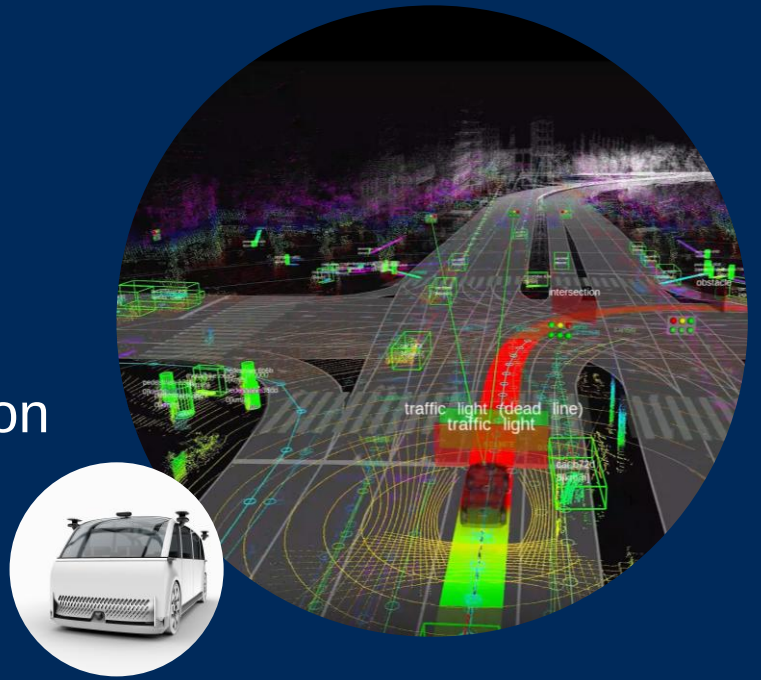
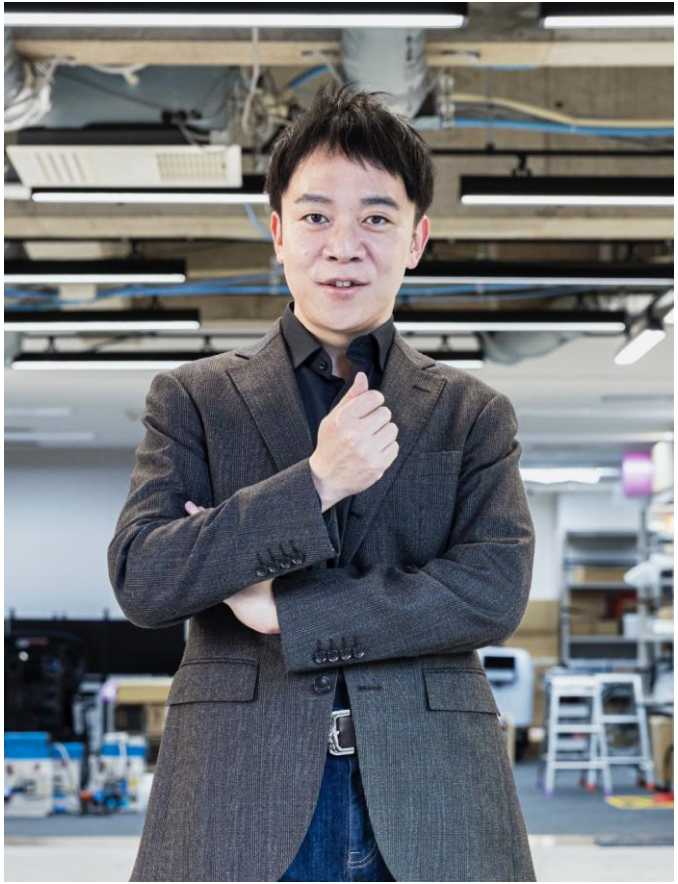
AI for Autonomous Driving

Shinpei Kato
Chairman, The Autoware Foundation



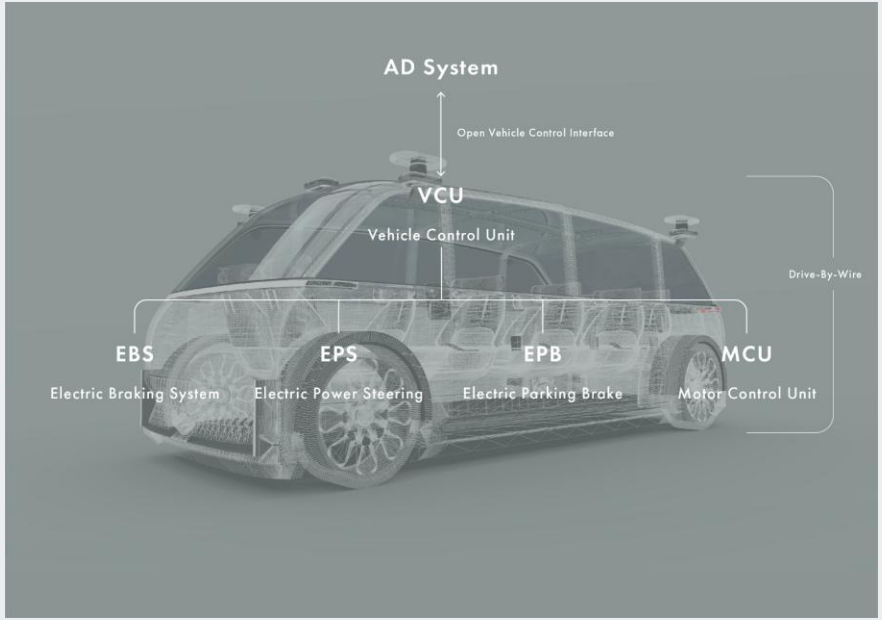


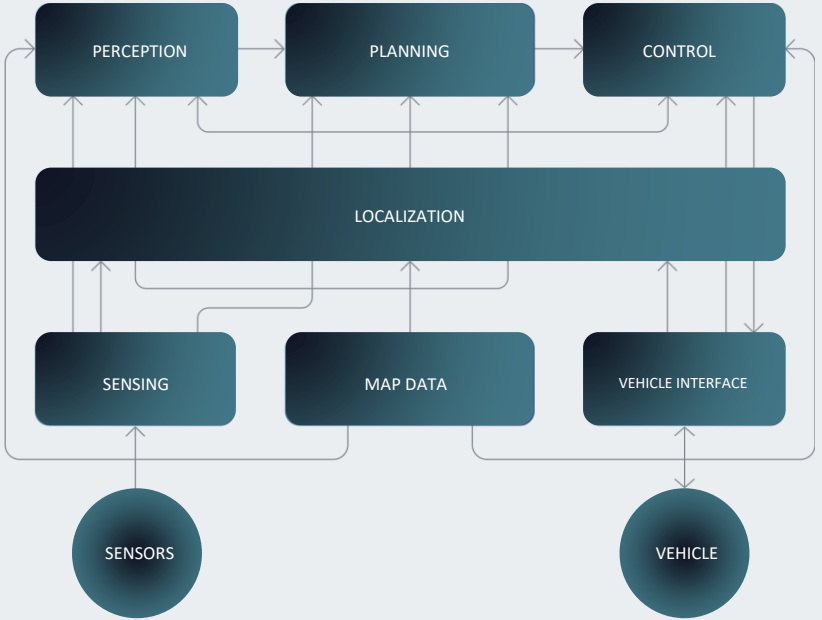
Shinpei Kato

An internationally renowned expert in computer science, and a pioneer in the evolution of open-source software for autonomous driving technology.

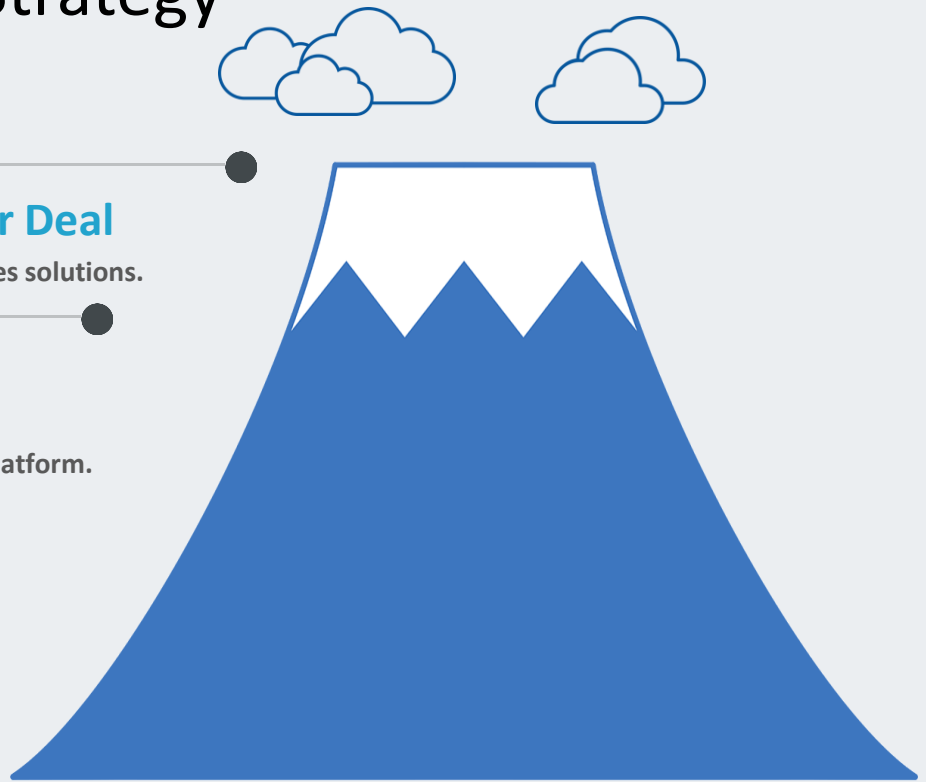
2023 – Present. CEO of TIER IV; Specially Appointed Professor, The University of Tokyo.
2018 – Present. Chairman of The Autoware Foundation.
2016 – 2023. Full-Time Associate Professor in Computer Science, The University of Tokyo.
2012 – 2016. Full-Time Associate Professor in Information Science, Nagoya University.
2009 – 2012. Postdoc Researcher, Carnegie Mellon University & University of California, Santa Cruz.
2008. Received Ph.D. in Engineering, Keio University.
1982. Born.

Autonomous Driving (AD)





Open Source and Business Strategy



The Summit

Customer Deal

TIER IV provides solutions.

9-th Station

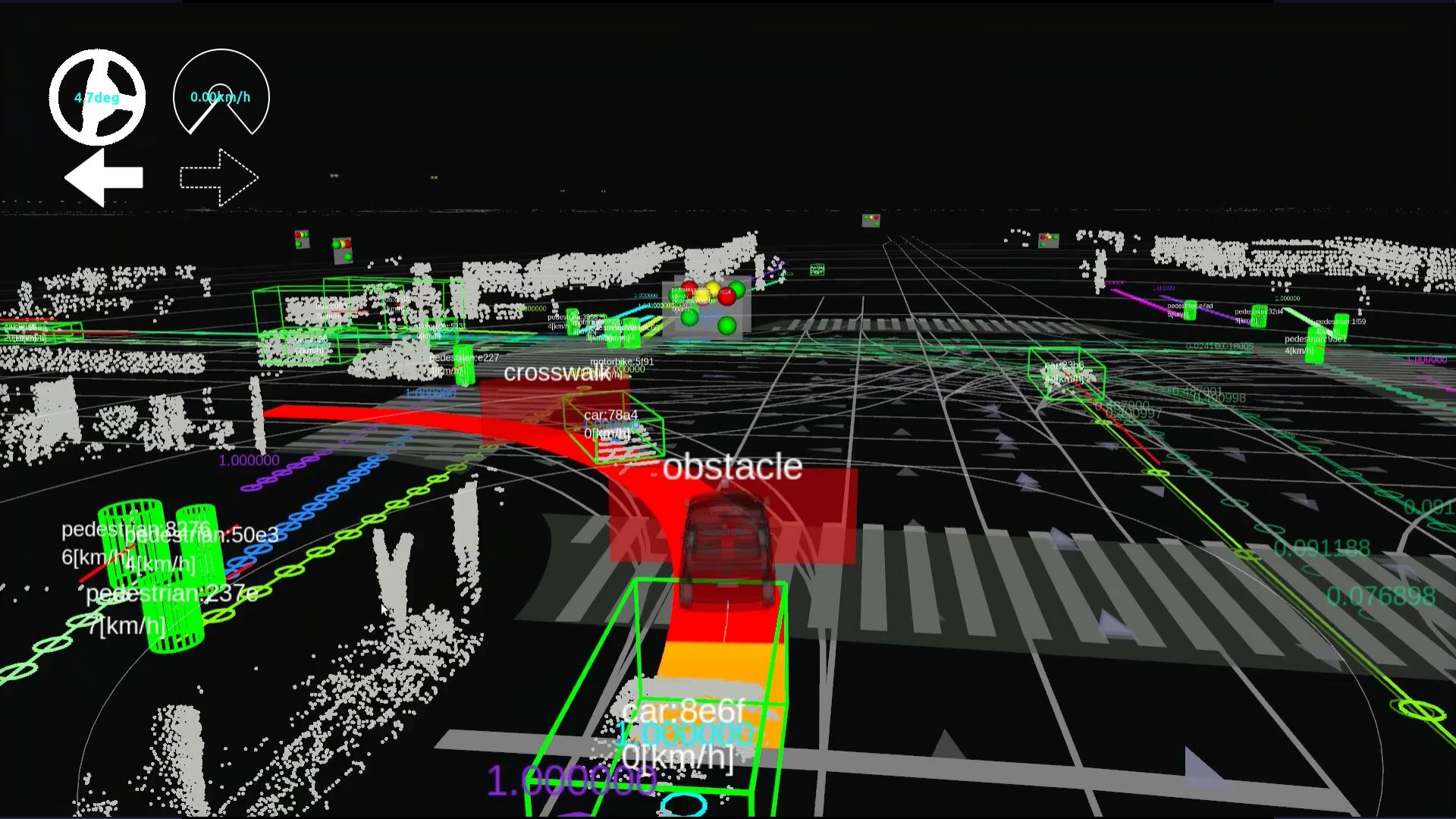
Product

TIER IV develops a platform.

5-th Station

Open Source

TIER IV leads Autoware.


4.7deg
0.00km/h
crosswalk
car:78a4
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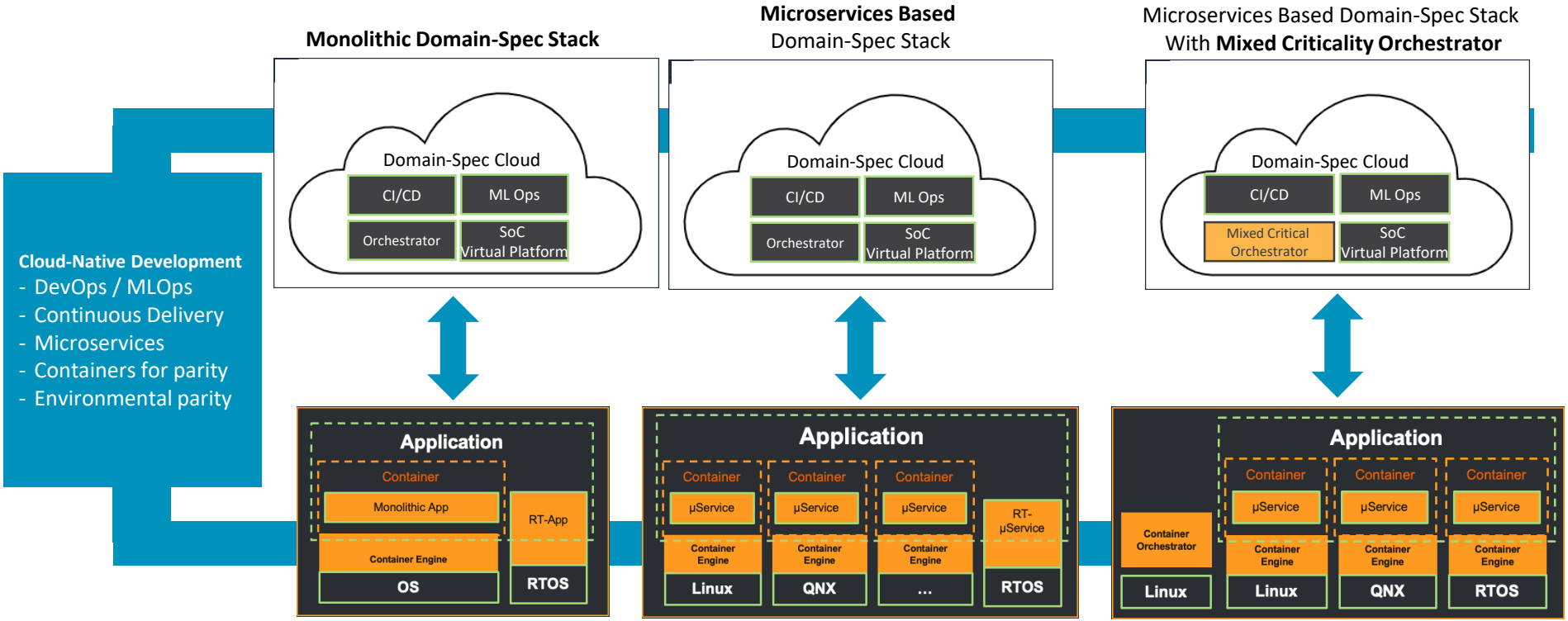
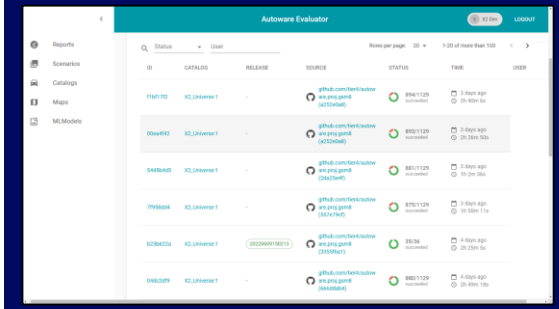
Software-Defined Vehicles Architecture

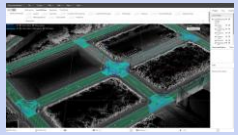


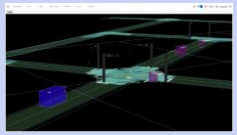
DevOps Framework

CI/CD Evaluation

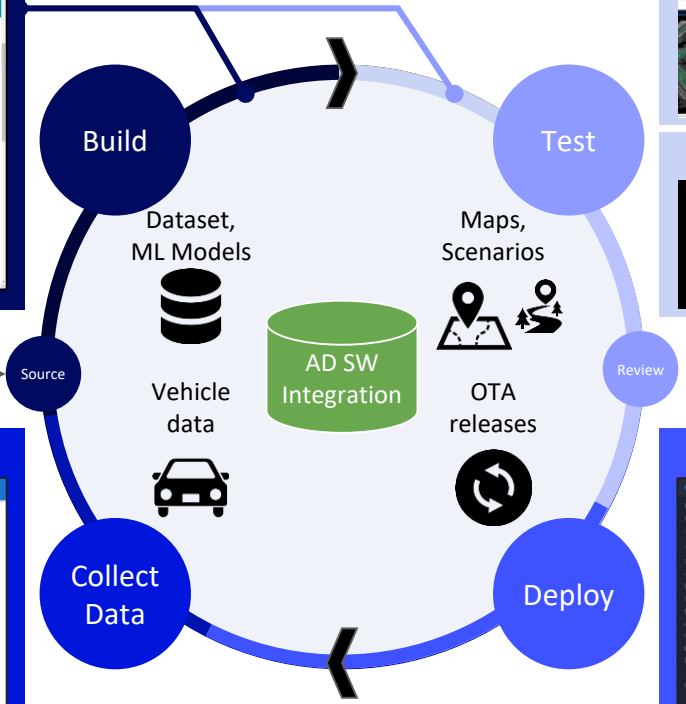


Map/Scenario



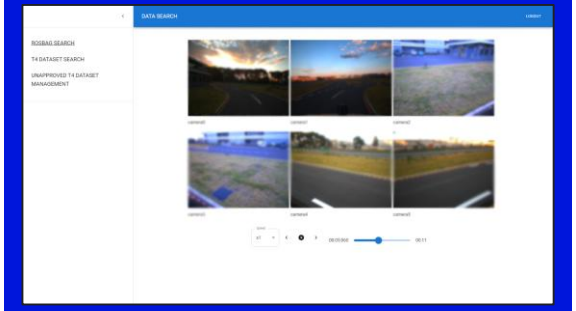


Testing

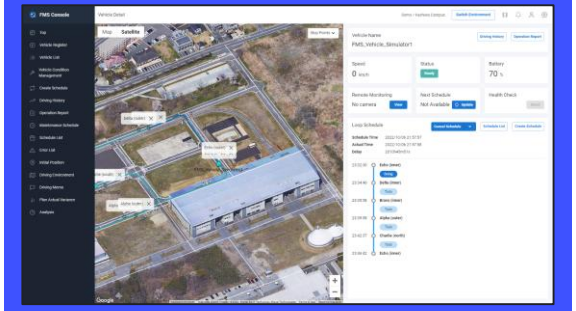


GitHub

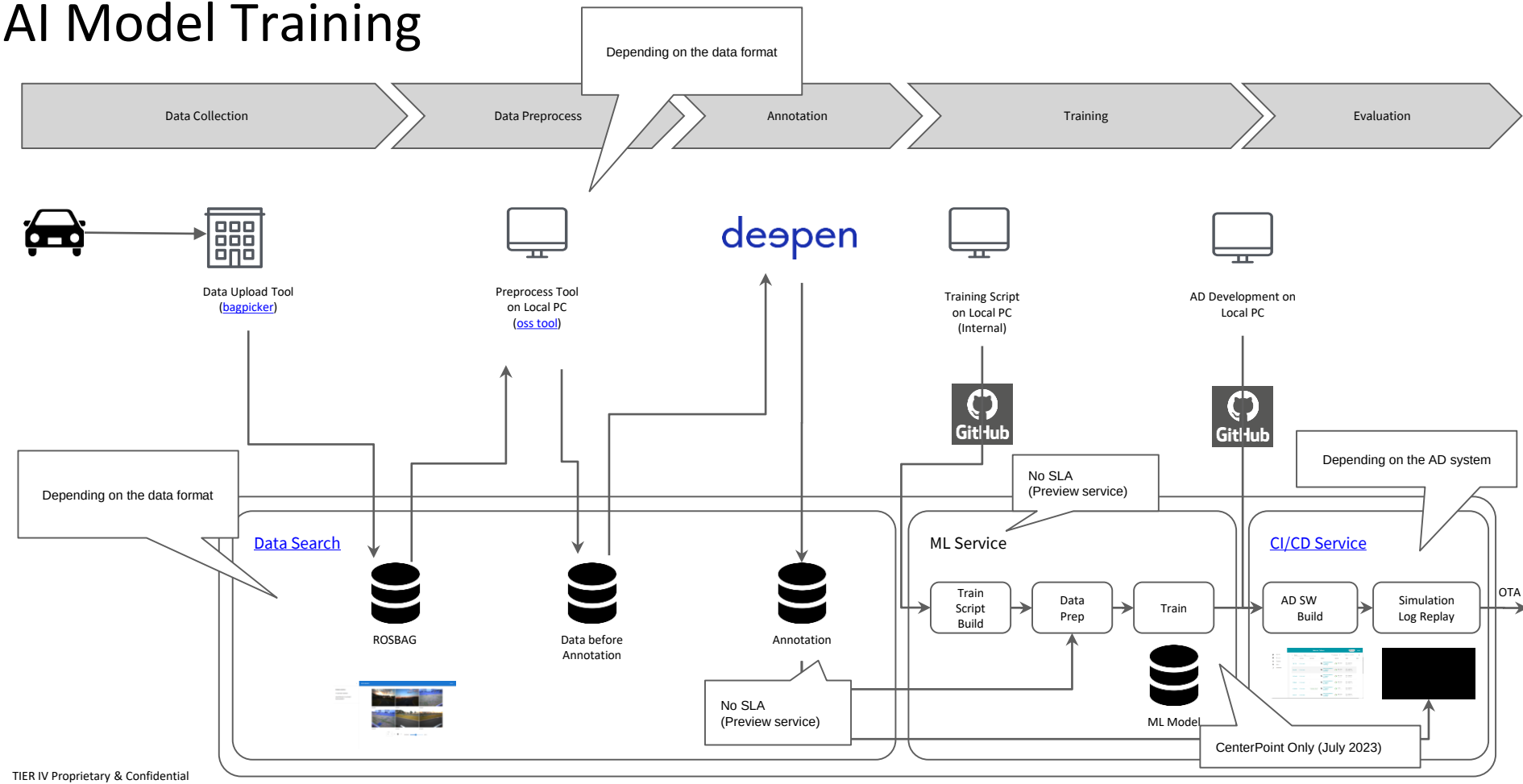
Data Search



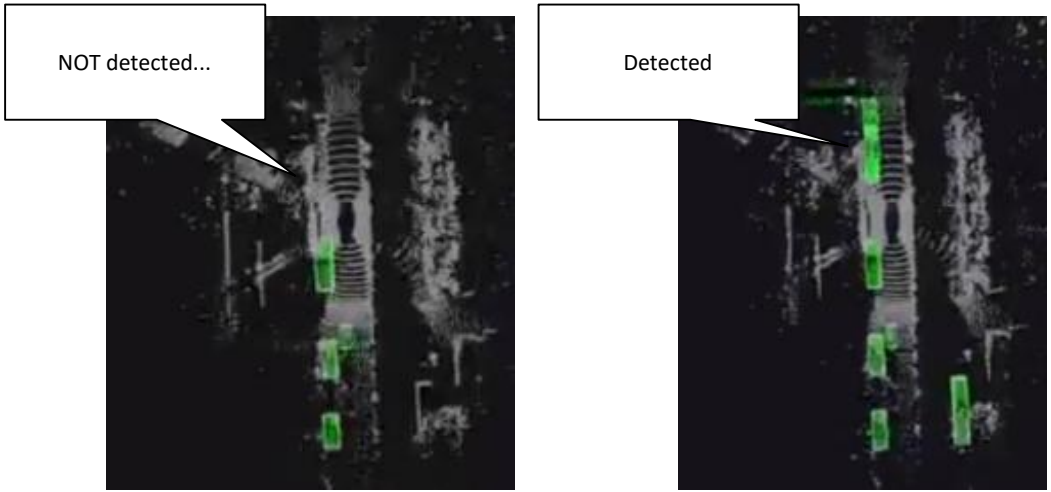
Fleet Management



AI Model Training

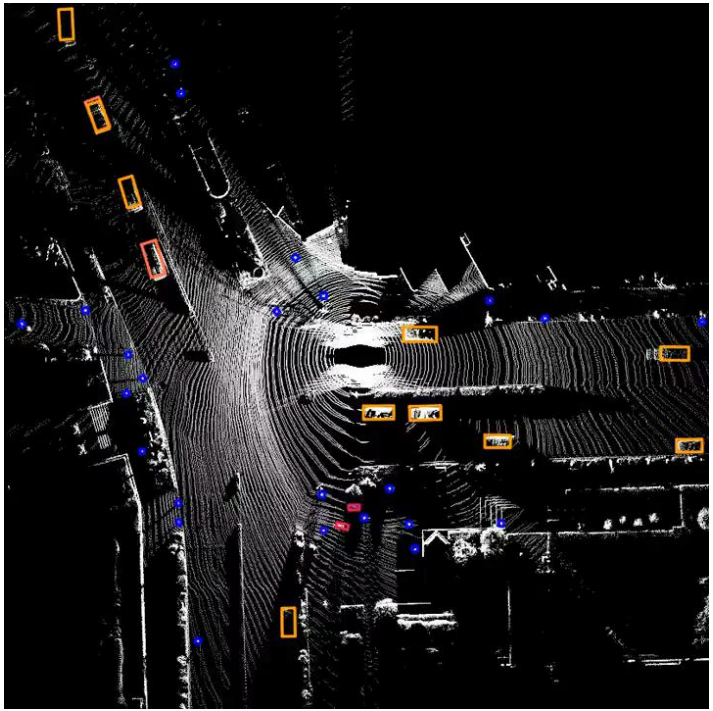


Domain Adaptation Challenges



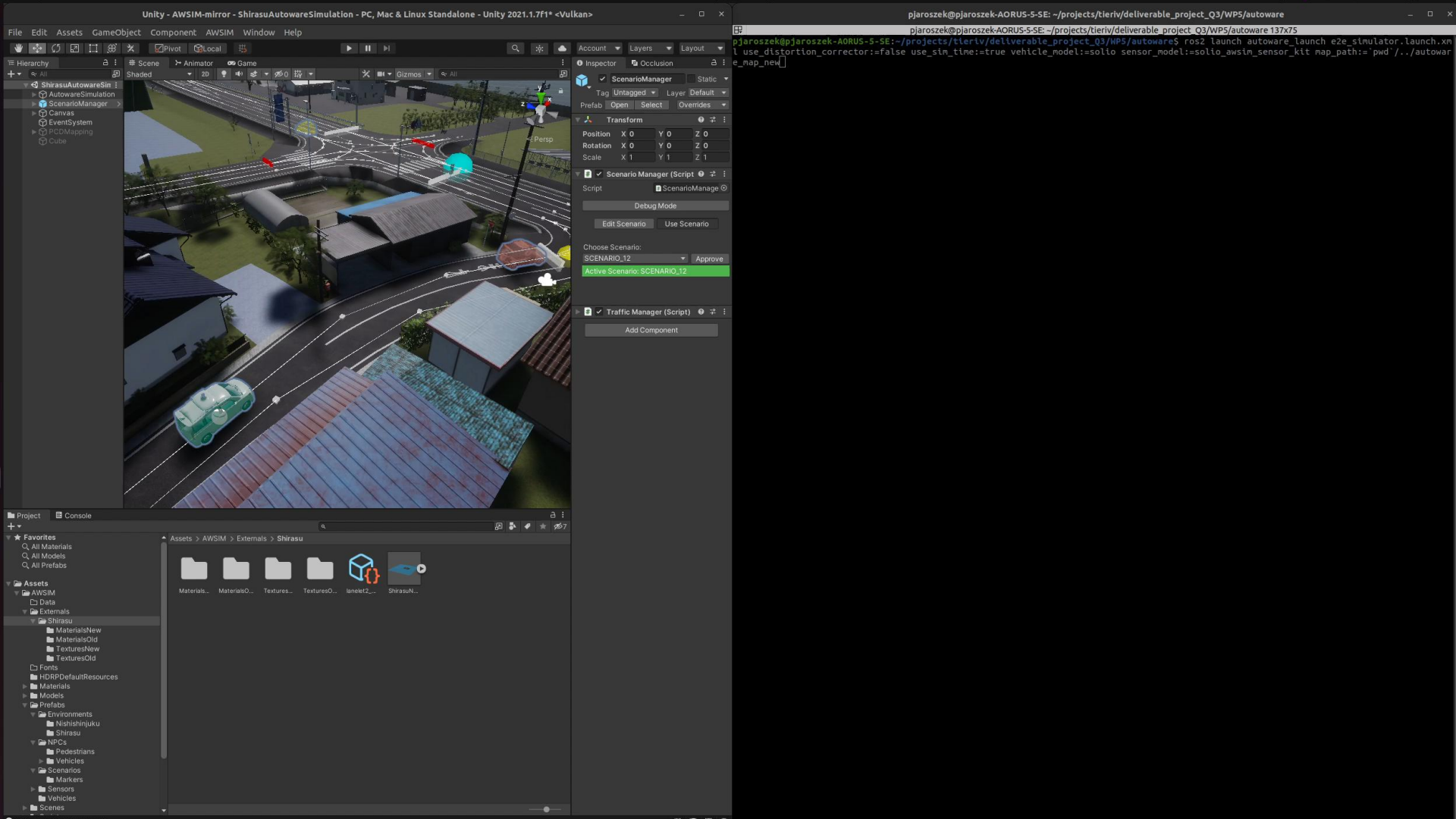
Without domain adaptation

With domain adaptation




21-89

Synthetic Data Generation with


Unity - AWSIM-mirror - ShirasuAutowareSimulation - PC, Mac & Linux Standalone - Unity 2021.1.7f1* <Vulkan>
File Edit Assets GameObject Component AWSIM Window Help
Hierarchy
ShirasuAutowareSin
AutowareSimulation
ScenarioManager
Canvas
EventSystem
PCDMapping
Cube
Scene
Animator
Game
Persp
Inspector
Occlusion
ScenarioManager
Static
Tag Untagged
Layer Default
Prefab Open Select Overrides
Transform
Position X 0 Y 0 Z 0
Rotation X 0 Y 0 Z 0
Scale X 1 Y 1 Z 1
Scenario Manager (Script)
Script ScenarioManage
Debug Mode
Edit Scenario
Use Scenario
Choose Scenario:
SCENARIO_12
Approve
Active Scenario: SCENARIO_12
Traffic Manager (Script)
Add Component
Project
Console
Favorites
All Materials
All Models
All Prefabs
Assets
AWSIM
Data
Externals
Shirasu
MaterialsNew
MaterialsOld
TexturesNew
TexturesOld
Fonts
HDRPDefaultResources
Materials
Models
Prefabs
Environments
Nishishinjuku
Shirasu
NPCs
Pedestrians
Vehicles
Scenarios
Markers
Sensors
Vehicles
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Materials...
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lanelet2_...
ShirasuN...

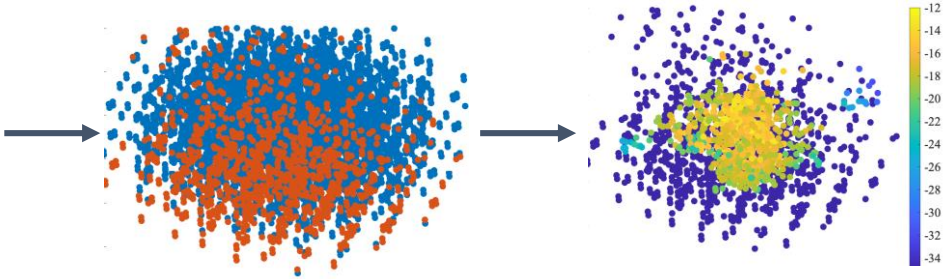
pjaroszek@pjaroszek-AORUS-5-SE: ~/projects/tieriv/deliverable_project_Q3/WP5/autoware
pjaroszek@pjaroszek-AORUS-5-SE: ~/projects/tieriv/deliverable_project_Q3/WP5/autoware 137x75
pjaroszek@pjaroszek-AORUS-5-SE:~/projects/tieriv/deliverable_project_Q3/WP5/autowareS ros2 launch autoware_launch e2e_simulator.launch.xml use_distortion_corrector:=false use_sim_time:=true vehicle_model:=solio sensor_model:=solio_awsim_sensor_kit map_path:=`pwd`/../autoware_map_new

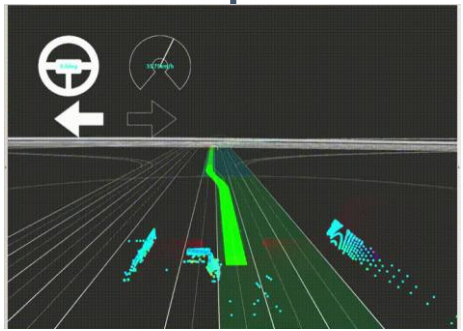
Engineers fix high-risk bugs

1.

Low dimensional representation of failures

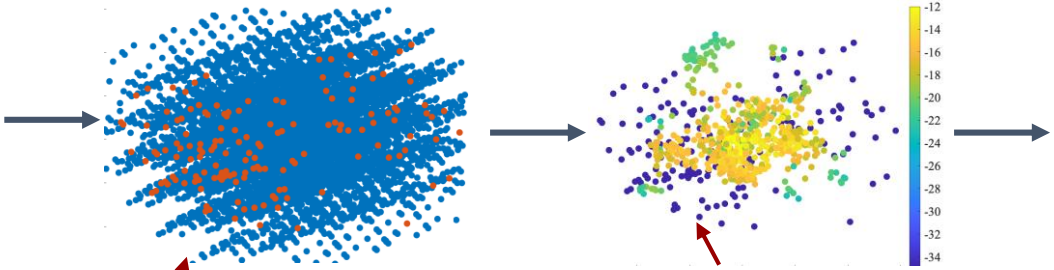
Log-likelihoods to prioritize/triage

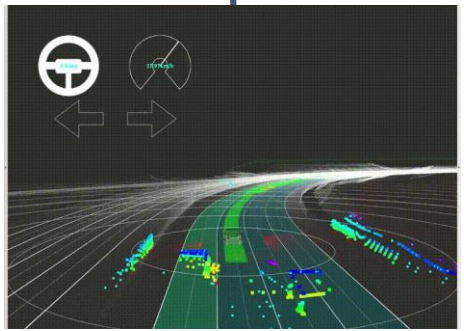




Start CI process again

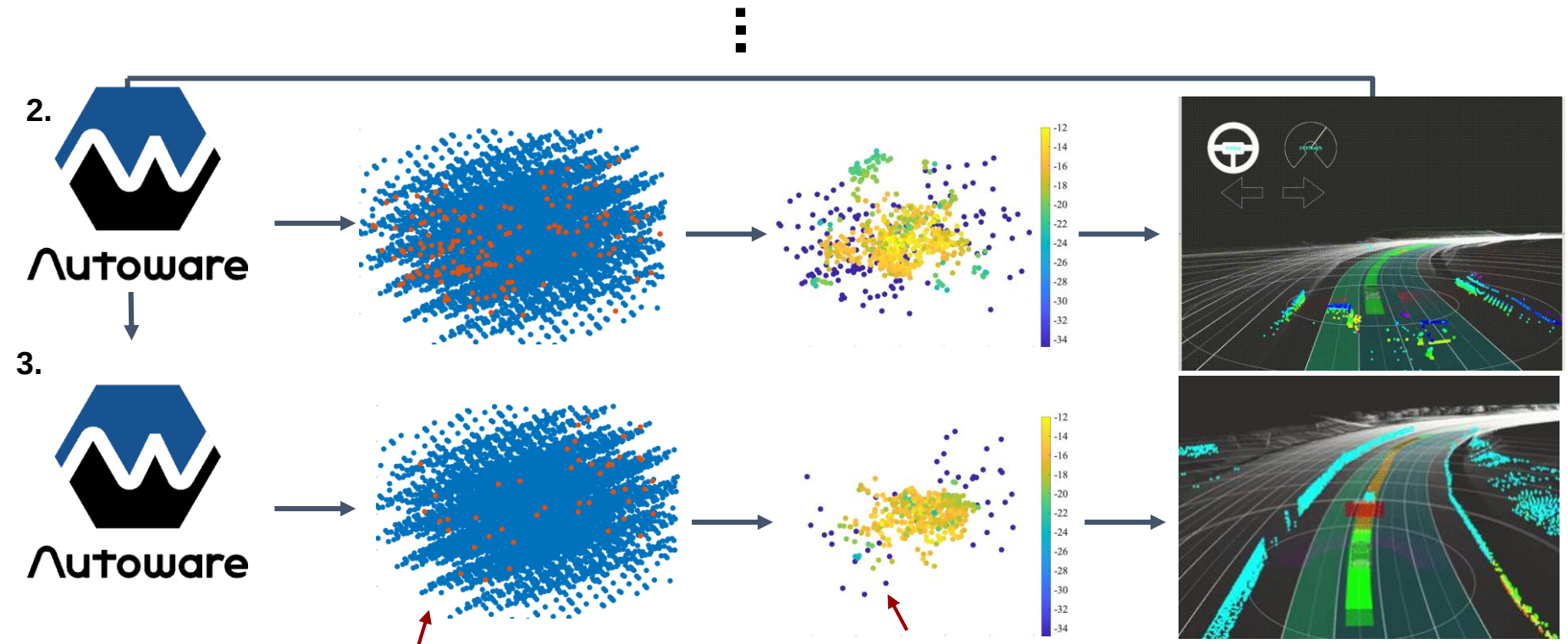
2.





2.5% of grid-search test points fail

The algorithm will crash 5% of the time on this scenario. Lane changes are successful 60% of the time


2.
Autoware
3.
Autoware
-12
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-24
-26
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-30
-32
-34
0.52% of grid-search test points fail
The algorithm will crash 2.7% of the time on this scenario. Lane changes are successful 60.1% of the time

Process Flow to Obtain L4 Operation Permit

Authorized L4 Organization

- Operation Plan
- T&C Compliances
- Training to operators

❶ Operation Plan Submission

❸ Approval

Administrative disposition when violates the law

PPSC *

❷ Hearing

Local Gov.

Mayor

Authorized L4 Operator

- Status monitoring
- In case of incident;
  - Reporting Police/ Fire department
  - Send personals to incident site for assistances

Remote Monitoring
(or safety Operator in vehicle)

Operational Design Domain (ODD)

*都道府県公安委員(PPSC): Prefectural Public Safety Commissioner


TIER IV
THE ART OF
OPEN SOURCE,
REIMAGINE
INTELLIGENT
VEHICLES.

THANKS !