

How are Emerging Data Enabling Smarter Safety Applications?

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<http://tse.bgu.tum.de> , <http://web.mit.edu/costas/www/>

The banner features the NTUA logo on the left. The text reads: "National Technical University of Athens Road Safety Observatory" followed by the website "www.nrso.ntua.gr". Below this, it says "Online workshop in the framework of" and "6TH UN GLOBAL ROAD SAFETY WEEK 17 - 23 May 2021". The date "Thursday 20 May 2021" is highlighted in a red box. The United Nations logo is present, along with the "Streets for Life" and "#Love30" campaign logos. A "30 KM/H" speed limit sign is also shown. At the bottom, a large blue banner reads "Innovation in Road Safety Research".

National Technical University of Athens
Road Safety Observatory www.nrso.ntua.gr

Online workshop in the framework of **6TH UN GLOBAL ROAD SAFETY WEEK**
17 - 23 May 2021

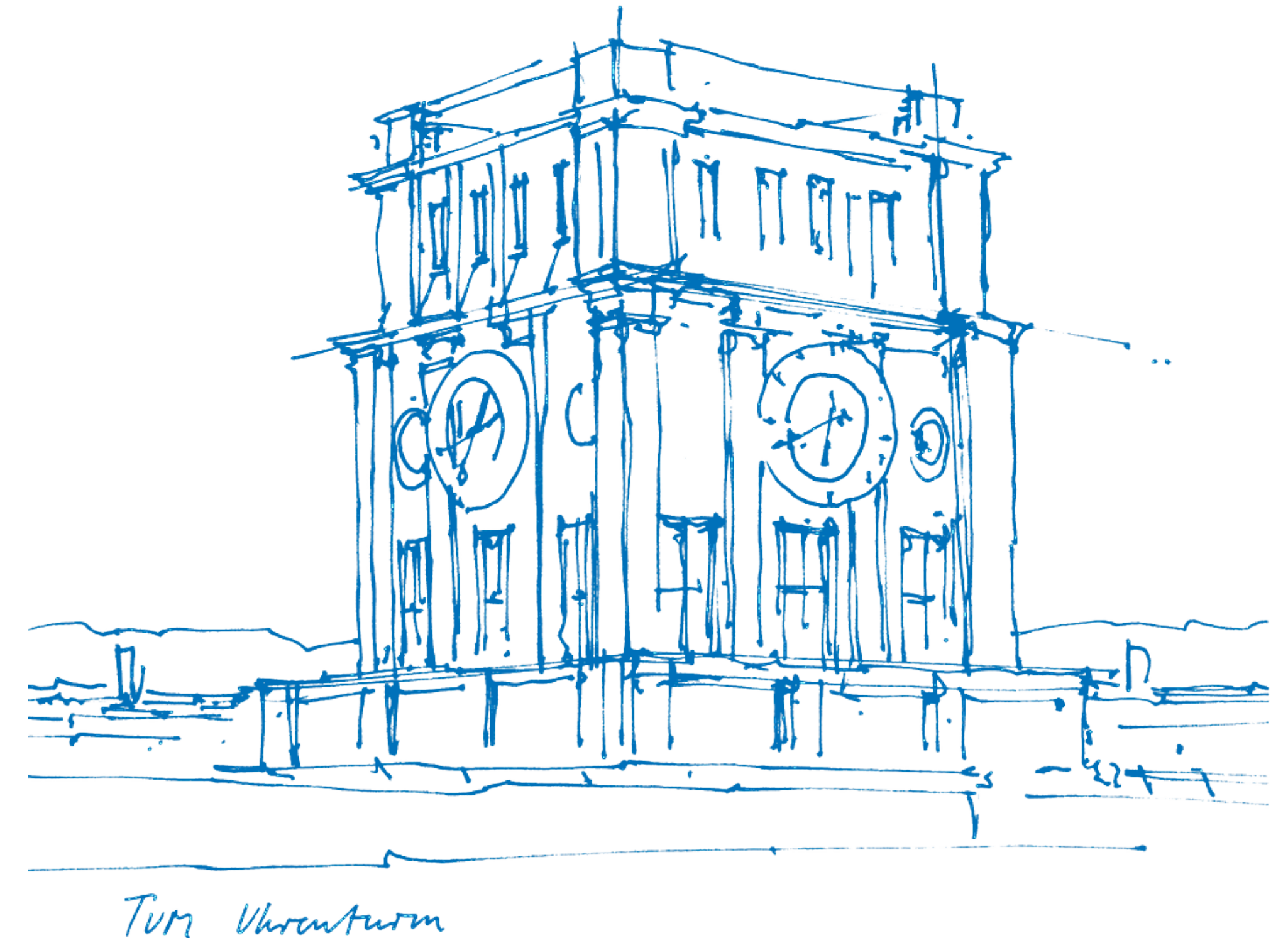
Thursday **20 May 2021**

Streets for Life
#Love30

DECADE OF ACTION FOR ROAD SAFETY
2021 - 2030

30 KM/H

Innovation in Road Safety Research





Drone Videography

Naturalistic trajectories

Time-space snapshot

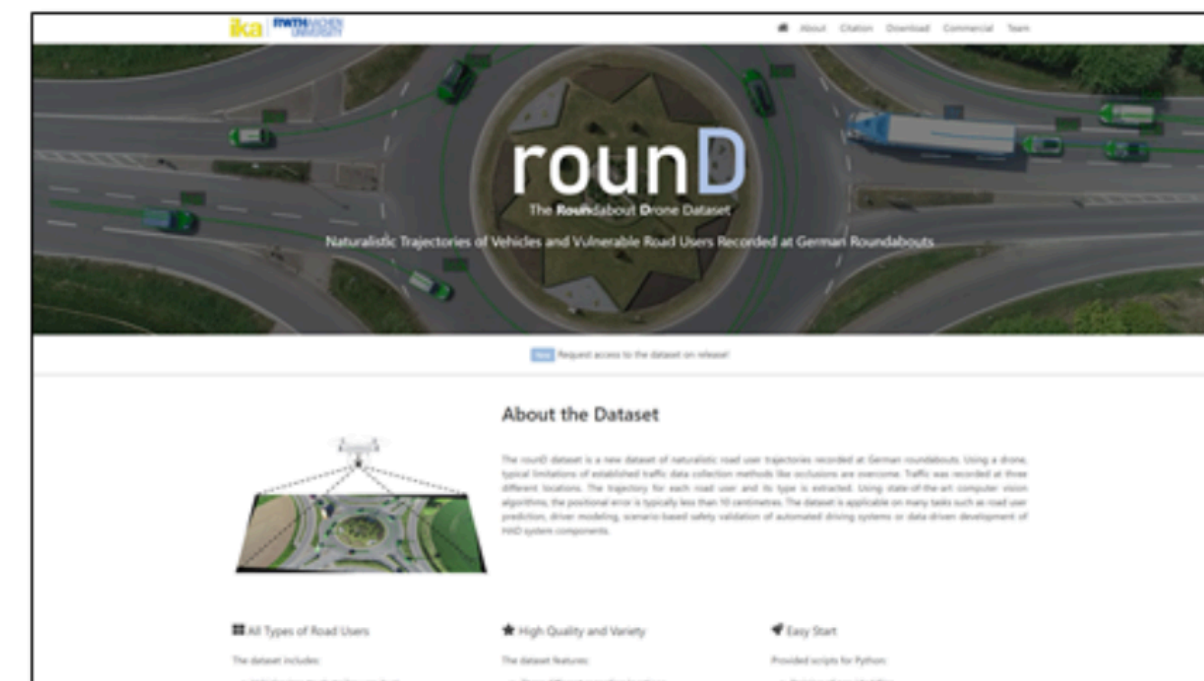
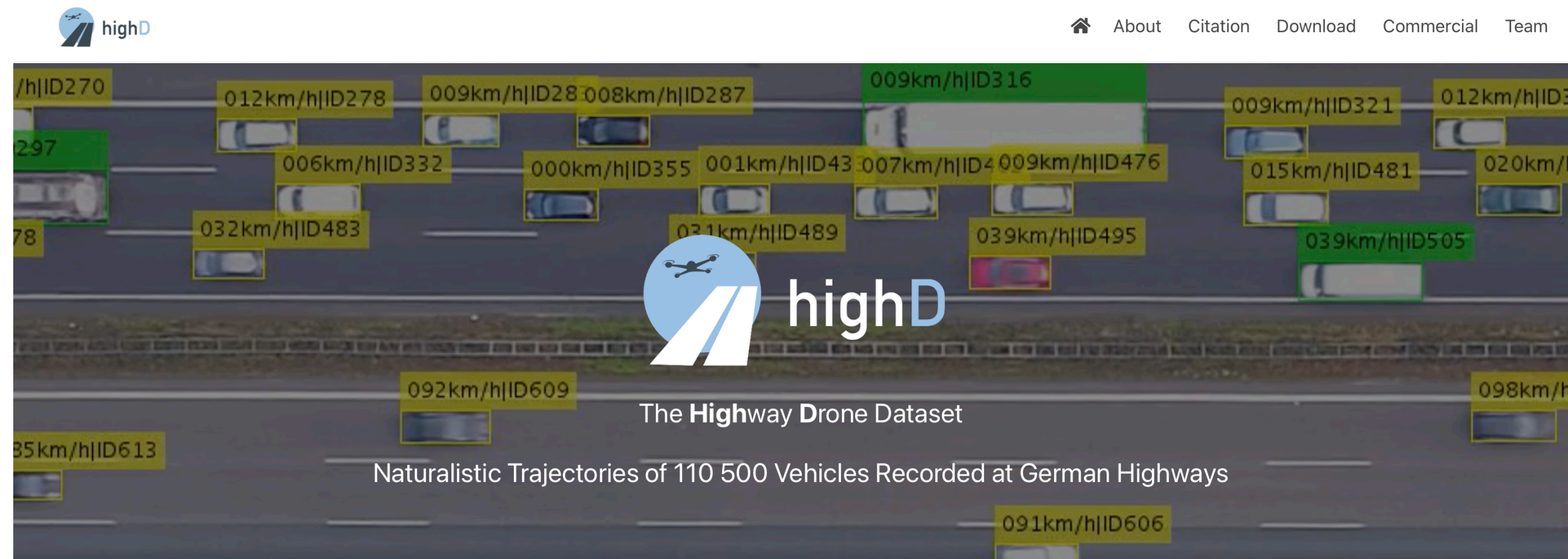
Machine learning for large data:

- High frequency
- Large number of vehicles



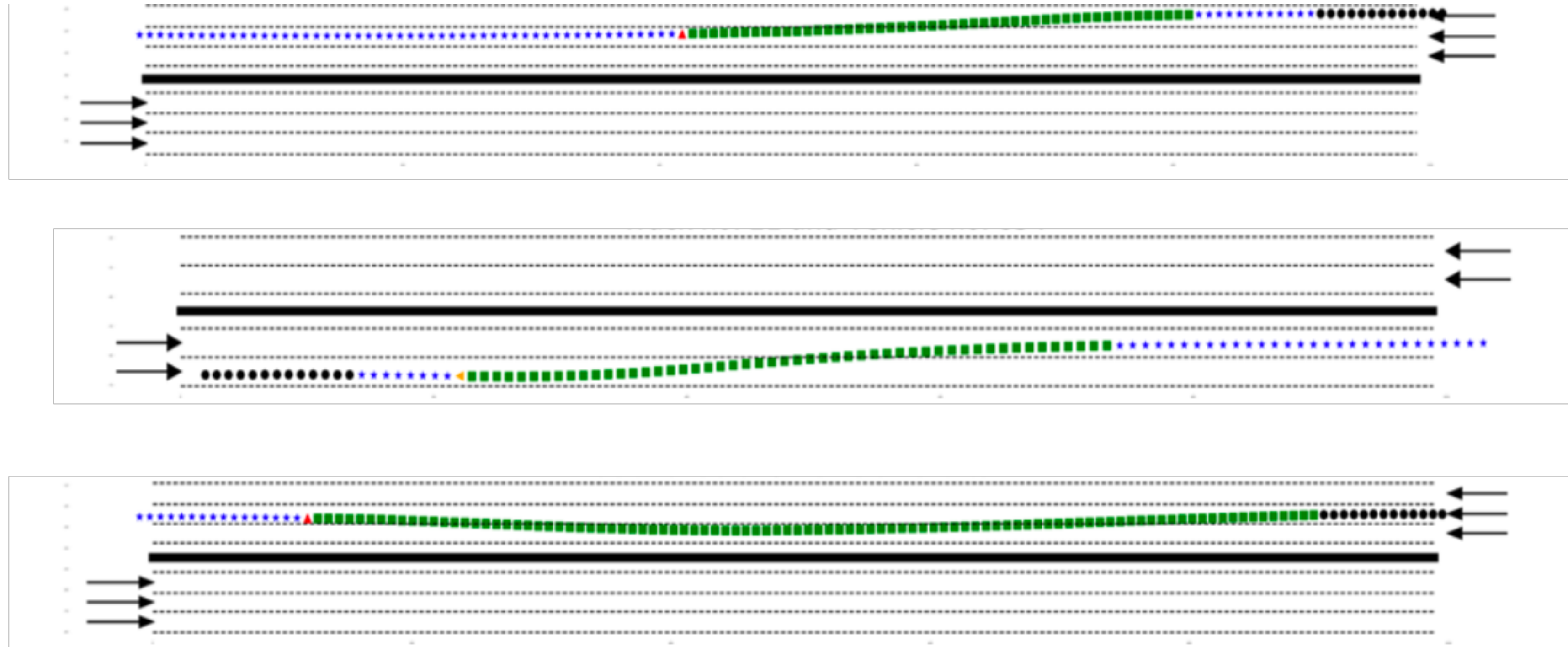
<https://open-traffic.epfl.ch>

And many others, e.g.



<https://www.highd-dataset.com>

Intention/ maneuver prediction

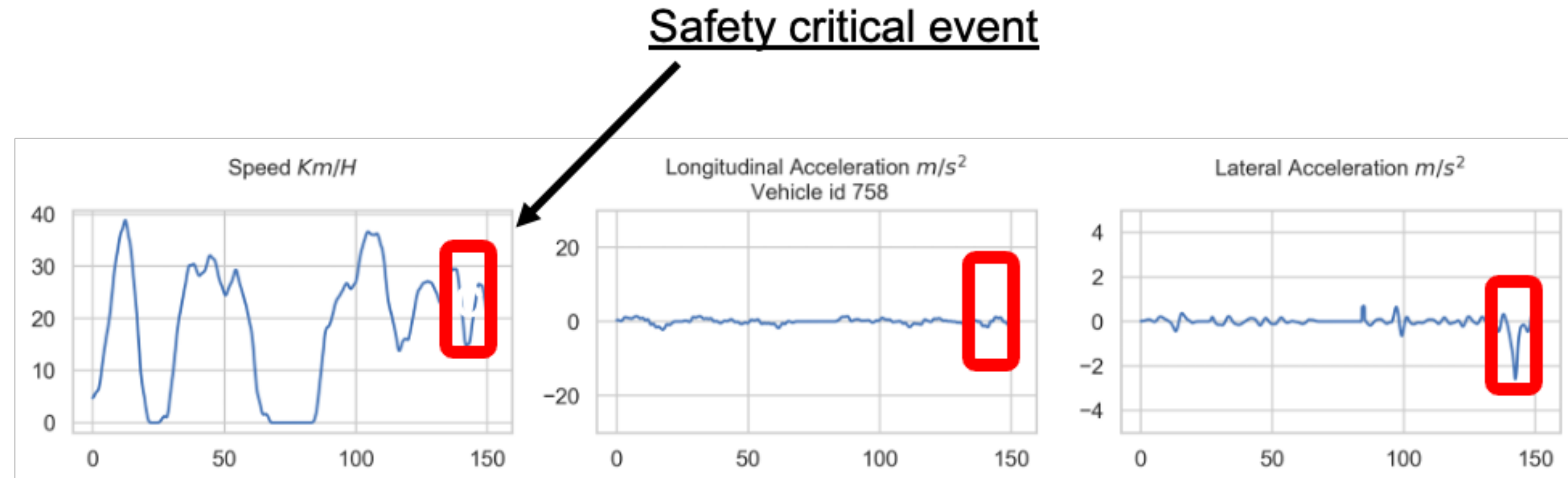


Lane change prediction in highD dataset

Mahajan, V., Katrakazas, C., & Antoniou, C. (2020). Prediction of Lane-Changing Maneuvers with Automatic Labeling and Deep Learning. *Transportation Research Record*, 2674(7), 336–347. <https://doi.org/10.1177/0361198120922210>

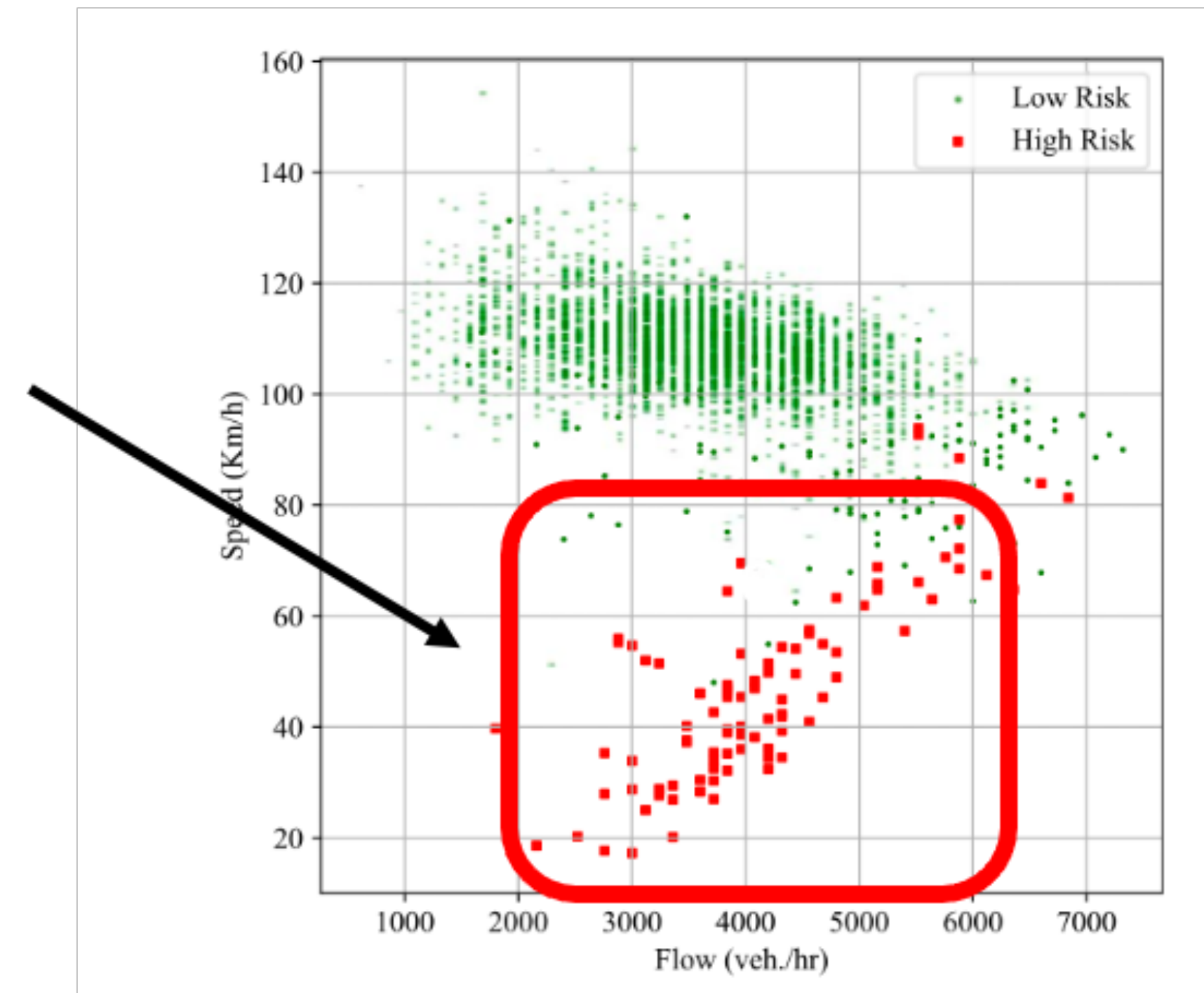
Level of analysis

Microscopic



Macroscopic

Section/ network-wide risk



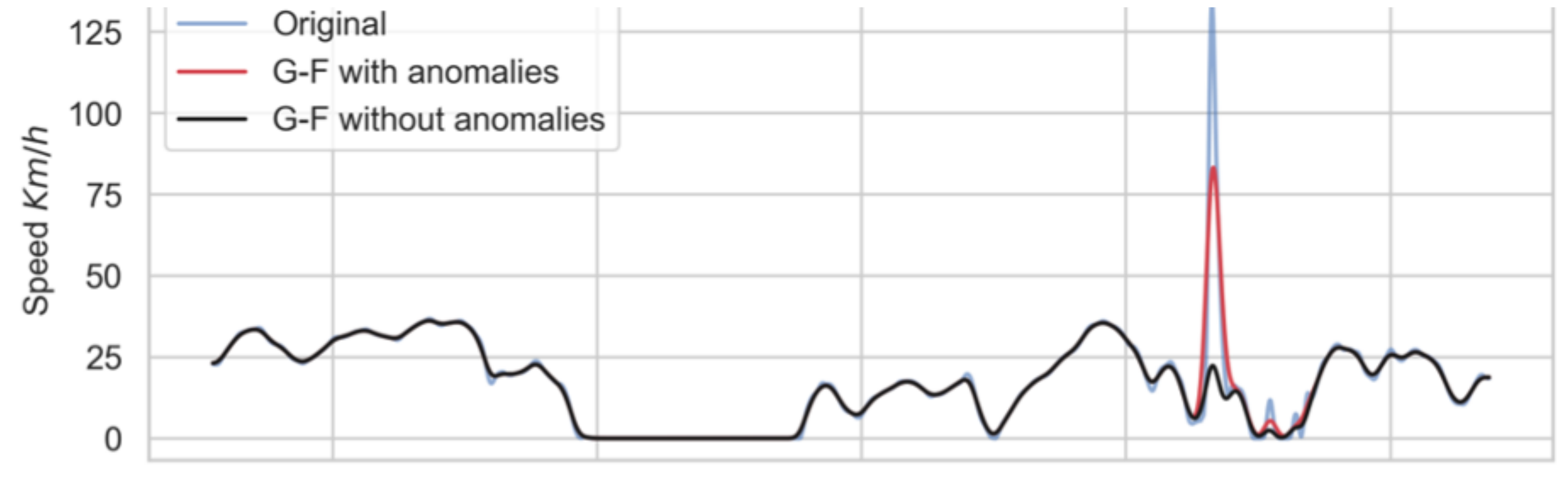
Mahajan V., Katrakazas C. and Antoniou C., "Crash Risk Estimation Due to Lane Changing: A Data-Driven Approach Using Naturalistic Data,"
in *IEEE Transactions on Intelligent Transportation Systems*, doi: 10.1109/TITS.2020.3042097

Data issues management

No driver attributes

Short-time and limited-space observability

Data accuracy and processing



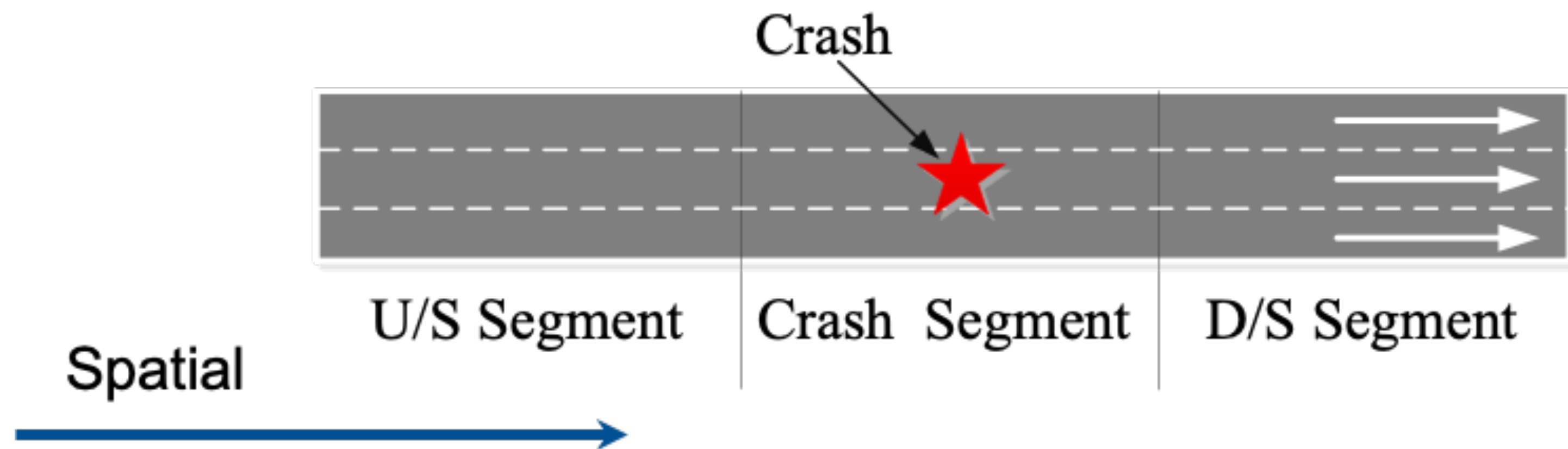
Treating anomalies in the pNEUMA dataset

Mahajan V., Barmounakis E., Alam Md., Geroliminis N. and Antoniou C., "Treating noise and anomalies in vehicle trajectories from an experiment with a swarm of drones" (In preparation).

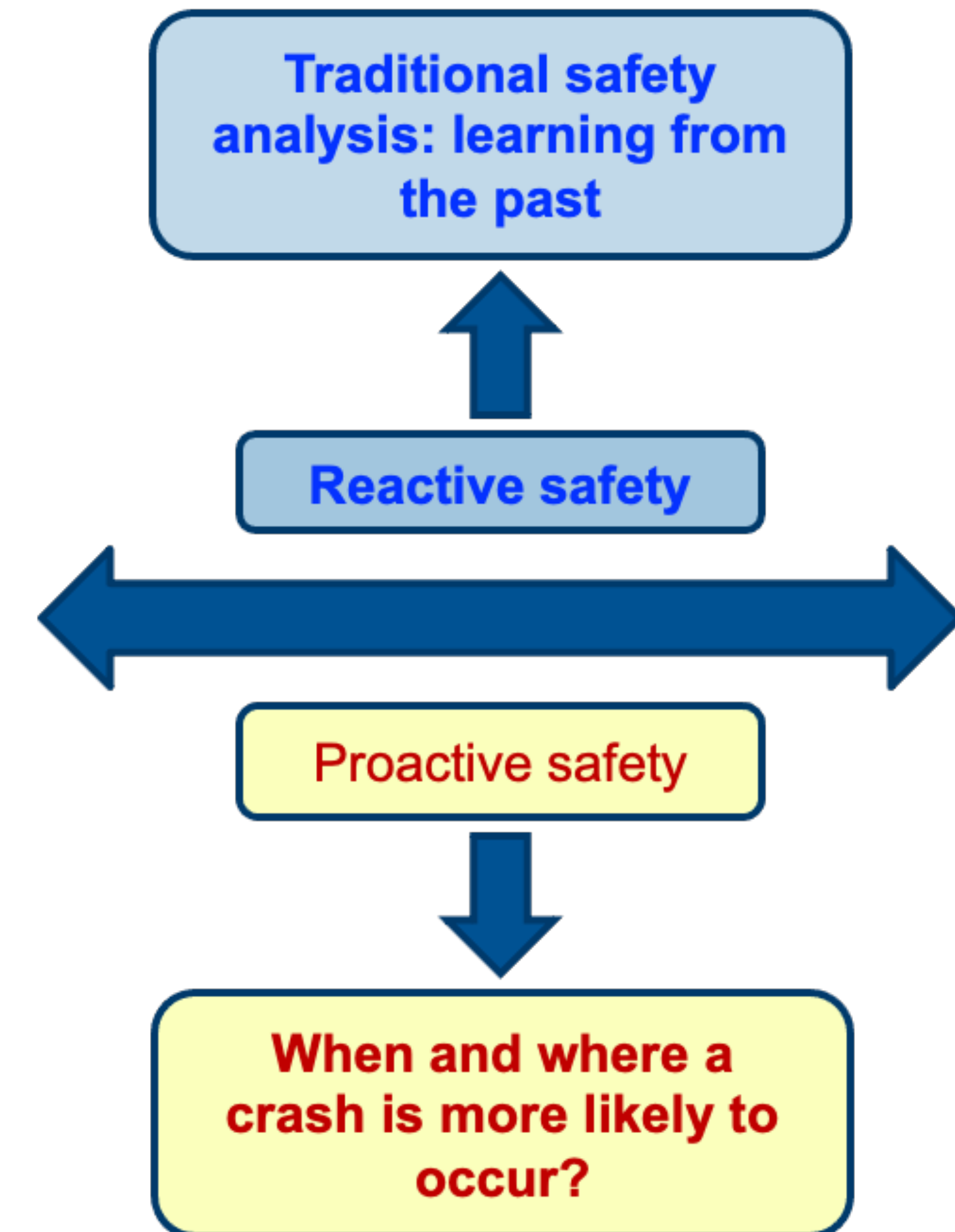
Real-time crash risk evaluation in mixed traffic flow scenarios

Real-time crash risk (crash vs non – crash) =
 $f(\text{traffic dynamics, weather conditions,}$
 $\text{geometric designs, driver behaviors, etc.})$

How to develop the best-fit function?

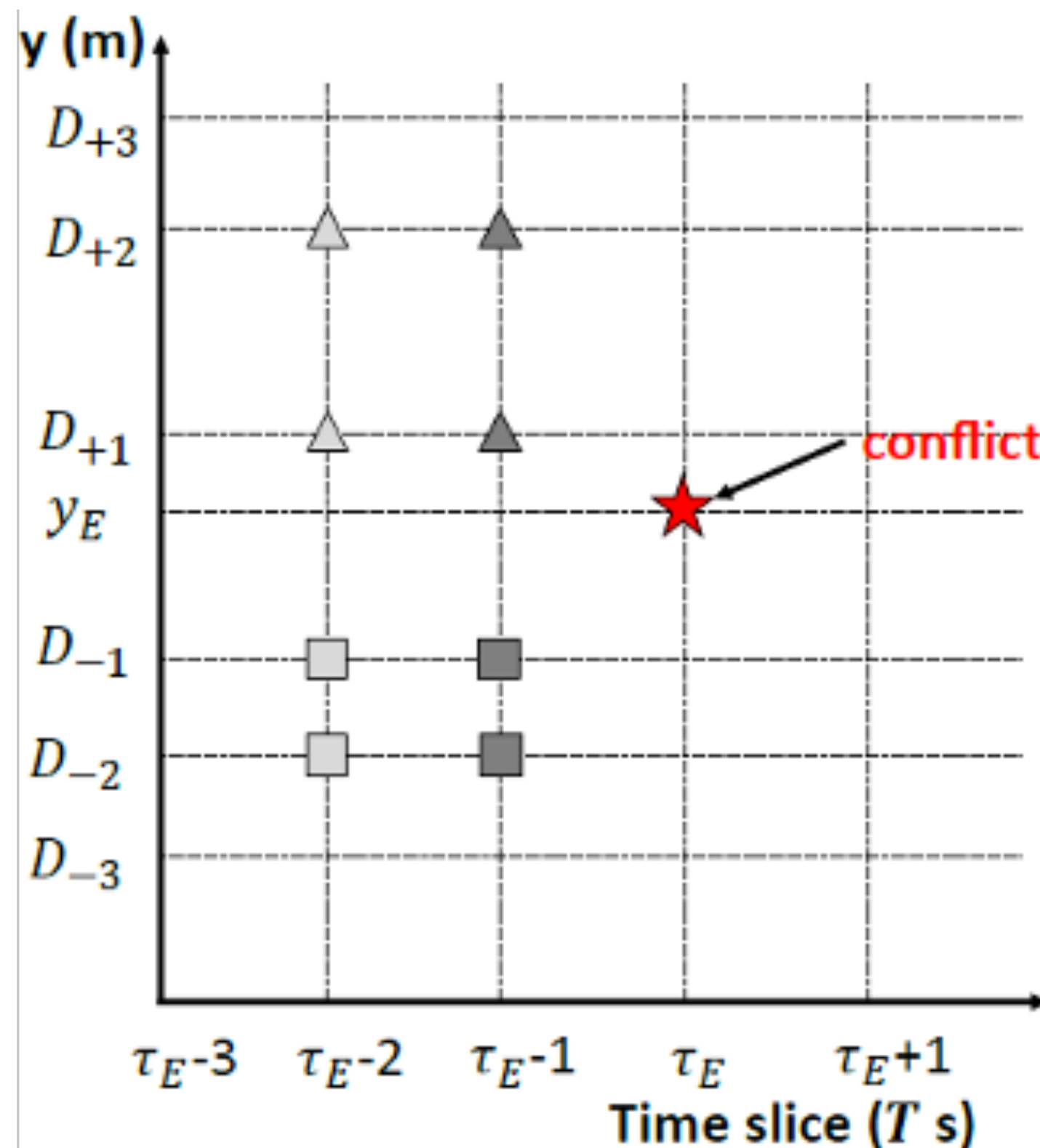


In mixed traffic flow scenarios, the data sources and traffic characteristics are different

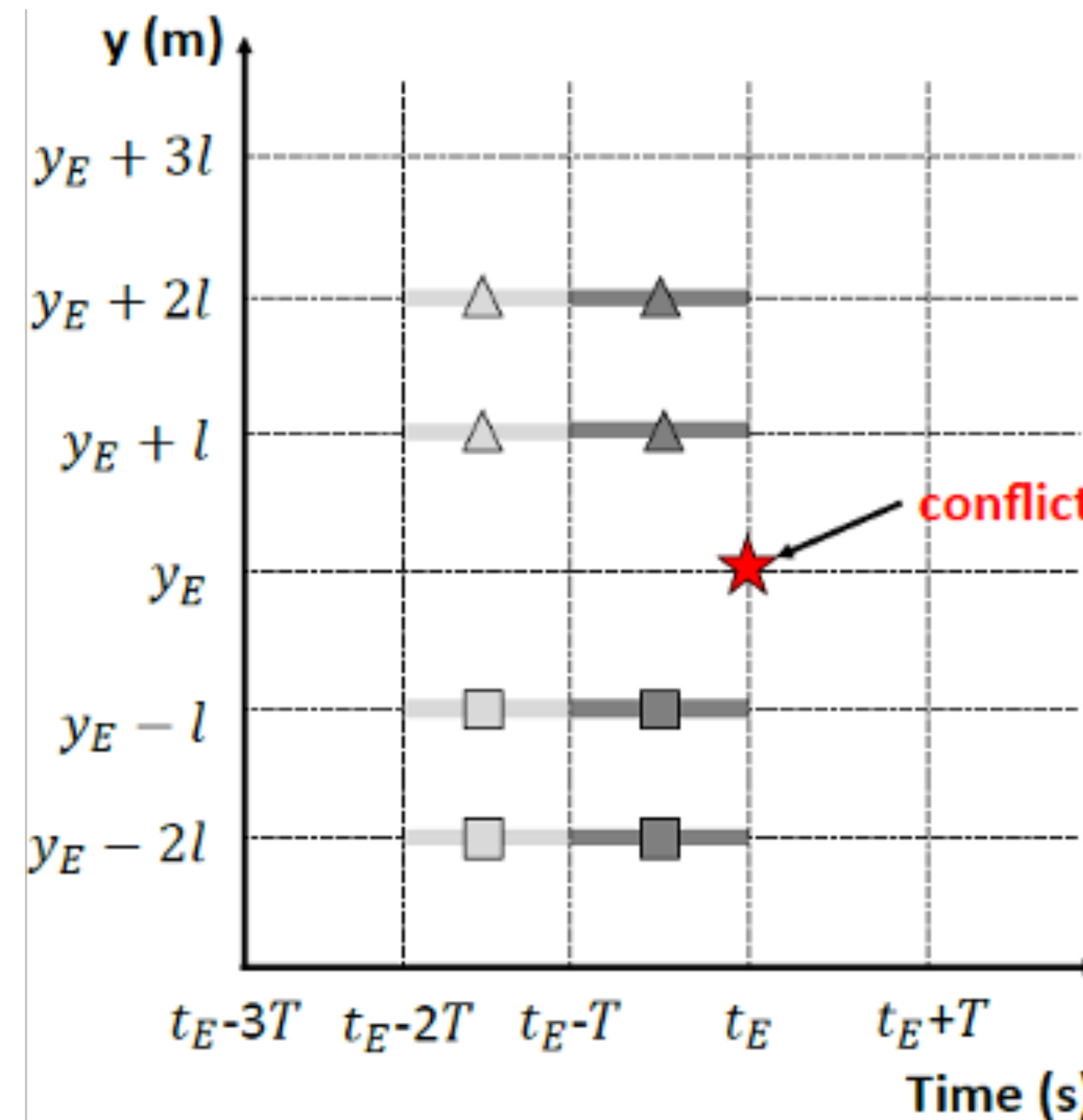


An example application

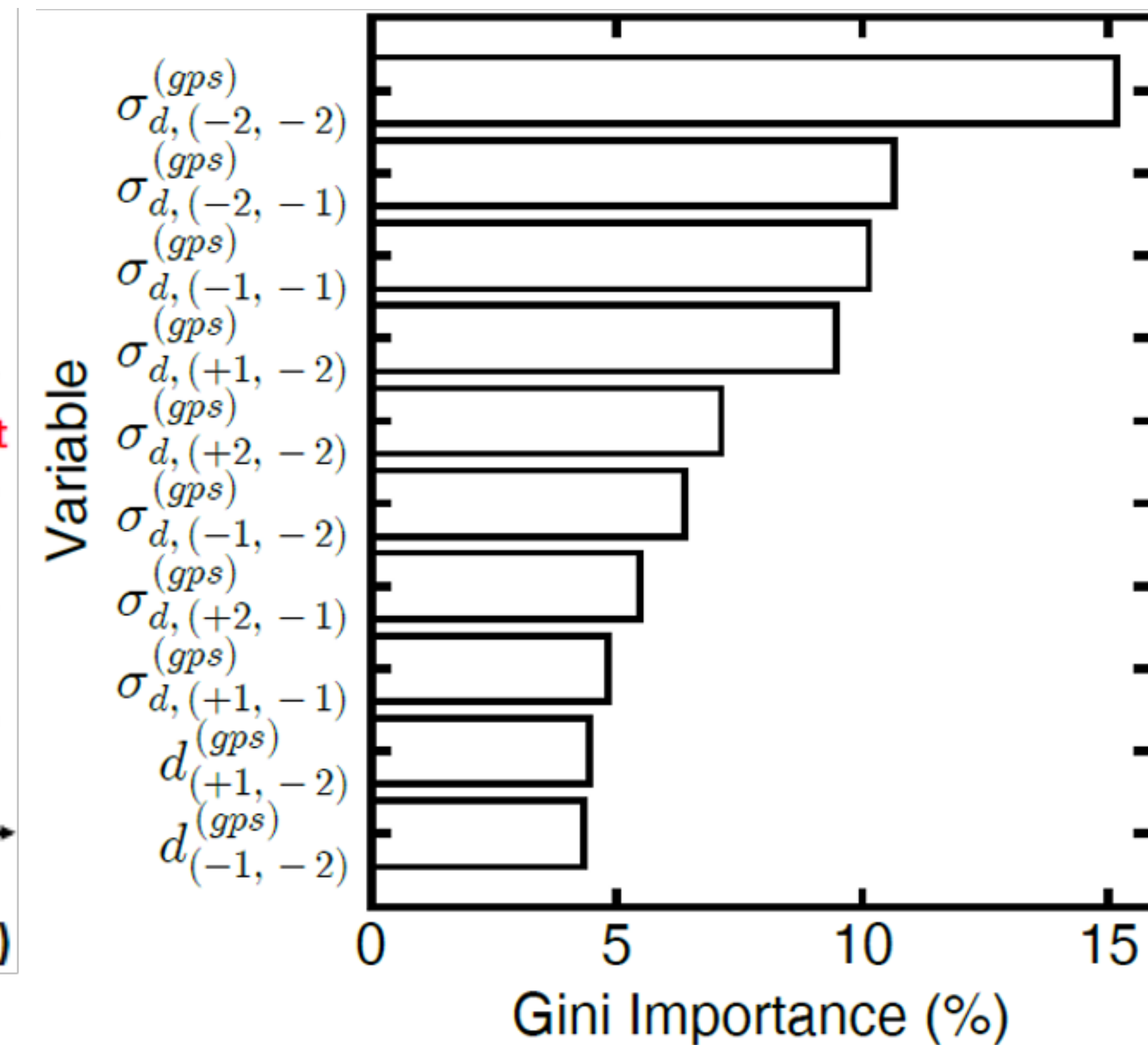
GPS-derived variables
are more significant

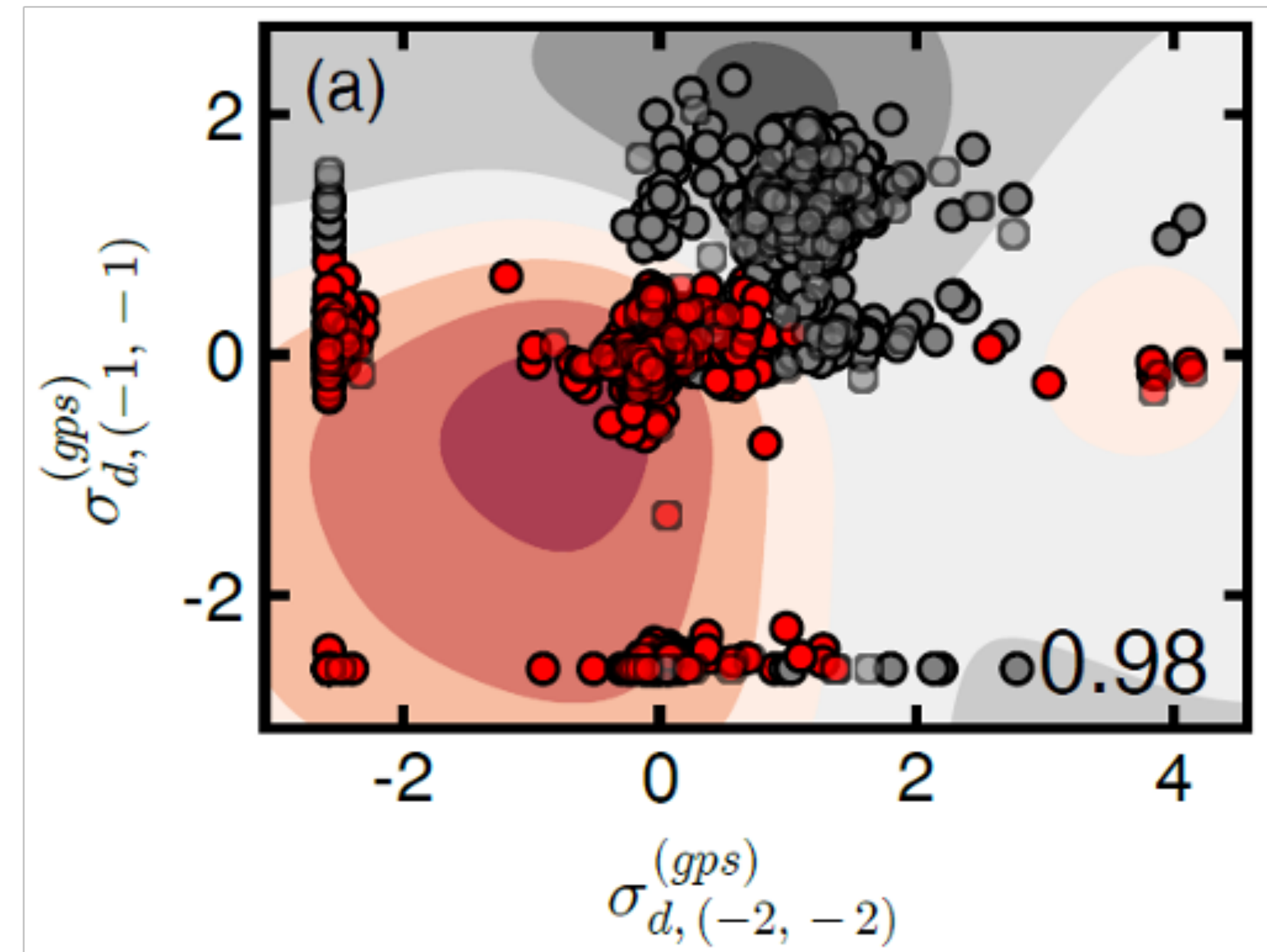
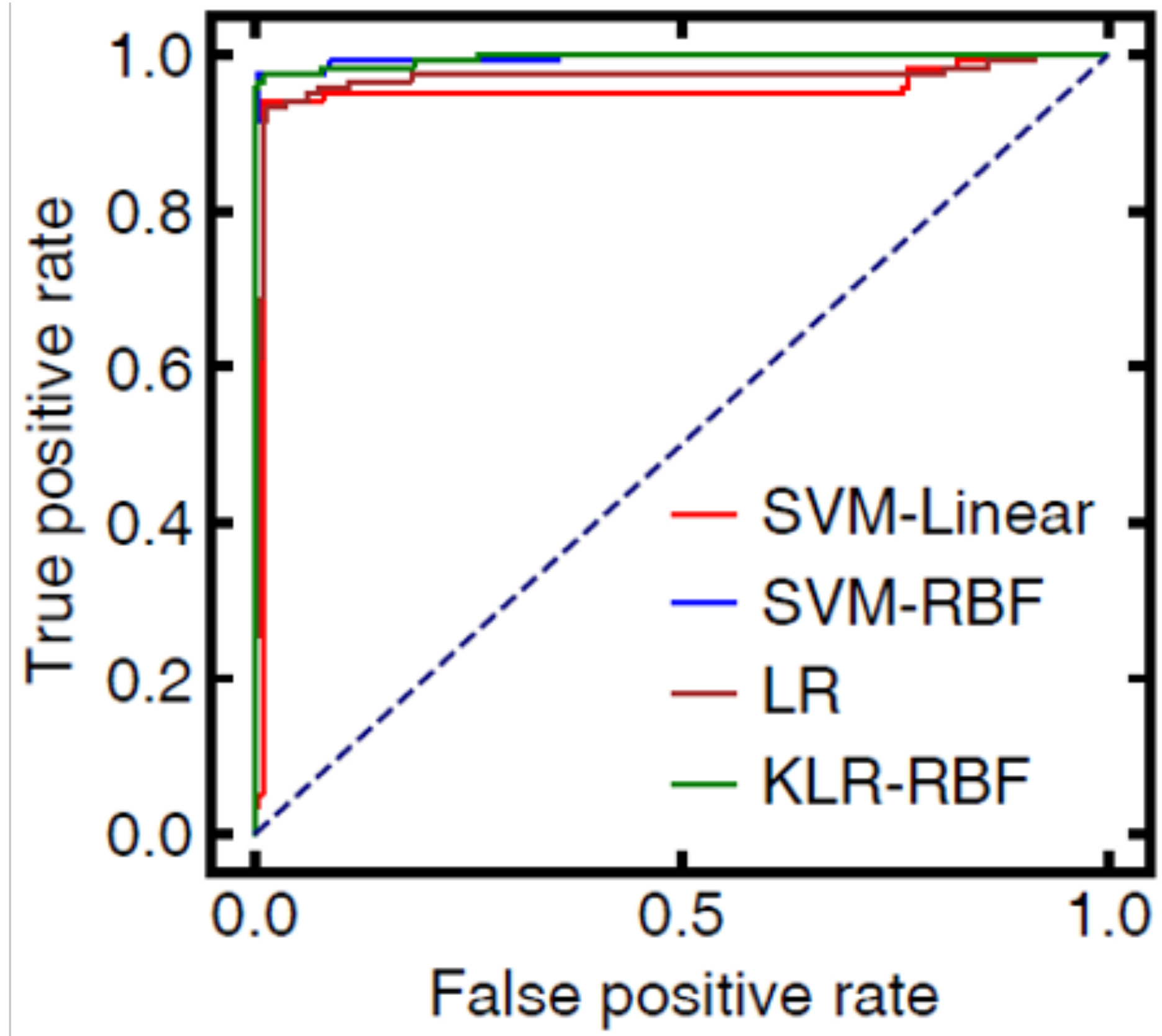


(a) Data points of detector data



(b) Data points of GPS data





Kernel Logistic Regression (KLR) outperforms SVM and logistic regression in distinguishing safe / dangerous traffic flow conditions with linear or non-linear boundaries

Future topics and challenges

Naturalistic driving / iDREAMS data

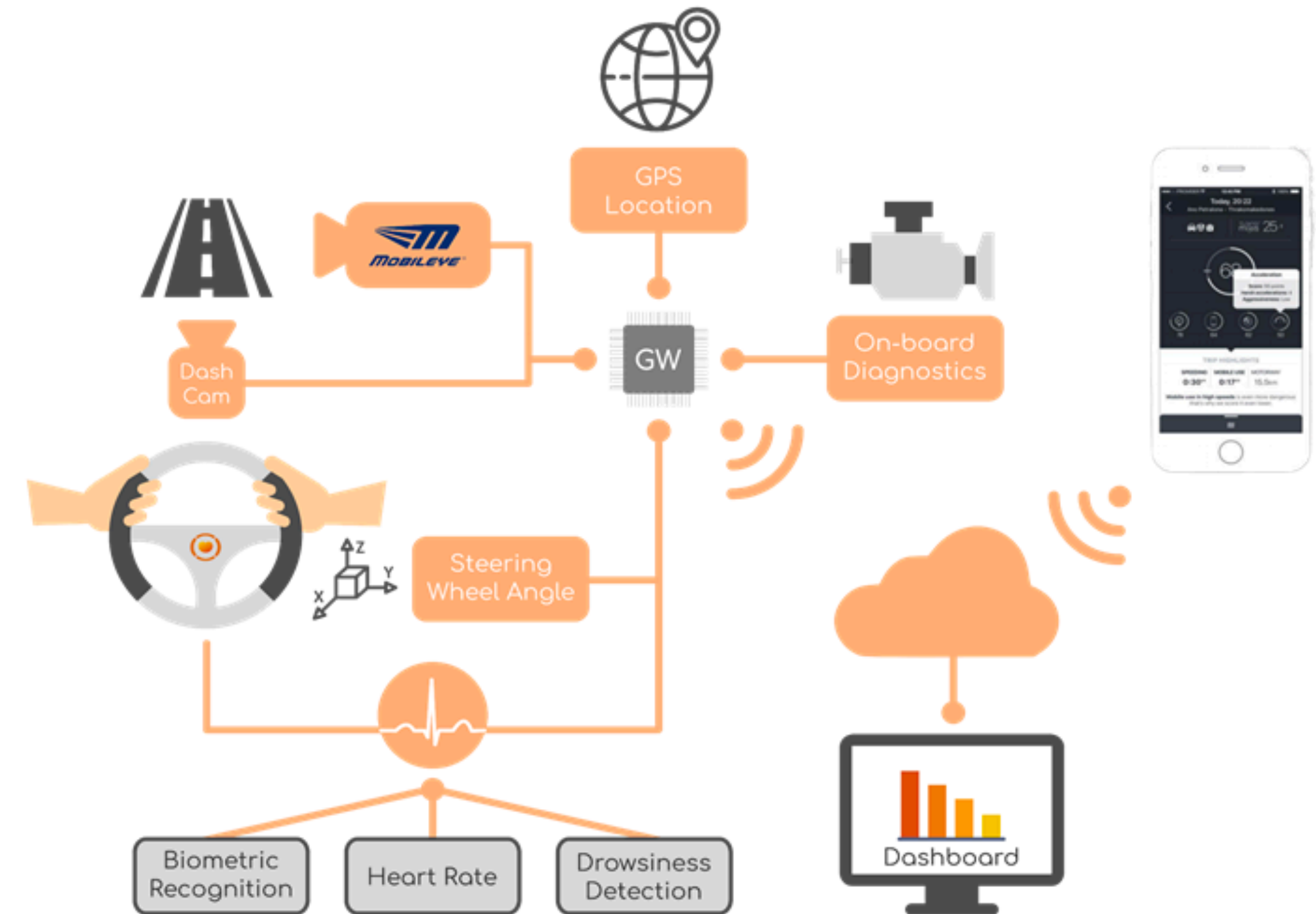
Real-time driving safety level evaluation

Safety level evaluation of lane change behavior

Safety level evaluation of car following behavior

Cause analysis related to traffic safety, eg, using phones, fatigue driving

The impact of driver characteristics on driving speed or traffic safety, eg, aggressiveness, education



Tobii Pro Glasses 3



Data from CCAM

CAVs routing design considering crash risk at the road segment level

Speed design strategies of CAVs considering crash risk

Fleet design strategies of CAVs considering crash risk

Active traffic management based on the real-time crash risk prediction for CAVs

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