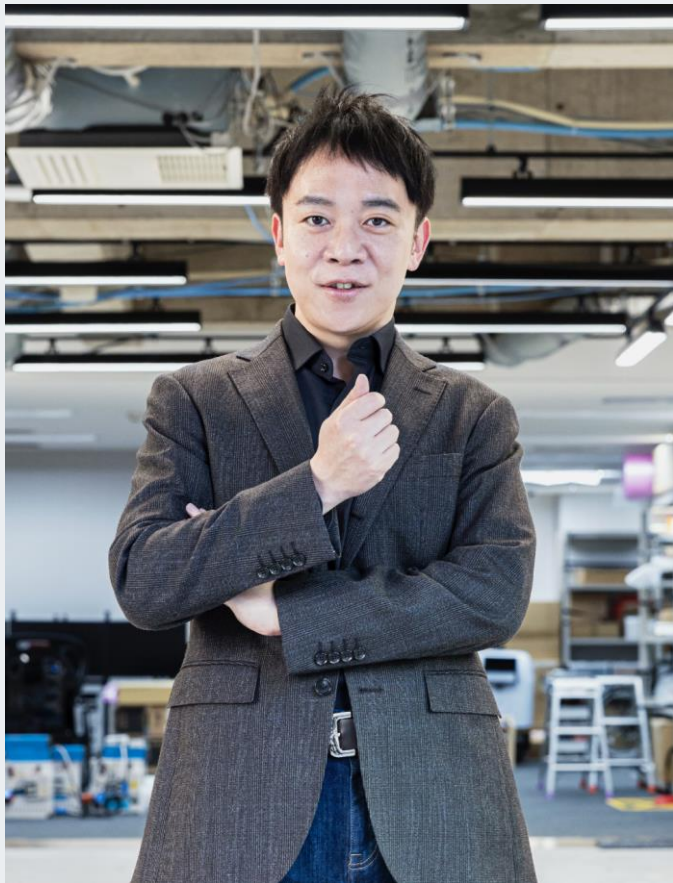


# 自動運転の民主化

加藤真平

東京大学大学院情報理工学系研究科特任准教授





## 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.

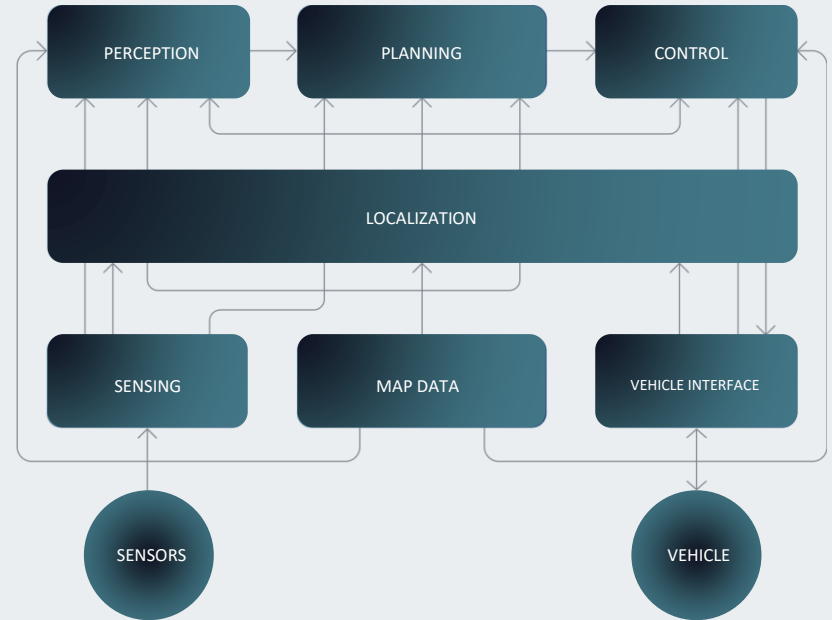
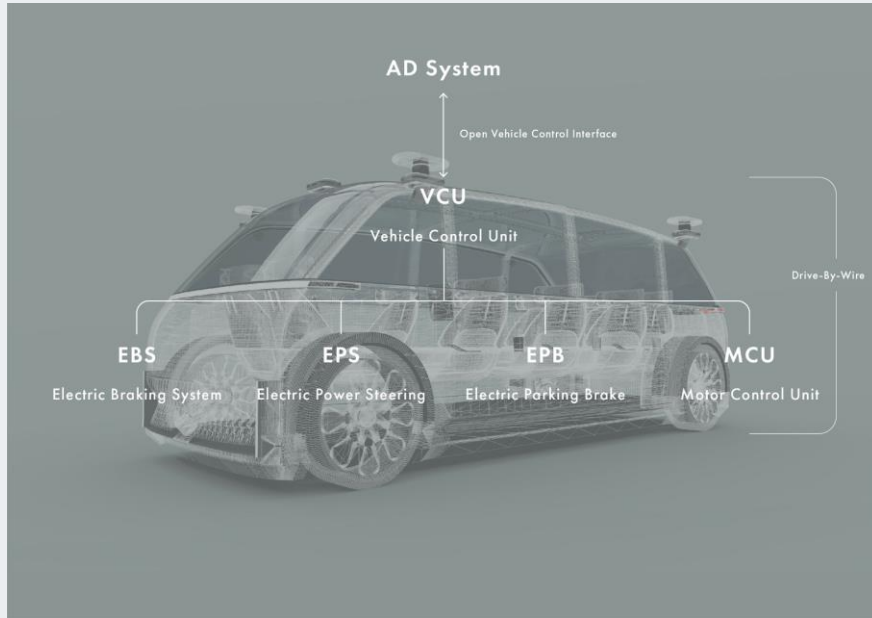
**2012 - 2016.** Full-Time Associate Professor in Information Science, Nagoya University.

**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

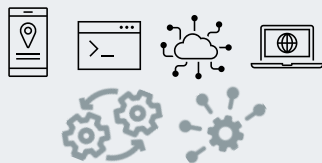
The Summit



**Customer Deal**

Providing solutions.

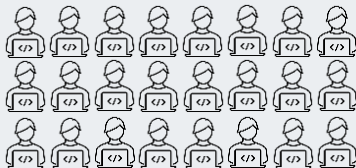
9-th Station



**Product**

Developing a platform.

5-th Station

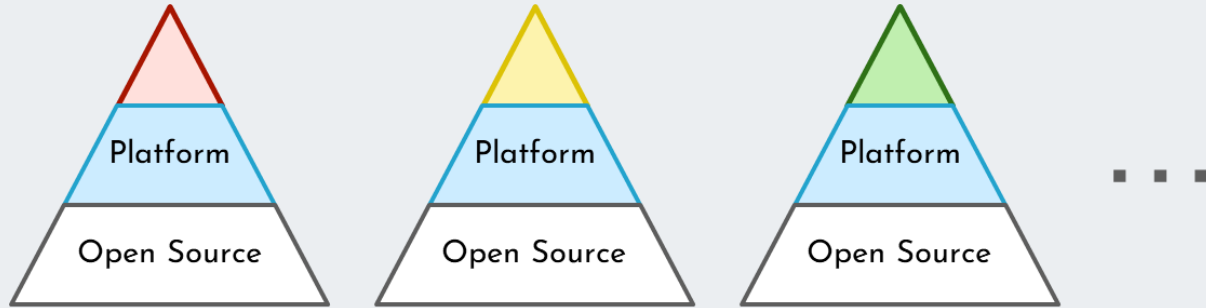


**Open Source**

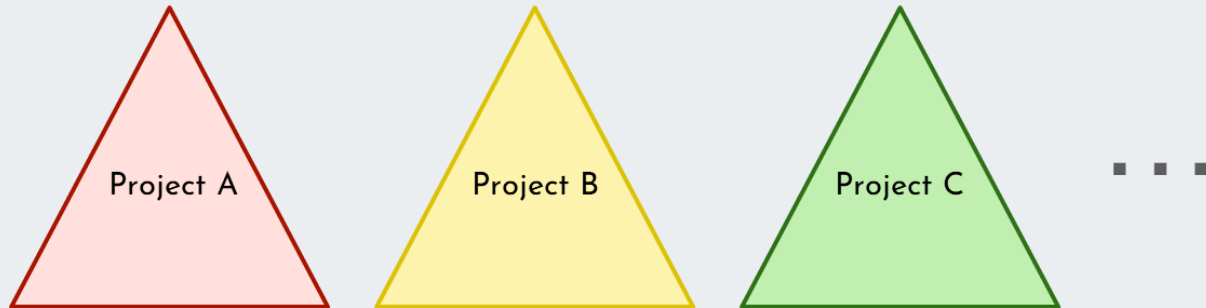
Leading Autoware.



# Business Concept



Which is more resource efficient?





<https://github.com/autowarefoundation/autoware>

# Autoware



**30+**

Vehicle Models



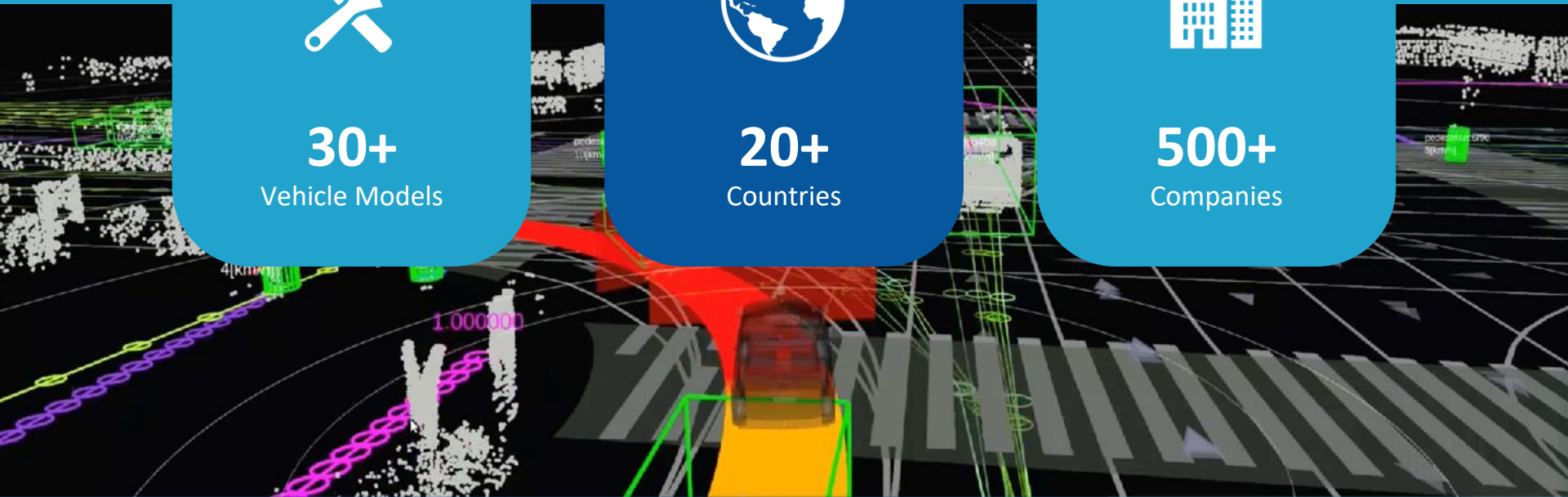
**20+**

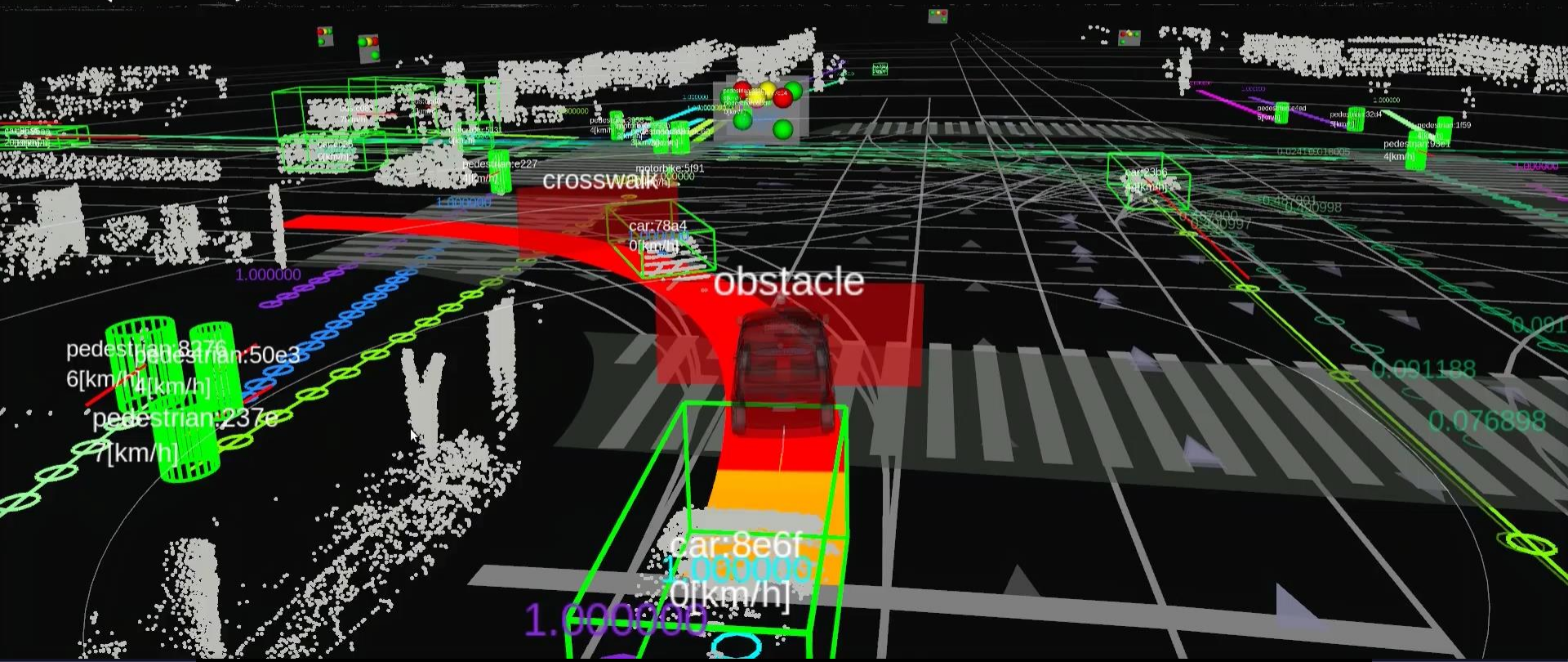
Countries



**500+**

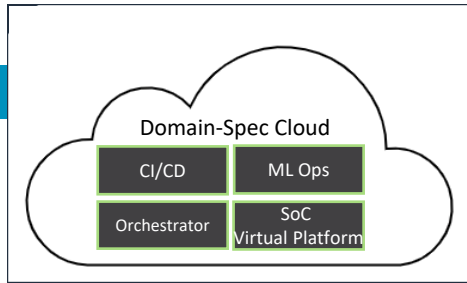
Companies



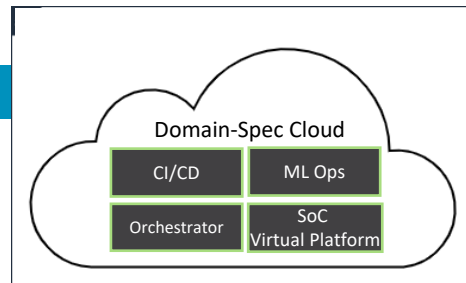


# Software-Defined Vehicles Architecture

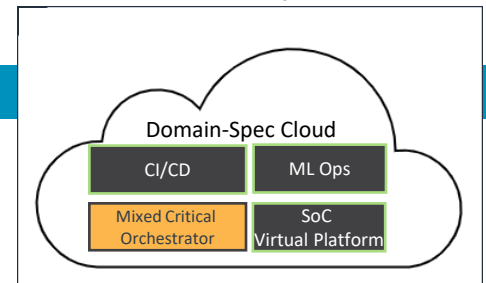
**Monolithic Domain-Spec Stack**



**Microservices Based Domain-Spec Stack**

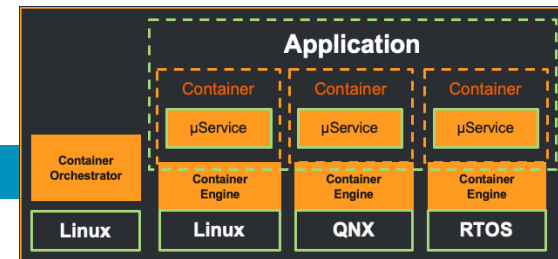
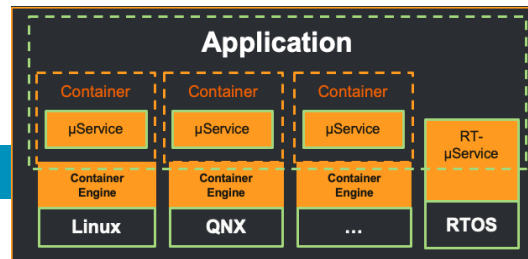
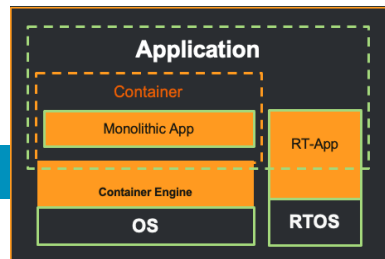


**Microservices Based Domain-Spec Stack With Mixed Criticality Orchestrator**



**Cloud-Native Development**

- DevOps / MLOps
- Continuous Delivery
- Microservices
- Containers for parity
- Environmental parity





# DevOps Framework

### CI/CD Evaluation

ID	CATALOG	RELEASE	SOURCE	STATUS	TIME	USER
F16717C	KL_Release1		github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API
05a4482	KL_Release1		github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API
5405465	KL_Release1		github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API
7905888	KL_Release1		github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API
8238425	KL_Release1	(3232001)0219	github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API
0461209	KL_Release1		github.com/foxglove/autoware	Success	3:04:11.219	0 - Build API

### Map/Scenario

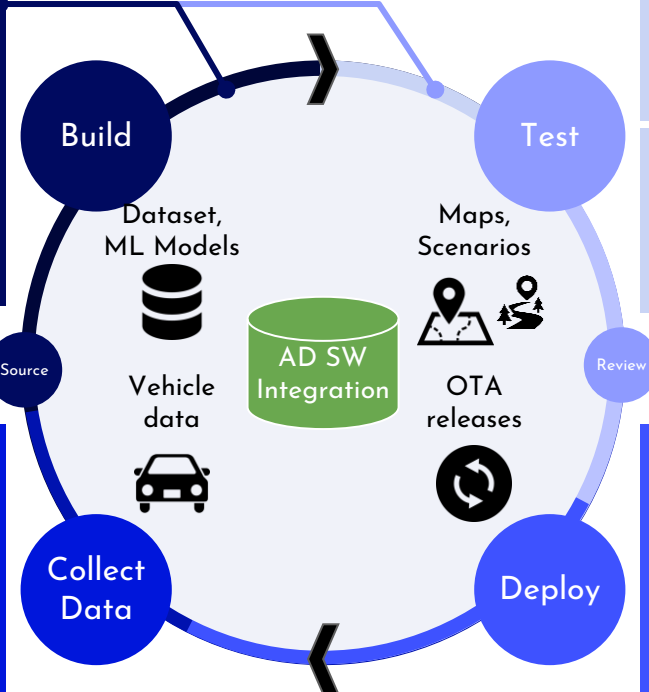
The left screenshot shows a 2D aerial map with green and red overlays indicating vehicle paths or zones. The right screenshot shows a 3D perspective view of a simulated environment with a vehicle and various objects.

### Testing

Two black rectangular placeholders representing testing outputs or results.

### Data Search

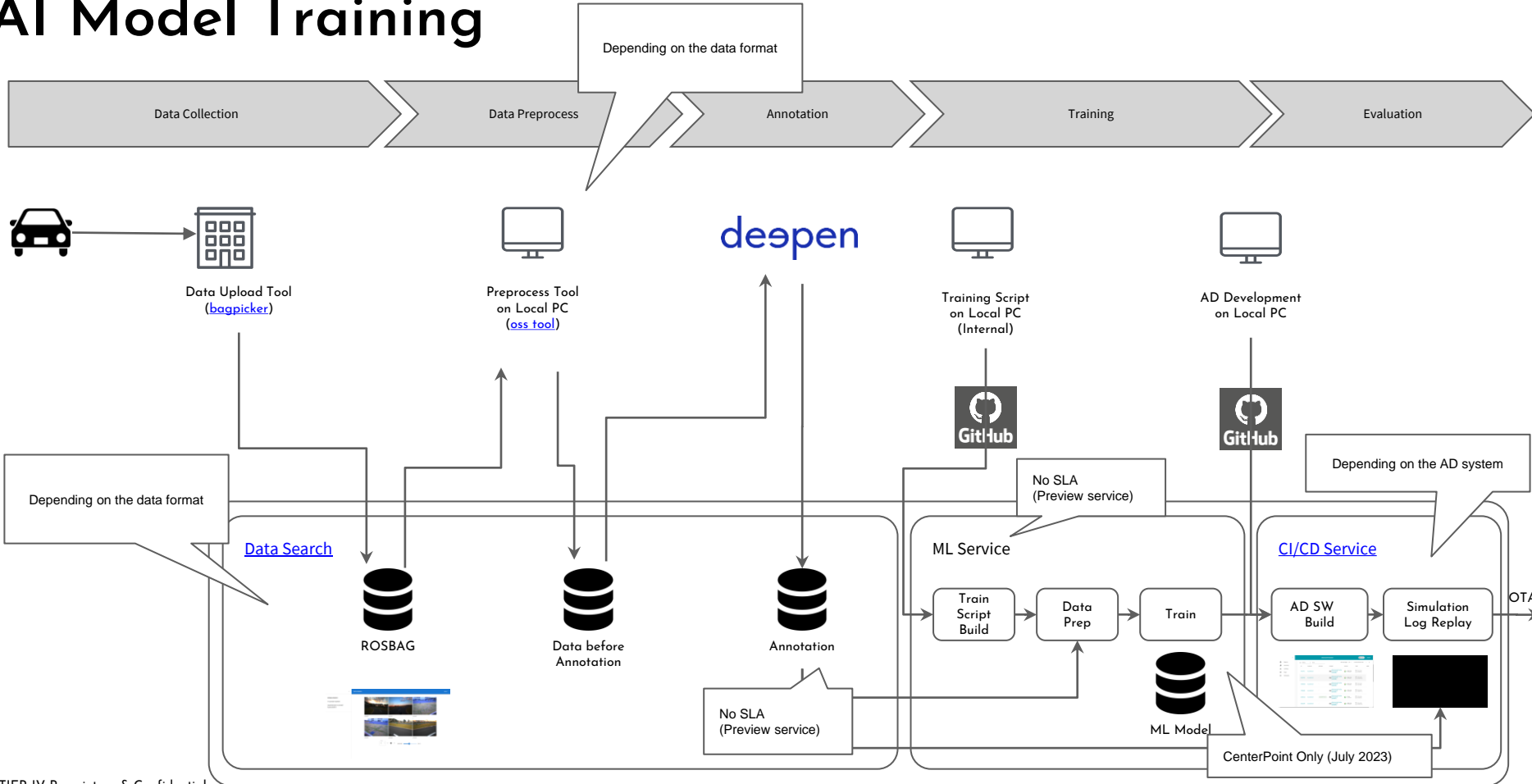
A screenshot of the Data Search interface showing a grid of image thumbnails representing different data points or scenarios.



### Fleet Management

A screenshot of the Fleet Management interface showing a map with vehicle locations and a sidebar with various management options.

# AI Model Training



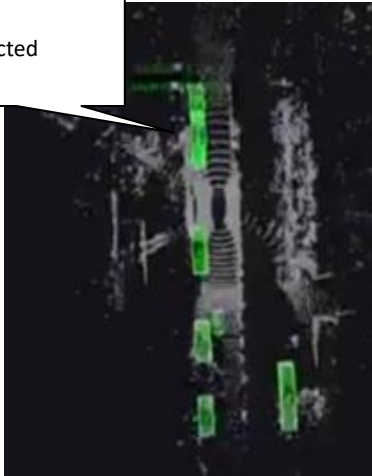
# Domain Adaptation Challenges

NOT detected...

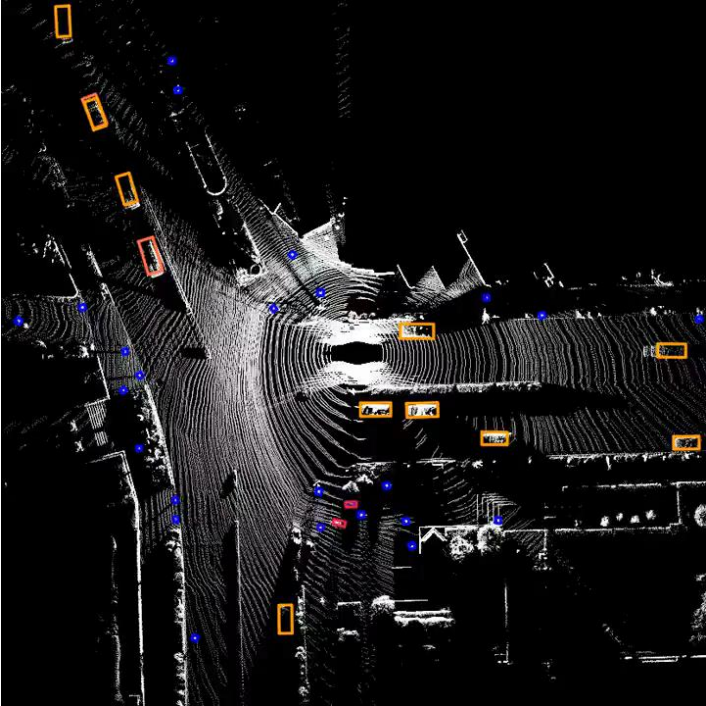


Without domain adaptation

Detected

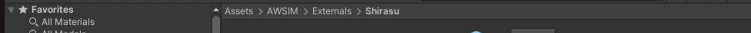
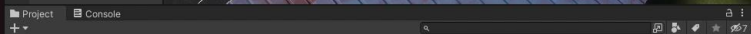
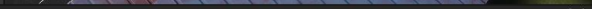
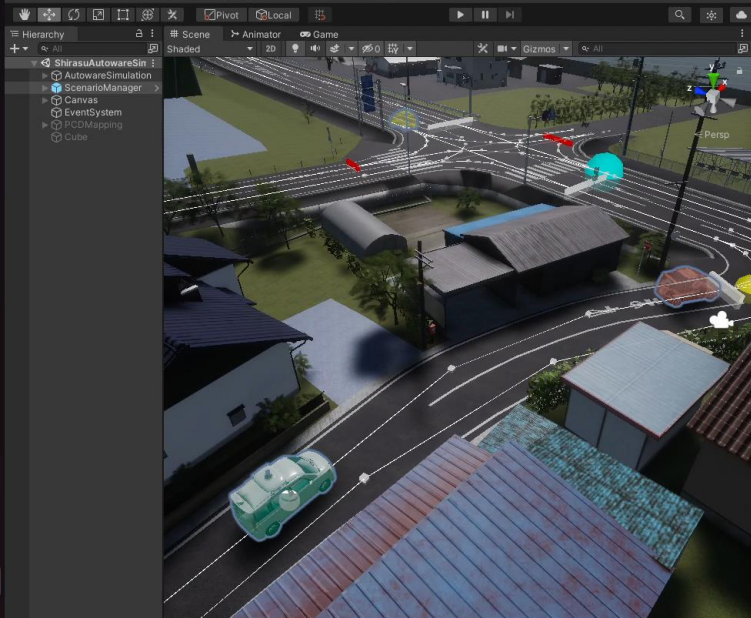


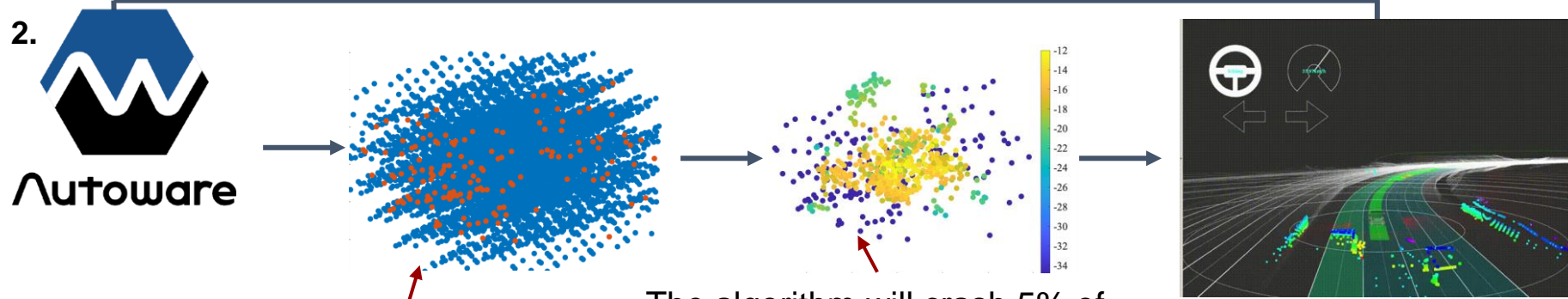
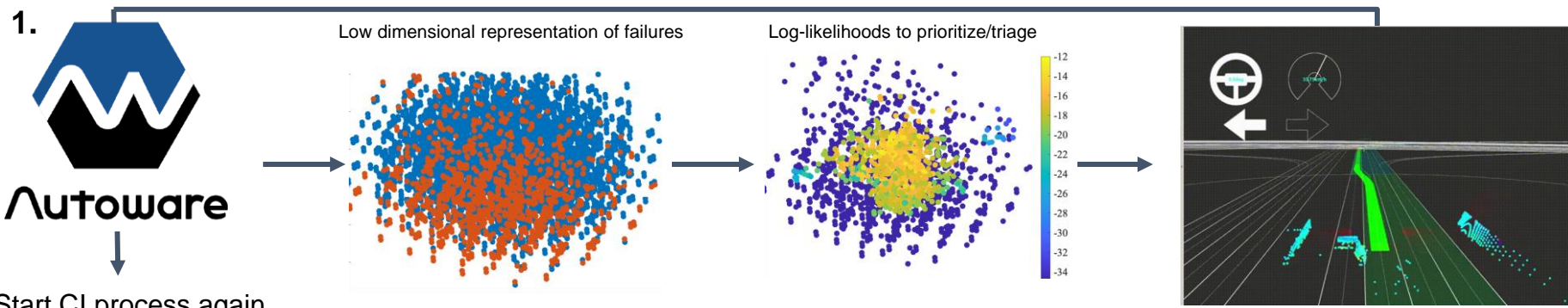
With domain adaptation





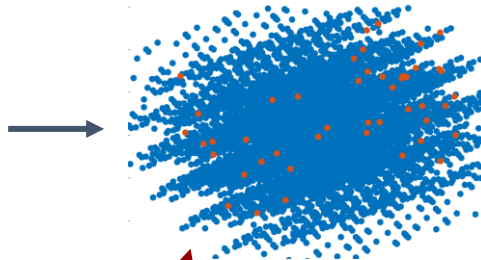
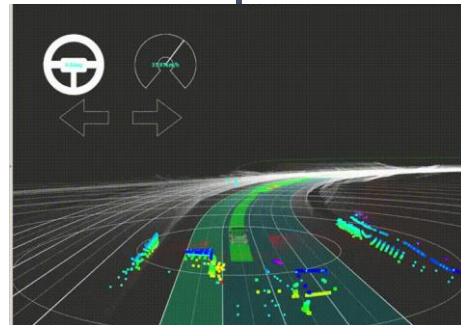
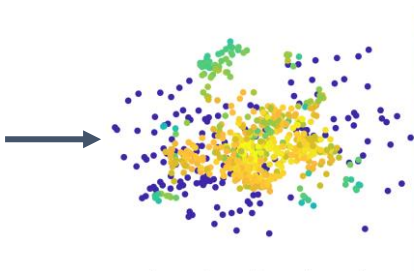
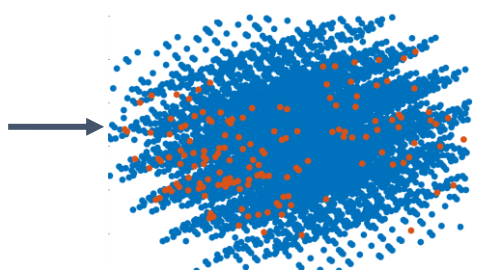
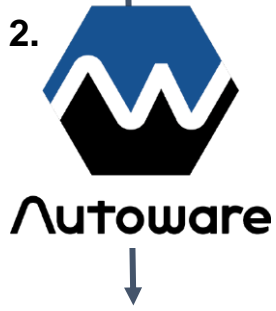
# Synthetic Data Generation with



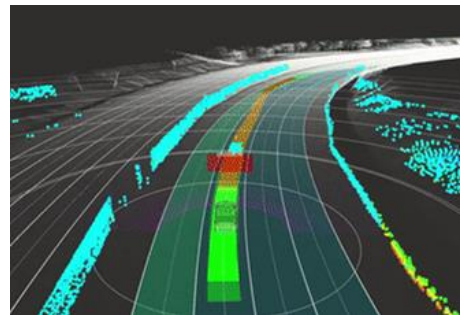
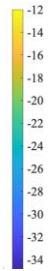
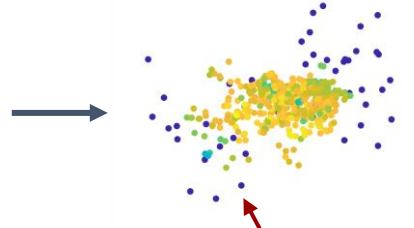


The algorithm will crash 5% of the time on this scenario. Lane changes are successful 60% of the time

...



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

Authorized L4 Operator

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

① Operation Plan Submission

③ Approval

*Administrative disposition when violates the law*

Remote Monitoring (or safety Operator in vehicle)



PPSC\*



② Hearing

Local Gov.



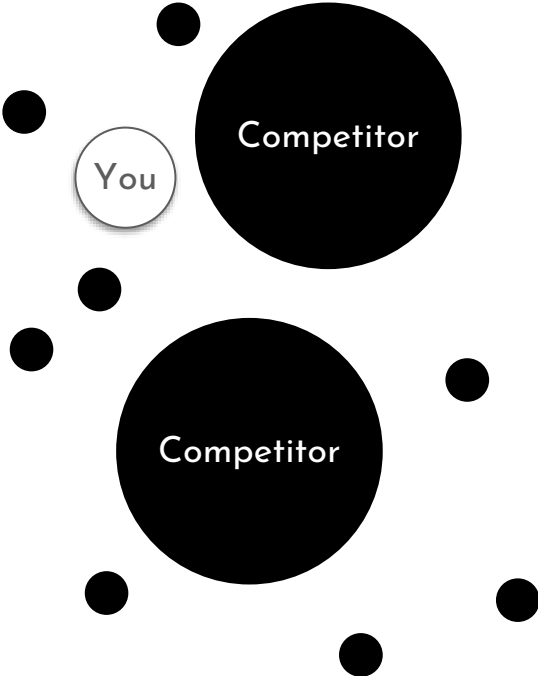
Mayor



Operational Design Domain (ODD)

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

# THANKS!



Once you become open source...

