

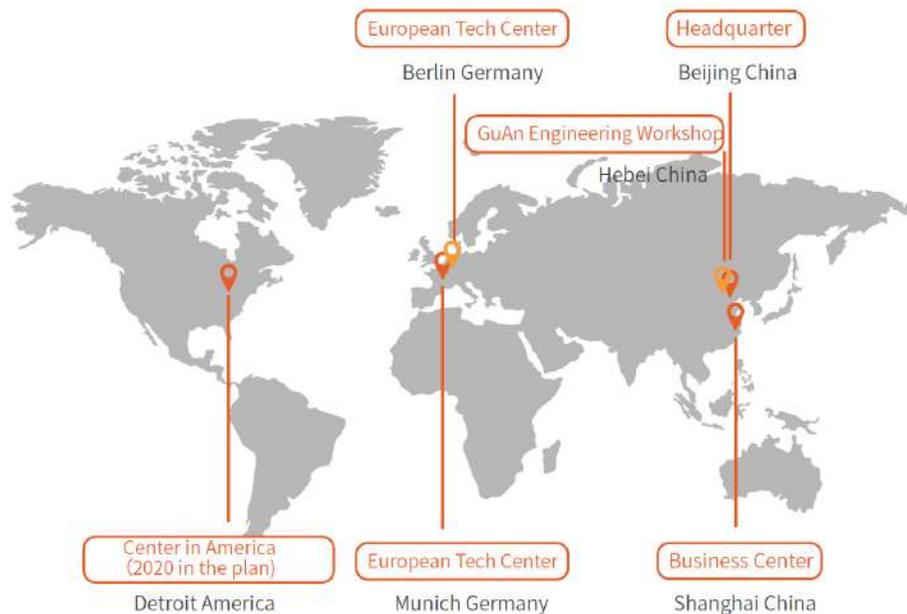
Testing & Validation as a Service for ADAS/AD Perception System

LiangDao Intelligence

Jiaxin Sun, 03.12.2019



About LiangDao Intelligence

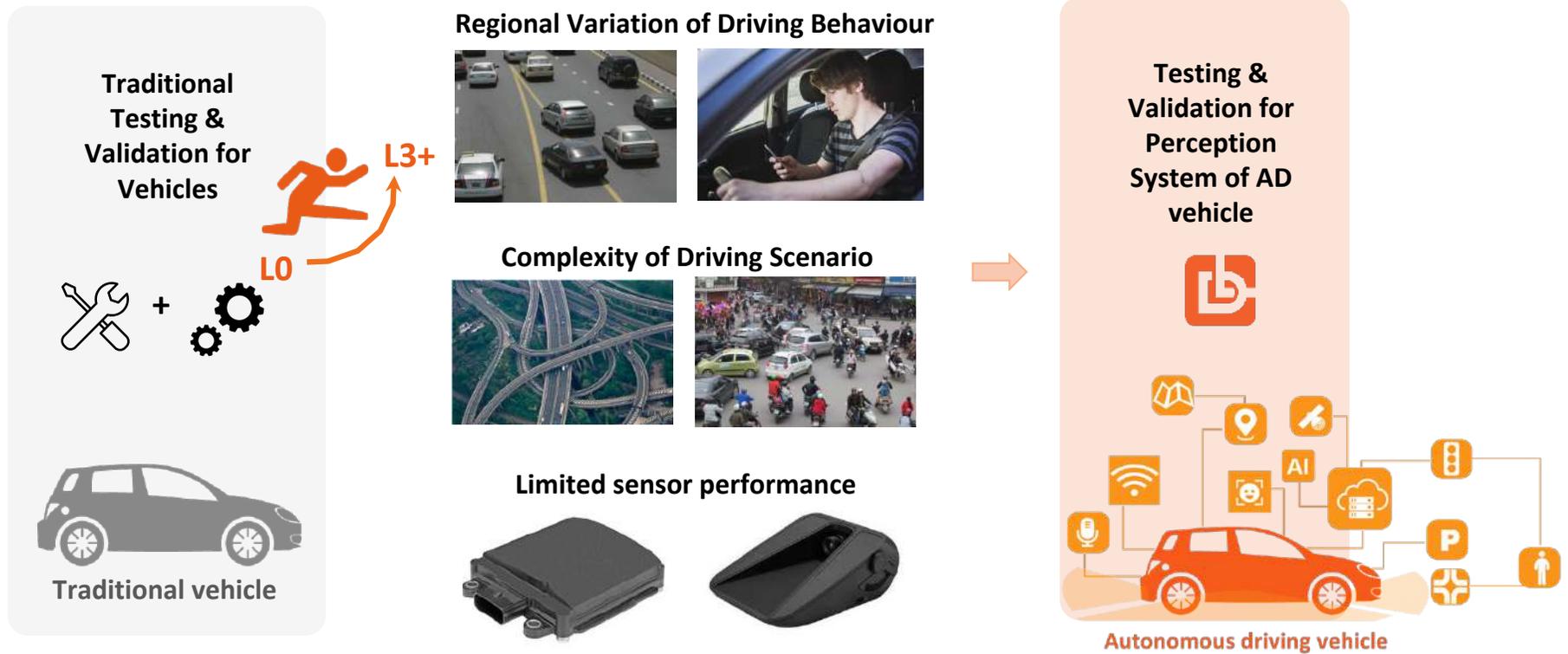


LiangDao Intelligence is an intelligent testing & validation service provider for ADAS/AD environment perception system.

- Reference system building up and sensor calibration
- Scenario based data acquisition
- Perception algorithm for ground truth generation
- Data management system and big data platform
- Testing & evaluation of DuT for autonomous driving
- Traffic statistics & driving behavior analysis
- Scenario datasets to simulation tool



Safety for Autonomous Driving



Enlighten Future Mobility



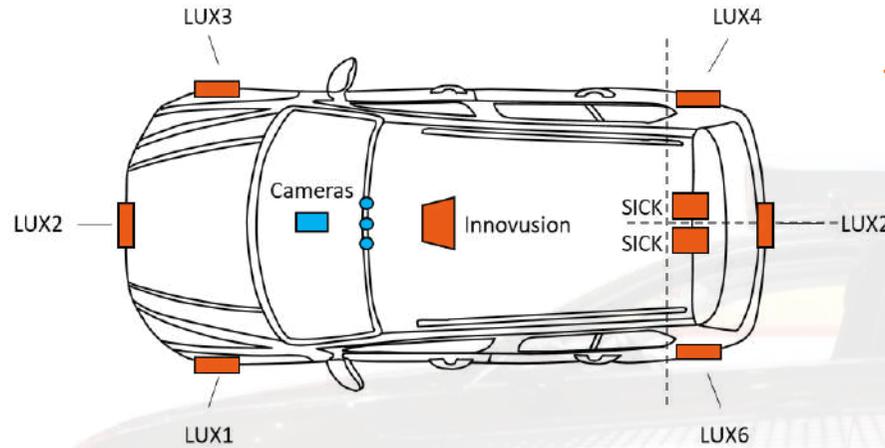
Testing & Validation Process



Enlighten Future Mobility

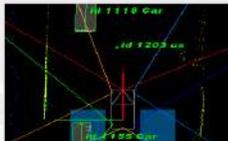


Testing Vehicle Preparation



+ DuT

- Sensor selection
- Sensor Integration
- Sensor calibration
- Time synchronization
- Data logging
- Data fusion



Dynamic target object geometry and motion information from high resolution Lidar (Ibeo and Innovusion)



CANBUS information such as turning signal, steering wheel angle, brake signal, etc.



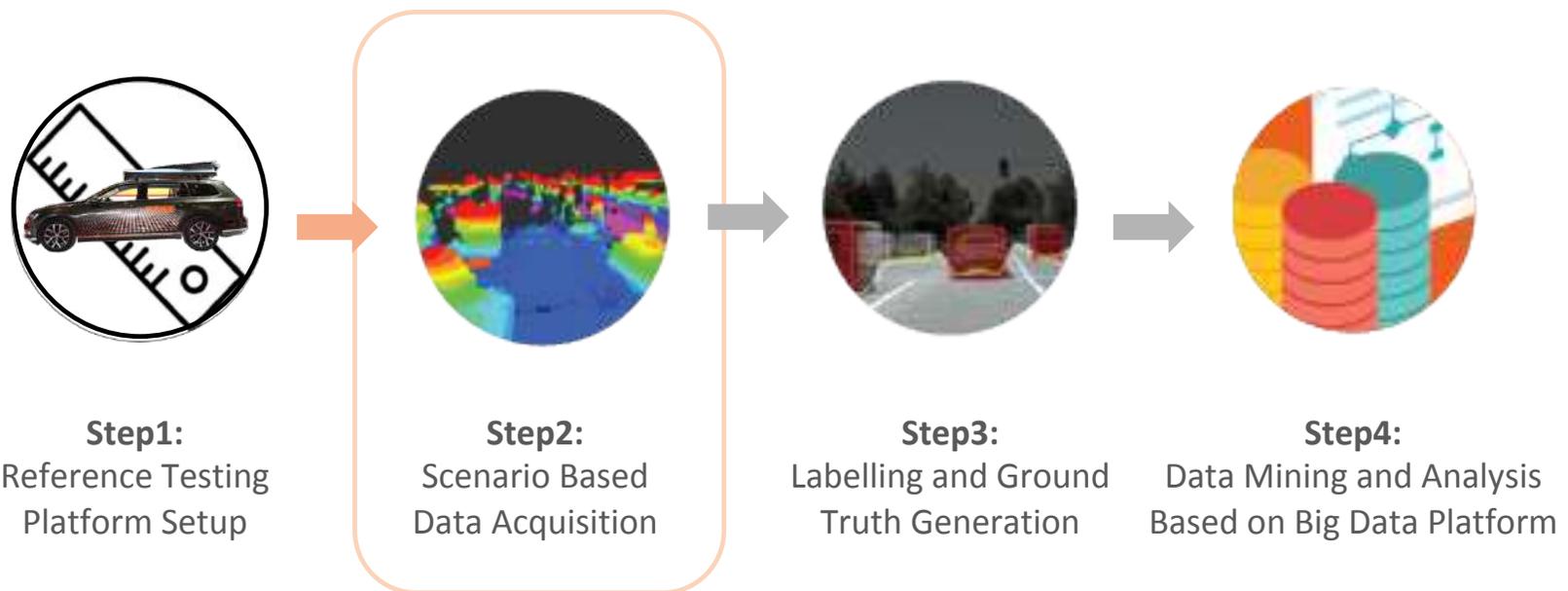
Mobileye lane, traffic sign, etc.



Dashcam videos and images



Testing & Validation Process



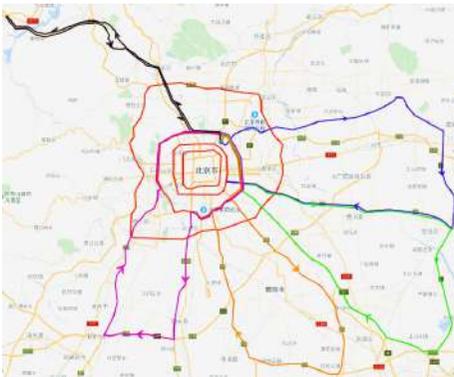
Enlighten Future Mobility





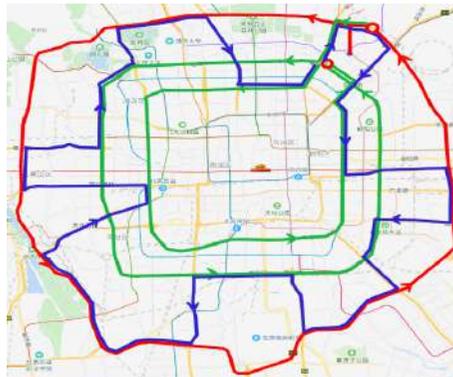
Intercity Highway Scenario

Data acquisition route – Intercity Highway



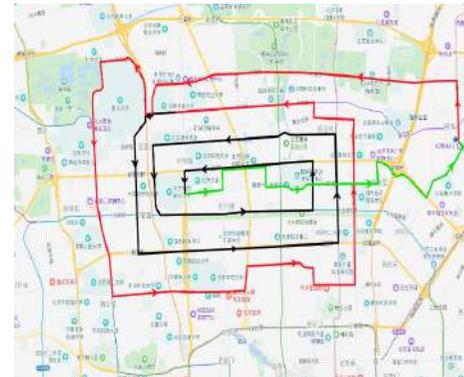
City Expressway Scenario

Data acquisition route – City Expressway



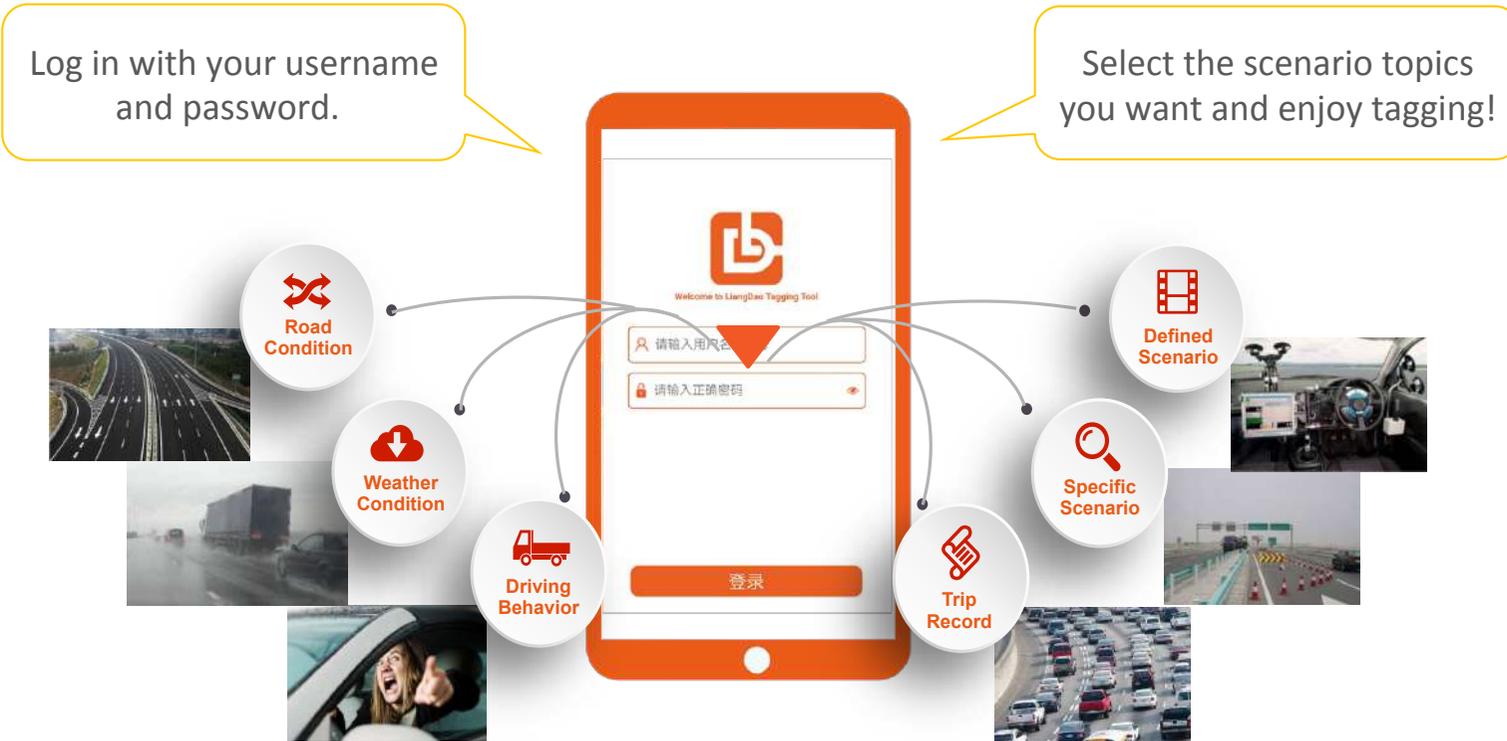
Urban Road Scenario

Data acquisition route-Urban Road





Scenario Metadata Tagging Tool

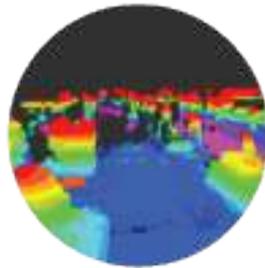




Testing & Validation Process



Step1:
Reference Testing
Platform Setup



Step2:
Scenario Based
Data Acquisition

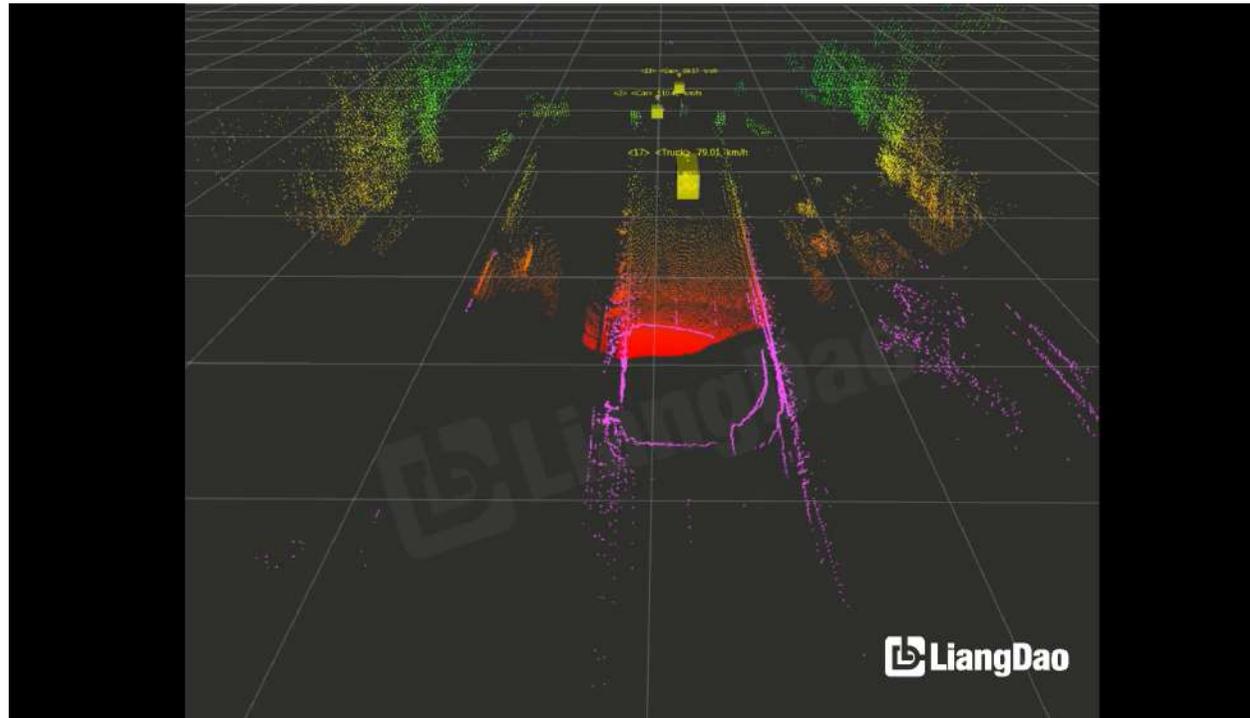


Step3:
Labelling and Ground
Truth Generation

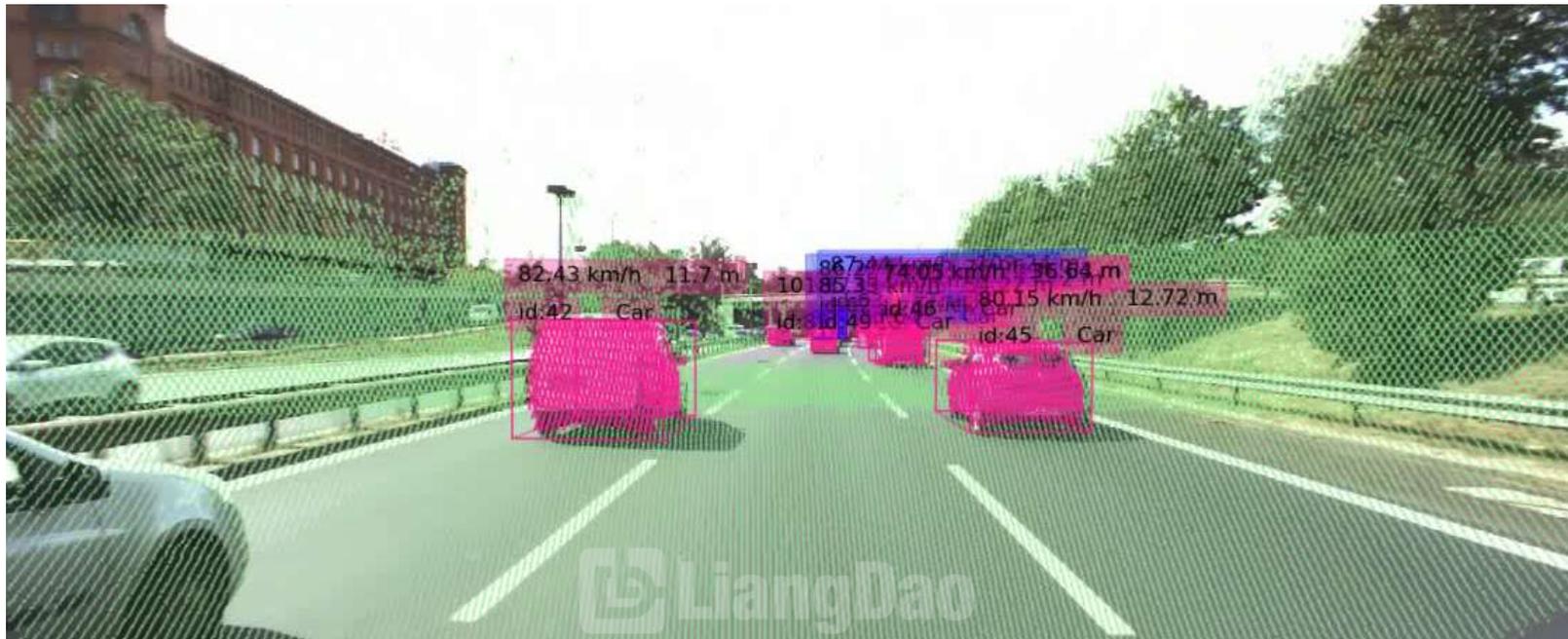


Step4:
Data Mining and Analysis
Based on Big Data Platform

Enlighten Future Mobility



Ground truth based on fusion of point cloud



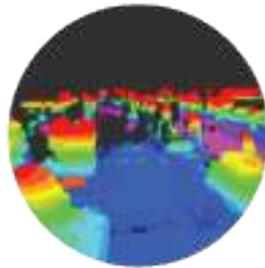
Object Mapping between LiDAR and camera
(Automatic labelling for Camera based on LiDAR)



Testing & Validation Process



Step1:
Reference Testing
Platform Setup



Step2:
Scenario Based
Data Acquisition

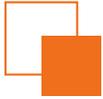


Step3:
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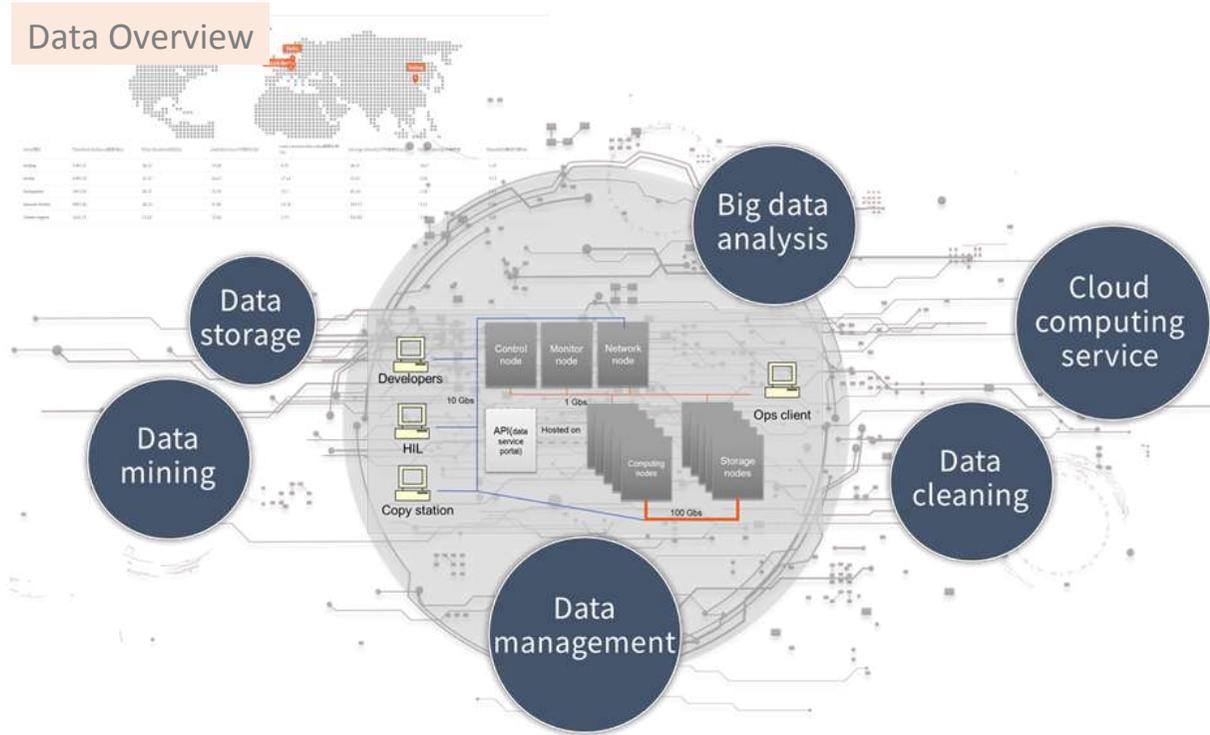


Step4:
Data Mining and Analysis
Based on Big Data Platform

Enlighten Future Mobility



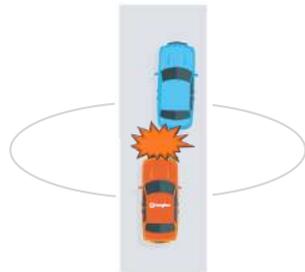
LiangDao SaaS Data Service Platform



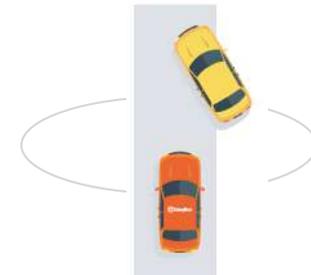
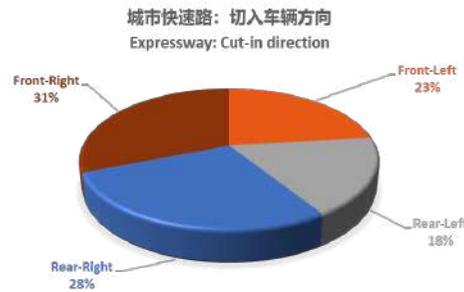
Enlighten Future Mobility



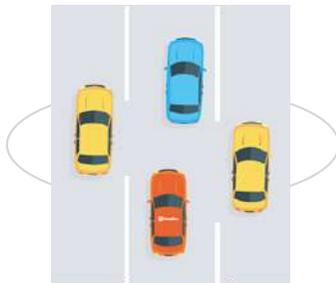
Scenario Detection and Analysis



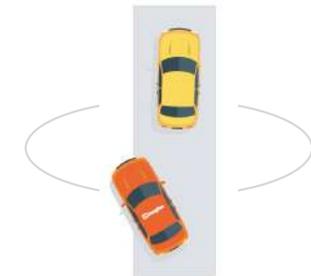
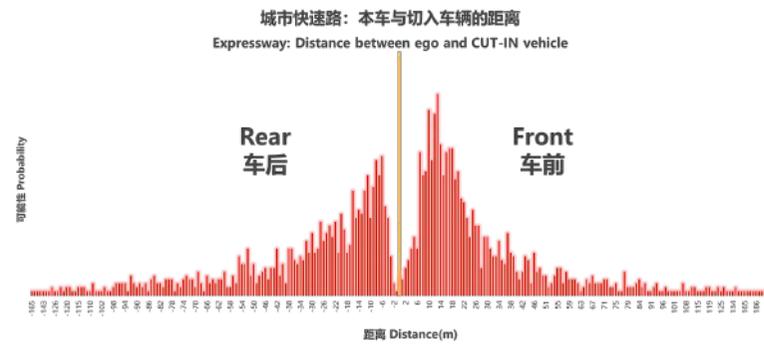
Critical Event



Cut in



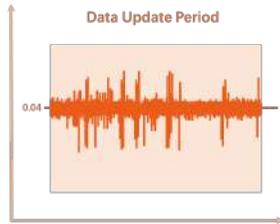
Traffic Jam



Lane changing



DuT Performance Evaluation



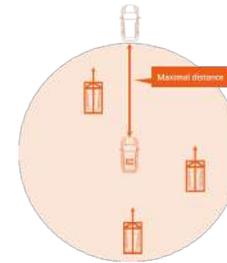
Data updating rate error



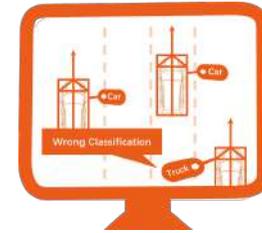
Total number of frames



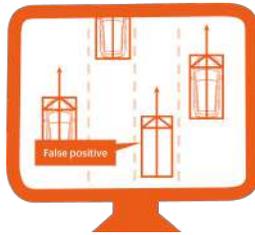
Accumulative number of objects



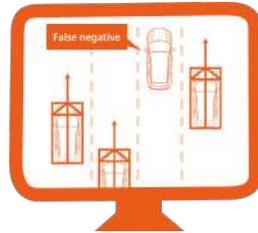
Maximal detection distance



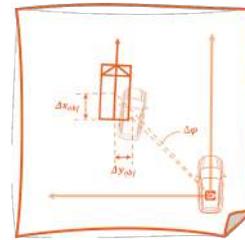
Wrong classification rate (per 100km)



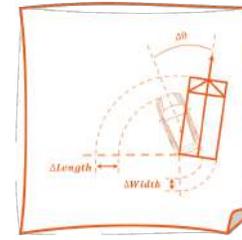
False positive rate (per 100km)



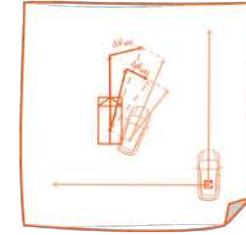
False negative rate (per 100 km)



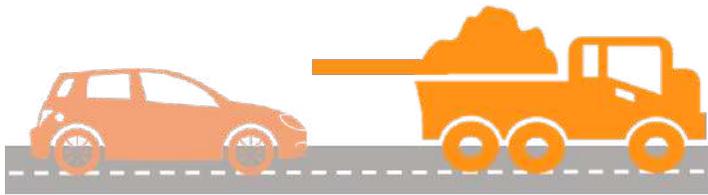
Object position error



Object contour error



Object motion information error



Truck with overhanging load

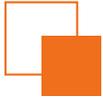


Small obstacles on the road



Scenario Dataset to Simulation Tool





LiangDao AD/ADAS Testing&Validation Process



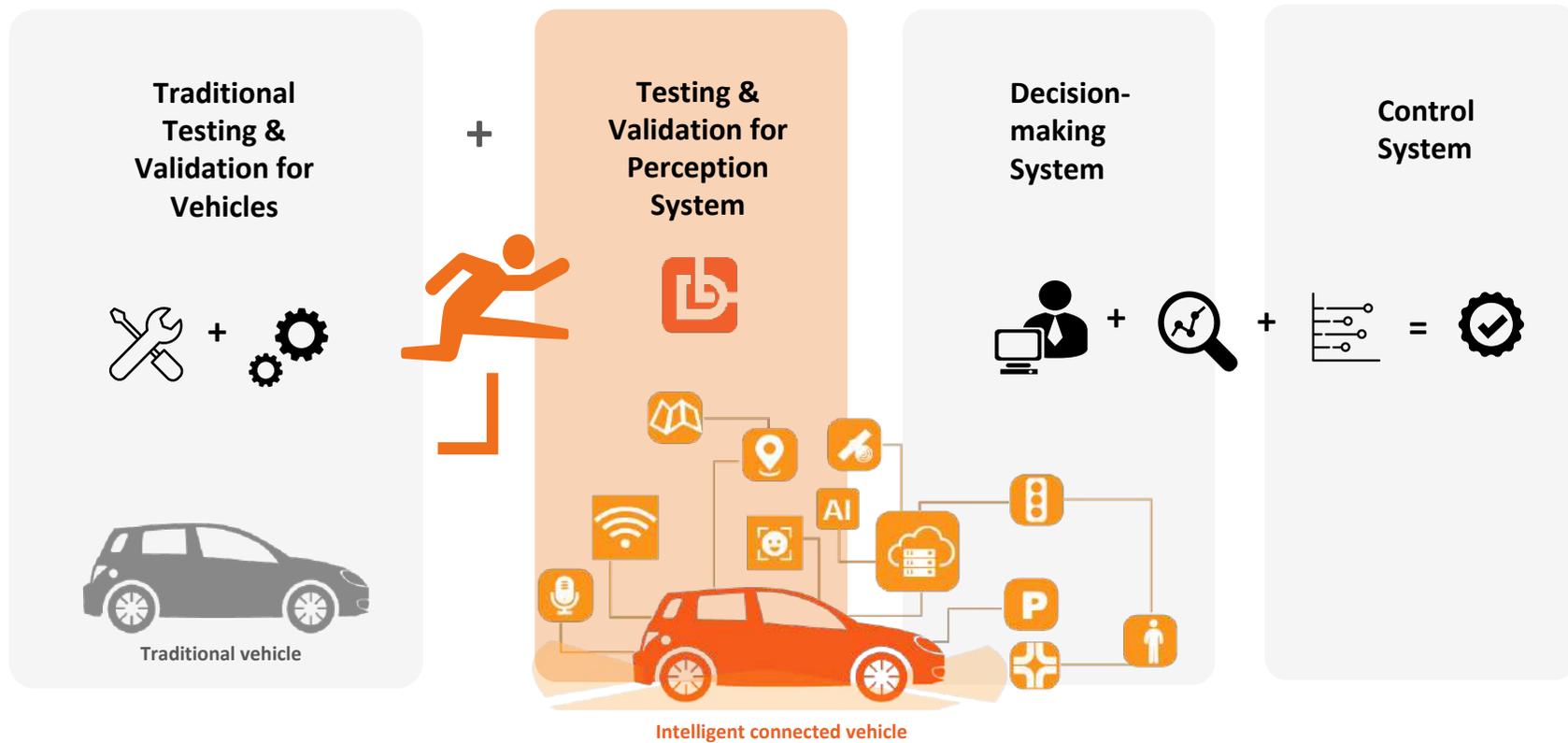


Thanks for your attention!

 LiangDao



Safety for Autonomous Driving



Enlighten Future Mobility



Benchmark Testing Vehicle Preparation



Scenario Based Data Acquisition



Labelling and Ground Truth Generation



Data Processing and Analysis



Benchmark Testing Vehicle Preparation



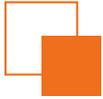
Scenario Based Data Acquisition



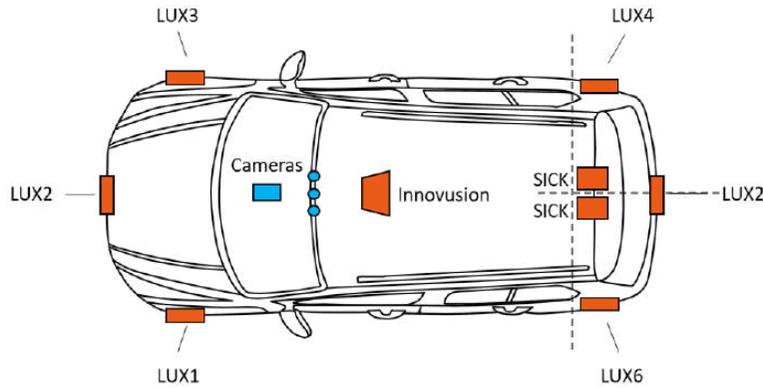
Labelling and Ground Truth Generation



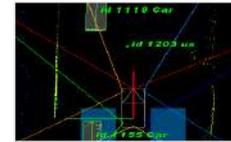
Data Processing and Analysis



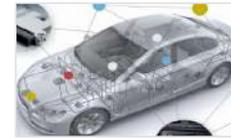
LD Reference Platform



System Overview



Dynamic target object geometry and motion information from high resolution Lidar (Ibeo and Innovusion)



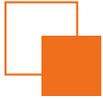
CANBUS information such as turning signal, steering wheel angle, brake signal, etc.



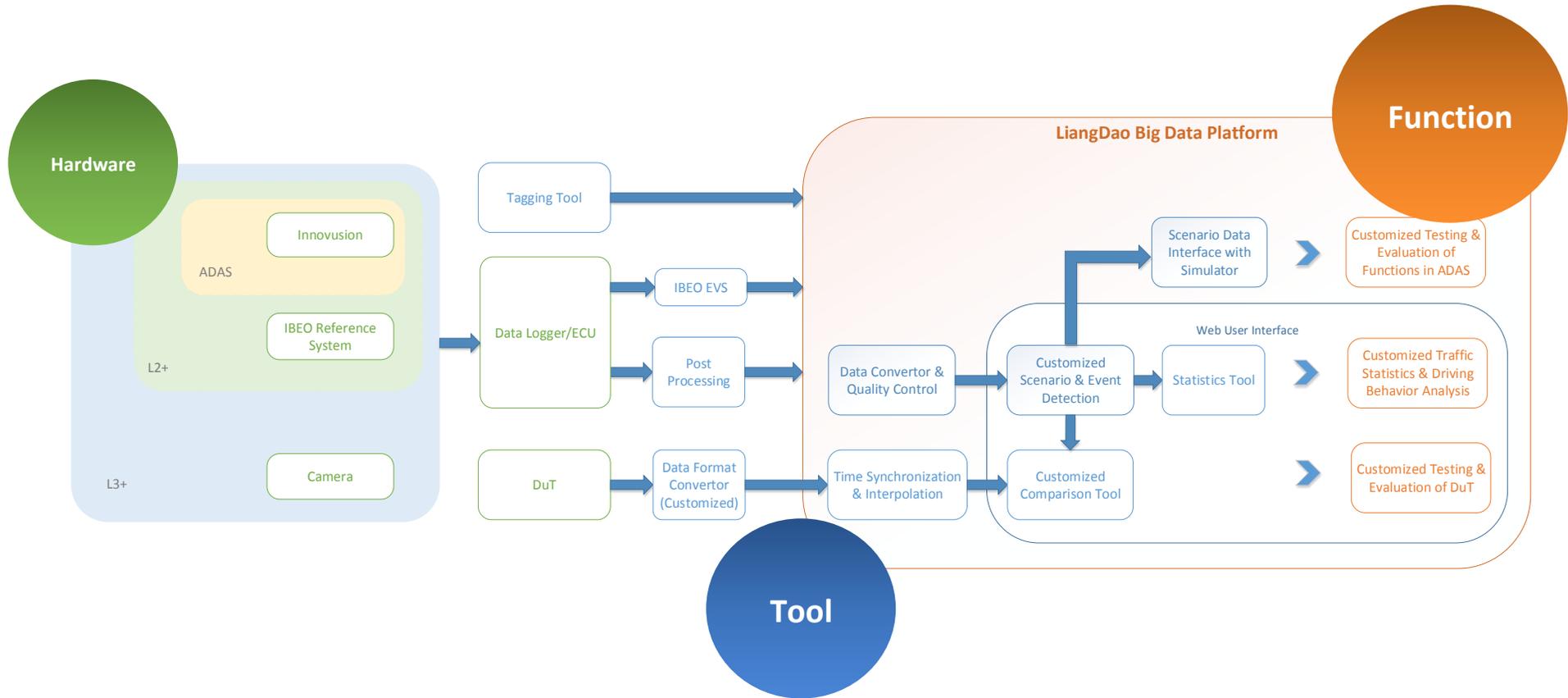
Mobileye lane, traffic sign, etc.

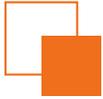


Dashcam videos and images

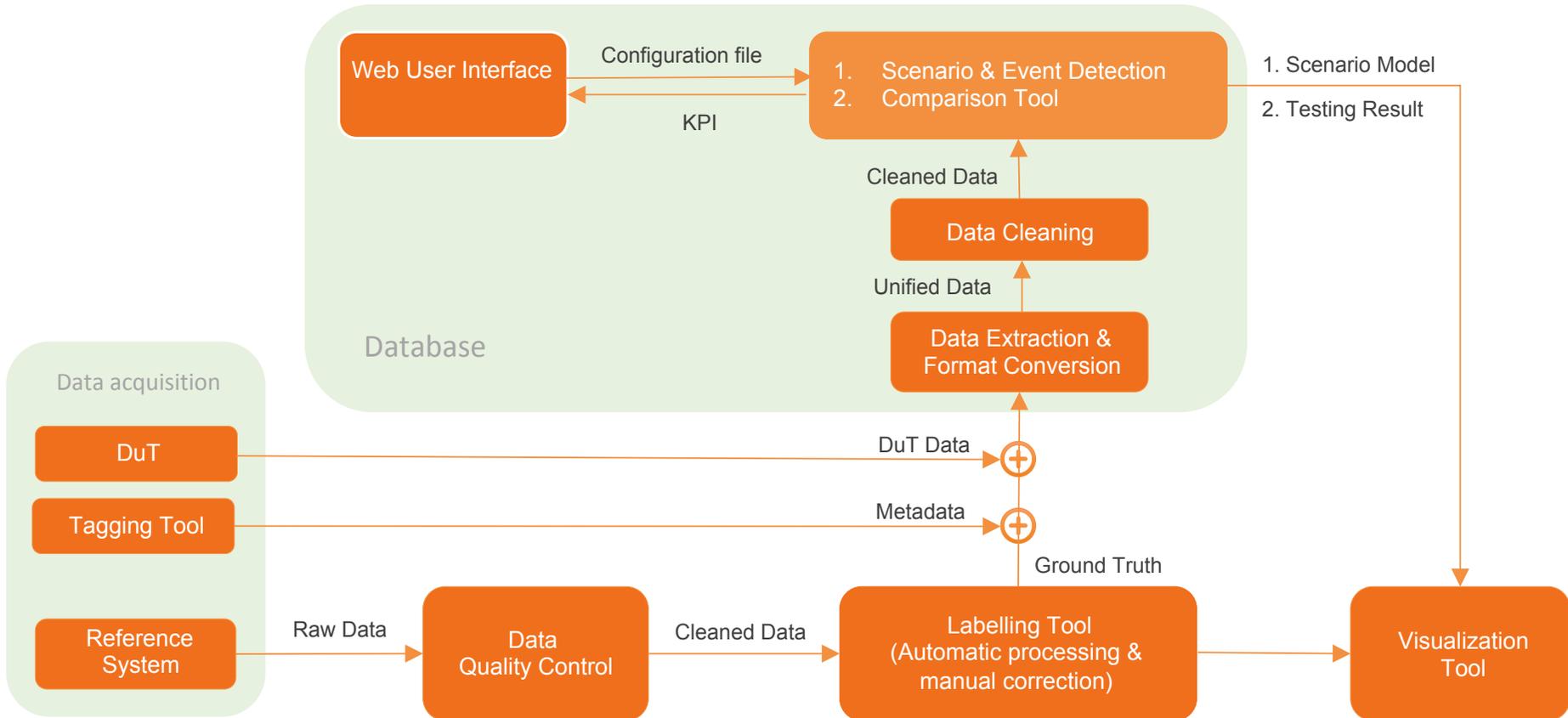


LiangDao AD/ADAS Testing&Validation Process





LiangDao AD/ADAS Testing&Validation Process





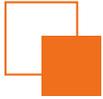
Metadata Tagging Tool



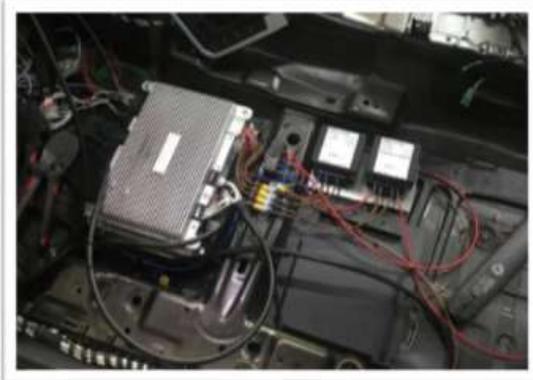
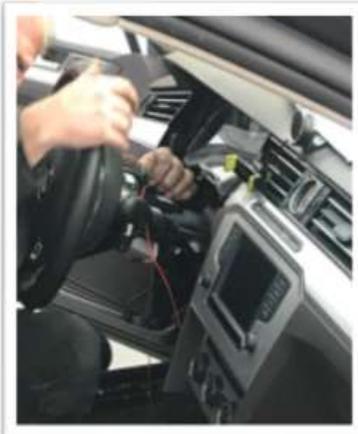
Log in with your user name and password.



Afterwards, you can select the scenario features you want. Then, it's time to start tagging!



Chassis refitting and wiring modification



Enlighten Future Mobility



Sensor calibration and configuration



Enlighten Future Mobility