

# **Is Aviation playing catch-up? Successful AI applications in automotive and manufacturing**

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# First! A comparative view of regulatory bodies

Aviation

Automotive



2022



1988



# Levels of automation vs AI levels

Aviation		Automotive
Level 1 AI: assistance to human	1A: Human augmentation	Level 0 : No automation
	1B: Human cognitive assistance in decision-making and action selection	Level 1 : Driver assistance
Level 2 AI: human-AI teaming	2A: Huma-AI system cooperation	Level 2 : Partial automation
	2B: Human-AI collaboration	Level 3 : Conditional automation
Level 3 AI: advanced automation	3A: AI-based overridable actions	Level 4 : High automation
	3B: AI-based non-overridable action	Level 5 : Full automation



# Where is automotive now?

- An example: Mercedes-Benz!
- First level 3 automation in US
- In short: Driving with the eyes closed



- The vehicle can take over the driving task, but a **driver** is still **required**
- Secondary activities of the driver depends on **regulations**

# Driving assistance systems - ADAS

- Hard to pinpoint a first ADAS system
  - E.g. ABS systems were introduced as early as in 70s
- Question: What is considered an assistance system?
- Few examples:
  - Adaptive cruise control (ACC)
  - Automated parking system
  - Emergency brake assist
  - Emergency steer assist
  - Fatigue monitoring system



**Driver is in control**



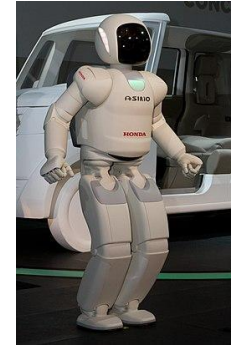
# Technologies used in ADAS

- Sensors
  - Cameras
    - Detection
  - Lidar/Radar
    - Distance and mapping
  - Ultrasonic
  - Infrared
  - GPS
- Software and algorithms
  - Object detection
  - Classification
- At the core of it
  - Signal processing
  - Kalman filters
  - Decision trees



# But...where is the AI?

- AI who?
- Classical methods of AI are still AI!
- But where is ML/DL in all this systems?
  - They are there....in research sector mostly
  - ...and in some very specific embedded hardware sections such as in LIDAR/RADAR
- Problem is:
  - Safety, trust, and traceability(explainability?)!
  - Putting beta systems in real world-not a very good idea





# And the level 3 Mercedes-Benz?

- As for technology
  - Not clear – what makes the decision?
  - Certain conditions e.g. face always visible
  - A mix of sensor fusion, rule-based, knowledge-base, ML/DL (?)
- And Human-AI?
  - Some suggest that level 3 is too dangerous!
  - Goal for level 4
  - Why? Human needs to be attentive



# Meanwhile in Aviation...

- The autopilot systems can be traced back as far as to 1930s...
- Aircrafts have sophisticated automated systems!
- What will be the role of the AI?
  - Sensor fusion?
  - More automation?
  - Assistant to the pilot?
  - Training for pilots?
  - Integrated EFB with a face?



# Overview for aviation

- Accessibility
  - Pilots, aircrafts, airports etc.
- Different domains, different needs
  - Training vs flying vs airport vs ATC
- Time periods
  - Planning
  - Operation vs Post-Operation
- Functions
  - Pilots monitoring or AI-based take-off and landing



# Potential problems

- Expenses
  - Pilots training, aircraft design
- Proper methodologies for different scenarios
  - Requirement analysis
- Data!
- Research vs industry
  - ML/DL
  - Explainability
  - Interaction



# Some remarks and recap

- Aviation vs automotive
  - Same sector (transportation), different stories – different innovation cycles
- Growth and development rate
  - Research and industries
- The role of local and regional (global) regulators
  - General guidelines and principles
  - Certifications



**Thanks for your attention**  
**Questions?**

