



49<sup>th</sup>  
CIECA Congress  
Trondheim 2017  
c/ieca 7-10 June

**Future challenges in driver instructor education with increased automation in cars**

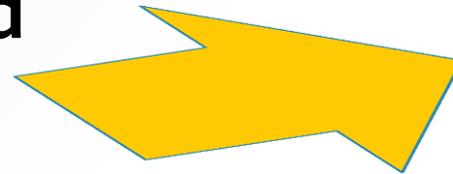
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# Nord University Road Traffic Section

- A separate training unit that teaches university students and driving license aspirants





**Future challenges in driver instructor education  
with increased automation in cars**

**Do we really need to hurry to  
find answers to the challenges  
that may exist?**



# Why do we see an accelerating development in automotive driver support technology?



- Available technology in the market
- Accelerating change
- Reduce accidents
- Market
- Reduce driver failure

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1970

1980

2000

2013

2020?

2040?

| SAE level   | Name                          | Narrative Definition   | Execution of Steering and Acceleration/Deceleration | Monitoring of Driving Environment | Fallback Performance of Dynamic Driving Task | System Capability (Driving Modes) |
|---|-------------------------------|--|---|-----------------------------------|--|-----------------------------------|
| <b>Human driver monitors the driving environment</b>                        |                               |  |   |                                   |  |                                   |
| <b>0</b>  | <b>No Automation</b>          | the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems   | Human driver  | Human driver                      | Human driver                                 | n/a                               |
| <b>1</b>  | <b>Driver Assistance</b>      | the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>           | Human driver and system                             | Human driver                      | Human driver                                 | Some driving modes                |
| <b>2</b>  | <b>Partial Automation</b>     | the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i> | <b>System</b>                                       | Human driver                      | Human driver                                 | Some driving modes                |
| <b>Automated driving system ("system") monitors the driving environment</b> |                               |  |   |                                   |  |                                   |
| <b>3</b>  | <b>Conditional Automation</b> | the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>  | System  | <b>System</b>                     | Human driver                                 | Some driving modes                |
| <b>4</b>  | <b>High Automation</b>        | the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>   | System  | System                            | <b>System</b>                                | Some driving modes                |
| <b>5</b>  | <b>Full Automation</b>        | the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>  | System  | System                            | System                                       | <b>All driving modes</b>          |

**Hands off**

**Eyes off**

**Brain off**

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It is no longer a question of whether it will be possible to have AVs on public roads, but rather a question of how, when, and under which conditions.

...driver training programs may have to be modified to ensure that humans are capable of using AVs.

Concluding remarks in "A Human Factors Perspective on Automated Driving." Kyriakidis (2017)

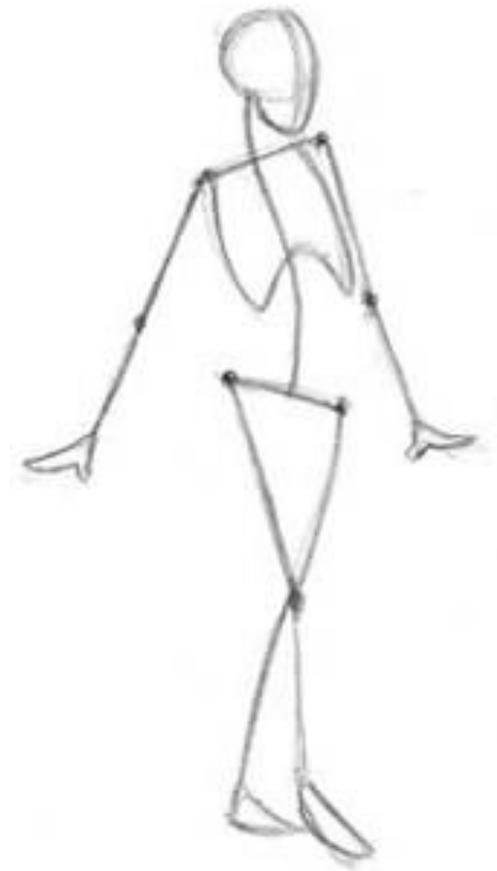


Humans may misuse, disuse, and abuse automation technology, .....humans tend to be poor supervisors of automation.

Parasuraman & Riley (1997)



For long-term successful deployment of the AVs all the relevant stakeholders including the automotive industry, research institutes, policy makers, and governmental bodies should work together to facilitate a safe deployment of AVs, not only taking technology into account but also the human factors and the end user's perspective.  
(Concluding remarks in "A Human Factors Perspective on Automated Driving." Kyriakidis) (2017)



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- The role of human drivers is one of the main challenges when discussing automated driving vehicles.
  - In vehicles where human drivers are expected to intervene, the human has to be both a driver and a supervisor.
- Marjan Hagenzieker cited in "A Human Factors Perspective on Automated Driving." Kyriakidis (2017)
- In addition, research should assist in redesigning the current driver training programs. On the one hand, the new programs have to ensure that human drivers are always capable of performing the driving task. On the other hand, they must instruct human drivers how to supervise automation, and to maintain their supervisory skills.



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## Questions to be asked in future traffic teaching could be:

- Cars with only basic equipment or with the most updated technology?
- Different cars with large varieties in regard to degree of automation and driver support technology?
- Which degree of technology would give the best learning outcome?
- How the technology development could affect the testing of driver skills?
- What kind of skills are optimal for drivers in regard of technology updates?
- Competence level and skills needed for driver instructors?
- How to use and keep updated on the new technology when they become a licensed driver?

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Do we really need to hurry to find answers to the challenges that exist?

# Probably yes!