Content

- Background
- Levels of automation explained
- The development of automated vehicles
- Human factors
- Accidents
- Research activities at SINTEF

Automation of transport

The transport sector is undergoing radical changes based on the possibilities of using new technologies, with the digitalization and automation of ever-increasing transport solutions and services.

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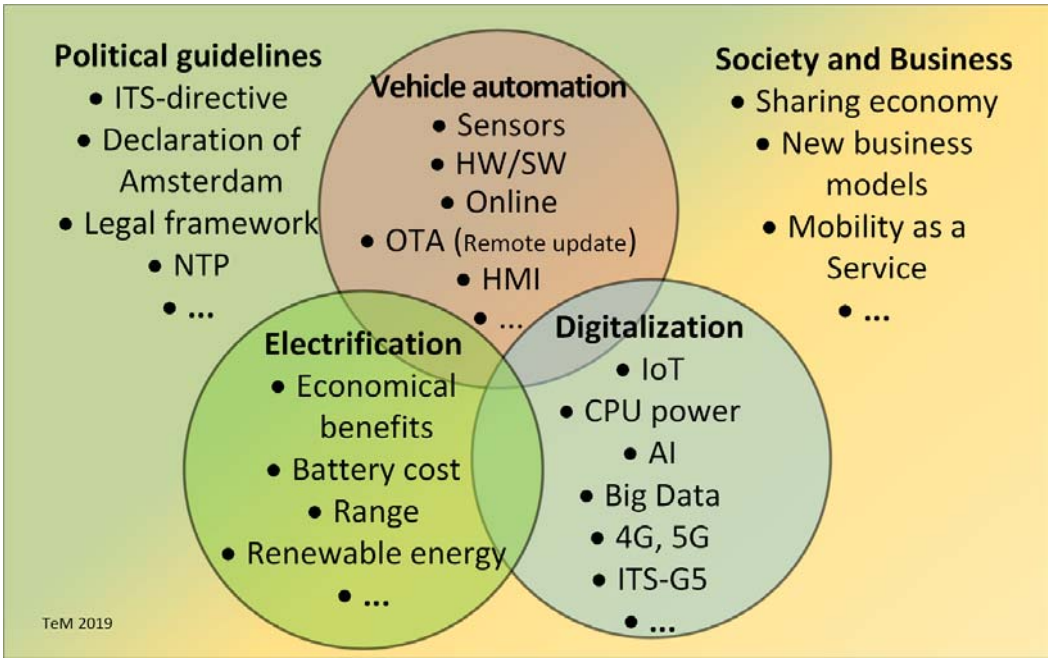
Trends and Drivers



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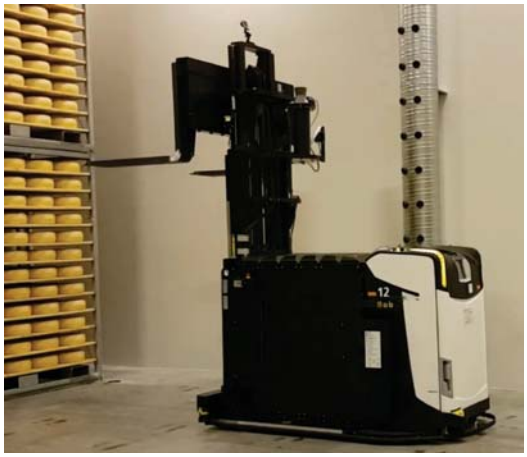
AGVs (Automated guided vehicles) in hospitals and industry

Source: St. Olavs Hospital, Trondheim



Source: TINE Jæren

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AGVs on harbours

Picture from the harbour of Rotterdam

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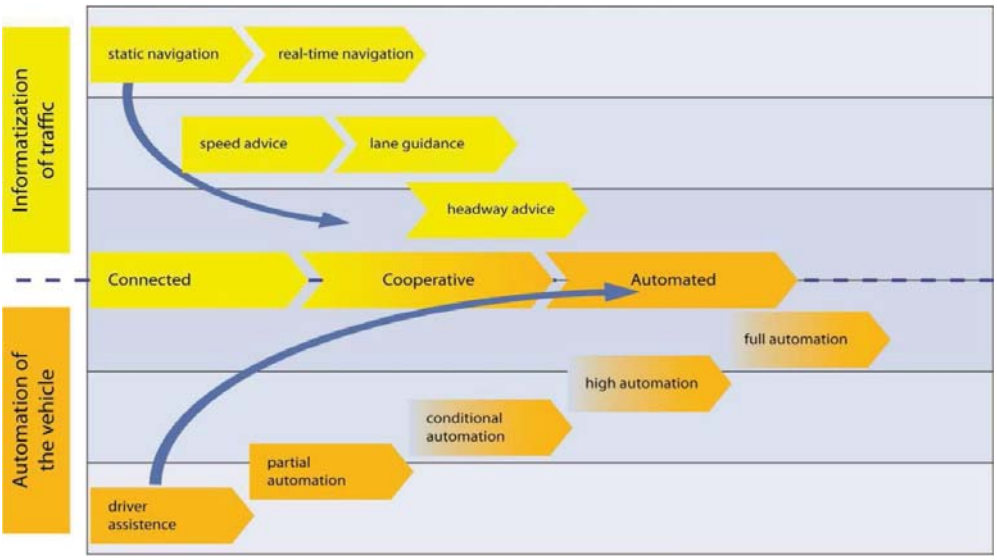
Declaration of Amsterdam of 2016:

Connected, cooperative and automated driving developments should come together to harvest societal benefits



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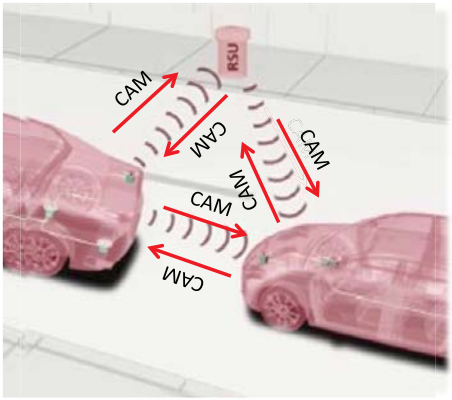
Vehicles communicates with each other and the infrastructure

Cooperative Awareness Message (CAM)



CAM specification (ETSI 302 637-2) focus on CAM being transmitted by all vehicles

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SAE J3016, JUNE 2018

Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles

På norsk: **Konsept, terminologi og klassifiseringen av systemer for automatisert kjøring med motorkjøretøyer på veg**

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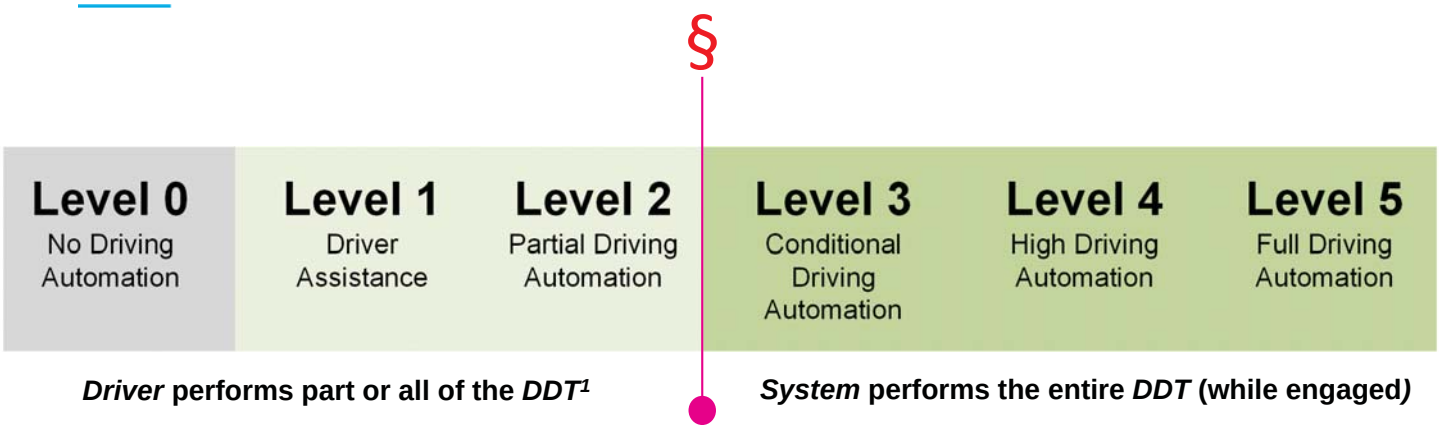
SAE J3016, Levels of Automation



1) DDT: Dynamic Driving Task - driving the vehicle

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What does the human in the seat have to do?

Source: SAE J3016, JUN2018

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What do these features do?

Source: SAE J3016, JUN2018

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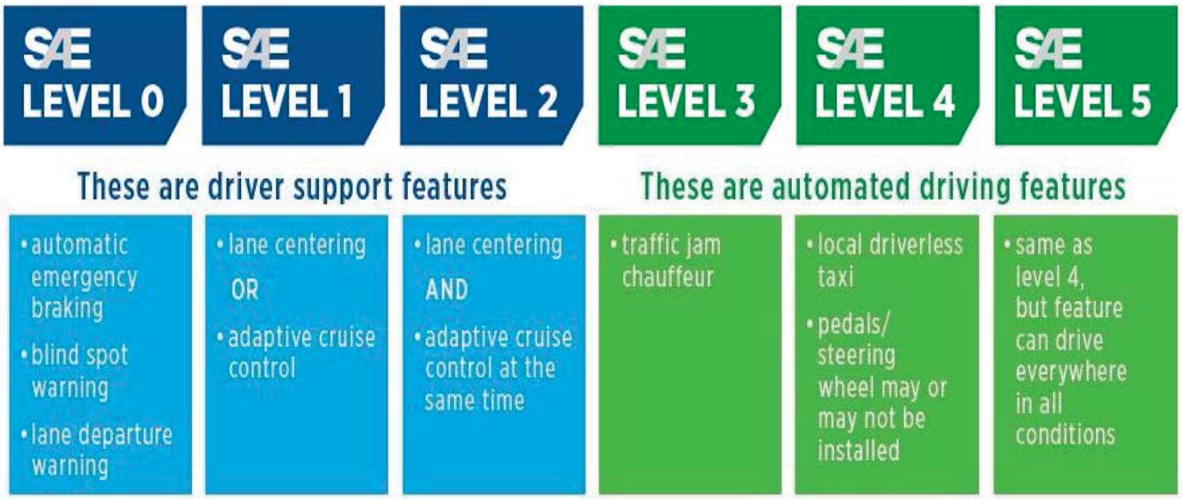
Example features



Source: SAE J3016, JUN2018

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User roles while a driving automation system is engaged

	No *Driving Automation*	**Engaged Level of *Driving Automation***				
	0	**1**	**2**	**3**	**4**	**5**
In-*vehicle user*	*Driver*			*DDT fallback-ready user*	*Passenger*	
Remote *User*	*Remote Driver*			*DDT fallback-ready user*	*Driverless operation dispatcher*	

Source: SAE J3016, JUN2018

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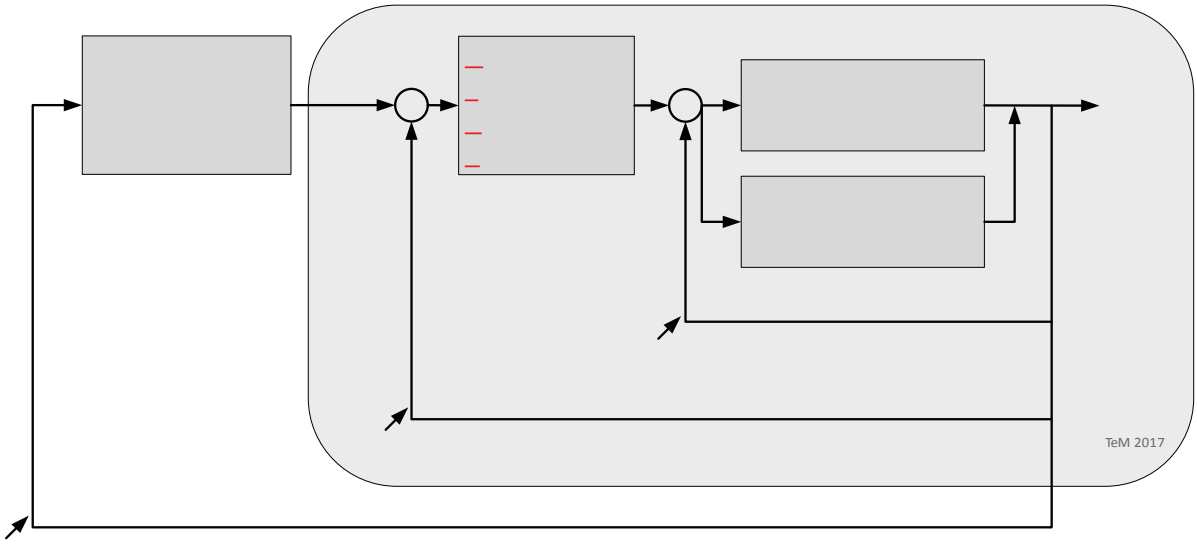
Dynamic Driving Task (DDT)



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SAE J3016, Operational Design Domain (ODD)
På norsk: **Funksjonelt virkeområde**

Operating conditions under which a given driving automation system or feature thereof is specifically designed to function

including, but not limited to:

- ❖Environmental
- ❖Geographical
- ❖Time-of-day restrictions
- ❖and/or the requisite presence or absence of certain traffic or roadway characteristics
- ❖Speed limitations

Two development directions for passenger transport

- Shuttlebuses for the first and last mile transport and for circle services. Constructed for Level 4, but aiming for Level 5.

- Cars that evolves from Level 0 to Level 5

Two development directions for trucks

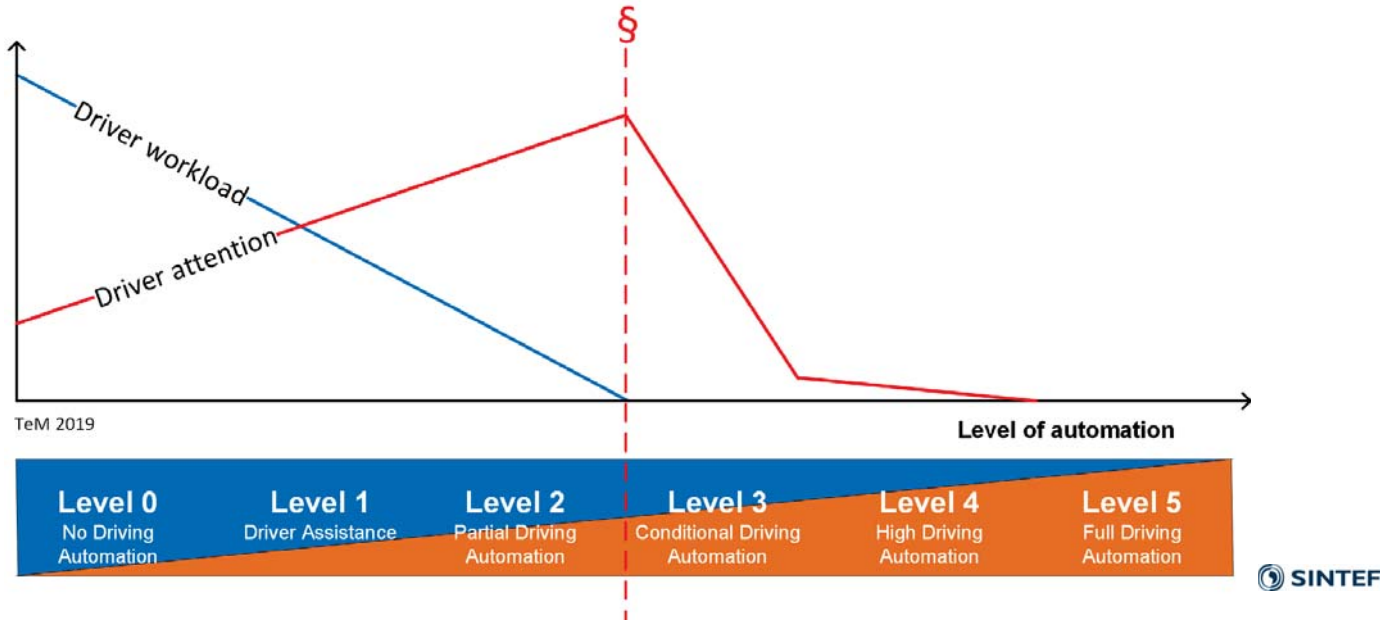
- Trucks originally designed for Level 4

Picture: Einride

- Trucks that evolves from Level 0 to Level 5

Picture: Henrik Sandsjö, Chalmers University of Technolog

Levels of automation and Human Factors



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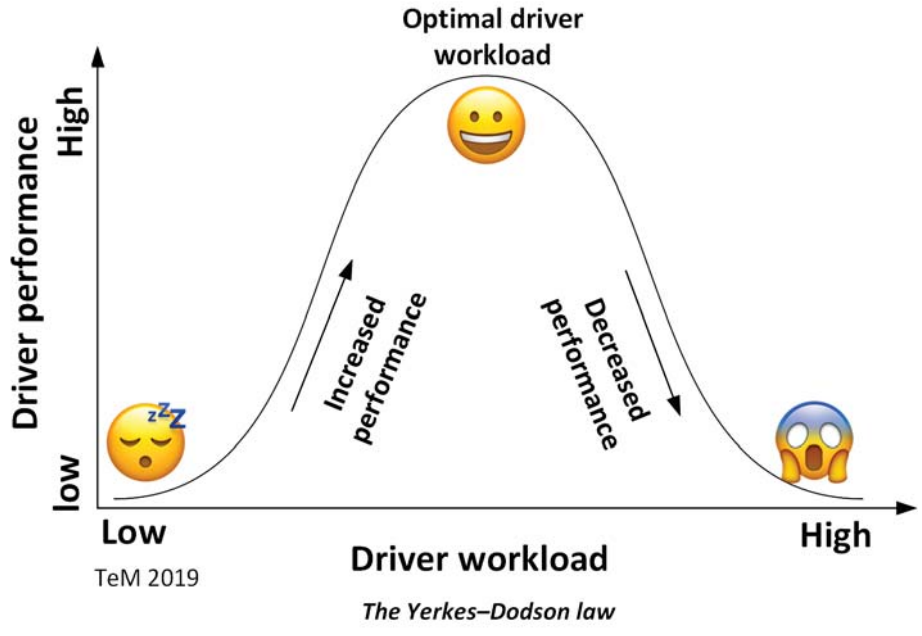
Driver workload and performance



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Some self-driving vehicles challenges

Interaction with vulnerable road users.

Interaction with other traffic and traffic light.

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The dilemma zone, Google patent 2016

Traffic signal response for autonomous vehicles

Aspects of the disclosure relate to determining whether a vehicle should continue through an intersection. For example, the one or more of the vehicle's computers may identify a time when the traffic signal light will turn from yellow to red. The one or more computers may also estimate a location of a vehicle at the time when the traffic signal light will turn from yellow to red. A starting point of the intersection may be identified. Based on whether the estimated location...

Related Terms: Autonomous Vehicle | Autonomous Vehicles

Browse recent Google Inc. patents
USPTO Applicaton #: #20160035223
Inventors: Jens-steffen Ralf Gutmann, Andreas Wendel, Nathaniel Fairfield, Dmitri A. Dolgov, Donald Jason Burnette

Short about the patent:

- Technology being able to decide weather or not a vehicle in autonomous mode shall stop on yellow traffic light.
- A tailgater may not expect the vehicle in autonomous mode to stop on yellow.
- Always stopping on yellow may not be such a good idea because it may lead to rear end accidents.

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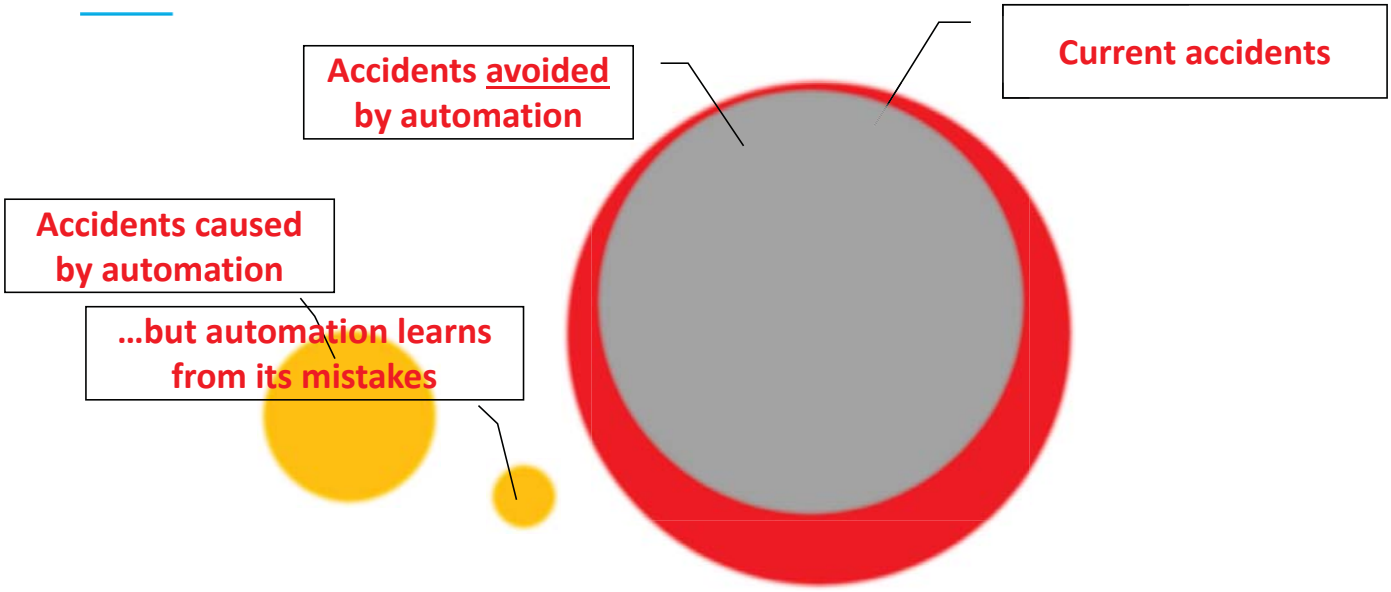
The risk of automated driving



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Dilemma regarding interpretation of sensor data

- False positive
- False negative

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Fatal Uber crash in Tempe, Arizona

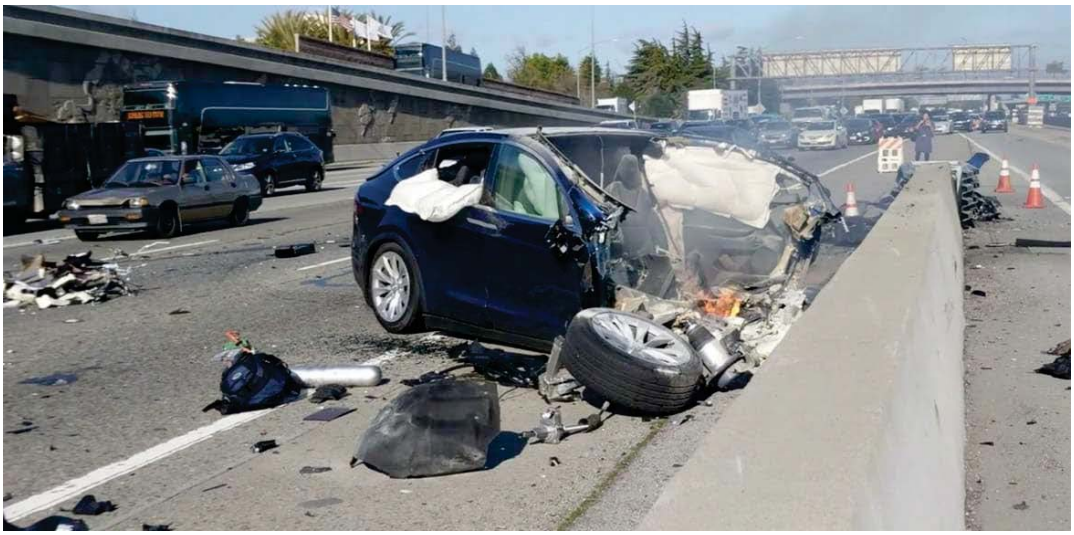
First recorded case of a pedestrian fatality involving a self-driving car, following a collision that occurred late in the evening of March 18, 2018

Source: Reuters

Tesla Model S Fatal Crash with a Truck, Williston, Florida, May 2016

Pictures: US NTSB

Tesla Model X Accelerated Into Barrier in Fatal Crash. Silicon Valley, March, 2018



Source: NBC Bay Area image

For both Tesla accidents

- Autopilot is a semi-automated system for use during highway driving
- The car issued several audible warning alerts that the driver has spent too long with his hands off the wheel.

Important topics

- Having a very good driver assist system lulls even aware drivers into a false sense of security?
- The sellers of such "too good" systems should face any responsibility for that, even if they take lots of reasonable steps to inform drivers of the realities of their system?

Source: Forbes, Brad Templeton, May 3rd 2019

More important topics

- It is valid to assert that in spite of Tesla's warnings that the current system is not a self-driving one, people are treating it like one.
- And it's also valid to assert that Tesla knows that people are doing this.
- There are people who, in spite of the warnings, are not getting the message
- or who are getting it and acting foolishly, treating Tesla Autopilot like a true robocar system.

Source: Forbes, Brad Templeton, May 3rd 2019

The SAREPTA project

Fully funded by the Norwegian Research Council for the project period 2017-2020

The vision of SAREPTA is

- *Enabling the transition to a green, smart, safe and secure autonomous transport system*

Our work will be concentrated in four different thematic areas:

- Risk identification and risk levels.
- Infrastructure vulnerabilities and threats.
- Technical, human and operational barriers to mitigate autonomous system risks.
- Organizational and human factors, and regulatory measures for risk mitigation.

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SAREPTA: Focusing on automated transport; Road and Sea

Source: www.dagbladet.no. 2009

Source: www.adressa.no. 2016

Source: Kongsberg Seatex

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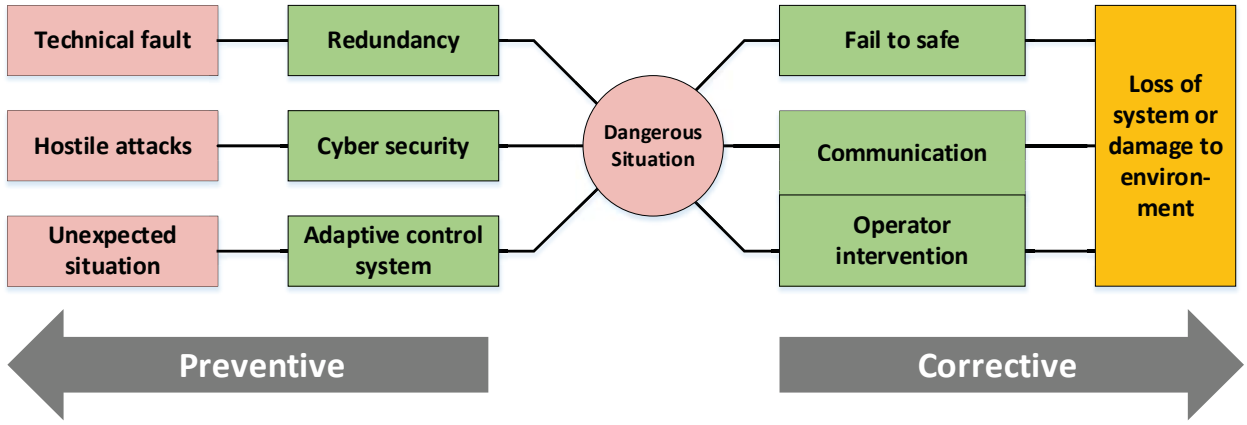
SAREPTA: Automation of transport and how to prevent a Dangerous situation



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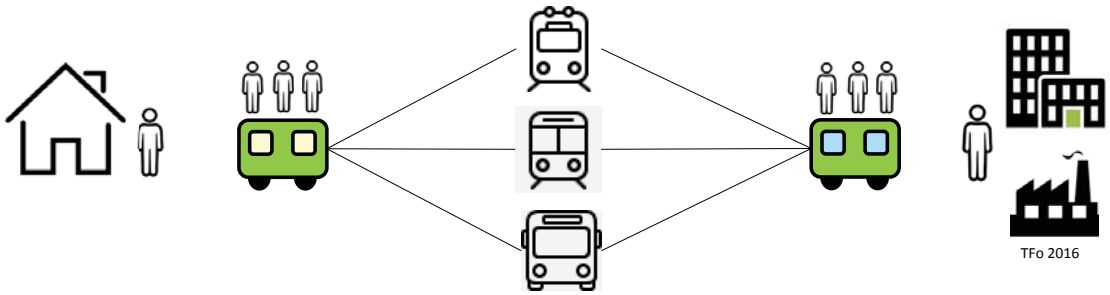
The SmartFeeder project

Partly funded by the Norwegian Research Council for the project period 2017-2020.

- How can seemless, connected and automated feeder and shuttle services contribute to improved public transport?



TFo 2016

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Technology for a better society