



WE MAKE FUTURE MOBILITY SAFE AND RELIABLE.



Bayern Innovativ
Friday webinar

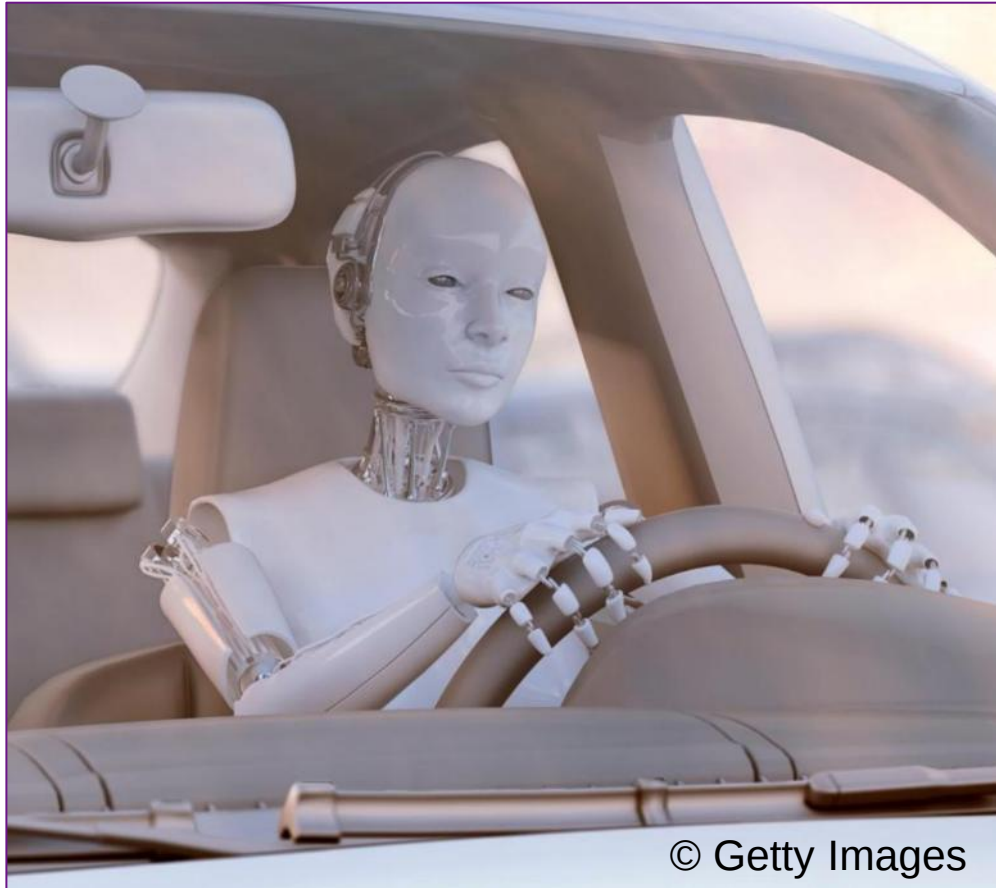
Impulses for transformation

Intelligent mobility: AI impulses from practice

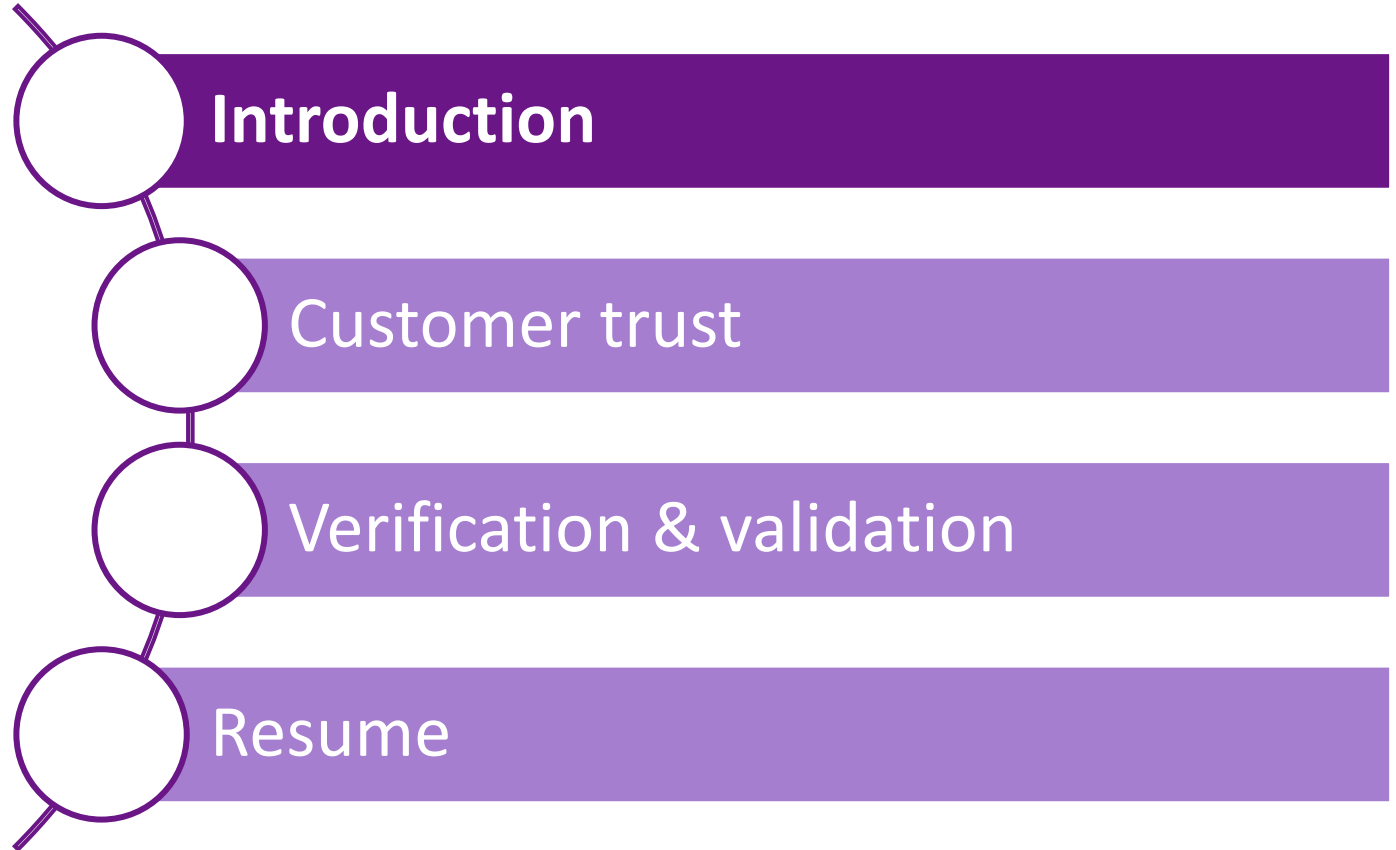
Udo Steininger
Managing Director

2026 Feb. 27

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Starting point

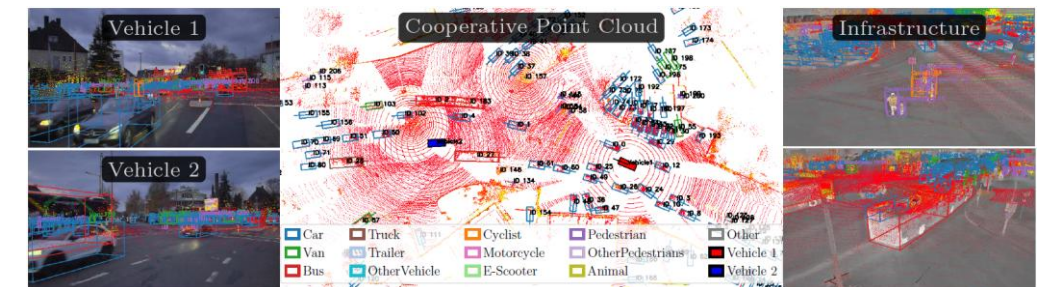
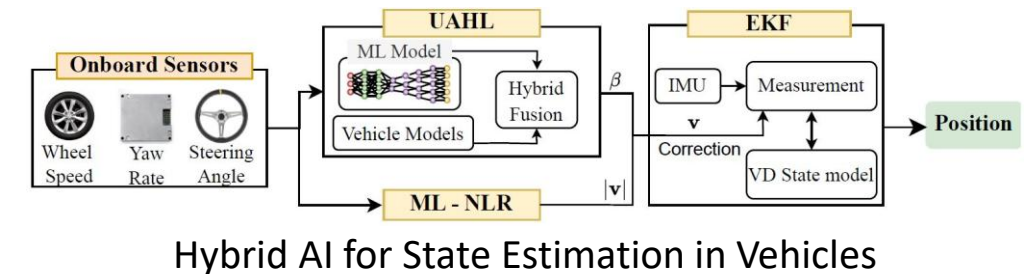
- AI is transforming car industry and vehicles
- Automated driving (AD) is transforming mobility
- AI × AD is changing everything

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ATLAS-L4 / MAN



AI × AD demands cooperation

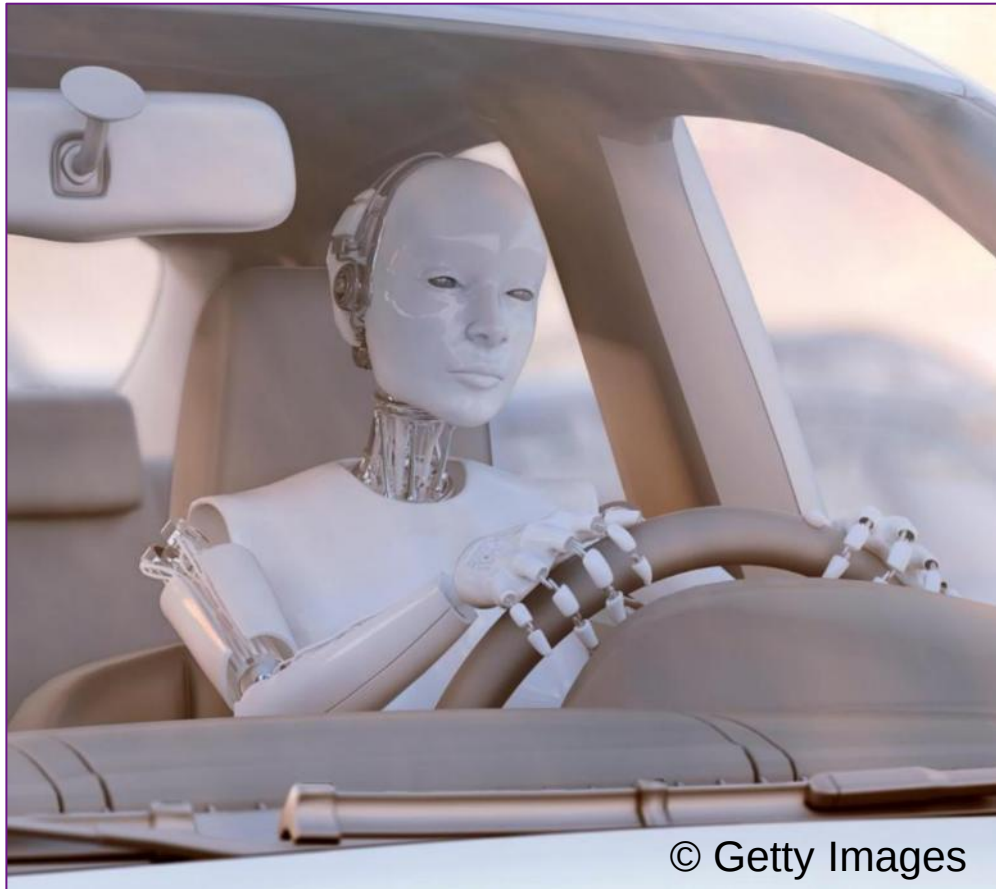
- Research, industry incl. SME & startups, and public institutions have to join forces - e.g., with the help of Bayern Innovativ
- Some examples from TH Ingolstadt
 - SAFIR project, e. g., hybrid AI combining domain knowledge with machine learning – more than 20 partners from research, industry and public institutions
<https://www.thi.de/en/research/transfer-at-thi/safir/intensification-phase/ip-cluster-1/>
 - KIVI and SiRaMiS projects addressing AI in smart intersection – about 10 partners from research, industry and public institutions
<https://www.thi.de/forschung/carissma/labore/reallabor-hdt/>



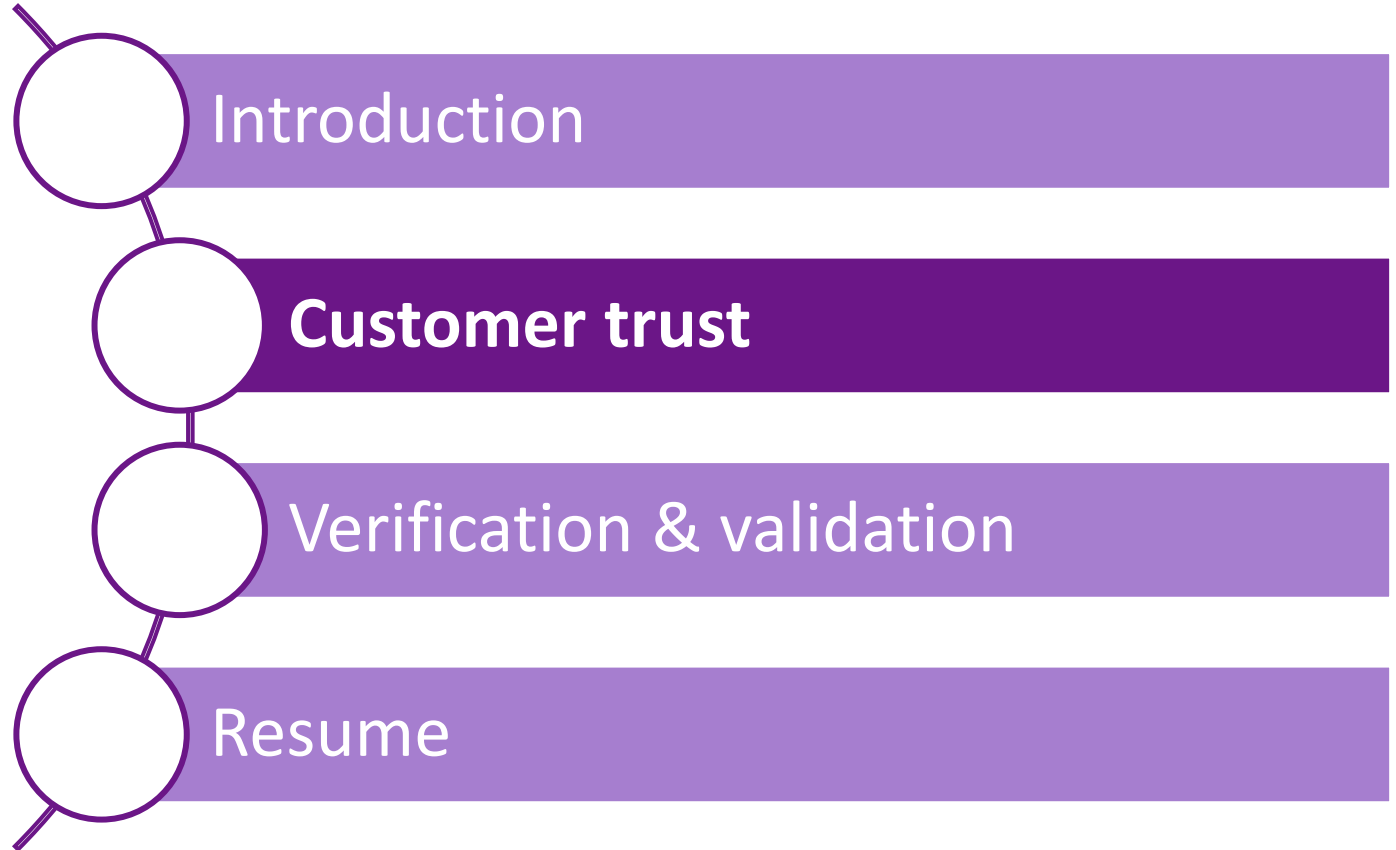
AI for Cooperative Perception in Smart Intersections

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Customer trust in AI technology

- Why is trust essential? In mobility and public transport, we deal with customers, passengers, users
- Preconditions
 - Non-negotiable: Safety
 - Necessary: Customer benefit
 - **Sufficient: Customer trust**
- How to built trust? By explaining ...
 - what we really do / plan and what not
 - what the technology is capable of, what not (yet)
 - what it never will be able to do

<https://www.next-mobility.de/algorithmus-des-todes-die-gedanken-eines-philosophen-zum-autonomen-fahren-a-954804/>

„Algorithmus des Todes“: Die Gedanken eines Philosophen zum Autonomen Fahren

10.08.2020 · Autor / Redakteur: Frank Wald / Benjamin Kirchbeck · 

Sind autonome Autos die Lösung für unsere verstopften Großstädte? Wie wird das automatisierte Fahren den Verkehr verändern? Und dürfen Autos im Notfall über Leben und Tod entscheiden? Deutschlands Vorzeige-Philosoph und Bestsellerautor Richard David Precht stellt dazu in seinem neuesten Buch einige bedenkenswerte Überlegungen an.



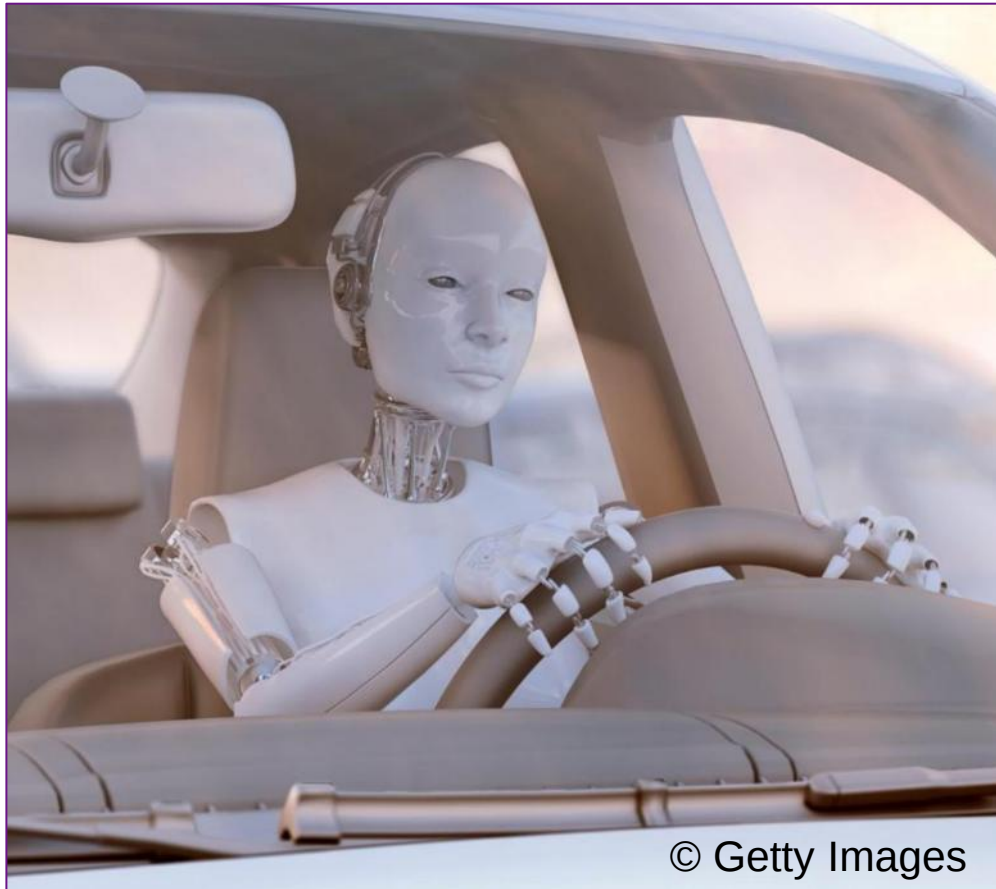
Welchen ethischen Leitlinien sollen autonome Fahrzeuge folgen?

(Bild: ©temp-64GTX - stock.adobe.com)

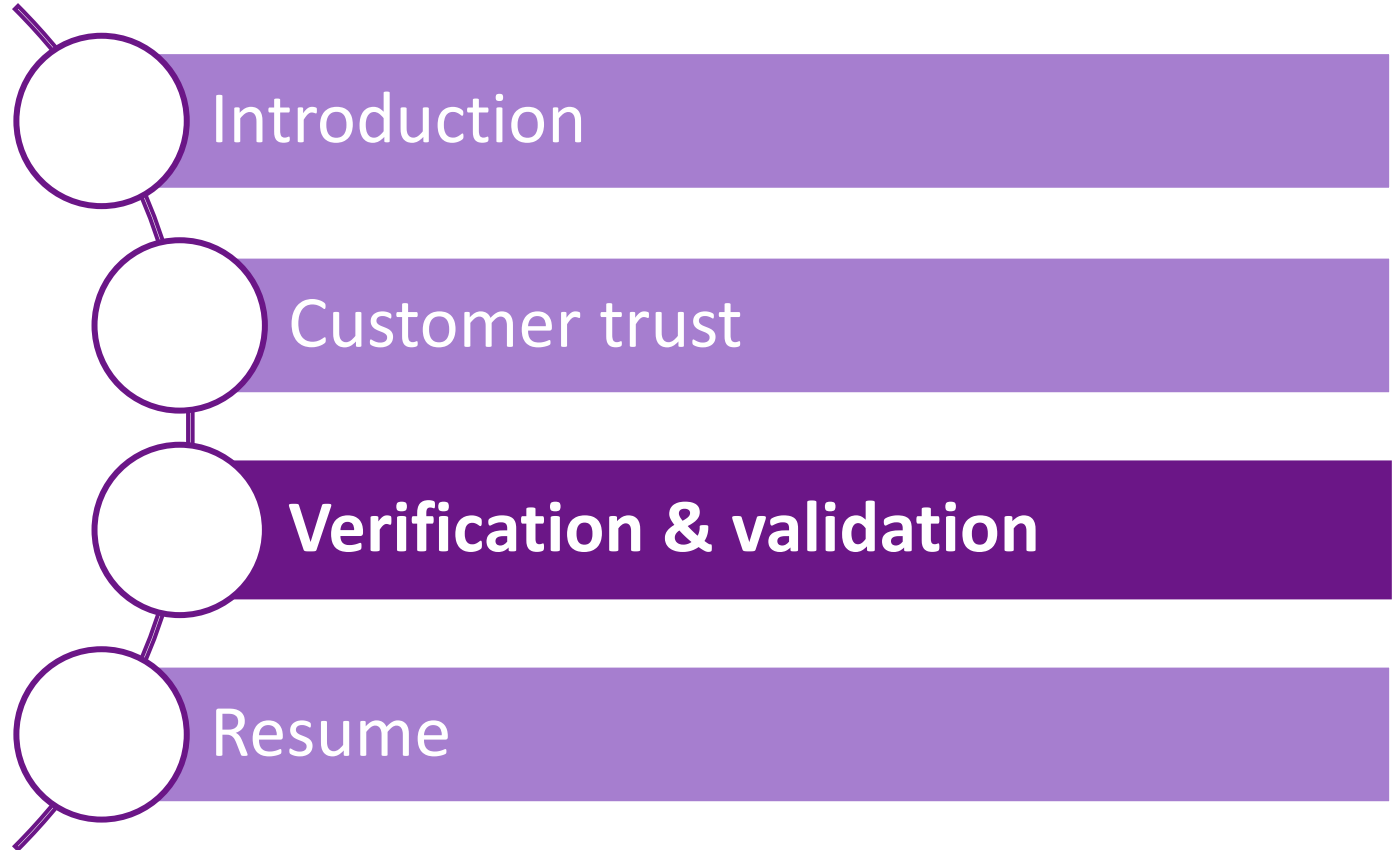
Demystifying AI technology

- Everyone is talking about AI, but today “only” machine learning (ML) and neural networks (NN) are used for vehicle systems
- Associated risk is overestimated in public perception
 - Even if we decorate ML and NN with adjectives such as *large* and *deep*, they are not able of creating new (risky) content or becoming independent
 - It is strictly forbidden that AI algorithms adept themselves *individually* during vehicle deployment - it contradicts idea of *type approval*
 - AI algorithms can be (further) developed by use of data, collect by vehicles in the field, but results have to be approved before implementation to all vehicles of a type
- **Conclusion: Let's call things by their proper name instead of throwing around terms that raise unfounded expectations as well as fears**

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Comprehensive safety of AD vehicles

- Safety of every vehicle system depends on 2 pillars
 - Safe design - for conventional E/E systems, *fail safe* is suitable
 - Verification & validation - proof of sufficient safety
- Regulation and standardization for AD introduce *comprehensive safety* and provides requirements for safe design of AD systems (ADS), e.g.,
 - “Safety and ease of traffic” (AFGBV*, comparable in EU 2022/1426)
 - *Dependability* = ability of a system to provide a function regarding reliability, availability, maintainability, safety and security - RAMSS (ISO/TR 4804)
 - Redundant safety channels / *fail degraded* design = property of an item to operate with reduced functionality in the presence of a fault (degradation) – at least for advanced automated / autonomous vehicles (ISO/TS 5083)

* Autonome-Fahrzeuge-Genehmigungs-und-Betriebs-Verordnung

Fail degraded architecture and AI

- Fail degraded design
 - 2-out-of-3 architecture with voter
 - 3 independent sensor systems
 - 3 independent processing channels
- Consequences for AI
 - 2 processing channels with high safety integrity (safety fall back channels) - expected deterministic
 - 1 processing channel with low safety integrity - gladly with AI
- **Well known and proven in use technology pave the way for safe implementation of AI in AD vehicle systems!**
(for references see backup slide)

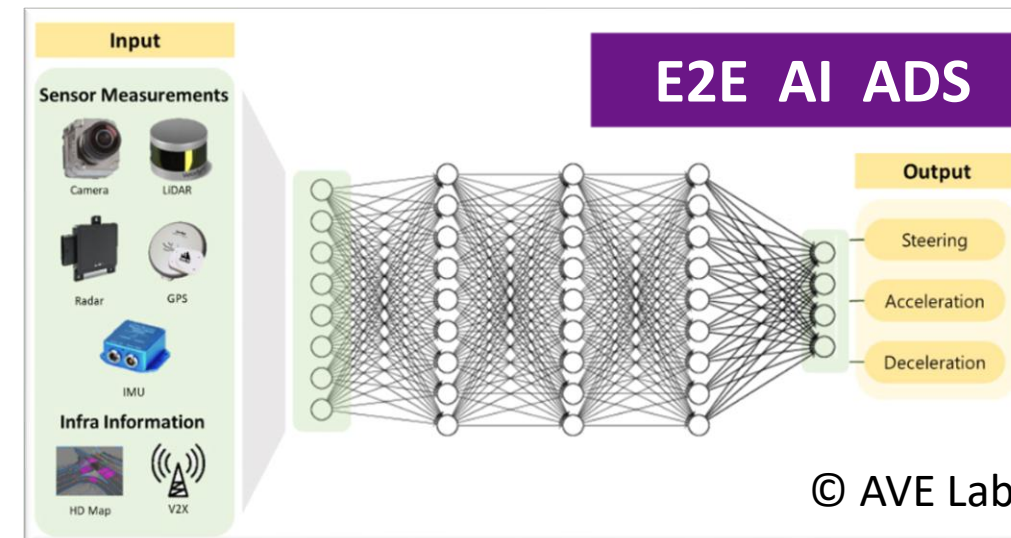
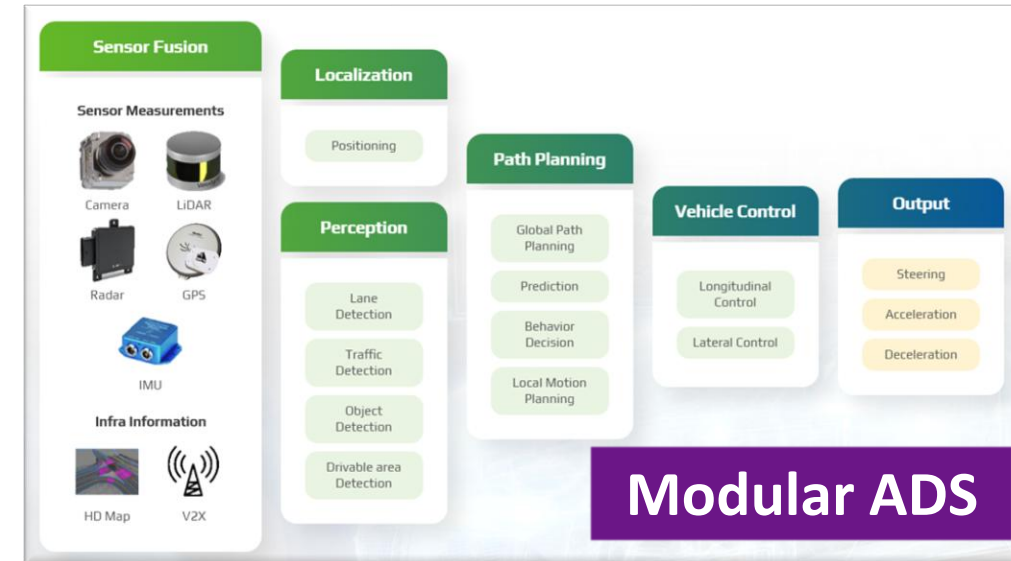


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Verification & validation

Myths and facts

- *Explainable AI* should sort it out → it doesn't help beyond a certain degree of complexity, millions of parameters and billions of training data cannot be traced back (not to mention GenAI)
- V&V not possible for *end-to-end (E2E)* AI systems → E2E AI cause trouble with failure allocation and debugging but regarding V&V we have to approve complete system and entire vehicle, it is per definition an E2E procedure

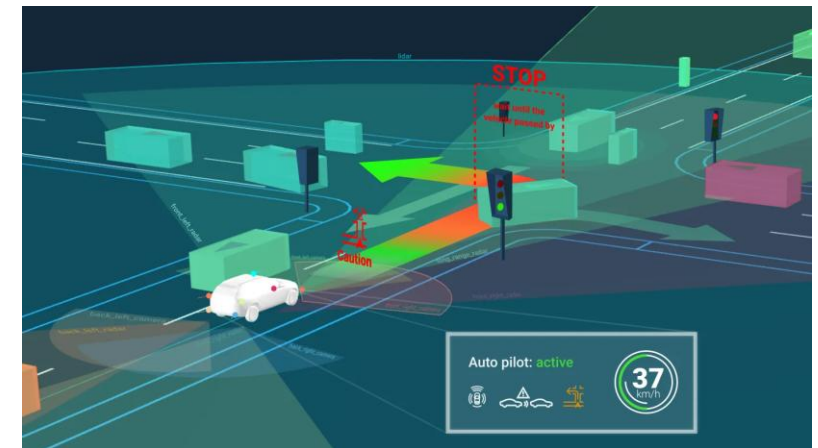


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Verification & validation

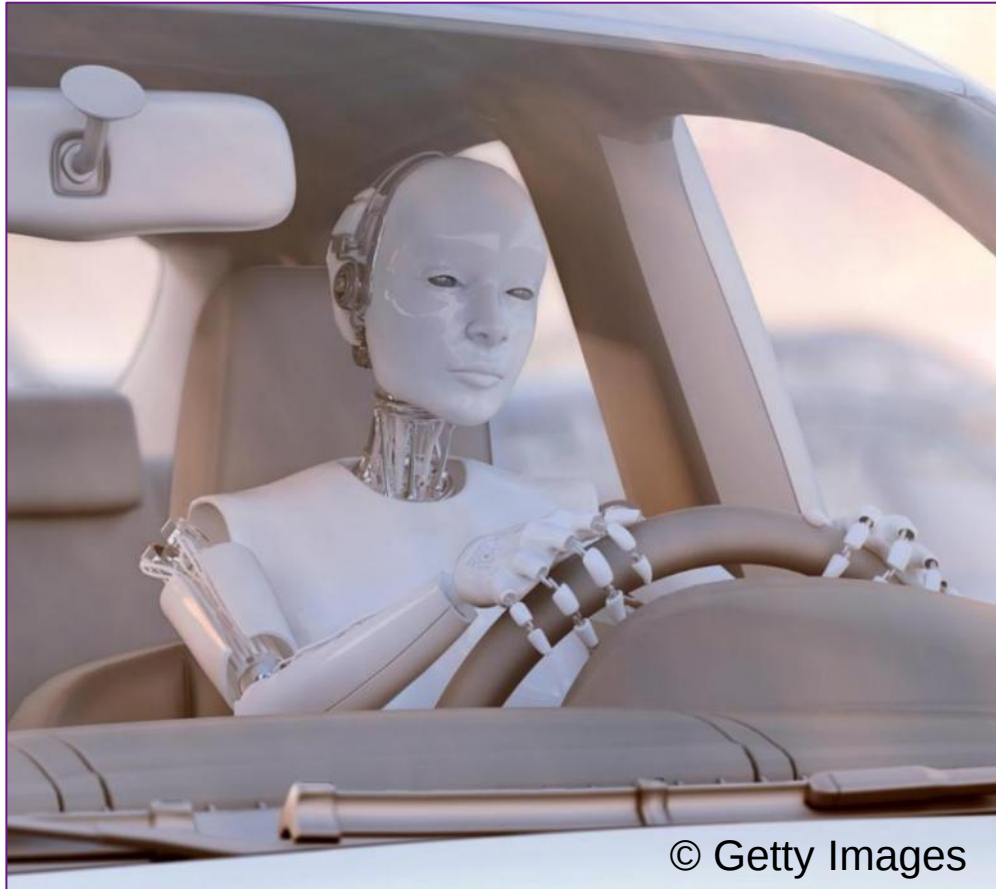
Real problem and solution

- Huge test space for ADS, billions of test kilometers would be required → solution
 - *Virtual scenario-based testing* to cover test space (automatic generation of test scenarios, e.g., with AI) combined with
 - real tests on proving grounds (for verification of simulation models and data) and
 - field tests (for validation)
- Comprehensively defined in regulations for automated and autonomous driving (UN-R157, AFGBV, EU 2022/1426)

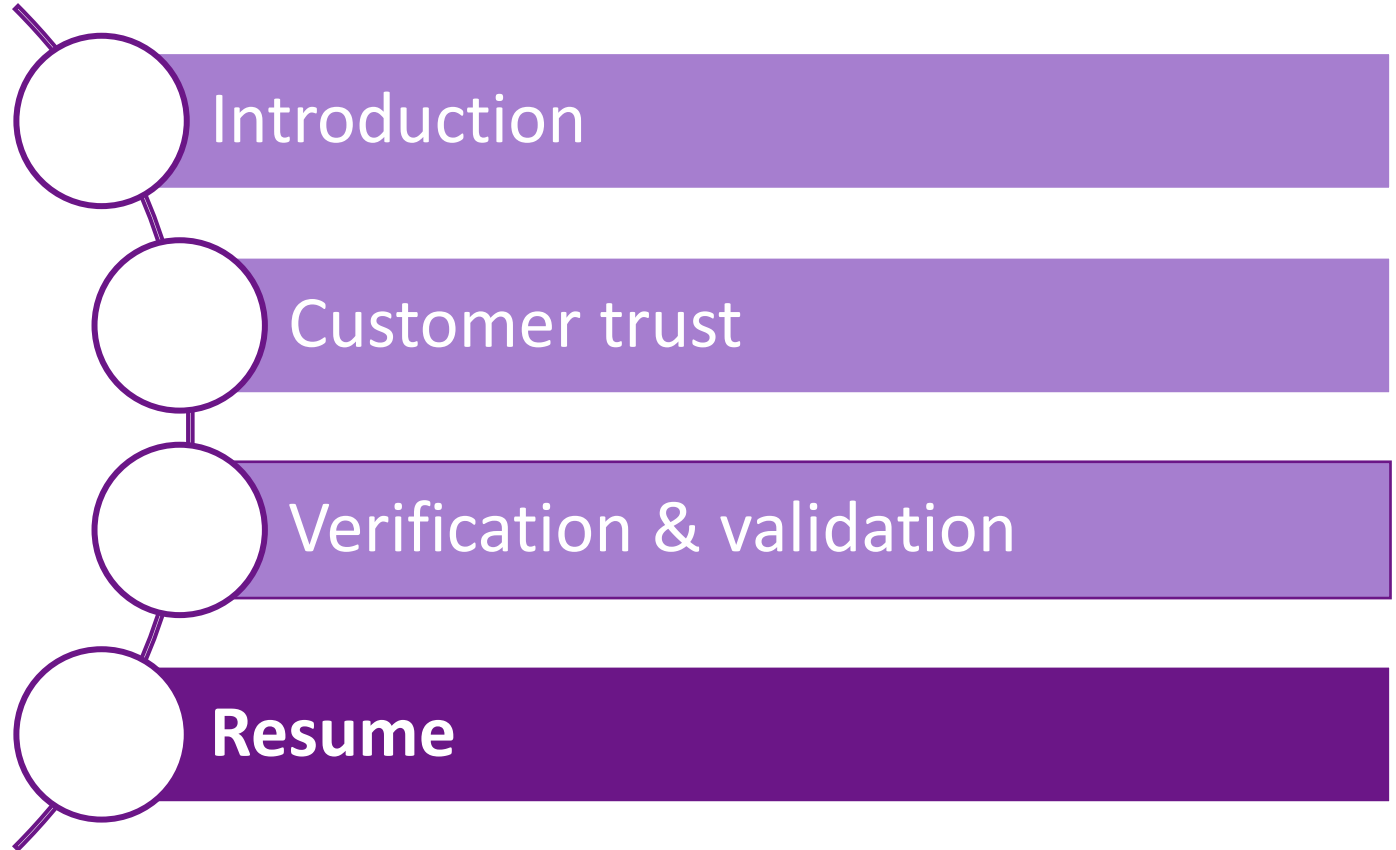


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Resume

- AI × AD is the game changer for future mobility
- To built customer trust, we have to explain what we really do / plan and what the technology actually is capable of to avoid unfounded expectations as well as fears
- We are able to design safe AD vehicles with AI systems and to proof sufficient safety, including E2E AI systems, considering available AD regulations and standards
 - Redundant, fail degraded system design
 - Virtual scenario-based testing

Outlook

Quo vadis GenAI - Brave new world or digital Mad Cow Disease?

- As a reminder: MCD arose because cattle were fed animal meal from infected animals
- AI must be trained (fed), e.g., with content from internet; this is full of synthetic content that has been generated entirely or partially by AI
- Researchers at Rice University in Houston, TX, discovered that AI trained with results of other AI becomes useless (stupid) after short time - comparison with MCD is obvious (<https://www.derstandard.de/story/3000000231157/wie-ki-modelle-an-rinderwahnsinn-zugrunde-gehen-koennen>)

Outlook

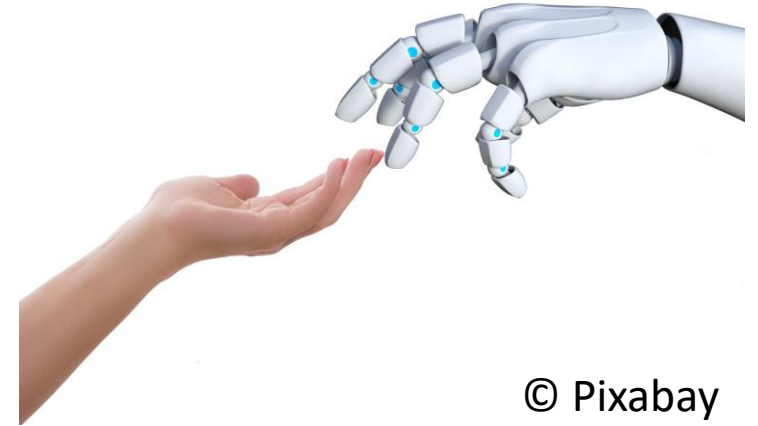


Image model trained to “precision” fully synthetic: in 1st run (left), people look different, after 5th run (right), all seem to be related to each other (<https://arxiv.org/abs/2307.01850>)

Outlook

Solution: More genuine, human-made content

- People must continue to research and communicate creatively – without help of AI
- It is the only way to ensure that database remains diverse and high-quality
- This confirms ...



© Pixabay

AI won't replace people - but people who use AI will replace people who don't.

IBM (2023): Augmented work for an automated, AI-driven world

<https://www.ibm.com/thought-leadership/institute-business-value/en-us/report/augmented-workforce>

Thank you for your time.
Are there any questions?



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Backup: References for ADS architecture



- U. Steininger - Case Study for Level 4 ADS and ADAS
https://www.tesaco.eu/files/ugd/1877ac_b3a0ddfebda24b5ba9c1acd1928dcbb8.pdf
- M. Werling et al. - BMW Level 3 Drive Pilot
<https://arxiv.org/abs/2503.20544>
- Mobileye - True Redundancy for Level 4 ADS
<https://www.mobileye.com/technology/true-redundancy/>