**
- Personalized **training programs** for all modes targeted to different users.
- Improved **pilot tests** for autonomous transportation
 - Larger testing period and network coverage
 - Participation of many different user classes





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DRIVE²
THE FUTURE