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**SOUČASNÝ STAV A ROZVOJ
SILNIČNÍ INFRASTRUKTURY STÁTU A REGIONŮ**

Autonomous shared vehicles and their interactions with other road users – insight from Oslo, Norway

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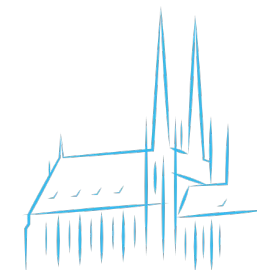
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Autonomous vehicles/transport and TØI

- Passengers' acceptance
- Interactions with other road users (safety, eHMI)
- Future scenarios/Pathways for AV introduction/Modelling
- Impacts on logistic procedures (MODI)
- Cybersecurity

tøi Institute of Transport Economics
Norwegian Centre for Transport Research



Autonomous vehicles and transport system organization

Shifting boundaries, mandates and responsibilities

Cyriac George, Jørgen Aarhaug

2066/2024



Transportation Research Interdisciplinary Perspectives

Volume 18, March 2023, 100781

“Game over” for autonomous shuttles in mixed traffic? Results from field experiments among pedestrians and cyclists interacting with autonomous shuttles in urban life traffic in Norway

Torkel Bjørnskau ^a, Ole Aasvik ^a, Tim De Ceunynck ^b, Aslak Fyhri ^a, Marjan Hagenzieker ^c, Carl Johnsson ^d, Aliaksei Lareshyn ^d

European Transport Research Review

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Original Paper | Open access | Published: 25 November 2021

Video observation of encounters between the automated shuttles and other traffic participants along an approach to right-hand priority T-intersection

Petr Pokorný, Belma Skender, Torkel Bjørnskau & Marjan P. Hagenzieker

European Transport Research Review 13, Article number: 59 (2021) | Cite this article

Exploring the general acceptance factor for shared automated vehicles: the impact of personality traits and experimentally altered information

Ole Aasvik^{1,2*}

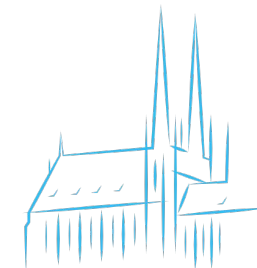
Pål Ulleberg²

Marjan Hagenzieker³

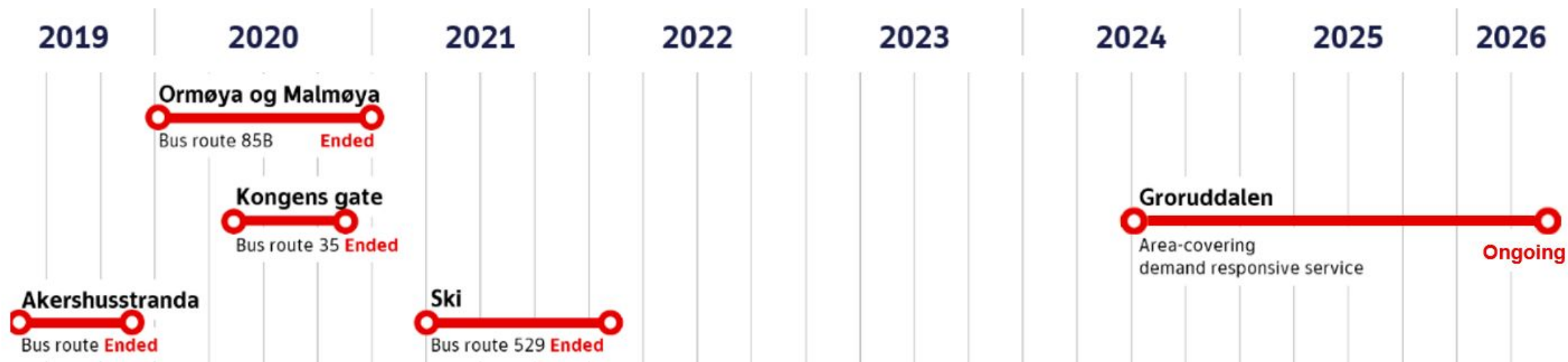
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Timeline of Oslo pilots

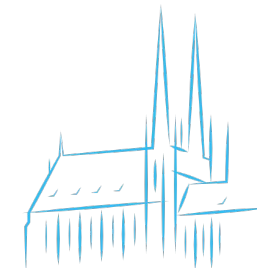




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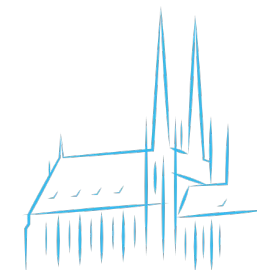
First pilots (2019-2022)



Observatory analyses in various settings and scenarios

- signalised intersections equipped with V2X technology
- T-intersection with a bicycle lane
- Shared space in a harbour area
- Narrow road with limited overtaking possibilities
- Residential roads without any sidewalks

Silnička 32



Main findings

- AVs were struggling in urban traffic.
- Reasons: predefined trajectories; “standard” situations only; defensive driving style.
- We observed many situations that resulted in stops of AVs, followed by an intervention from safety driver.
- Some of these stops were hard and sudden and thus not pleasant for passengers inside AVs. Increased risk of rear-end collisions.
- Slow and defensive driving style of AVs irritated some car drivers, which led to several types of negative behavioural adaptation.

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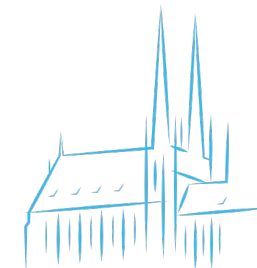
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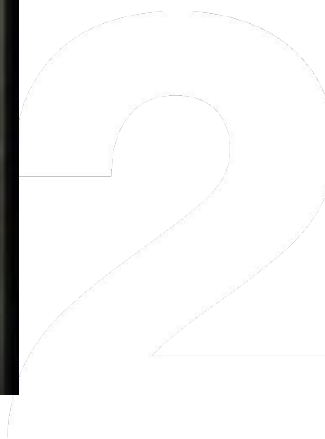
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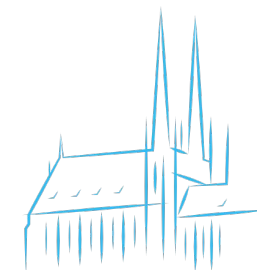




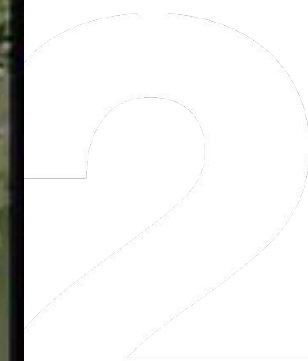
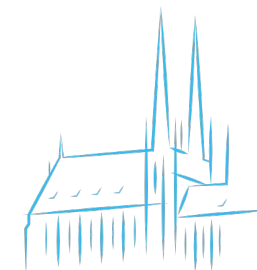
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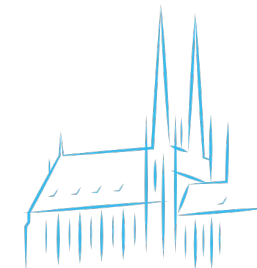




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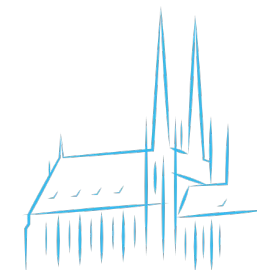
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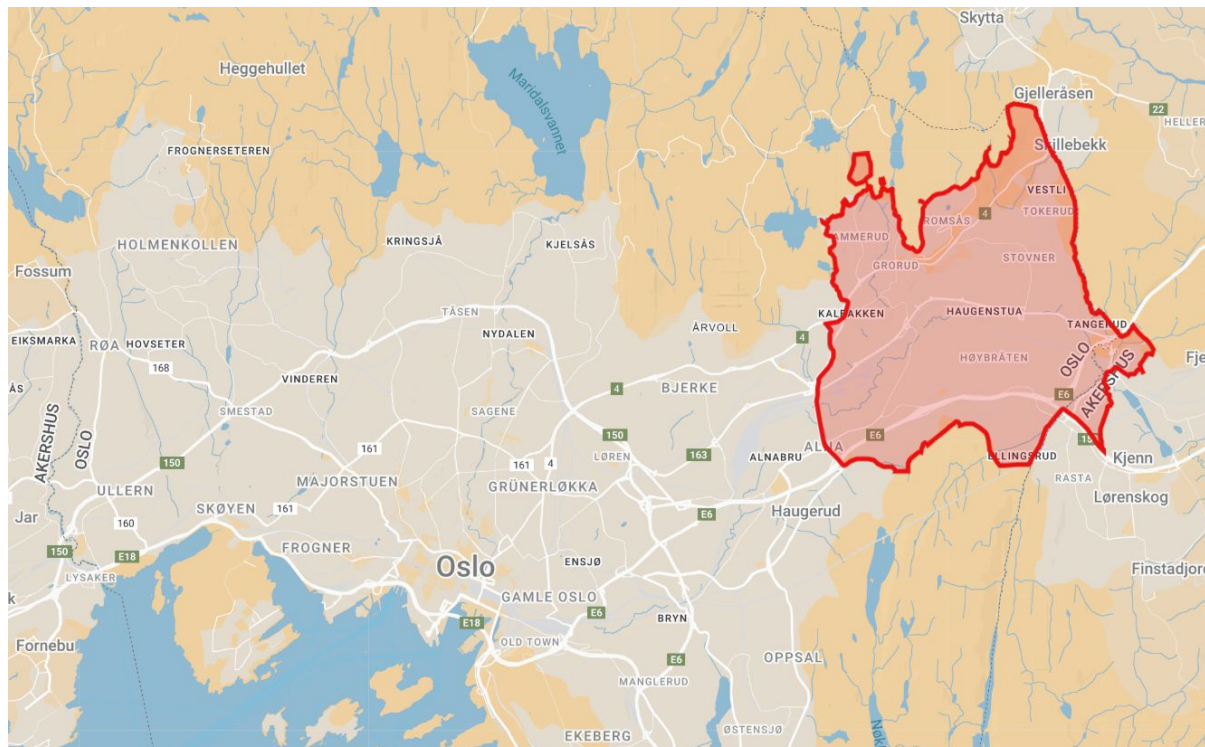
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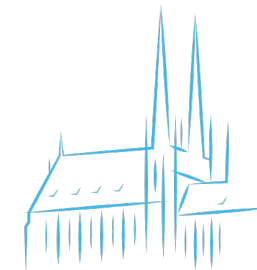
Latest pilot – Grorud Valley (2024-2026)



- **Right-of-way interactions on T-intersection regulated by right-hand rule, under winter conditions**
- **AVs performance in traffic interactions, while considering local traffic rulers, norms and culture**

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Video observations + AV log data + insight from AV provider





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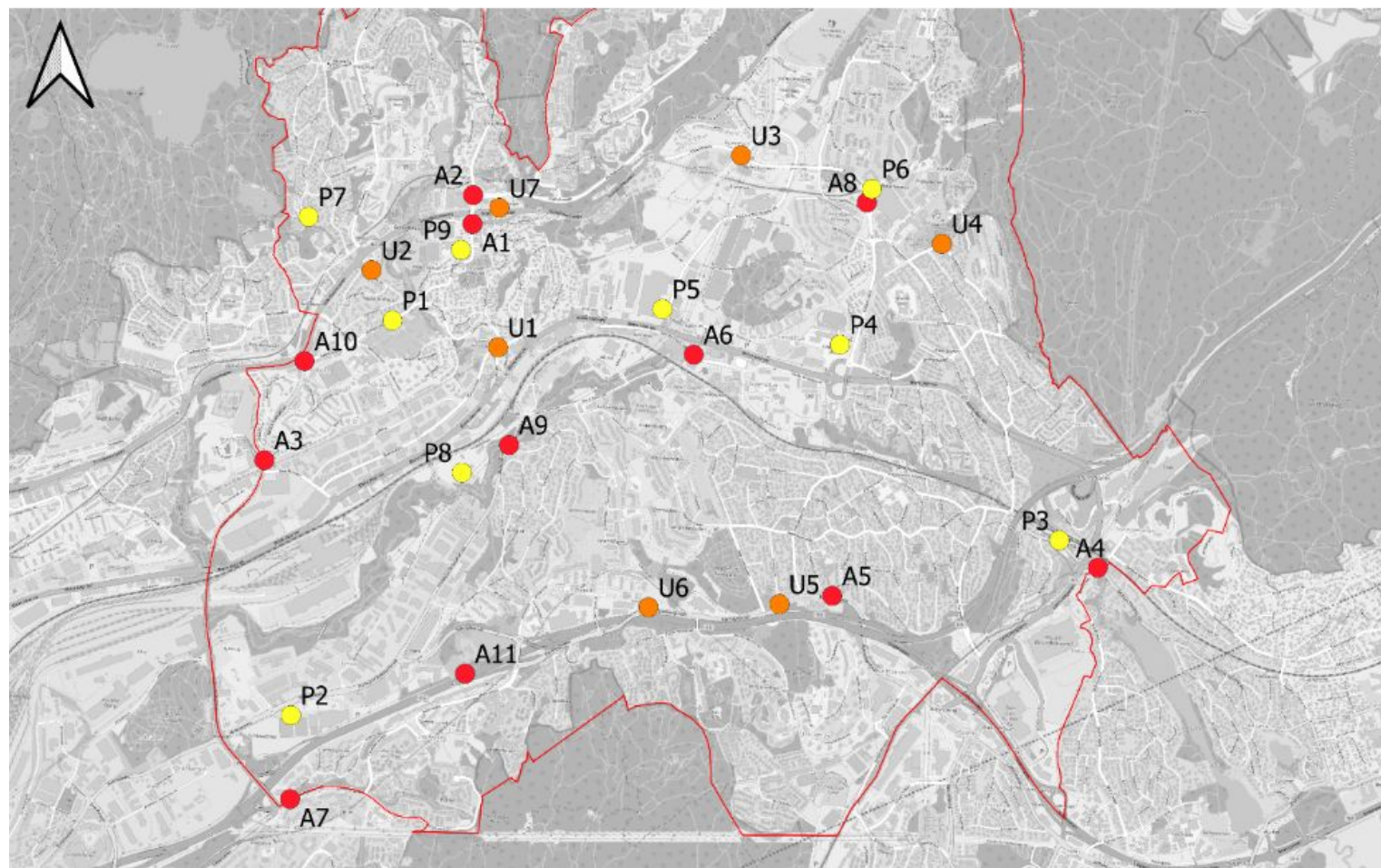
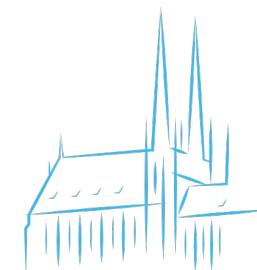
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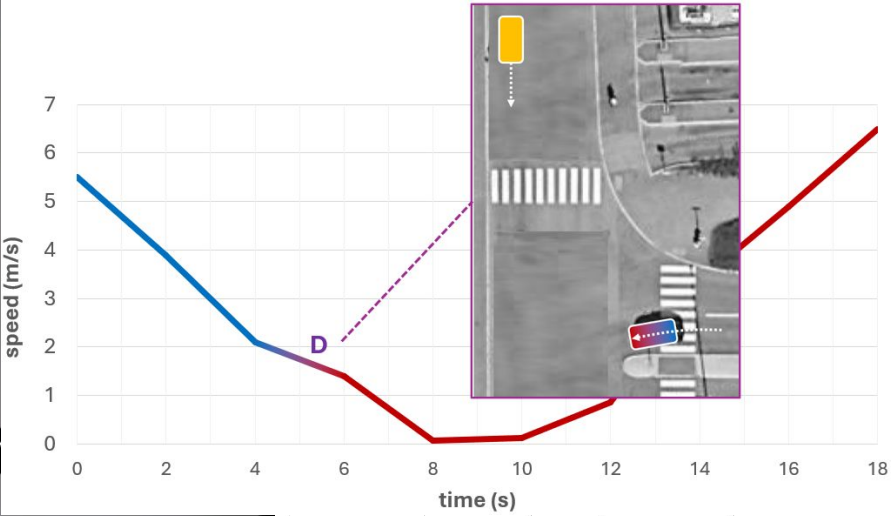
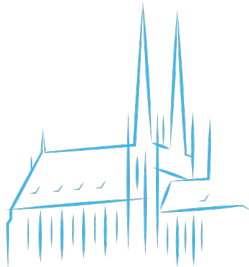
Sites - candidates for observations



- PUDOs in challenging areas
- Unpleasant places
- Accident locations

The total amount of recorded video data was **3103 hours** collected at **13 sites**

Due to limited availability of operational data from AVs earlier in the project and specifications of the testing phase, the observational analyses utilised only the data collected in **final stage of the project**

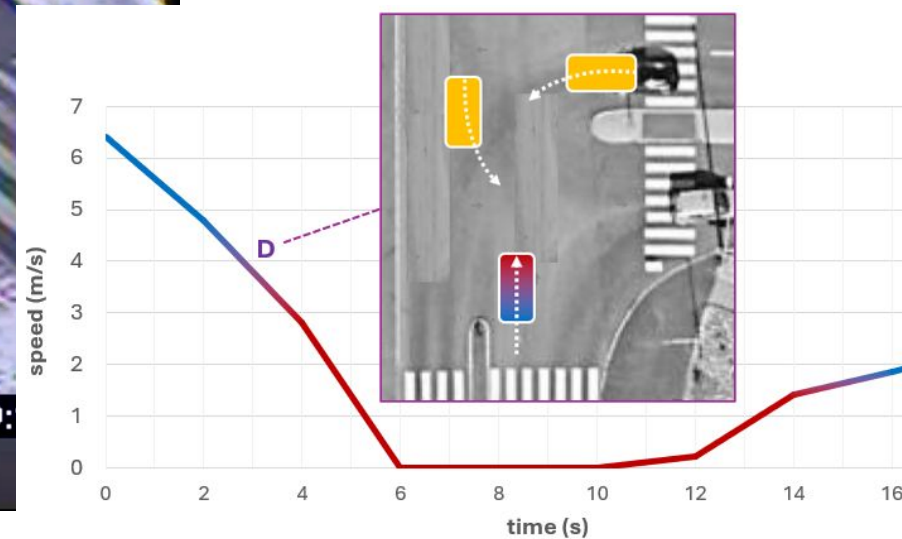
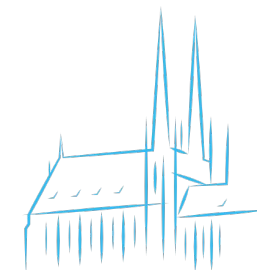




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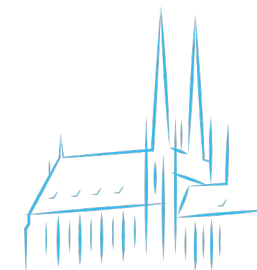




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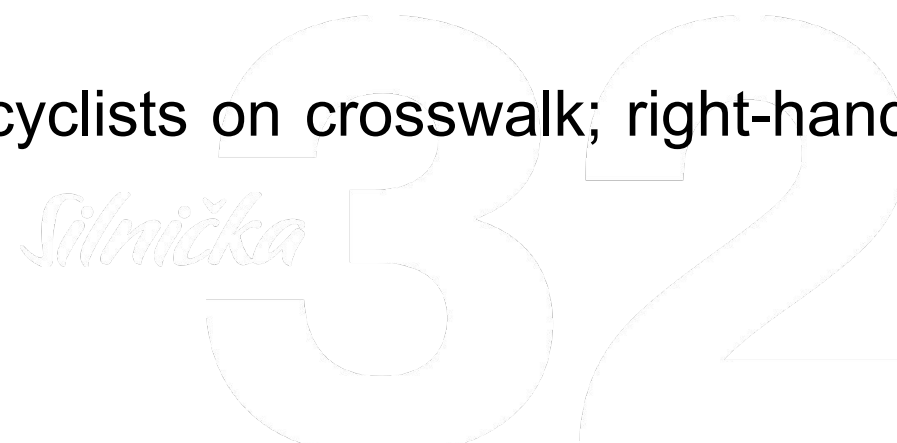
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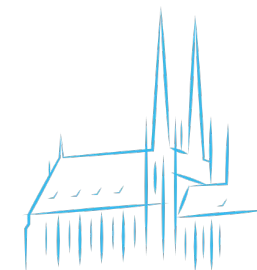
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Main findings

- Limited validity. The findings should not be interpreted as indicative of how AVs would perform in routine operations without an on-board human operator.
- Compared with earlier pilots, the AVs in this pilot demonstrated notable improvements in their ability to operate in complex traffic environments.
- However, the dependency of AVs on predefined routes and maps updates makes their applicability in urban environment questionable.
- No observations of any behavioural adaptation
- Local traffic culture vs. software from abroad (cyclists on crosswalk; right-hand rule; level of assertiveness of AVs)





Děkuji za pozornost



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