

# PhD in in Mechanical Engineering

## Research Title: Human factors in Automated Vehicles

<b>Funded by</b>	DIMEAS/Ateneo fondi CRT
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<b>Context of the research activity</b>	<p>The role of human drivers is one of the main challenges when discussing automated vehicles (AV's). Up to Level 4 automation, human drivers will have to operate the vehicle in conditions not supported by the automation, and will be expected (Level 4), or even required (Levels 2 and 3) to resume manual control when needed. Although it is feasible to deploy conditional automated driving vehicles, the expectation that a human driver can remain alert and rapidly regain situational awareness following a request by the system is unrealistic. Vehicle automation negatively affects mental workload and situation awareness. As a result, perception-reaction time increases as the level of automation increases.</p> <p>Within this context, human factor research in autonomous vehicle aims at several goals. First, to define the acceptance criteria of human drivers regarding the automated driving functionalities and to ensure drivers' situation awareness and well-being when not driving (i.e., no motion sickness). Second, to determine the individual capabilities of human drivers when using AVs and in turn to ensure safety while</p>
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	<p>changing driving modes in different driving scenarios. Third, to provide design solutions regarding the interfaces installed in AVs and their interaction with the human drivers. Finally, to investigate the interaction and communication between AVs and conventional cars and other road users.</p>
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<p><b>Objectives</b></p>	<p>The PhD will build on the knowledge of different research teams to make a step forward into the broad domain of human factors in automated vehicles.</p> <p>Vibrational comfort is essential to ensure the driver’s awareness and reaction times in all driving scenarios. However, drivers, who never suffer from motion sickness while driving, might be susceptible to motion sickness, when riding as passengers in automated cars, due to the lack of controllability on the vehicle in addition to sensory conflicts.</p> <p>The recent research points out that a customisable solution could be the only viable solution to mitigate motion sickness, due to the large variability among individuals in anthropometric, physical as well as physiological traits. Indicated framework of research include three main components that the PhD will investigate:</p> <ul style="list-style-type: none"> <li>- a passenger-centric component which registers the human physiological state,</li> <li>- a vehicle-centric component to register vehicle state and adjust in-car environment.</li> <li>- the HMI system with smart AV apps to enable passengers to understand and to predict the vehicle’s intentions and to feel comfortable and safe.</li> </ul> <p>A potential leap forward will consider looking at design solutions, which may include the statistical clustering of personal characteristics for several potential drivers as ride-sharing companies are preparing to release shared AVs onto public roadways.</p>
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<p><b>Skills and competencies for the development of the activity</b></p>	<p>The candidate needs to possess specific skills in:</p> <ul style="list-style-type: none"> <li>- vehicle architecture</li> <li>- vehicle system dynamics</li> <li>- human factors</li> <li>- human machine interfaces</li> <li>- sensing technologies for time monitoring of vehicle performance and human-vehicle interaction</li> </ul>
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- statistical tools for data clustering and data depth analysis

Required competencies:

- critical thinking and research oriented problem solving,
- ability to work in team as well as to self-manage work
- good oral and written communications in English