Micromobility: an opportunity for future transport and a challenge for intelligent vehicles

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CHALMERS
UNIVERSITY OF TECHNOLOGY

2023 AUTOMOTIVE USER INTERFACES

INGOLSTADT, GERMANY

Summary

- Micromobility
- Cycling and e-scootering
- Road-user behavior
- Naturalistic data
- Road-user modelling
- Experimental data
- Future opportunities

Slakthusgatan, Göteborg, Sweden © 2022

Micromobility Lab, Chalmers, Sweden © 2023

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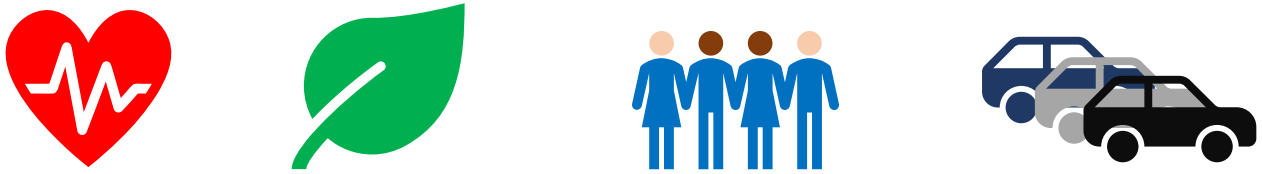
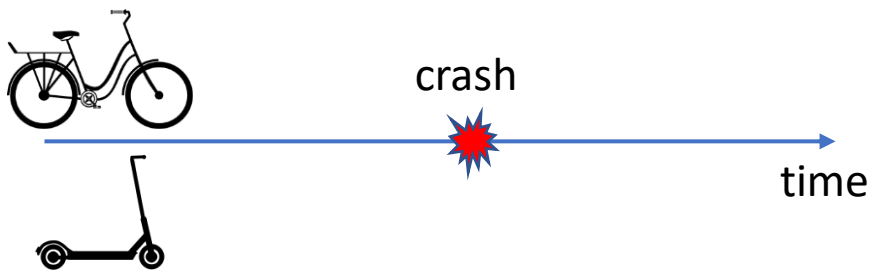
Micromobility



Micromobility is transportation by light vehicles

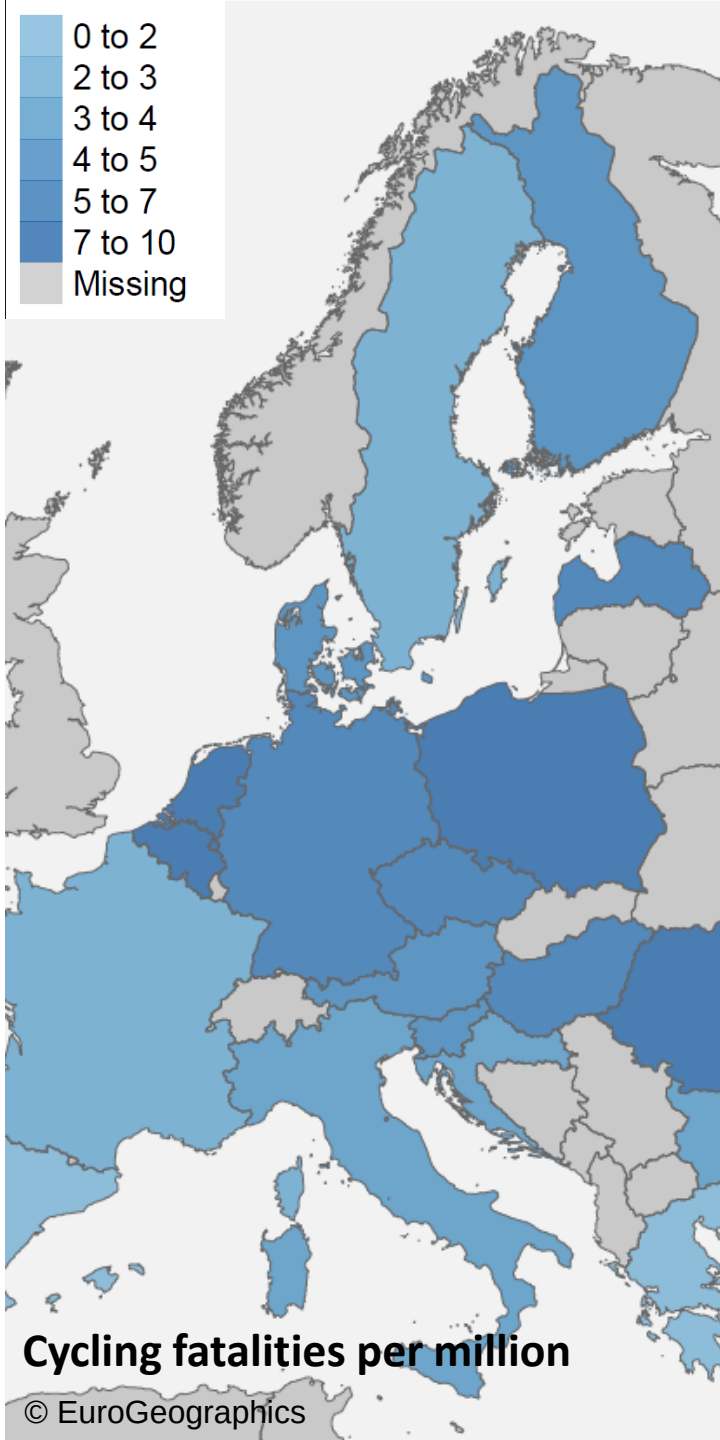
R.L. Abduljabbar et al. Transportation Research Part D 92 (2021)


crash
time

Cycling safety

41k fatalities

2k fatalities (9%)



Wolrd Health Organization – Cyclist Safety, 2020
European Road Safety Observatory - Facts and Figures – Cyclists, 2023
J.-K. Kim et al., Accident Analysis and Prevention 39 (2007) 238–251
International Transport Forum – Road Safety Report, 2021 (SE, DK, DE, AU, IT)

E-scootering safety

5.3

~0.53

26%

#1

80%

30%

Voi, *Safety Report*, April 2023
Fearnley, N. (2020). Micromobility – Regulatory Challenges and Opportunities. In A. Paulsson & C. H. Sørensen (Eds.), Shaping Smart Mobility Futures: Governance and Policy Instruments in times of Sustainability Transitions (pp. 169–186). Emerald Publishing Limited.
Austin Public Health, *Dockless electric scooter - related injuries study*, 2019
Clough et al., *Major trauma among E-Scooter and bicycle users: a nationwide cohort study*. Injury prevention, 29(2), 121-125, 2023.
European Commission, *Road safety thematic report – Personal Mobility Devices. European Road Safety Observatory*. Brussels, EC, Directorate General for Transport, 2021

Countermeasures

Equipment

Education

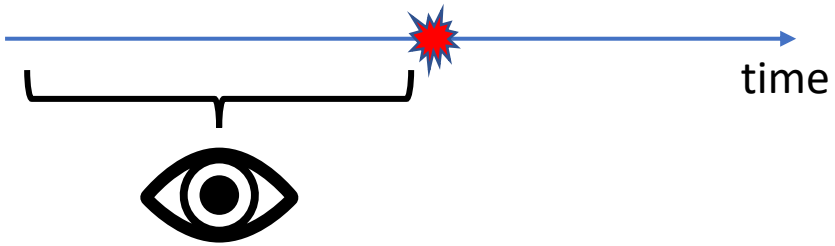
Infrastructure

Vehicle technology

Policies

The safety problem

- Statistics tells how big is the problem, not where it comes from.
- If we understand the problem, we can devise more efficient solutions.
- So, why do crashes happen?



Naturalistic data

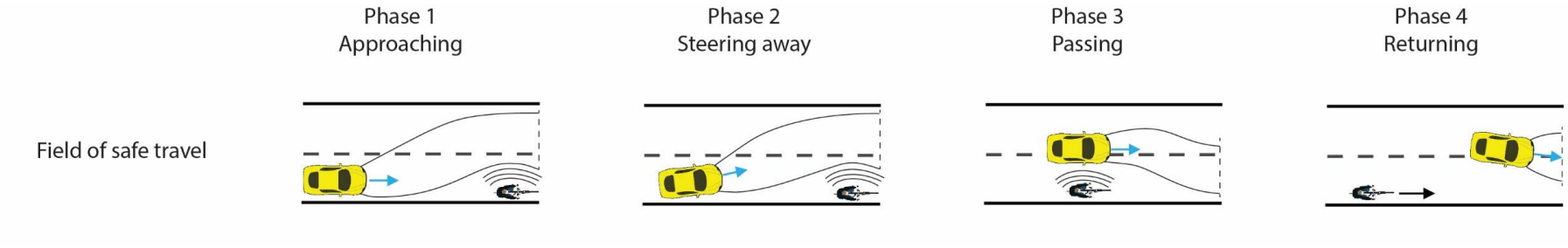
- Data collected in real-traffic as road users attend their daily routine.
- Show how and *why* crashes happen (or not happen).

Dozza and Werneke, Transportation Research Part F, 2012

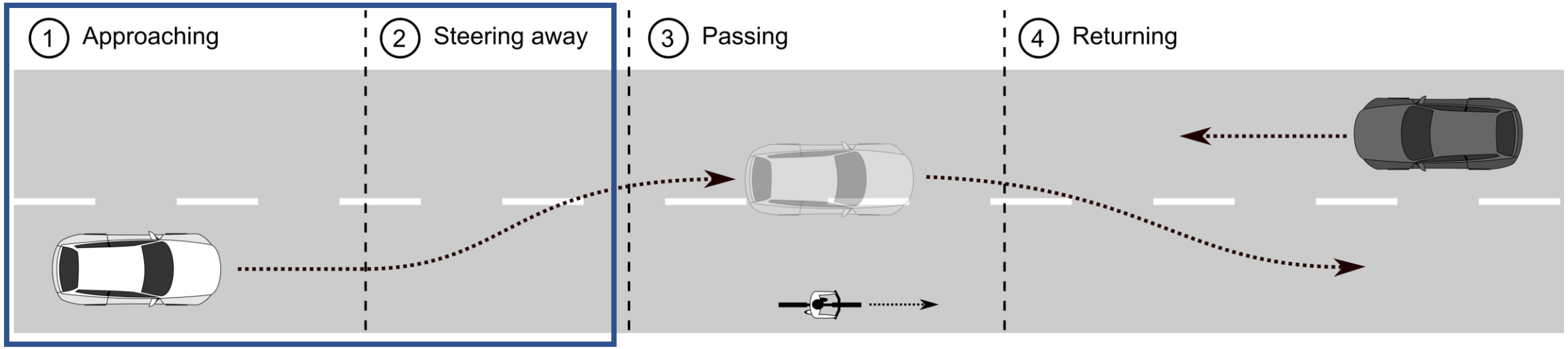
Videos

What does Marco do with so much data?

Modelling behaviour in overtaking

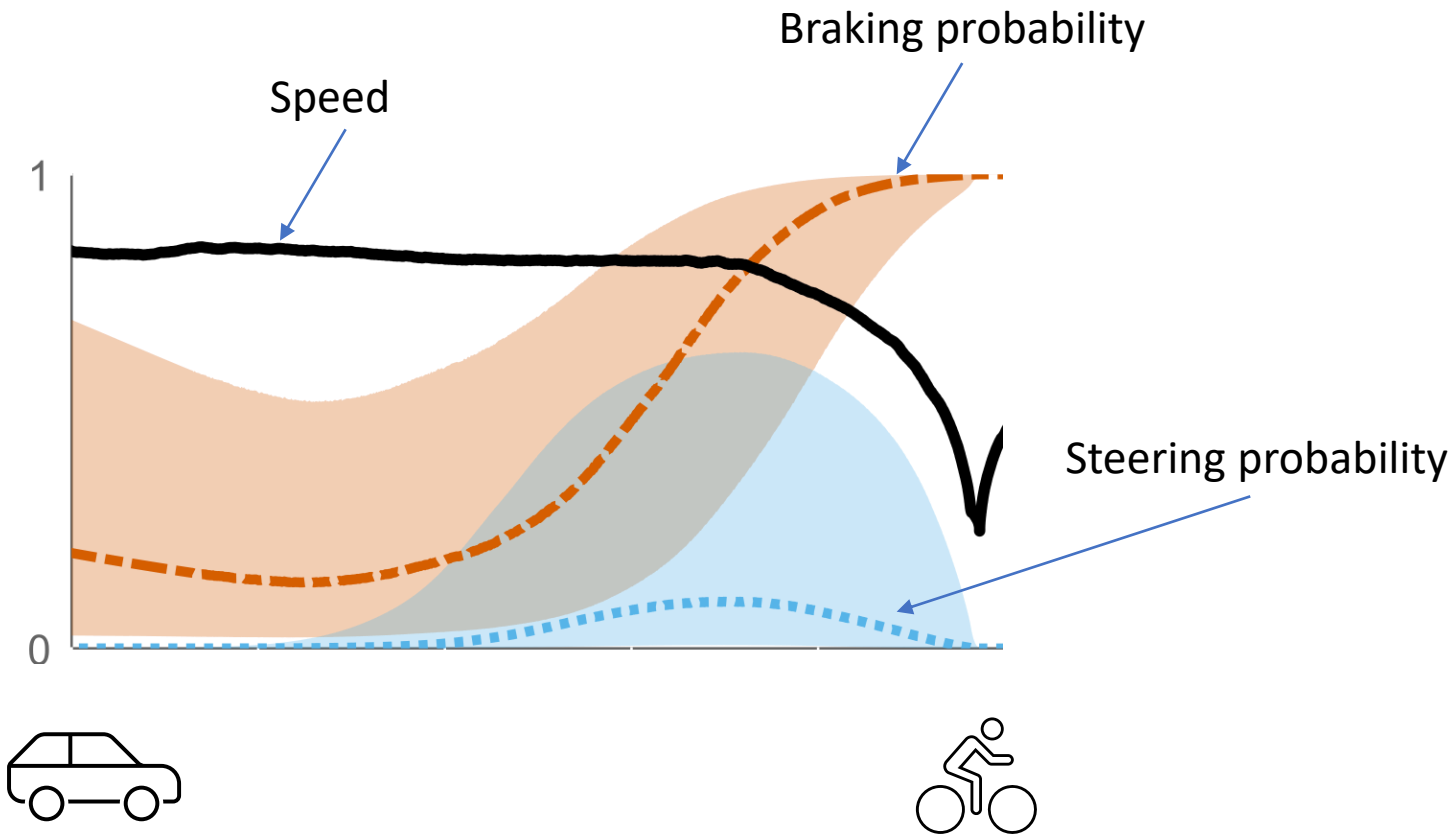


Overtaking: approaching and steering away



Rasch, A., & Dozza, M. (2022). Modeling Drivers' Strategy When Overtaking Cyclists in the Presence of Oncoming Traffic. IEEE Transactions on Intelligent Transportation Systems, 23(3), 2180–2189.

Braking/steering model



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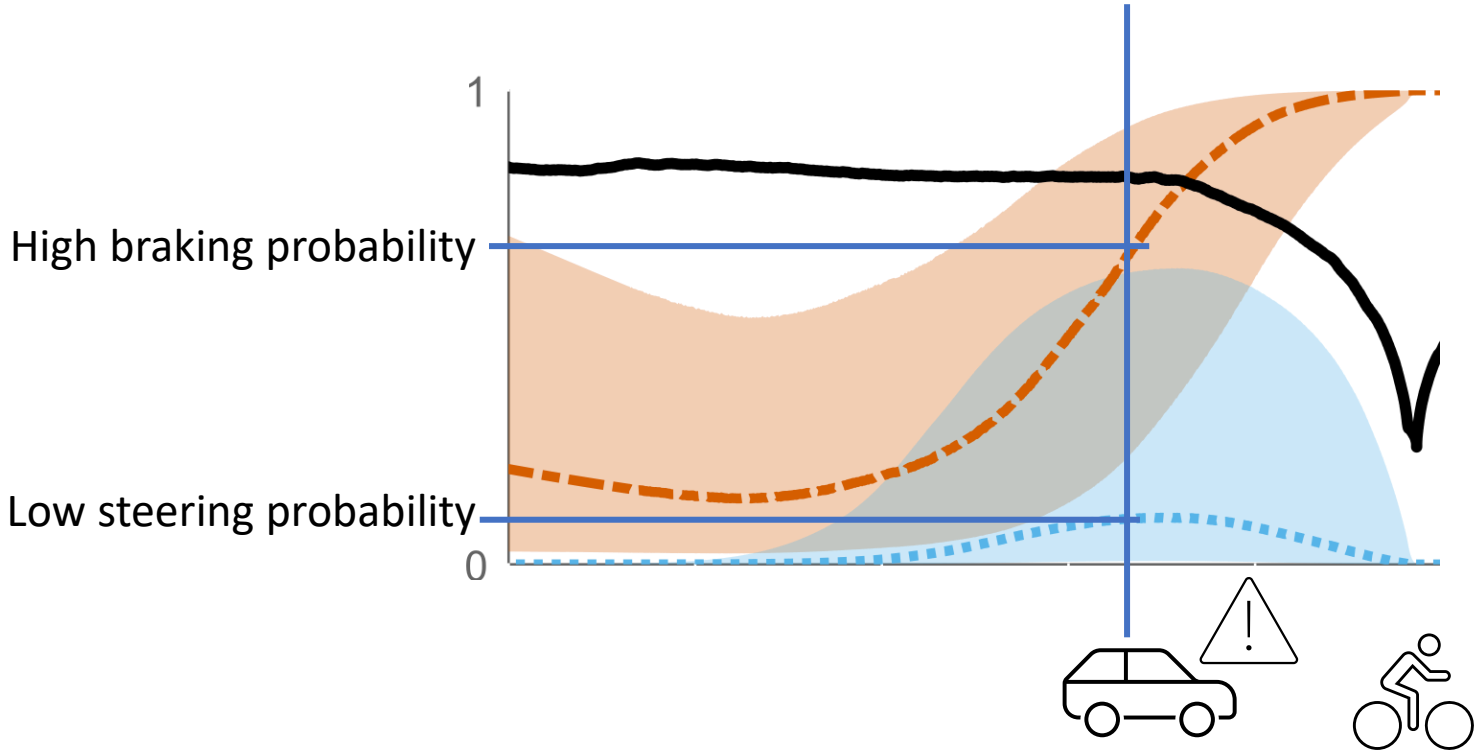
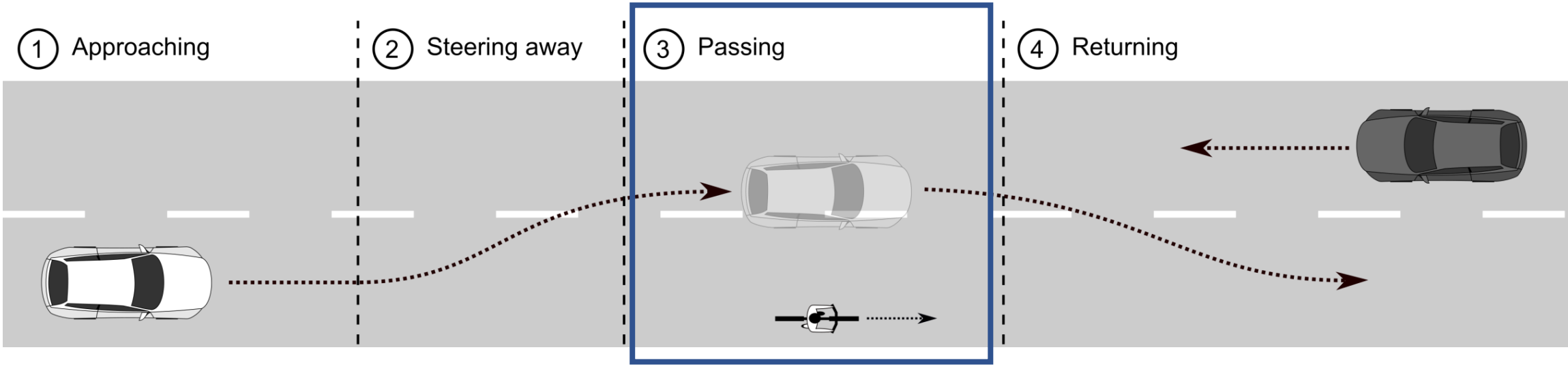
Braking/steering model



Rasch, A., & Dozza, M. (2022). Modeling Drivers' Strategy When Overtaking Cyclists in the Presence of Oncoming Traffic. IEEE Transactions on Intelligent Transportation Systems, 23(3), 2180–2189.

Overtaking: passing



Rasch, A., Moll, S., López, G., García, A., & Dozza, M. (2022). Drivers' and cyclists' safety perceptions in overtaking maneuvers. *Transportation Research Part F: Traffic Psychology and Behaviour*, *84*(July 2021), 165–176.
Rasch, A., Tarakanov, Y., Tellwe, G., & Dozza, M. (2022). Drivers overtaking cyclists: How does visibility affect safety? Results from a naturalistic study. (submitted to Journal of Safety Research)

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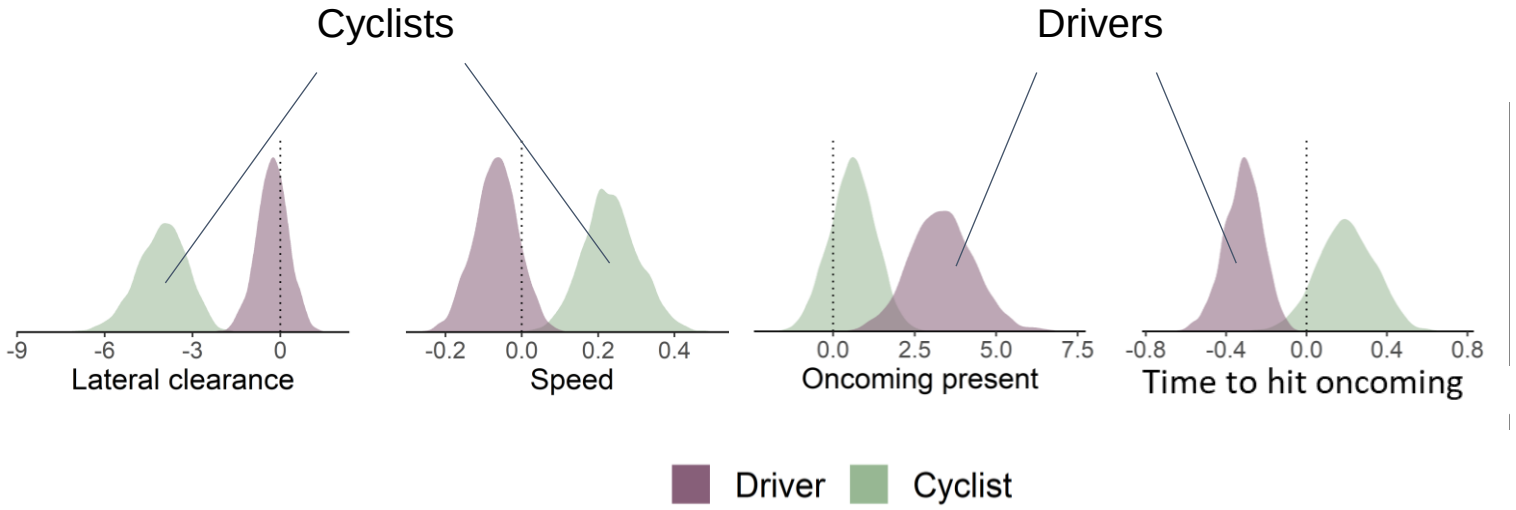
The passing phase



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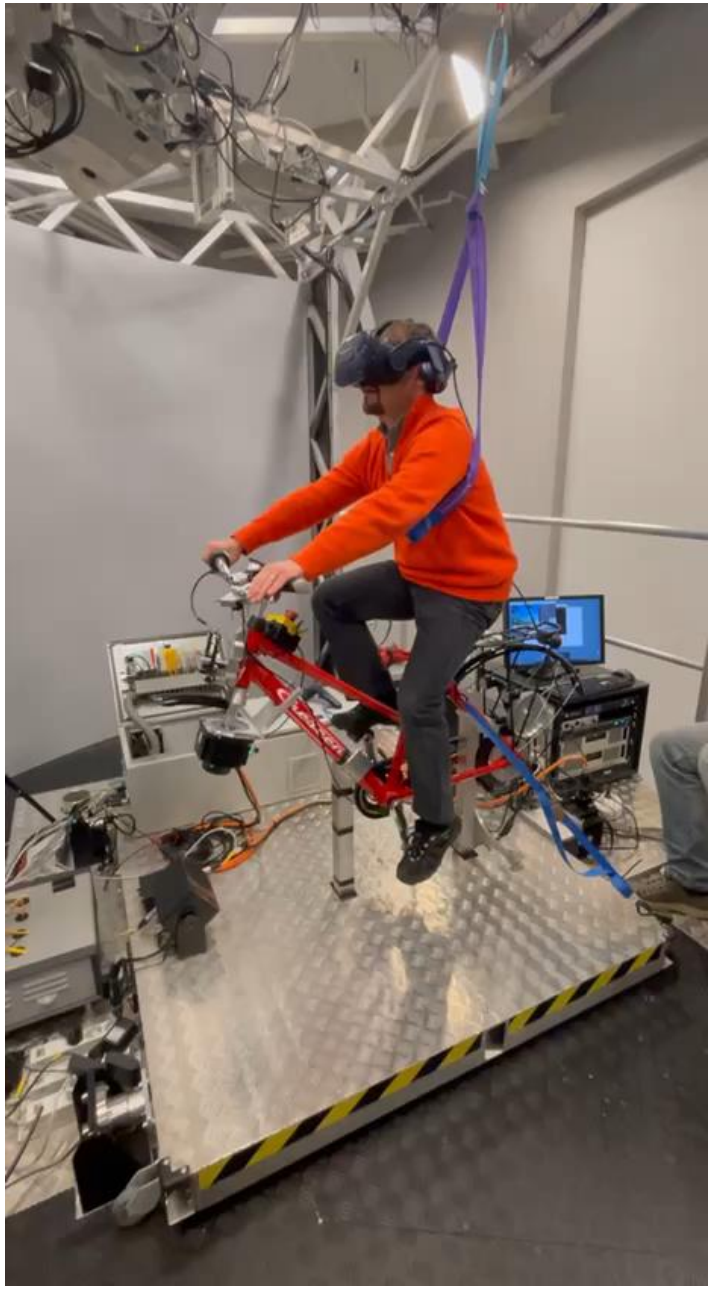


VTI bike simulator - Göteborg

WIVW bike simulator - Wurzburg

VTI bike simulator - Linköping

MICA 2

Micro SAFETY – www.microsafety.eu

- **Two goals:**

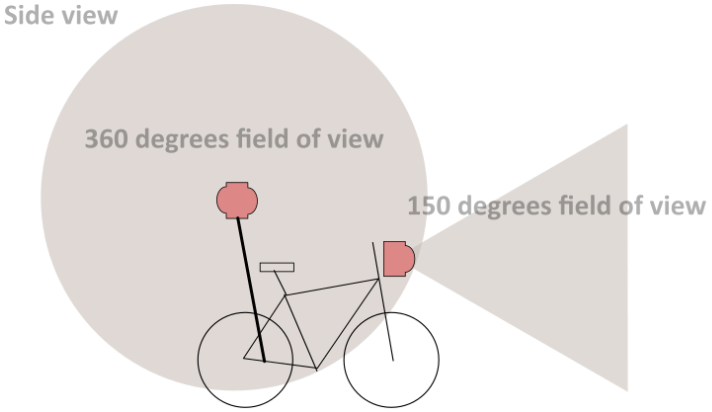
  1. **Disseminate research**

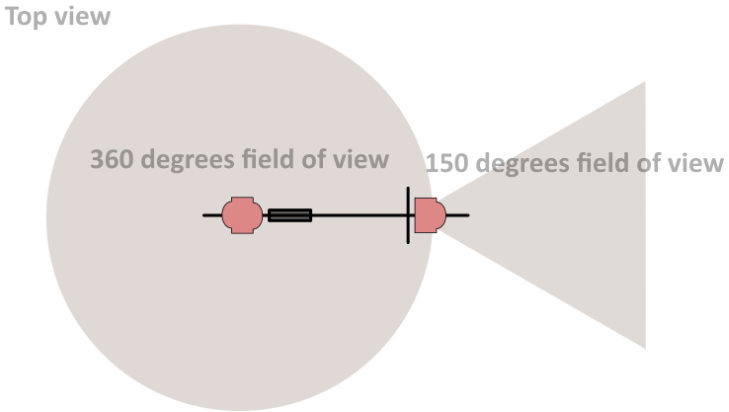
  2. **Collect naturalistic data**

THI bike simulator - Ingolstadt

1900 Km - 16 Stages - 10 Events - 2.5 Tb of data

MicroSAFETY – Data





- Videos
- GPS
- Kinematics

SAFER

TRAFIKVERKET

NTF SÄKER TRAFIK

CANYON

Autoliv

Folksam

Göteborgs Stad

BOSCH

@marcochalmers

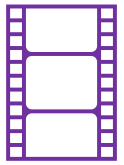
Advances in video processing and distance estimation from cameras

Predictions

Micromobility will ”grow”

Vehicles will be ”smarter”

Virtual worlds will ”develop”



AI will ”understand” videos

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