HTWD Hochschule für Technik und Wirtschaft Dresden University of Applied Sciences

Laboratory of Automotive Mechatronics Mechlab.de

University and Mechlab-Laboratory

Kontakt:
Prof. Dr. rer. nat.
Toralf Trautmann
Faculty Mechanical Engineering

T +49 152 53920818
trautmann@htw-dresden.de

The HTWD

HTWD Hochschule für Technik und Wirtschaft Dresden
University of Applied Sciences

163
Professors

40+
Degree programmes

4800
Students

2
Campuses: Dresden-City und Pillnitz

10
Percent international students

18
Mio. Euro third-party funding income in 2022

150+
International university partners

Founded

Mechlab – Head and stuff

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Prof. Dr. rer. nat. Toralf Trautmann (Physicist)

1967:	born in Zella-Mehlis (Free State of Thuringia),
1995 - 2000:	PhD research at Freiberg University of Technology, Thesis: „Radioluminescence of Feldspar“
2001 - 2005:	Development Engineer Robert-Bosch-GmbH, Schwieberdingen
since 2005:	Professor of Automotive Mechatronics (HTWD)

Research/Education:

- Development and test of advanced driver assistance systems,
- Surrounding sensors (**Lidar**, Radar, Camera) and data fusion,
- **Type approval process and PTI for autonomous vehicles**,
- Software development and prototyping using Matlab/Simulink/ROS.

Stuff:

- 1 lecture assistant and 3 full time research assistants
- 3 student workers (automotive engineering)
- 1 guest student (University of Primorska, Slovenia)

Equipment and partners

Partners:
- tracetronic GmbH
- FSD Fahrzeugsystemdaten GmbH
- GTÜ GmbH
- Accident Research Institute
- Bertrandt GmbH
- Dewesoft d.o.o. (Slovenia)

Universities:
- TU Dresden
- University of Primorska (Slovenia)
- Univ. of the Balearic Islands (Spain)

- Different test cars (Skoda Enyaq, MB EQE, Passat GTE)
- Autonomous Shuttle (EasyMile EZ10)
- Matlab with all toolboxes
- Lidars: Velodyne, Ouster, Livox, LS-Lidar (1550nm), OPSYS
- Radar: Continental SRR & LRR

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Project 1

Test center for autonomous vehicles

Verordnung zur Genehmigung und zum Betrieb von Kraftfahrzeugen mit autonomer Fahrfunktion in festgelegten Betriebsbereichen (Autonome-Fahrzeuge-Genehmigungs-und-Betriebs-Verordnung - AFGBV) vom **24.06.2022**

Autonomous Vehicle Approval and Operation Regulation – AFGBV

Type-Approval **& Daily Procedures**

COMMISSION IMPLEMENTING REGULATION (EU) 2022/1426

of 5 August 2022

laying down rules for the application of Regulation (EU) 2019/2144 of the European Parliament and of the Council as regards uniform procedures and technical specifications for the type-approval of the automated driving system (ADS) of fully automated vehicles

Type-Approval ONLY

Verordnung über Ausnahmen von straßenverkehrsrechtlichen Vorschriften für ferngelenkte Kraftfahrzeuge (Straßenverkehr-Fernlenk-Verordnung – StVFernLV)* vom 16. Juli 2025

Regulations for remotely controlled motor vehicles

AFGBV – Daily pre-departure check

Extensive obligations for the owner of vehicles with autonomous driving functions (excerpt from Section 13, Paragraph 7). Extended daily pre-departure check before starting operation:

- **Test drive to activate all systems!**

  Subsequent inspection of:
  - Braking system,
  - Steering system,
  - Lighting system,
  - Tires/Wheels,
  - Chassis,
  - Safety-relevant electronically controlled vehicle systems as well as the sensors for recording external and internal parameters and
  - Mechanical vehicle systems for active and passive safety.

- Regular inspection of the active and passive vehicle systems according to manufacturer's specifications
- Comprehensive vehicle inspection according to manufacturer's specifications every 90 days
- The vehicle must undergo a **general inspection every 6 months**

HTWD test area – driving routes and external sensors

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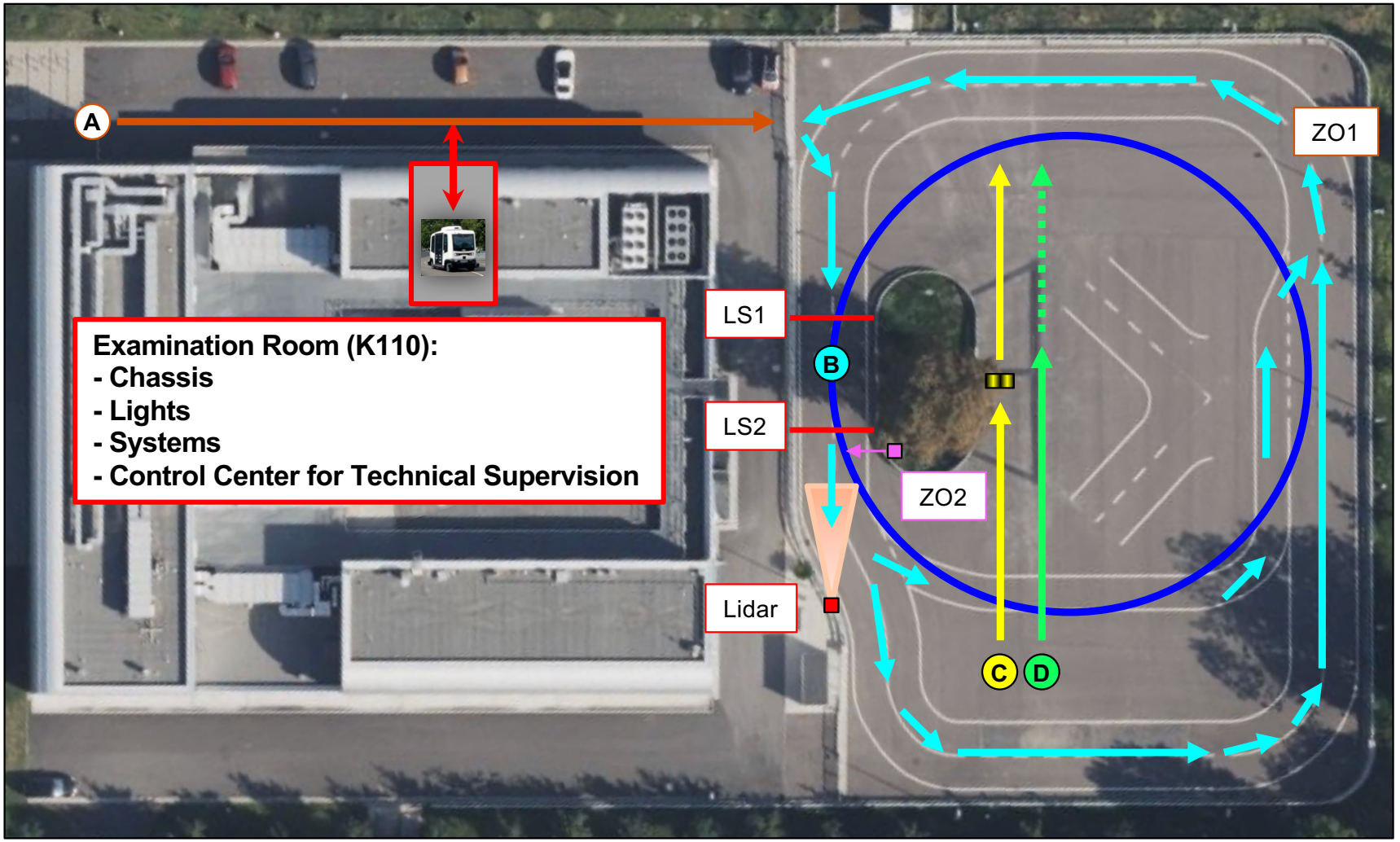

Test cases

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Nr.	Measured quantity	Remarks	External sensors	Start
1	Target detection (ZO1)	e.g. traffic signs detected by Lidar and Camera		A
2	Time to GNSS-Fix			K110
3	Deviation starting position		Lidar (Puck, Livox)	B
4	Passage speed	Use circular drive	Lidar (Puck, Livox), light barrier	B
5	Emergency brake (ZO2)	**At least 3 situations:** passing, braking, swerving	Lidar (Puck, Livox), light barrier	B
6	Threshold crossing		PTI-Adapter	C
7	Reference braking		PTI-Adapter	D
8	Stationary circular drive		PTI-Adapter	B
9	Server latency	Testing data transfer to a server		

Automated emergency braking (AEB) – Test cases

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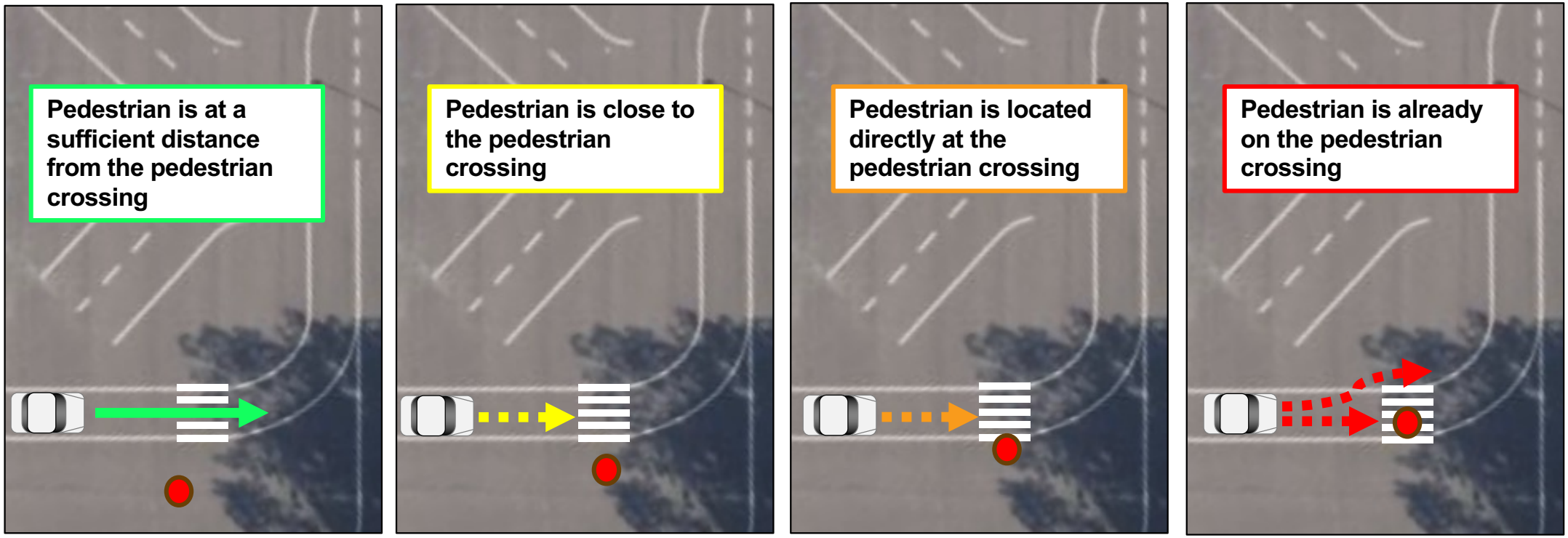
Passing	Warning	Partial braking	emergency braking
Pedestrian is at a sufficient distance from the pedestrian crossing	Pedestrian is close to the pedestrian crossing	Pedestrian is located directly at the pedestrian crossing	Pedestrian is already on the pedestrian crossing



- 4 situations with different reactions
- Determination of precise test parameters is necessary
  - Distances, speed of Car and Pedestrian

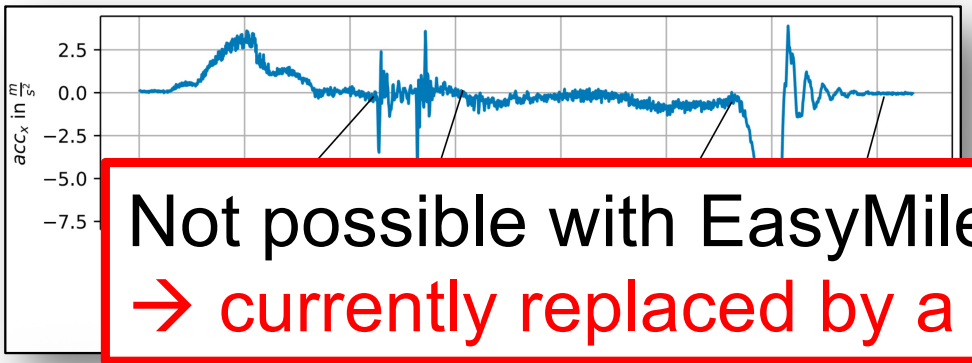

Leipziger
Verkehrsbetriebe
TECHNISCHE
UNIVERSITÄT
DRESDEN
ABSOLUT
ez.10
ez.10


Leipziger
ABSOLUT
TECHNISCHE
UNIVERSITÄT
DRESDEN
e210

Regulation according to the German Road Traffic Regulations
FSD → PTI-Adapter

Dynamische Prüfungsfahrt

- Schwingungsdämpfer*
- Bremswirkung gemäß Nr. 6.1 Anlage VIIIa StVZO
- ABS-Regelung
- Scheinwerfereinstellung gemäß



Not possible with EasyMile due to chassis instabilities
→ currently replaced by a comparable vehicle ;-)

Extension of tele-assistance

Antrieb

Pfadplanung

Sensorik

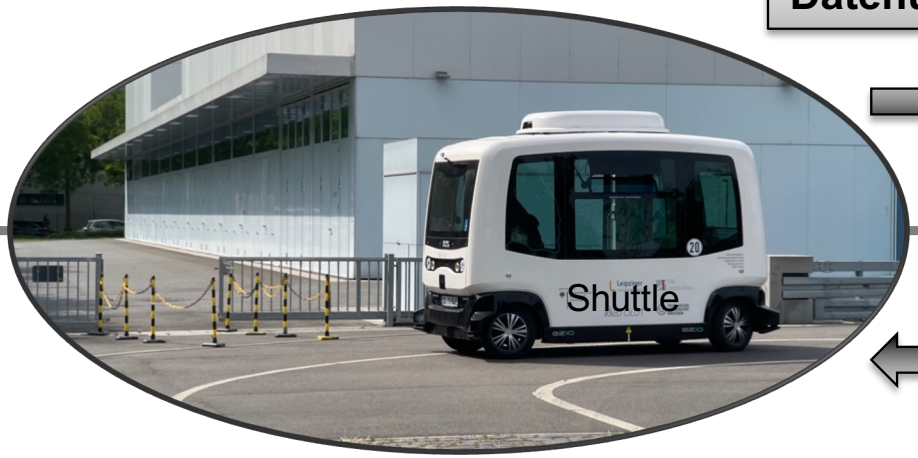
Infrastruktur

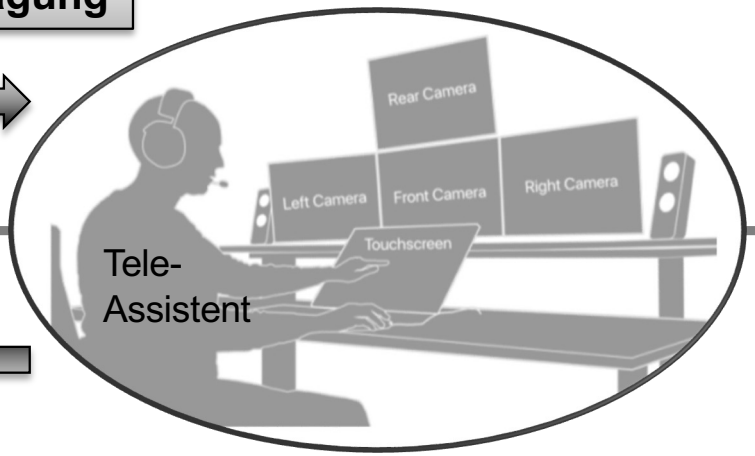
Fahrtabsicherung

Datenübertragung

Technik-Domäne

Test-Domäne





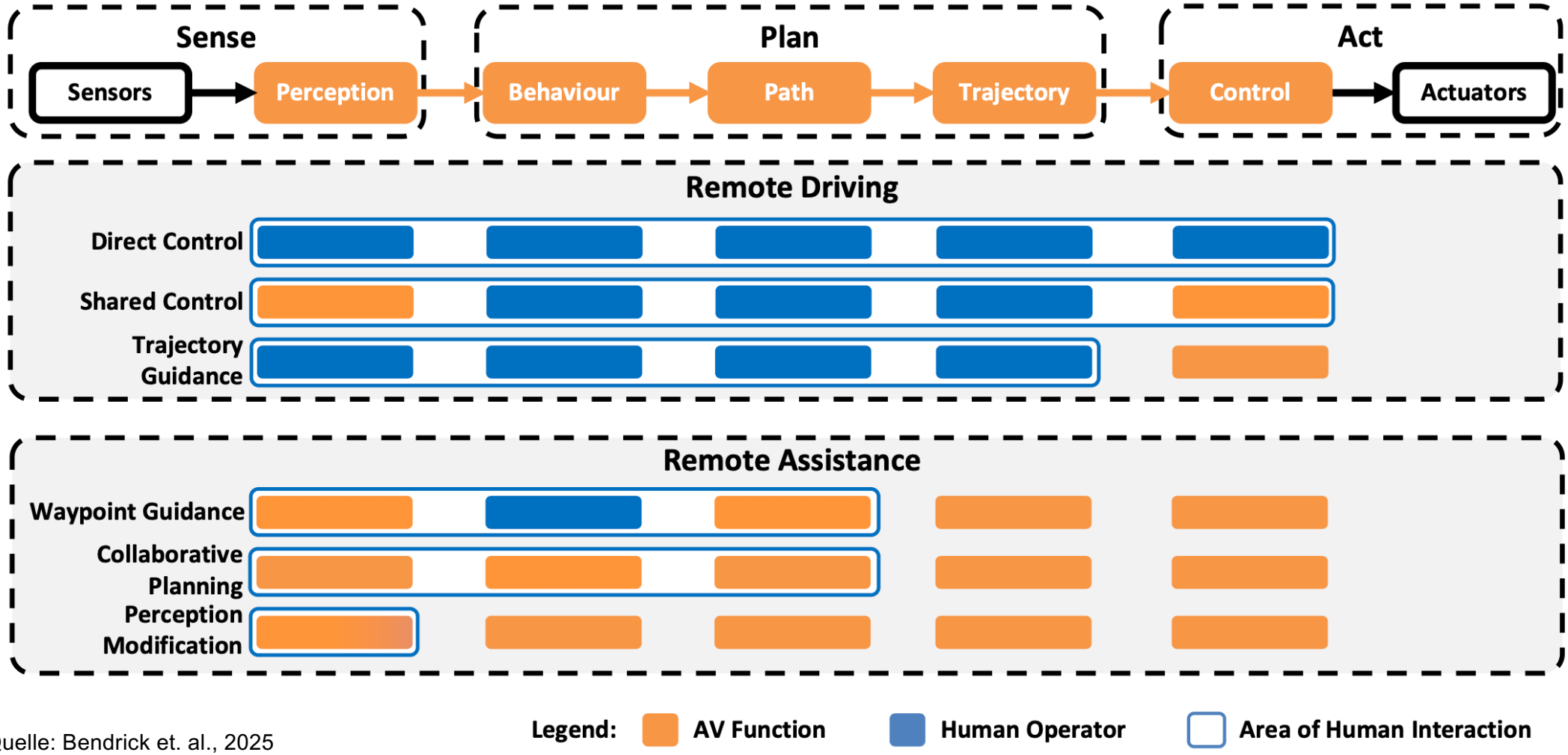
Typ-zulassung

Betriebs-freigabe

Haupt-untersuchung

Anforderungs-ermittlung

Teleoperation → Classification



Quelle: Bendrick et. al., 2025

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Project 2

Lidar at difficult weather situations

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Project 2

Lidar at difficult weather situations

Digitrans – Test Track (1)

Immediately after the measurement

Digitrans – Test Track (2)

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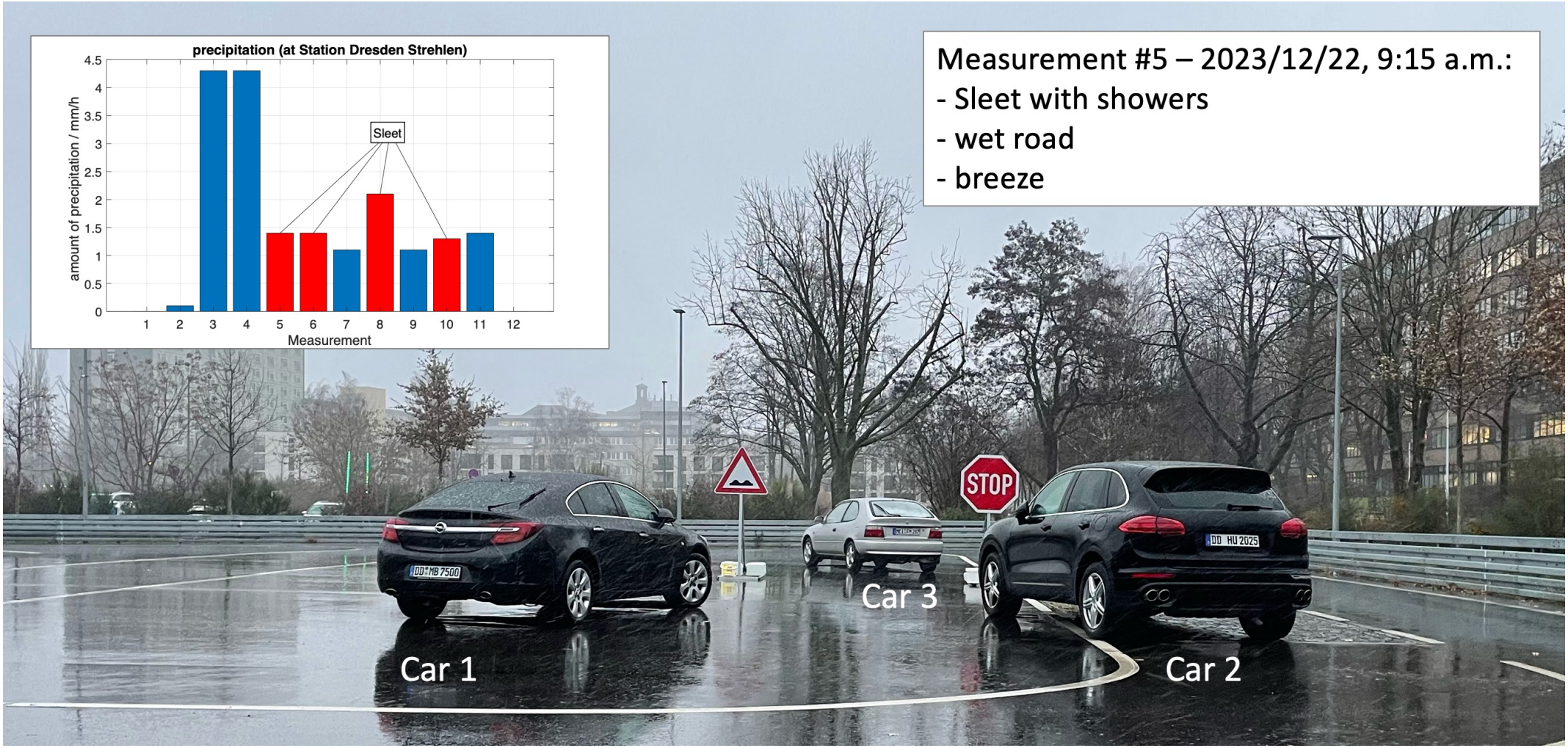
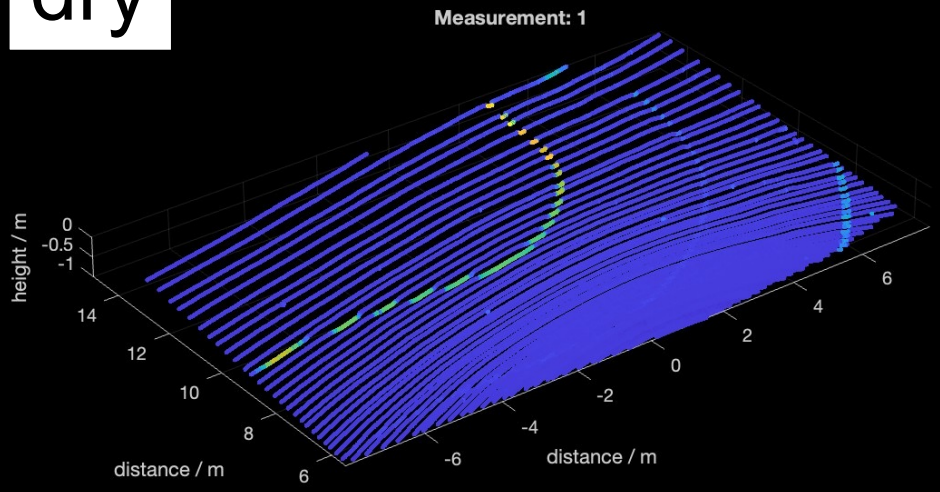
automatisiertes
Forschungs-
fahrzeug
Digitrans | eVAN
digitrans-evan.info
L 9217 W

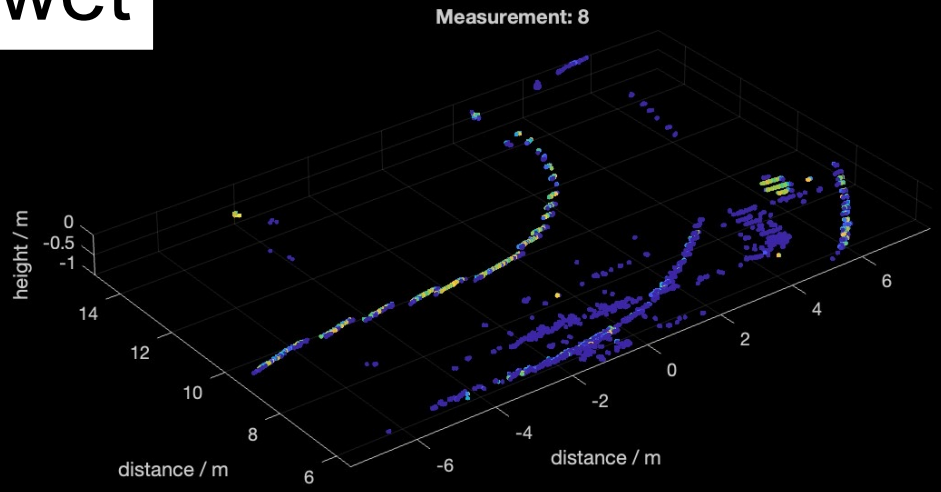
HTWD – Rain/Snow (1)



dry



wet



Lidar with 1550 nm → extreme loss of points

No stable test conditions in Dresden → OSLO?

Lidar Test Bench (1)

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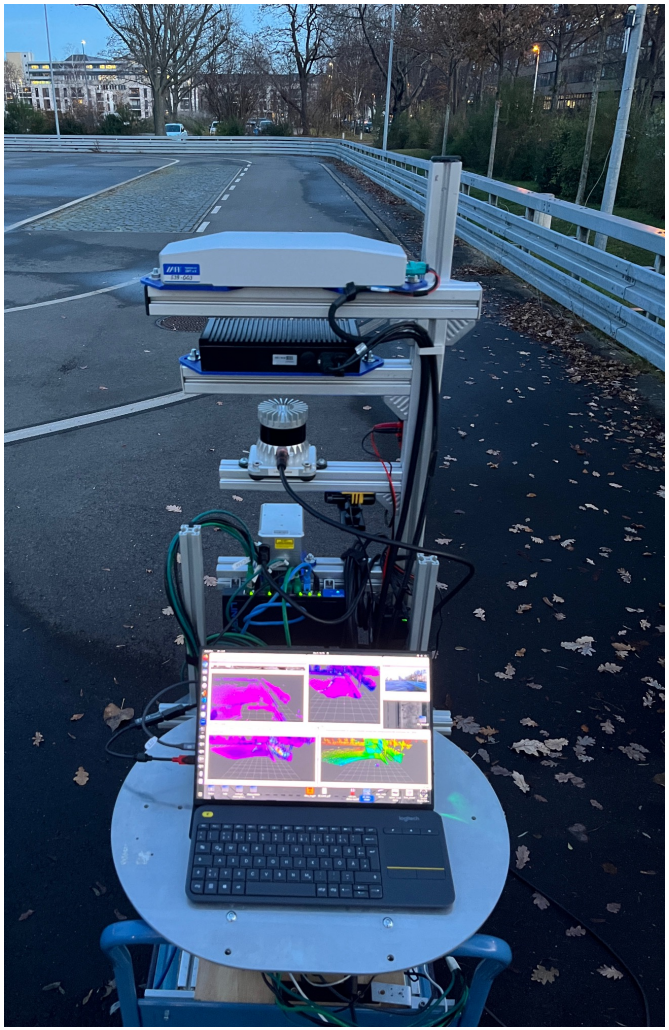

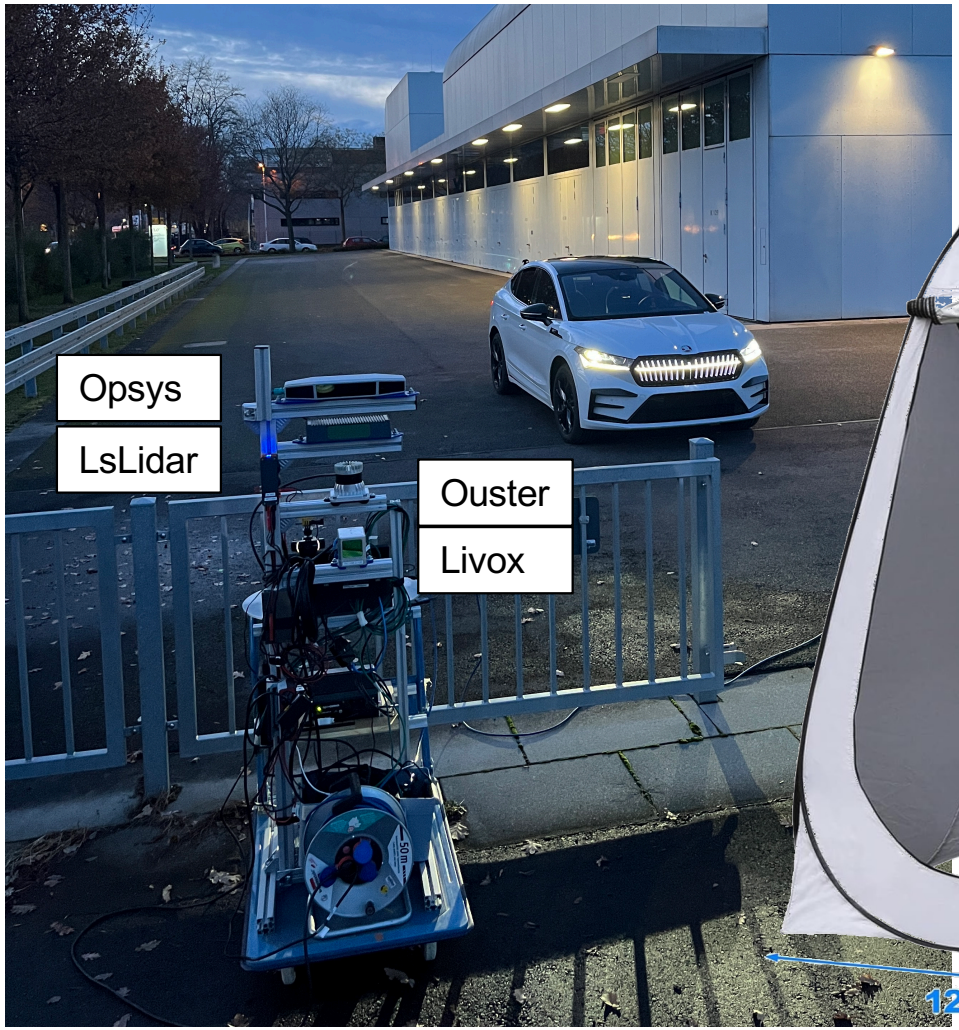

Weather protection

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Project 3

Accident analysis (Software and Tools)

Analysis of crashed cars using Lidar (e.g. iPhone)

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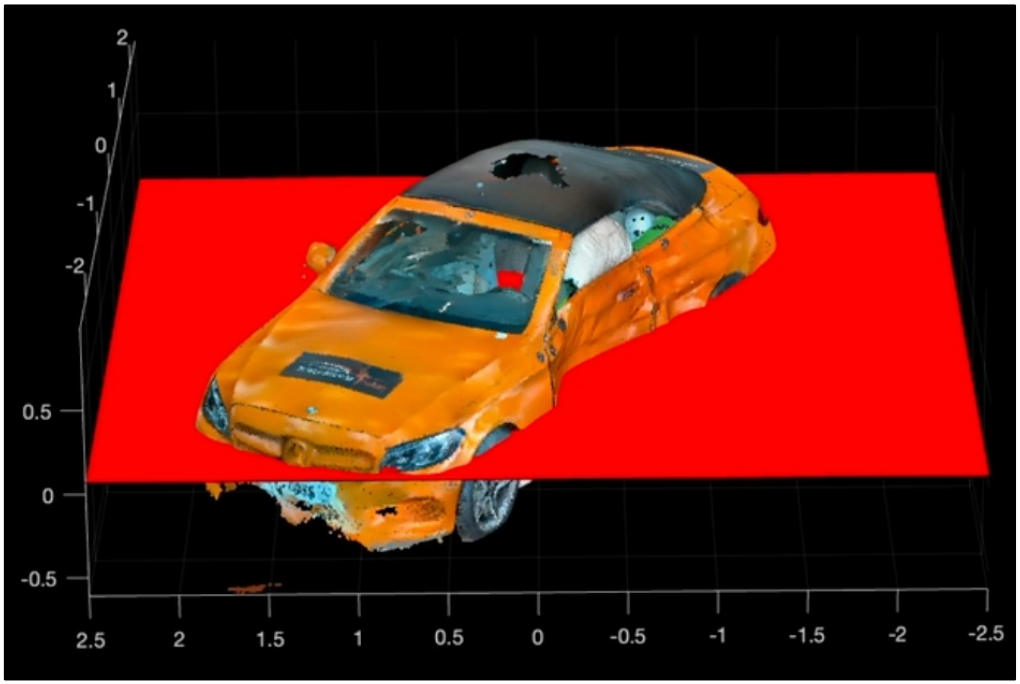

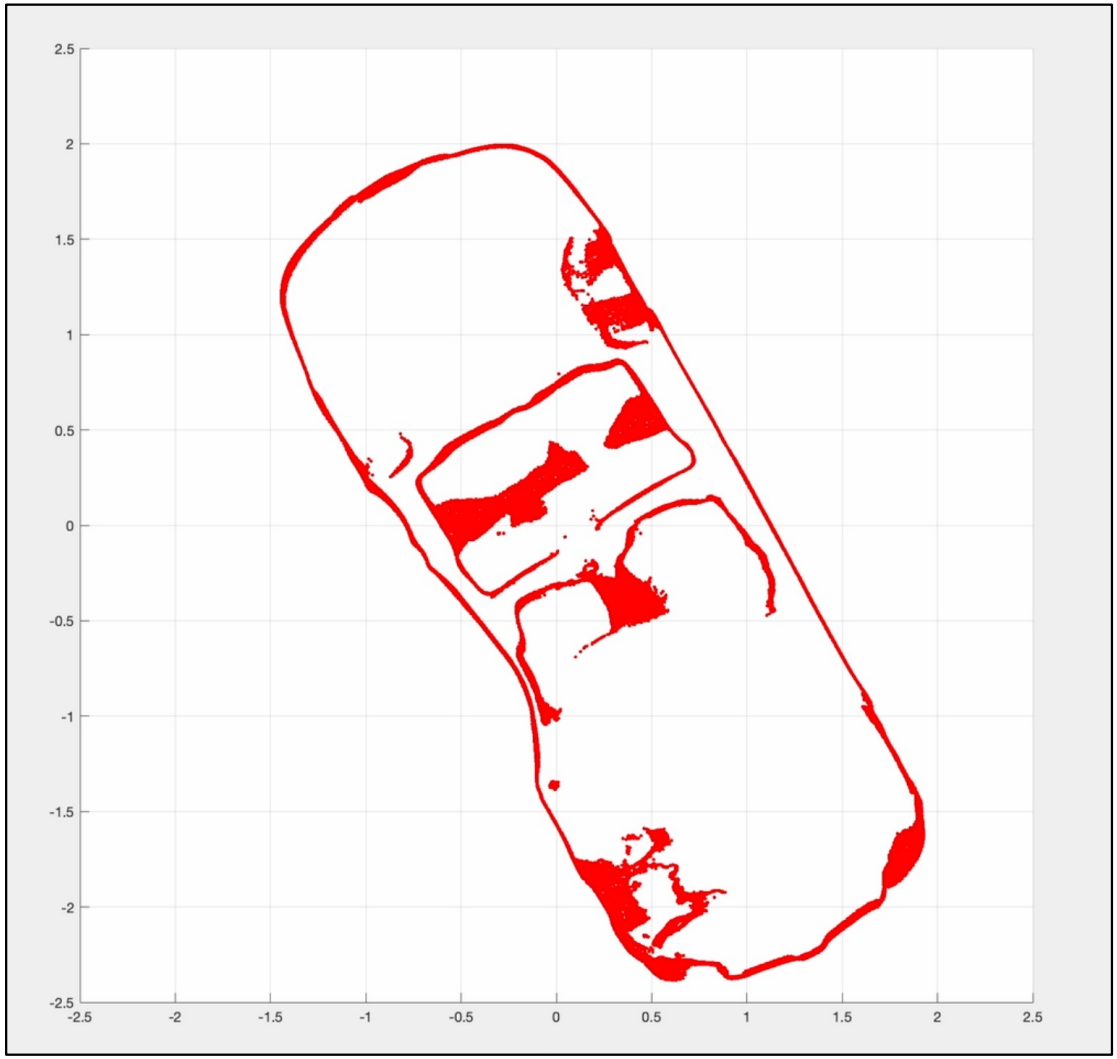

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See you in DRESDEN

Prof. Dr. rer. nat.
Toralf Trautmann
Faculty Mechanical Engineering

T +49 351 462 2383
trautmann@htw-dresden.de