

The Safer LiDAR solution, Vueron

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Company Introduction

About Vueron

Overview

Name	Vueron Technology Co., Ltd.
Foundation	October 10 th 2019
CEO	Joseph Kim
Office	<ul style="list-style-type: none"> • HQ Seoul, South Korea • San Jose office • Munich office 
Team	44 (32 engineers)
Products	<ul style="list-style-type: none"> • VueOne (Automotive solution) • VueTwo (Smart-infra solution)
Mission	<ul style="list-style-type: none"> • Making people safer by providing the best LiDAR solution

History

- 2024. 09** Series A Funding U\$20m (shinhanvc, KDB and more)
- 2024. 01** CES®2024 Innovation awards
- 2023. 06** Release Smart Crowd Analytics (SCA) solution
- 2023. 01** Release VueTruck – eco-friendly, self-driving truck
- 2022. 06** Obtained AV permit in US (CA / NV)
- 2022. 01** Pre-A Funding U\$10m (KDB, Bon Angels and more)
- 2021. 02** Obtained AV permit in Korea
- 2020. 11** Release VueTwo – Smart infra solution
- 2020. 07** Release VueOne – Automotive solution
- 2020. 05** Seed Funding(Naver, Bon Angels)
- 2019. 10** Vueron Technology Foundation

About LiDAR

Scene



Real 3D world

- People, car, cyclist, roads, lanes and more

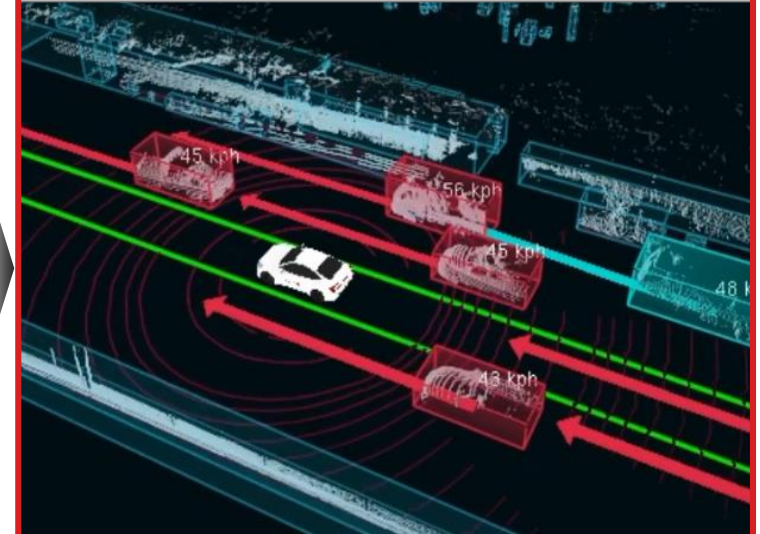
LiDAR Hardware



Hardware only provides point information

- Point X, Y, Z, and Point Intensity

LiDAR Software



Software provides useful information

- Class, position, size, velocity, and more

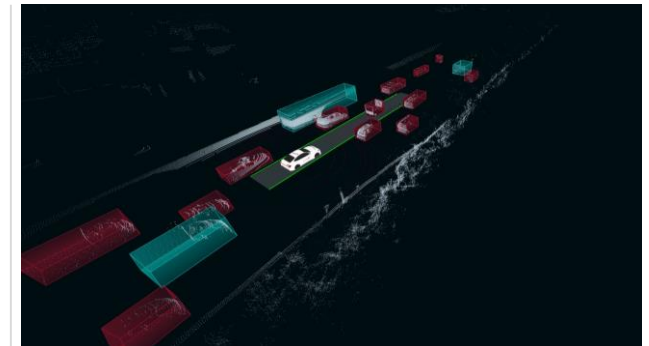
Product Line

Vueron LiDAR Solution

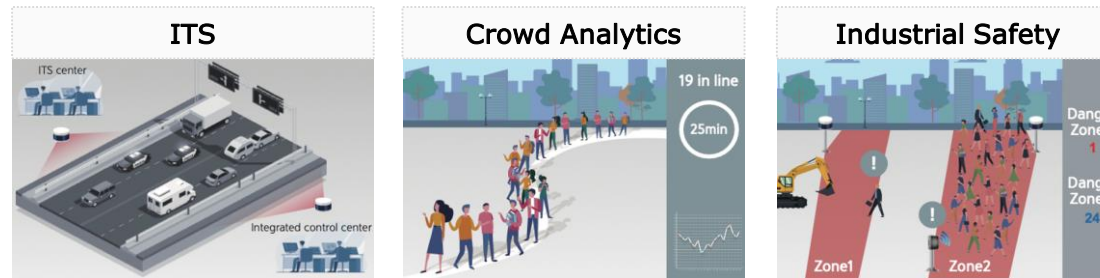
VueOne
Taking responsibility for the safety of the driver



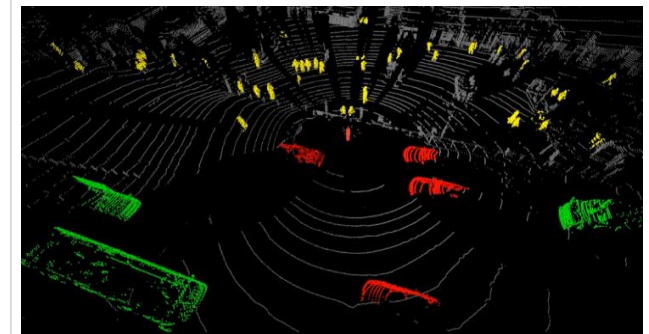
LiDAR perception for all kinds vehicles' **ADAS** (Lv2+,Lv3)



VueTwo
Making the city smarter and safer

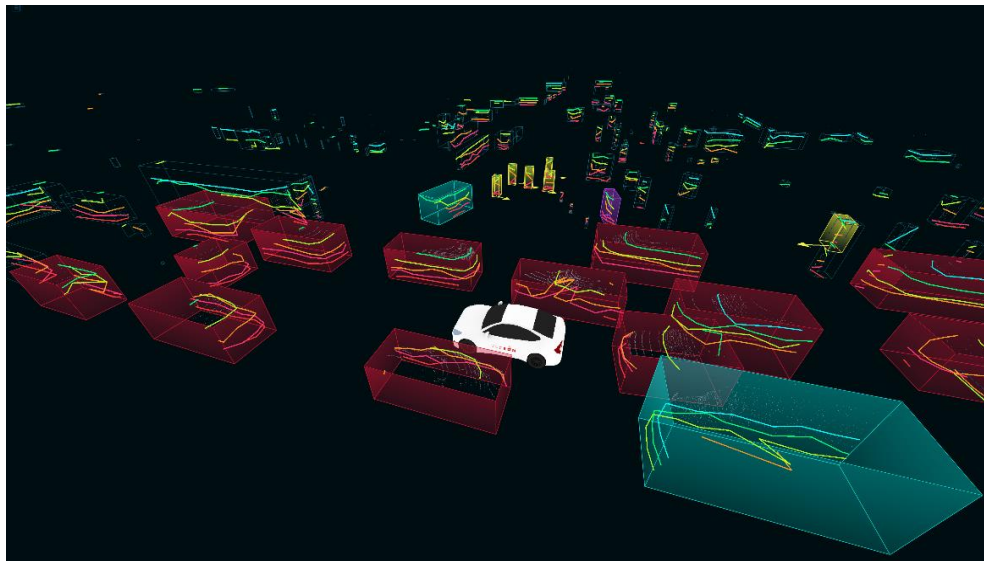


LiDAR perception for **Smart-infrastructure**



VueOne

Basic Output



- Car
- Commercial Vehicles
- Pedestrians
- Cyclist
- Unknown object
- ➔ Velocity
- Object contour

Platform

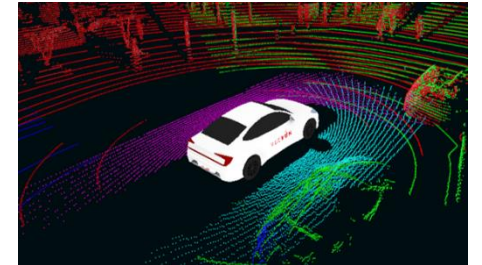


Functions

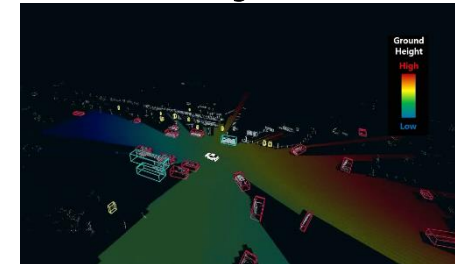
Lane detection



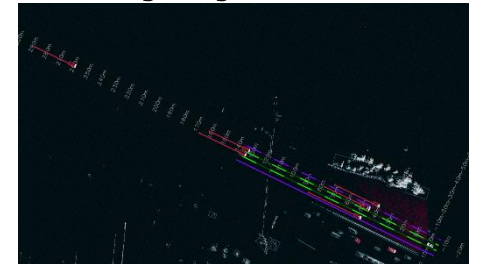
Multi-LiDAR calibration



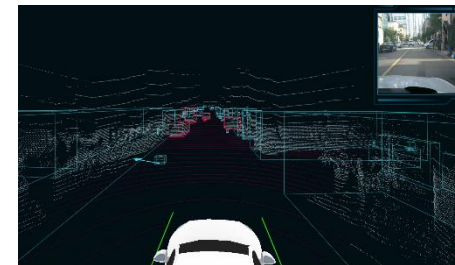
Ground height detection



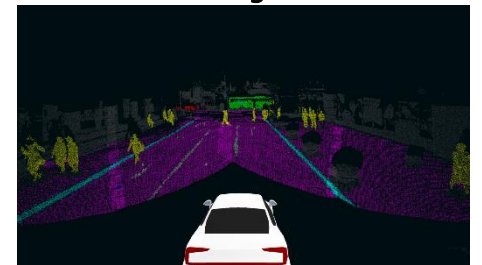
Long range detection



Road obstacle detection

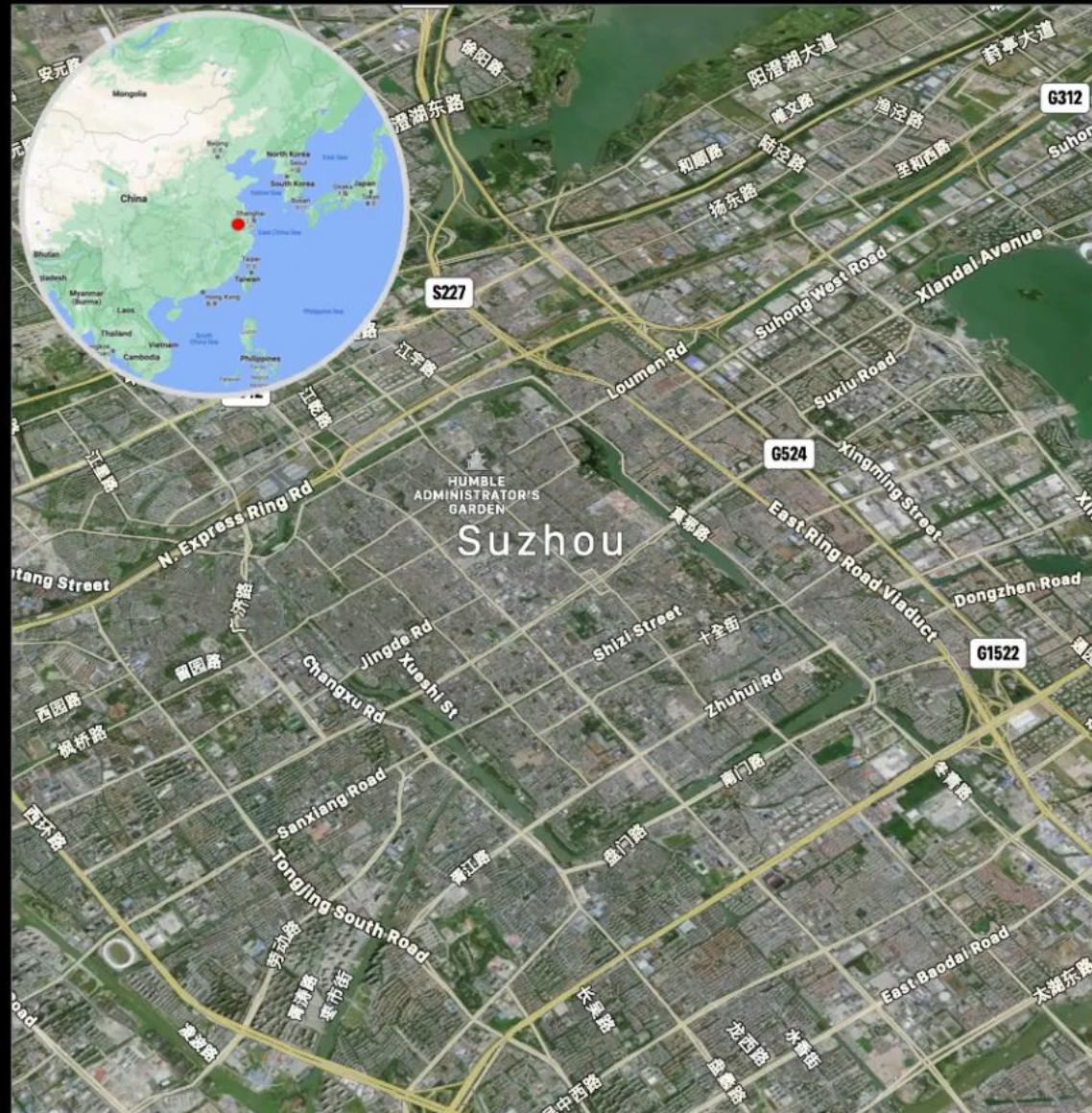


Semantic segmentation



Driving Environment

Area

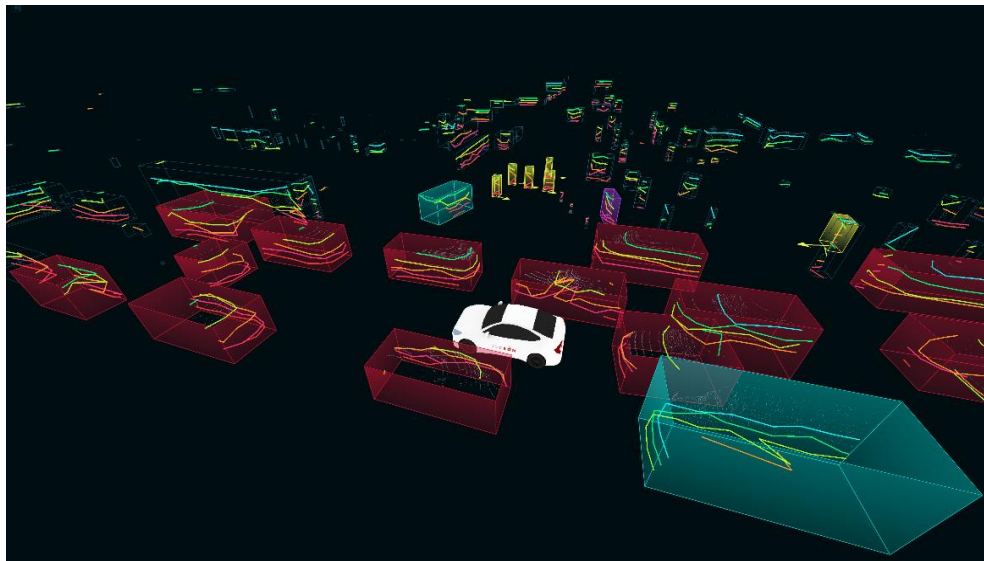


Course



VueOne

Basic Output



- Car
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- Unknown object
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Platform

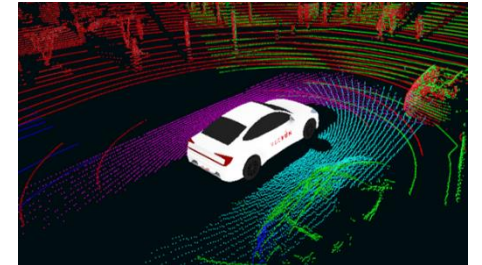


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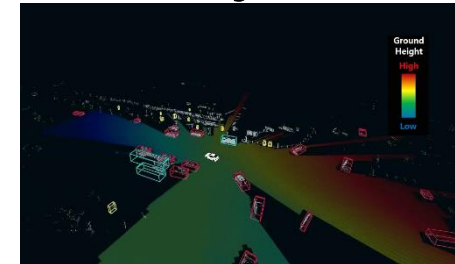
Lane detection



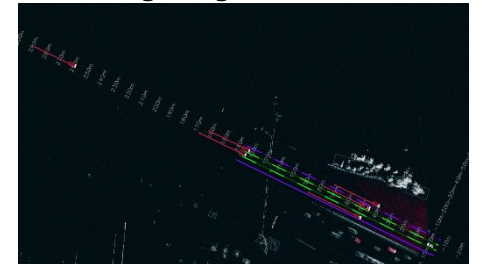
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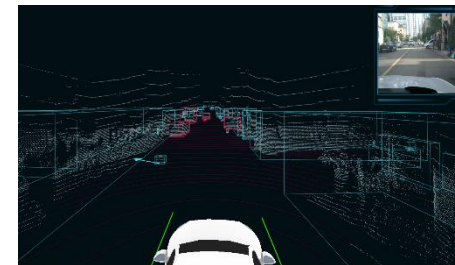
Ground height detection



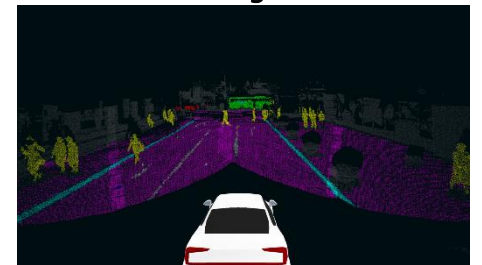
Long range detection



Road obstacle detection

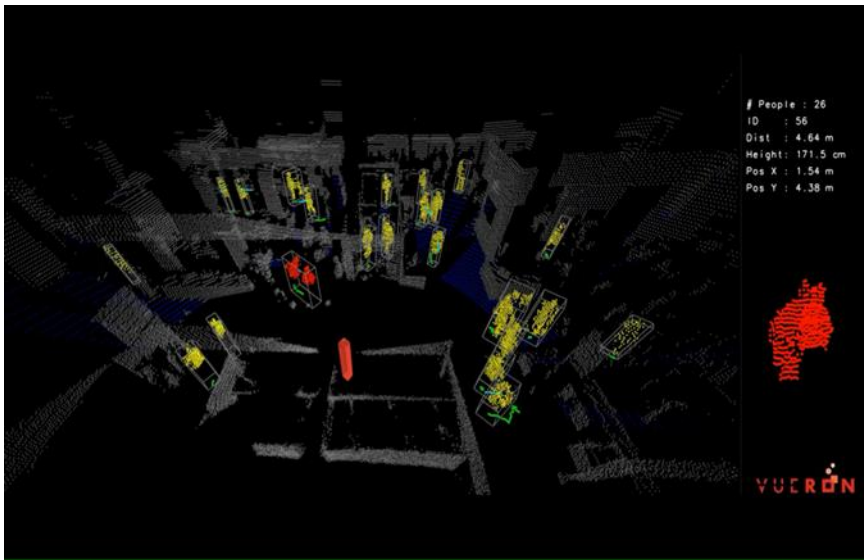


Semantic segmentation



VueTwo

Basic output



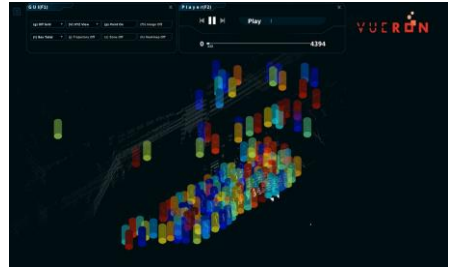
Platform



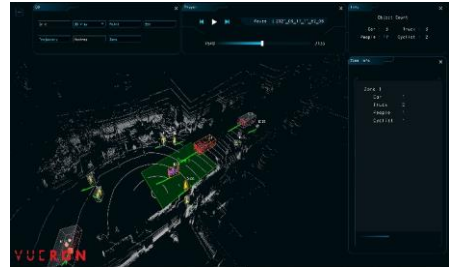
- Object Class (people, car, and more*)
 - Distance
 - Height
 - Velocity
 - Direction
 - Trajectory
- *More classes are available upon request

Function

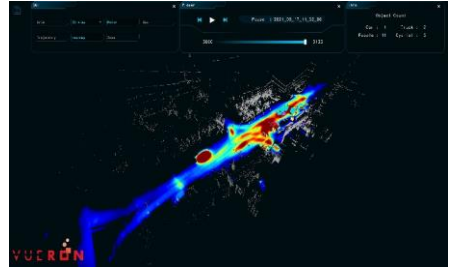
People counting



Danger zone alarm



Heat map



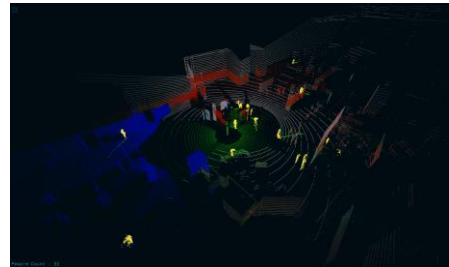
People tracking



Moving object detection

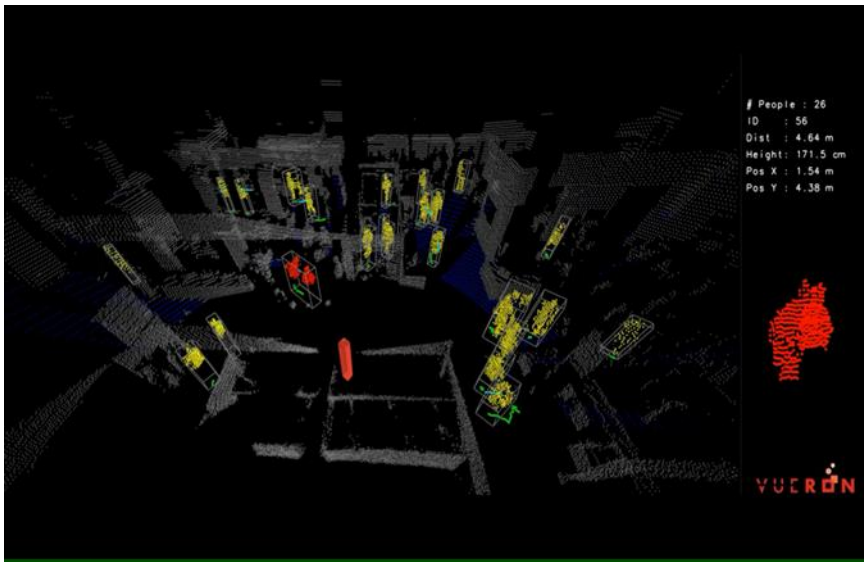


Multi-LiDAR processing



VueTwo

Basic output



- Object Class (people, car, and more*)
- Distance
- Height
- Velocity
- Direction
- Trajectory

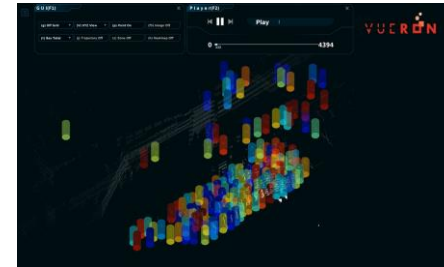
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Platform

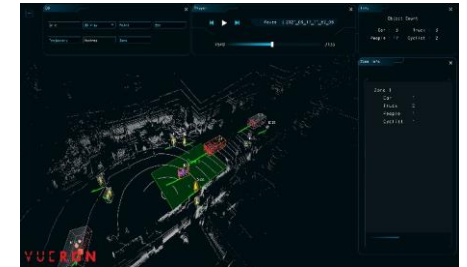


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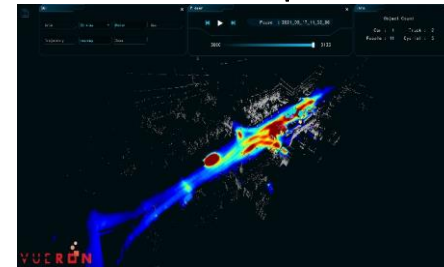
People counting



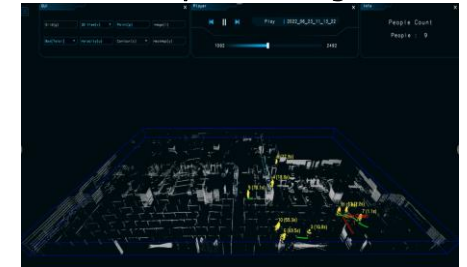
Danger zone alarm



Heat map



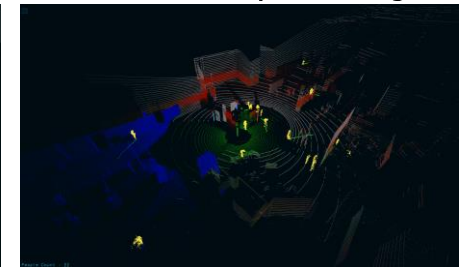
People tracking



Moving object detection



Multi-LiDAR processing



Competitive Edge

Why Vueron

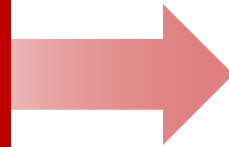
Strict Standard for Automotive Serial Production

Key factors

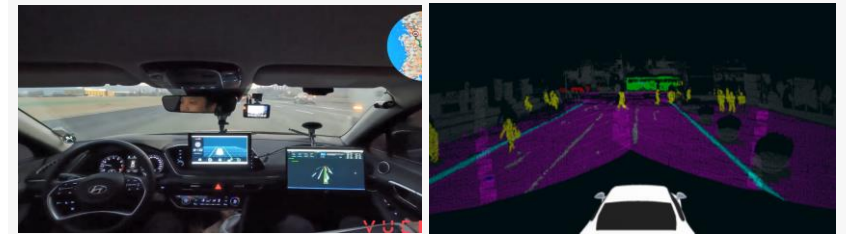
Vueron Solution

⊖ Performance

- Real-time
- Accurate object info

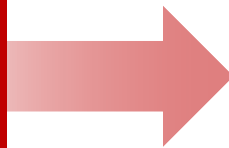


- "The first" and "the only" LiDAR only autonomous driving permit in the world
- Waymo benchmark "the world top 1"



⊖ Applicability

- Optimization
- Customization

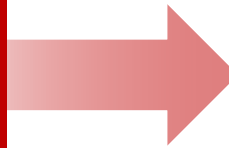


- Can be deployed on automotive chips, such as Texas Instrument, Renesas and Nvidia Drive Orin
- Can be used for any kinds of LiDAR sensors

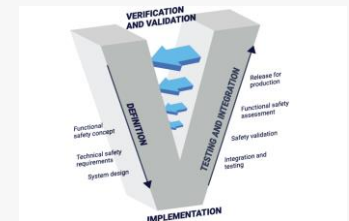


⊗ Safety

- Unknown object
- Validation & Verification



- Hybrid AI (Algorithm + Deep learning)
- Functional safety & automotive industry-standard guideline (on process)



Why Vueron

⊖ Performance : Be making History - World Title

Autonomous Driving Licenses

라이다 센서만으로 자율주행 면허 획득 및 주행한 최초 사례

기사도 7기 | 등록 2021.02.19 09:02



Vueron Technology has been approved LiDAR only autonomous vehicle permits from the California DMV

Vueron Technology Co., Ltd
2022-09-18 00:00 | 5993

SAN JOSE, Calif., June 18, 2022 /PRNewswire/ -- LiDAR autonomous vehicle startup Vueron Technology ("Vueron") has succeeded to obtain an autonomous vehicle permit that uses only one LiDAR sensor that no one has yet tried in California, where the numerous autonomous vehicle companies are fiercely competing.



Vueron California LiDAR only autonomous vehicle

The California Department of Motor Vehicles approved LiDAR-only autonomous vehicle testing permits for Vueron.

World's 1st company obtaining **AV permit with 1 LiDAR** in Korea and California/Nevada

- Feb '21, Obtained AV permit in Korea
- Jun '22, Obtained AV permit in CA, USA
- Jul '22, Obtained AV permit in NV, USA

World 1st in Waymo Benchmark

Challenge 3D Semantic Segmentation

Leaderboard disqualified from the 2022 Waymo Open Dataset Challenge

Method Name	Sensors	Frames [-p, +0]	mIoU	Class-wise Breakdown	Date (Pacific Daylight Time)
VUEN, Vueron	All	[-undefined, +0]	0.7205	MEAN_IoU	2023-02-09 00:56
LidarMultiNet		[-undefined, +0]	0.7201	MEAN_IoU	2022-05-23 19:19
LISD		[-undefined, +0]	0.7126	MEAN_IoU	2024-02-02 18:22
Cylinder3D		[-undefined, +0]	0.7114	MEAN_IoU	2022-05-23 23:54
MSeg3Dv2		[-undefined, +0]	0.7093	MEAN_IoU	2022-08-15 00:42
SegNet3Dv2		[-undefined, +0]	0.7088	MEAN_IoU	2022-05-23 15:27
SegNet3D		[-undefined, +0]	0.7066	MEAN_IoU	2022-05-22 03:02
Offboard_SemSeg		[-undefined, +0]	0.7054	MEAN_IoU	2022-05-23 11:03
MSeg3D		[-undefined, +0]	0.7050	MEAN_IoU	2022-08-07 20:09
HorizonSegExpert		[-undefined, +0]	0.7028	MEAN_IoU	2022-05-23 20:07

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LiDAR Autonomous Driving from Los Angeles to San Francisco

Why Vueron

⊖ Performance : Be making History - World Title

Autonomous Driving Licenses

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2022-06-18 00:00

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Offboard_SemSeg		[-undefined, +0]	0.7054	MEAN_IoU	2022-05-23 11:03
MSeg3D		[-undefined, +0]	0.7050	MEAN_IoU	2022-08-07 20:09
HorizonSegExpert		[-undefined, +0]	0.7028	MEAN_IoU	2022-05-23 20:07

Page 1 of 4 10 Rows

Why Vueron

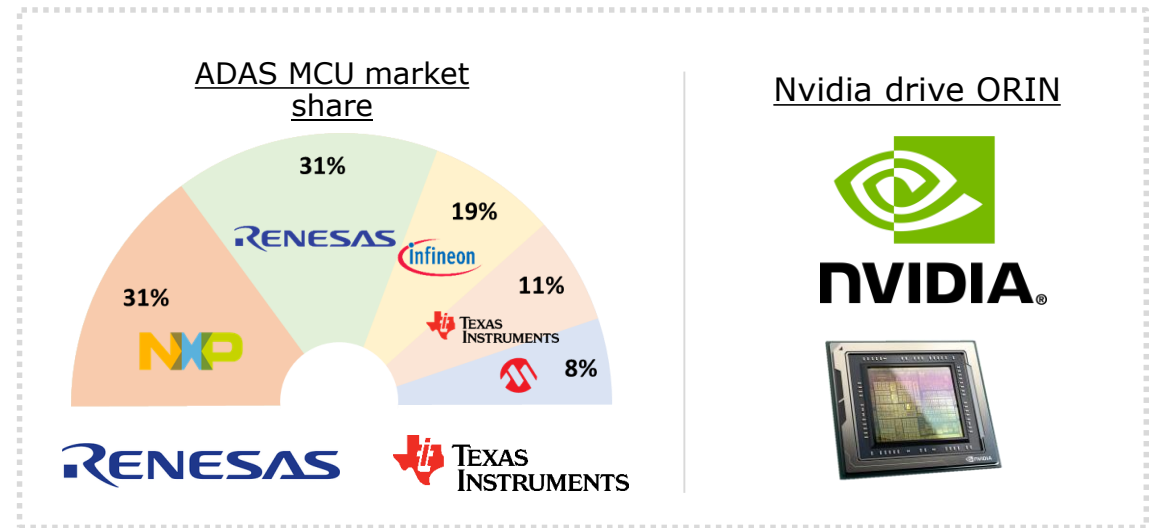
⊖ Applicability : Friendly to Mass Production

Applicable LiDAR Hardware



- Regardless of manufacturer and product type, **compatible LiDAR S/W**

Applicable Processors

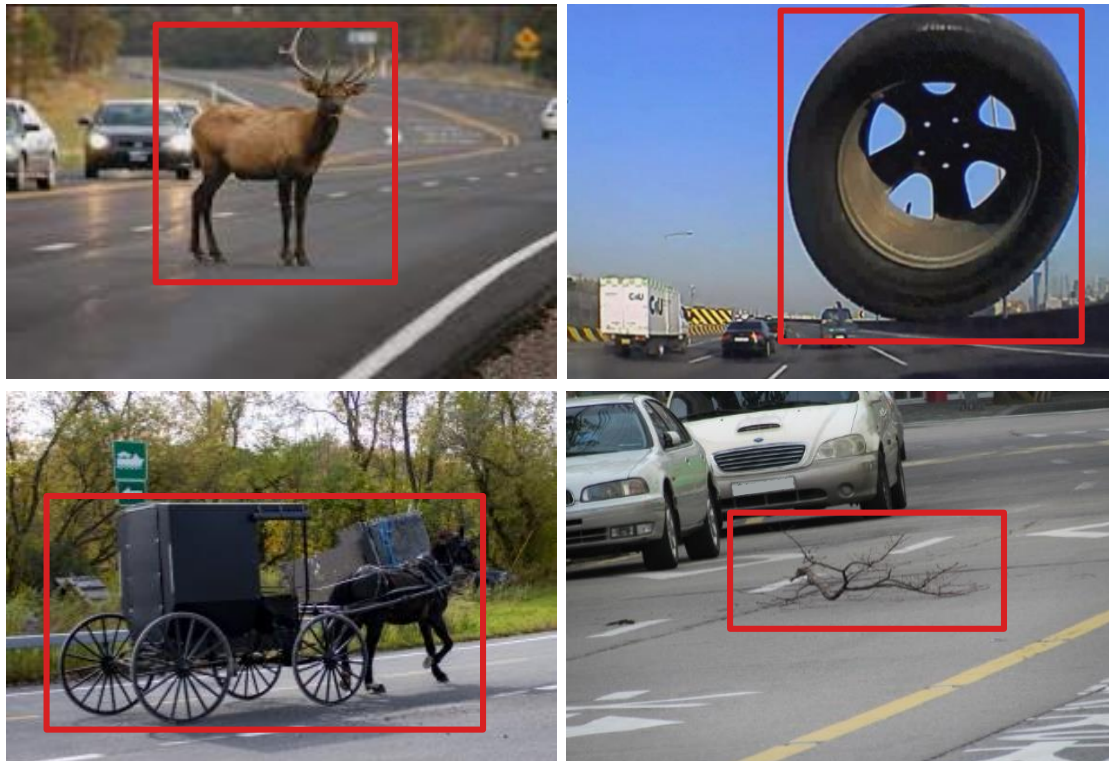


- LiDAR S/W available in not only with high-performance GPU, but also with **MCU in mass-produced vehicles** now using with low-power

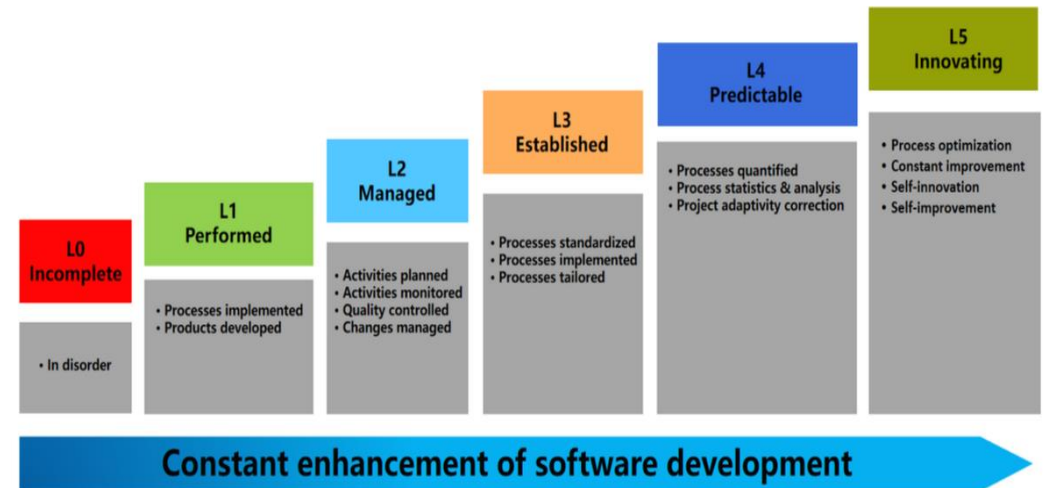
Why Vueron

⊗ Safety : No Missing Object

Unknown / Unlearned Object Detection



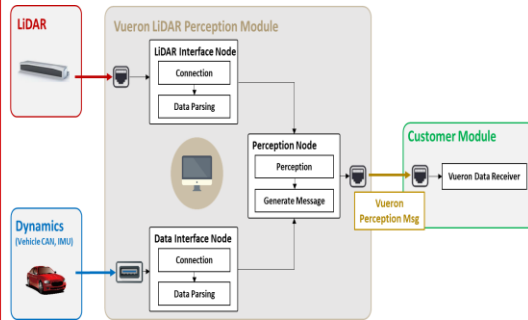
Verification & Validation (On process)



The Various LiDAR Applications

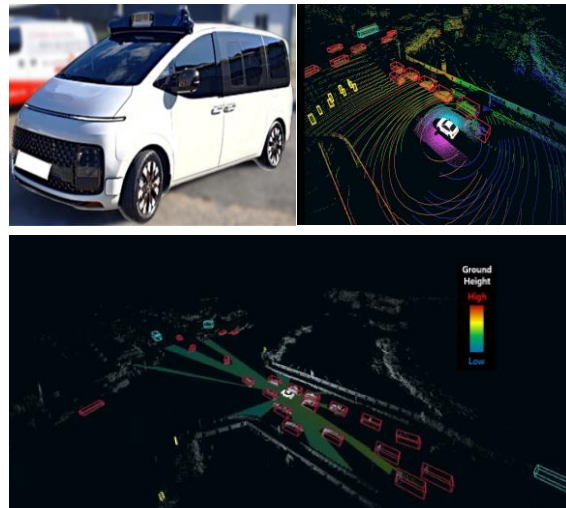
Track record - Automotive solution

Perception Software



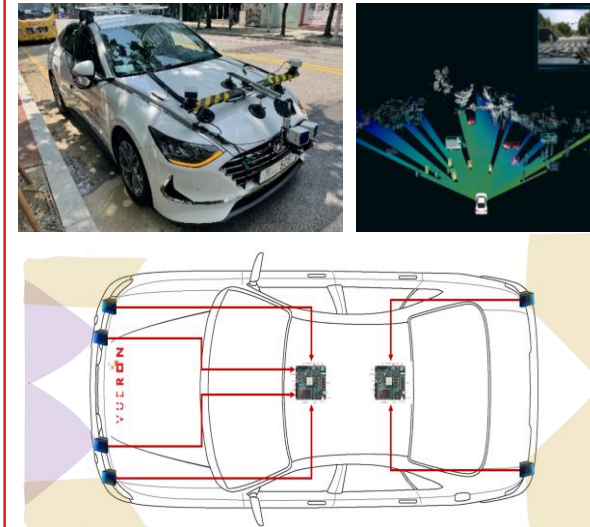
- **Customer : OEM**
- Date: '23.02 – ing
- Details : PoC project to provide the perception s/w for LiDAR sensor that is considered mass production
- Goal : Evaluate the perception software performance for LiDAR module development

Autonomous Shuttle



- **Customer : Tier-1**
- Date : '22.10 – ing
- Details : PoC project to provide the LiDAR perception s/w for Lv4. autonomous shuttle
- Goal : provide the safe environment for Lv4. autonomous shuttle

ADAS Lamp System



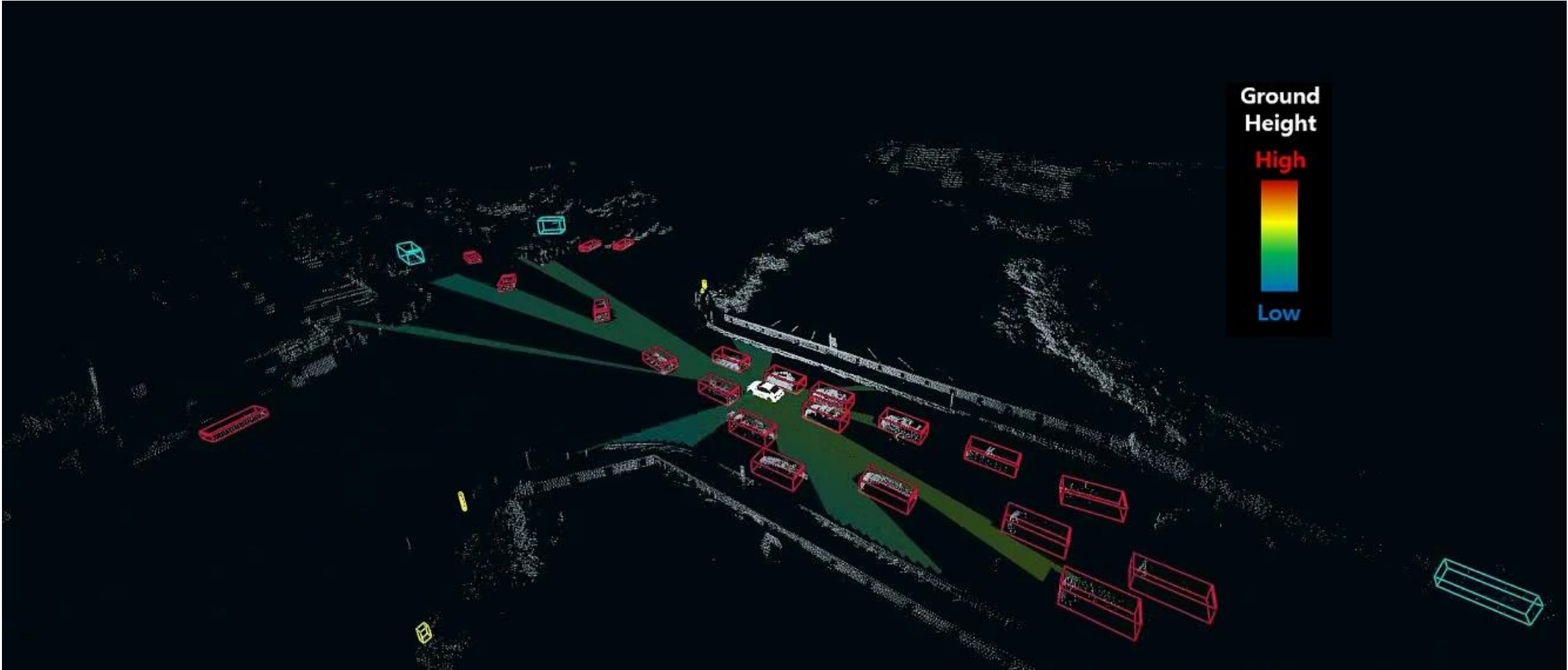
- **Customer : Tier -1**
- Date : '23.03 – ing
- Details : PoC project to provide the LiDAR perception s/w for ADAS lamp system
- Goal : develop the LiDAR based ADAS Lamp module together

Auto Labeling solution



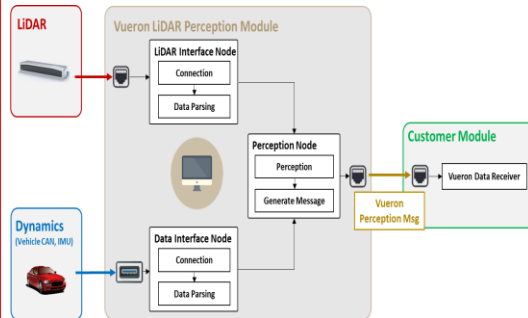
- **Customer : Tier -1**
- Date : '22.12 – ing
- Details : Pre-labeling system to enhance the labeler's efficiency
Provide the high quality detection data set to the labeling company
- Goal : develop the auto-labeling system for development automation





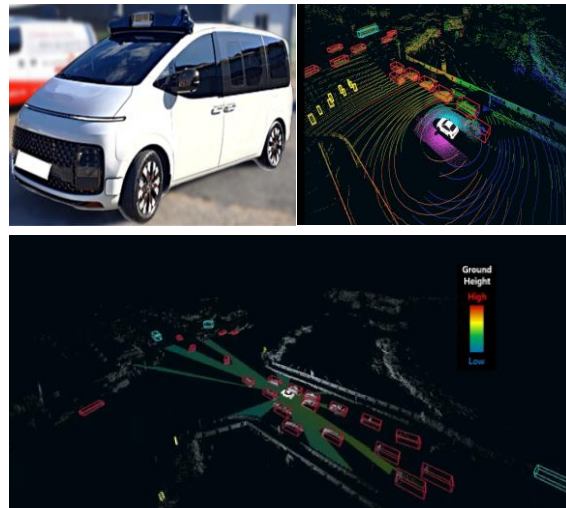
Track record - Automotive solution

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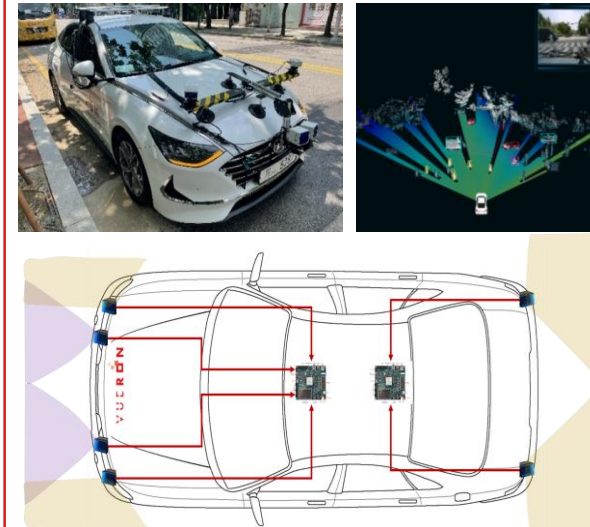
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Autonomous Shuttle



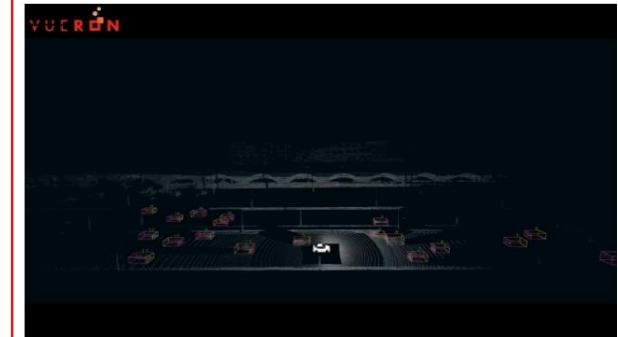
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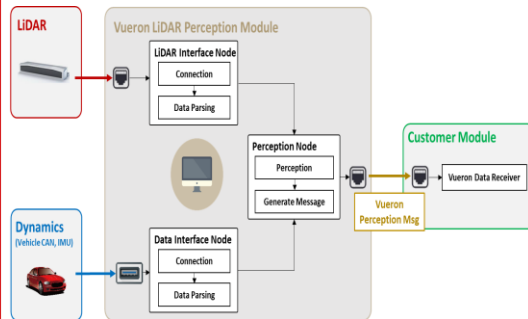


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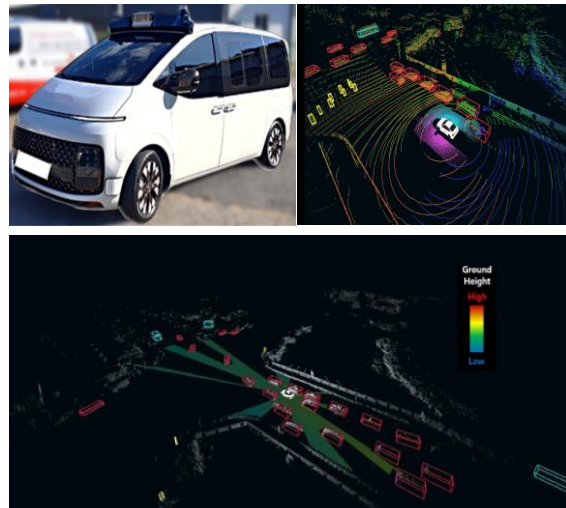
Track record - Automotive solution

Perception Software



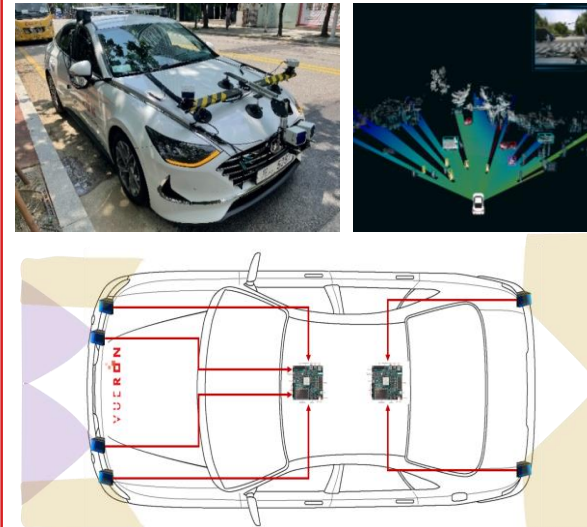
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Autonomous Shuttle



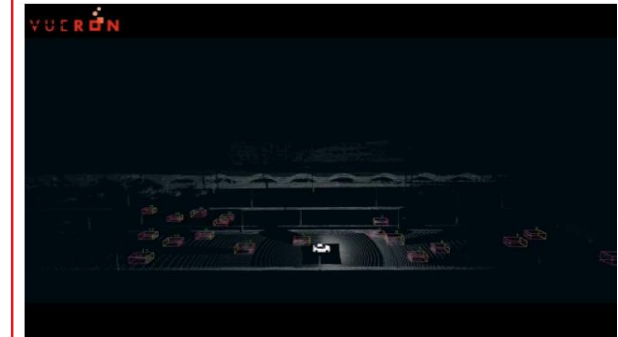
- **Customer : Tier-1**
- Date : Oct 2022 – ing
- Details : PoC project to provide the LiDAR perception s/w for Lv4. autonomous shuttle
- Goal : provide the safe environment for Lv4. autonomous shuttle

ADAS Lamp System



- **Customer : Tier -1**
- Date : Mar 2023 – ing
- Details : PoC project to provide the LiDAR perception s/w for ADAS lamp system
- Goal : develop the LiDAR based ADAS Lamp module together

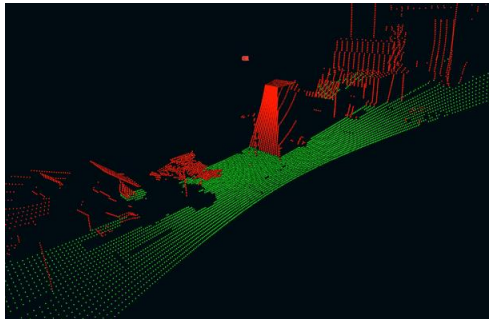
Auto Labeling solution



- **Customer : Tier -1**
- Date : Dec 2022 – ing
- Details : Pre-labeling system to enhance the labeler's efficiency
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- Goal : develop the auto-labeling system for development automation

Track record - Unmanned Vehicles

UAM



- Customer : KARI(Korea Aerospace Research Institution)
- Date: May 2023 - ing
- Details : Develop LiDAR perception software for UAM (Phase 1)
- Goal : Mass production of LiDAR solution for UAM

Parking robot



- Customer : H Machinery Company
- Date : Jul 2023 - ing
- Details : LiDAR solution for parking robot in the car making factories.
- Goal : After the project, hundreds of parking robots will be deployed in car making factories in Georgia and others in the US

Excavator safety system

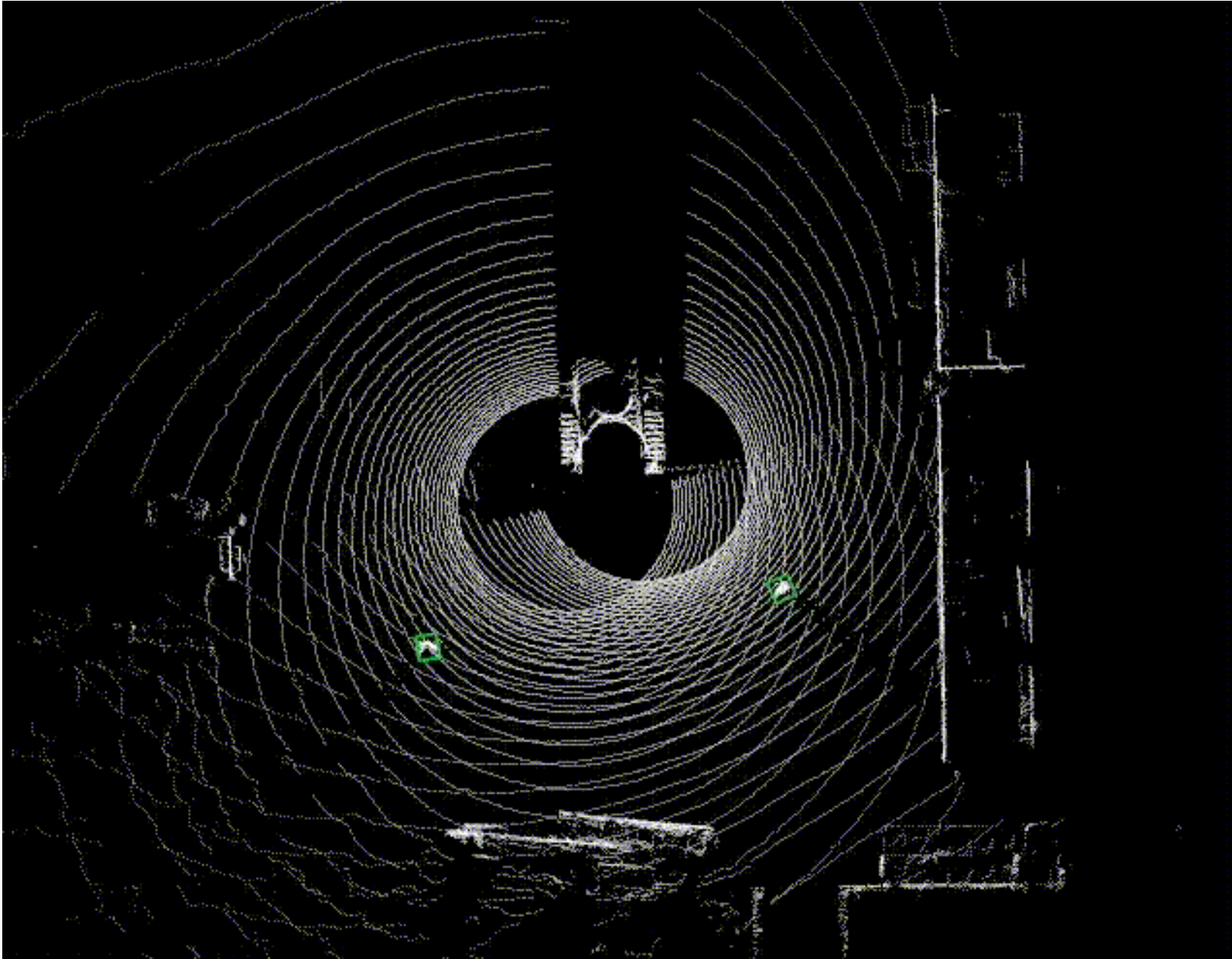


- Customer : H Construction Co.
- Date : Dec 2023 - ing
- Details : Develop LiDAR based collision avoidance system for excavator safety system
- Goal : After the PoC project, H Construction Co. wants to develop a LiDAR-based safety system.

Mining autonomous Trucking

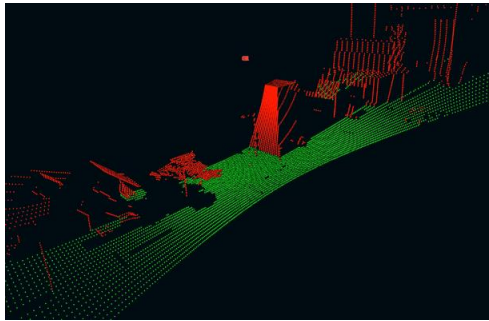


- Customer : Tier -1
- Date : Jul 2023 - ing
- Details : Develop LiDAR based collision avoidance system for mining trucks in Japan
- Goal : After the project, Vueron will develop LiDAR perception solution for hundreds autonomous mining trucks



Track record - Unmanned Vehicles VueOne

UAM



- Customer : KARI(Korea Aerospace Research Institution)
- Date: May 2023 - ing
- Details : Develop LiDAR perception software for UAM (Phase 1)
- Goal : Mass production of LiDAR solution for UAM

Parking robot



- Customer : H Machinery Company
- Date : Jul 2023 - ing
- Details : LiDAR solution for parking robot in the car making factories.
- Goal : After the project, hundreds of parking robots will be deployed in car making factories in Georgia and others in the US

Excavator safety system



- Customer : H Construction Co.
- Date : Dec 2023 - ing
- Details : Develop LiDAR based collision avoidance system for excavator safety system
- Goal : After the PoC project, H Construction Co. wants to develop a LiDAR-based safety system.

Mining autonomous Trucking



- Customer : Tier -1
- Date : Jul 2023 - ing
- Details : Develop LiDAR based collision avoidance system for mining trucks in Japan
- Goal : After the project, Vueron will develop LiDAR perception solution for hundreds autonomous mining trucks

Track record-VueOne

Unmanned Vehicles



Delivery Robot Mass Production



- **Customer : Global Tier 1**
- Date : '24.03 – ing
- Goal : Provide the LiDAR perception solution for Robot
- Details
 - Tier-1 announces the introduction of delivery robots for the expansion of its New Mobility business
 - Currently, expansion and mass production are underway

• NRE and License Cost

Items	Contents
NRE	<ul style="list-style-type: none"> • development period of a certain duration • guarantee of NRE development cost
License per robot	<ul style="list-style-type: none"> • Guaranteed robot licensing

• Delivery robot capacity (estimated)

Step	Period	Volume
1	n year	50
2	n+1 year	Over 1,000
3	n+2 ~ n+7 year	Over 10,000 yearly

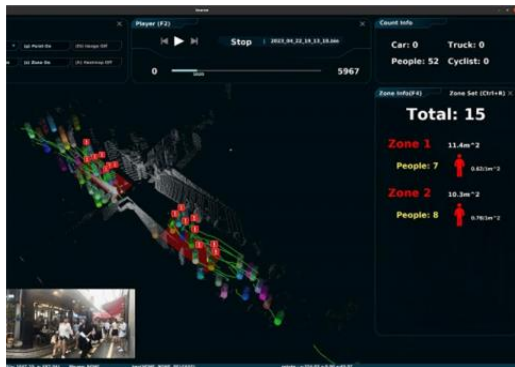
• Response for mass production

- Support for Over-The-Air (OTA) software updates
- If additional feature development is required, it's possible to negotiate and sign additional development contracts & increase licensing costs

Track record-VueTwo

Safety of pedestrian traffic

Smart Crowd Analytics



- Customer : Seoul city
- Date: May 2023 - ing
- Details : LiDAR solution to prevent human accidents by congestion-based alarms and nighttime object detection
- Goal : to enhance crowd management for safety and convenience of communities

Smart Queue Management



- Customer : K airport
- Date: Oct 2023 - ing
- Details : LiDAR solution for traffic monitoring system in the highway
- Goal : enhancing accuracy in incident detection and traffic analysis for S city

Military Surveillance



- Customer : Military Departments
- Date: May 2022 - ing
- Details : Detect and track the invaders in military bases
- Goal : to supplement and replace existing camera based security solutions

People safety in public facility

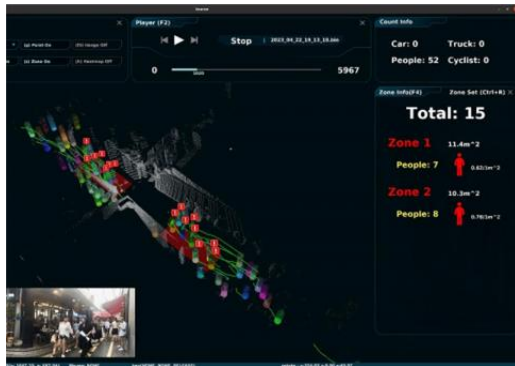


- Customer : Local division in Korea
- Date: Nov 2023 - ing
- Details : Establishment of pedestrian safety environments utilizing technology for detecting pedestrians and motorcycles based on LiDAR technology
- Goal : to ensure the safety of citizens in parks.

Track record-VueTwo

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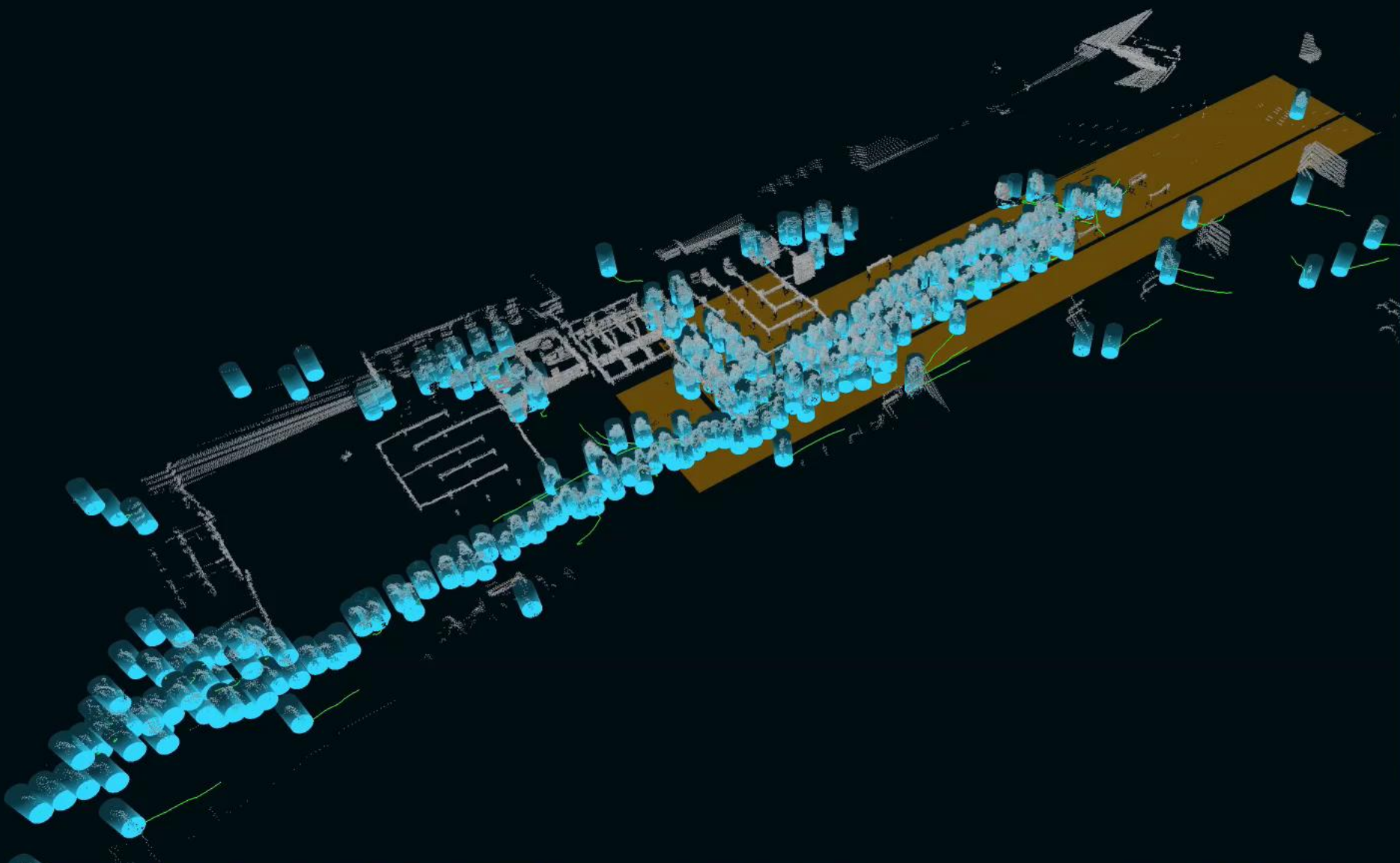


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Count Info

Car: 0 Truck: 0

People: 280 Cyclist: 0

Zone Info(F4) Zone Set (Ctrl+R) X

Total: 145

People: 117		227.12m ²
		0.52/1m ²
People: 28		114.83m ²
		0.24/1m ²

Track record-VueTwo

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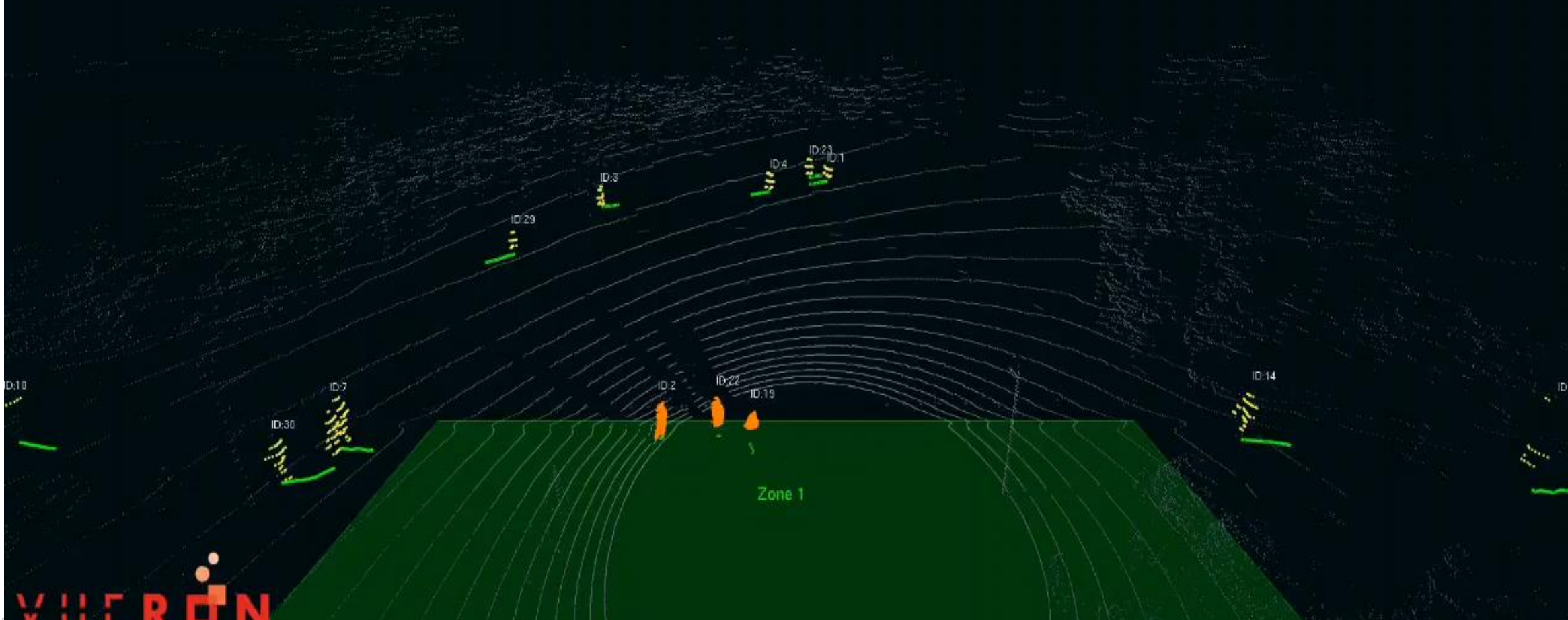


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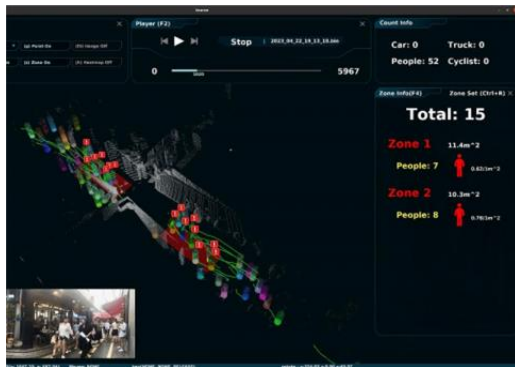
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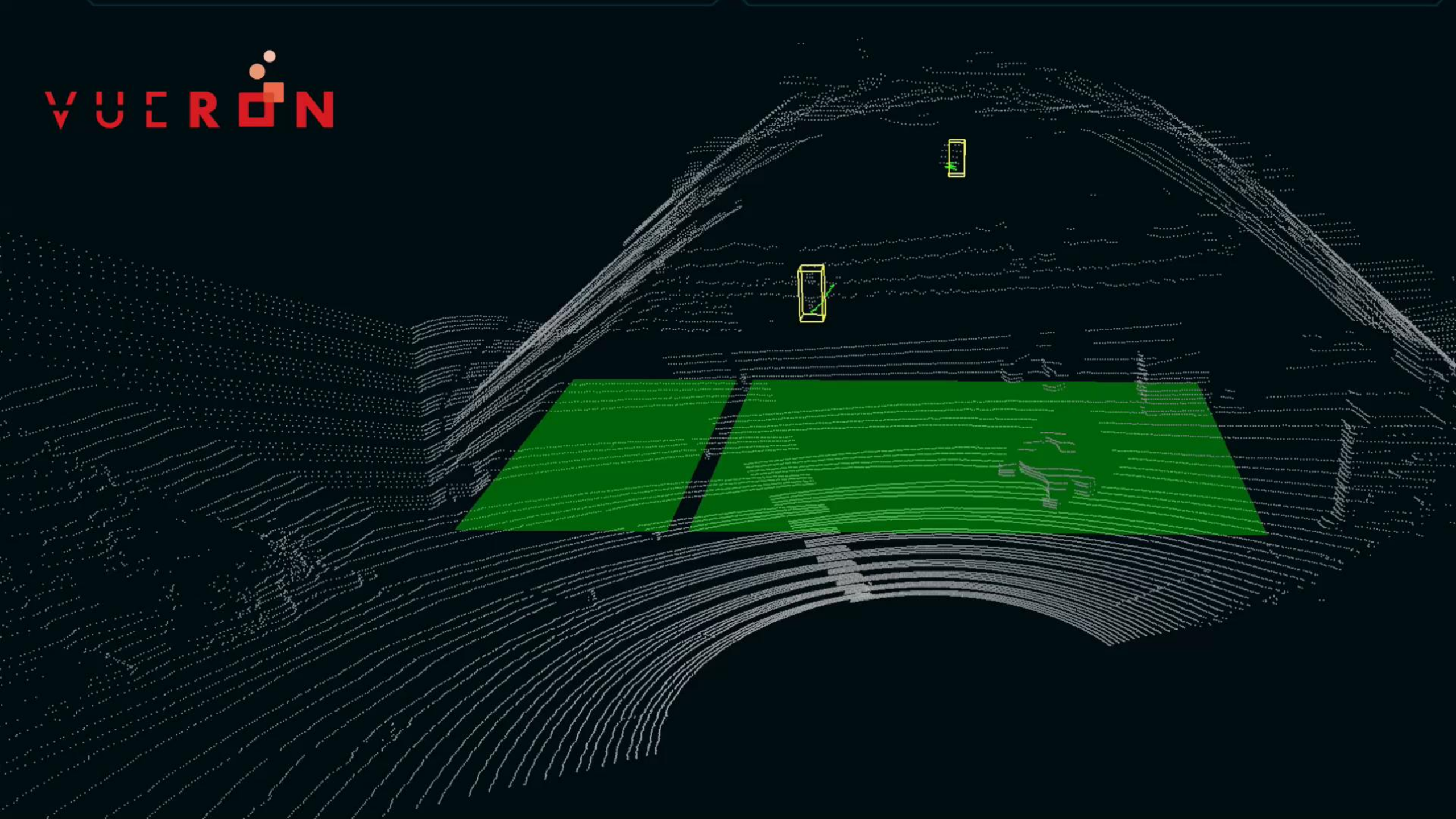
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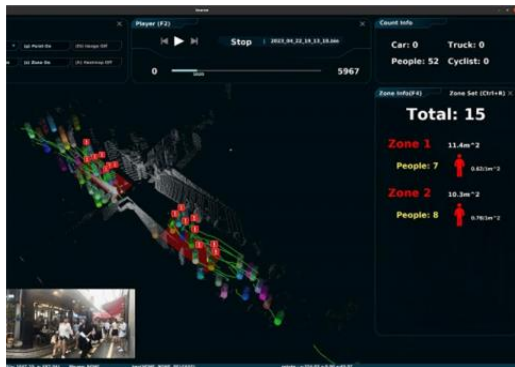
VUERÓN



Track record-VueTwo

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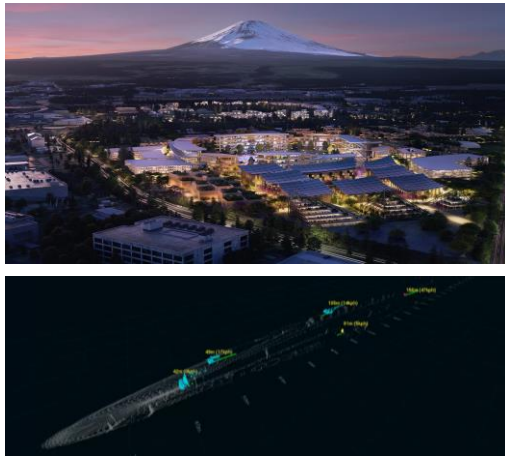


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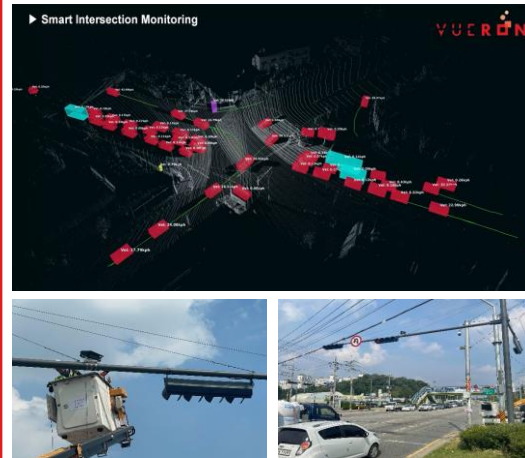
ITS

Smart-Pole



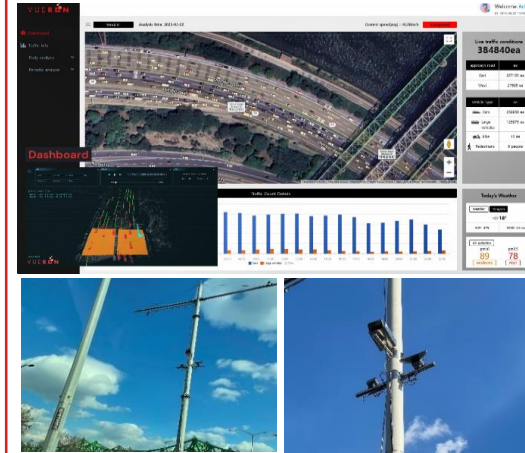
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- Date: Jun 2022 - ing
- Details : LiDAR solution for traffic monitoring system in the planned smart city in Japan
- Goal : mass production to cover the road in the new smart city to control traffic

Smart Intersection Monitoring



- Customer : A City in Korea
- Date: Oct 2023 - ing
- Details : Crossroad control, smart intersection performance evaluation
- Goal : Analyzing and providing traffic information for signal optimization using LiDAR at intersections

Smart Highway Monitoring

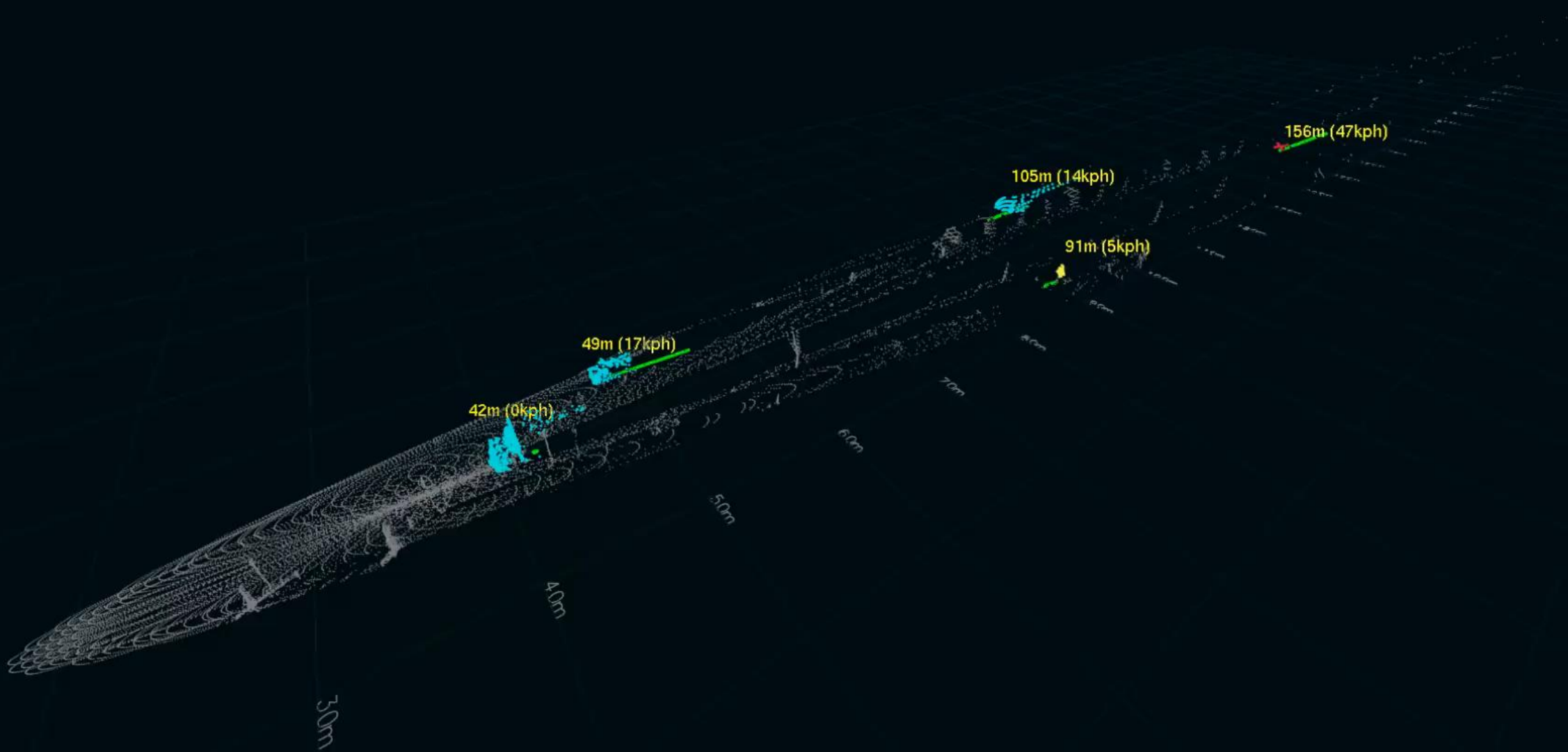


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- Goal : Analyzing information and detect sudden incidents near expressway in Seoul city

Monitoring of Rest Areas



- Customer : Anseong Rest Area
- Date: Jan 2024 - ing
- Details : Assessing traffic volume at the entrance and exit of the rest area
- Goal : Distinguishing between passenger cars, trucks, and buses to assess traffic volume by vehicle type.



Track record-VueTwo

ITS

Smart-Pole



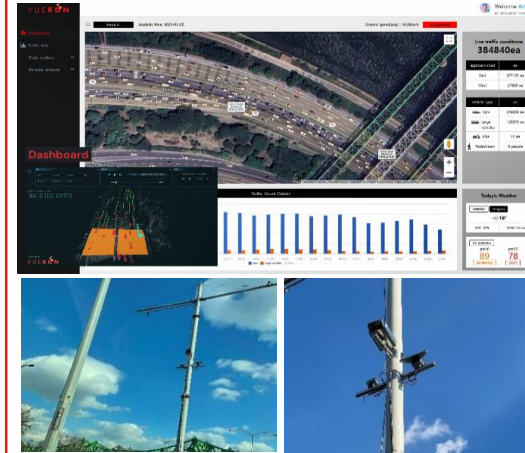
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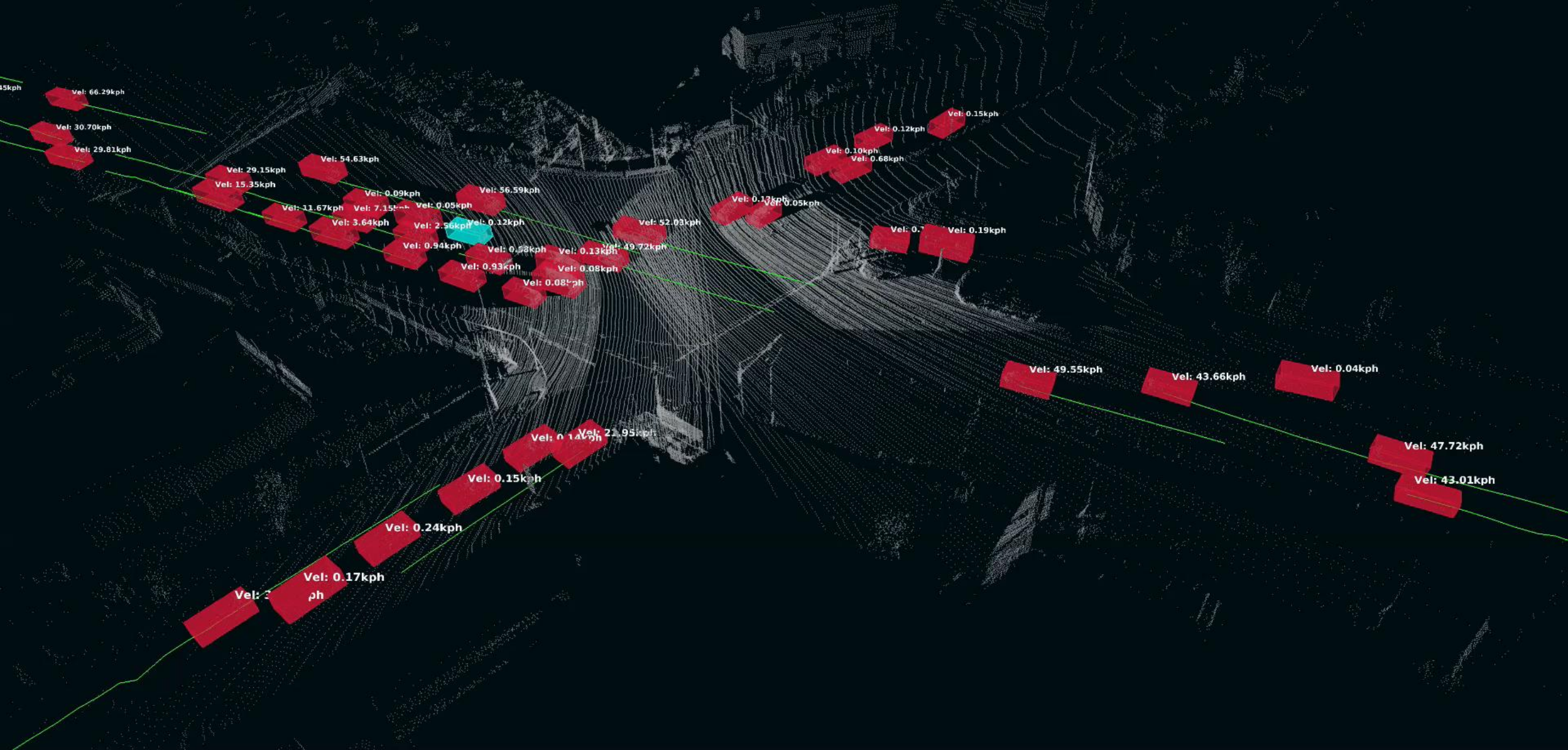


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45kph

Vel: 66.29kph

Vel: 30.70kph

Vel: 29.81kph

Vel: 29.15kph

Vel: 15.35kph

Vel: 54.63kph

Vel: 0.09kph

Vel: 56.59kph

Vel: 11.67kph

Vel: 7.15kph

Vel: 0.05kph

Vel: 3.64kph

Vel: 2.56kph

Vel: 0.12kph

Vel: 52.03kph

Vel: 0.12kph

Vel: 0.05kph

Vel: 0.12kph

Vel: 0.15kph

Vel: 0.10kph

Vel: 0.68kph

Vel: 0.7kph

Vel: 0.19kph

Vel: 0.94kph

Vel: 0.53kph

Vel: 0.13kph

Vel: 49.72kph

Vel: 0.93kph

Vel: 0.08kph

Vel: 0.08kph

Vel: 49.55kph

Vel: 43.66kph

Vel: 0.04kph

Vel: 0.14kph

Vel: 21.95kph

Vel: 0.15kph

Vel: 0.24kph

Vel: 0.17kph

Vel: 3kph

Vel: 47.72kph

Vel: 43.01kph

Track record-VueTwo

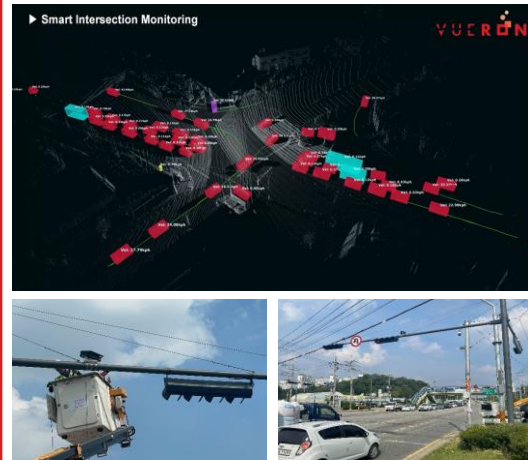
ITS

Smart-Pole



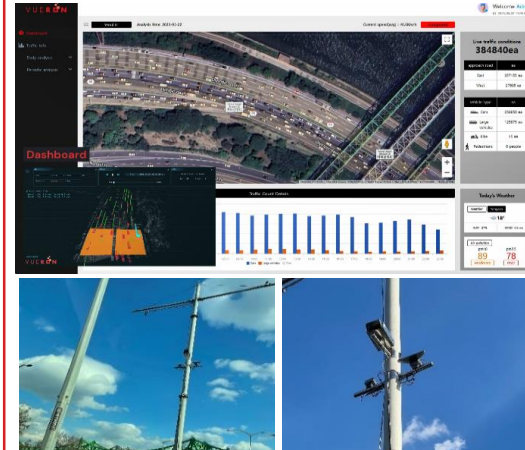
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GUI



Player



Info



Grid 3D View Point Box
 Trajectory Heatmap Zone



Play | 2022_12_27_16_12_39.bin

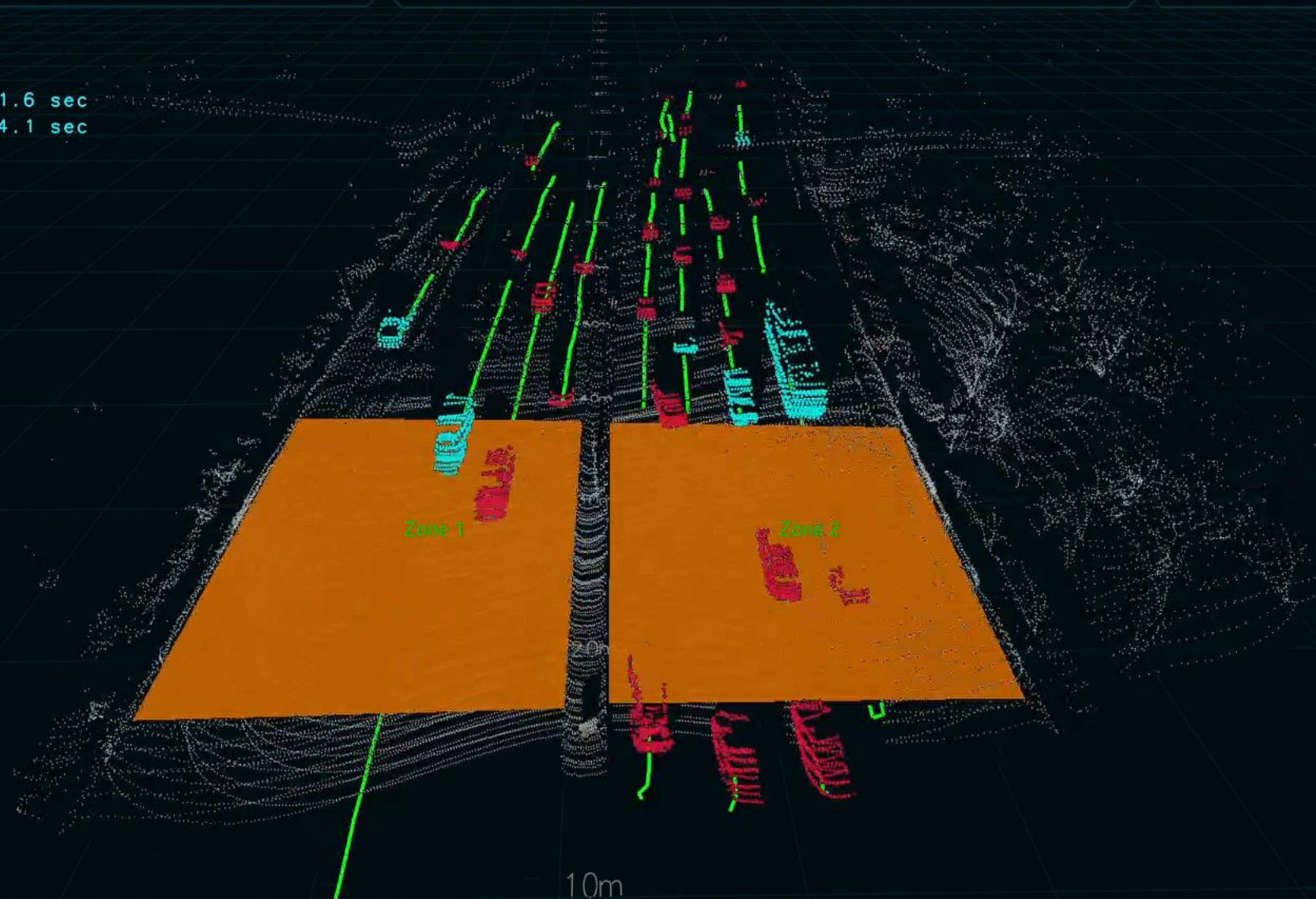
52 | 6323

Object Count in Scene
 Car : 27 Truck : 6

Stationary Time

Zone1 : Car 1.7 sec, Truck 1.6 sec

Zone2 : Car 2.6 sec, Truck 4.1 sec



Zone Mode.

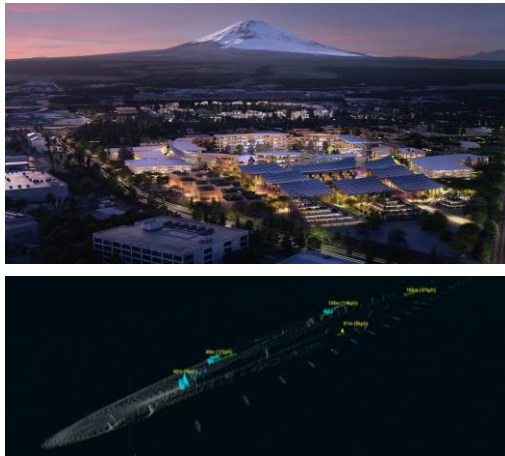


10m

Track record-VueTwo

ITS

Smart-Pole



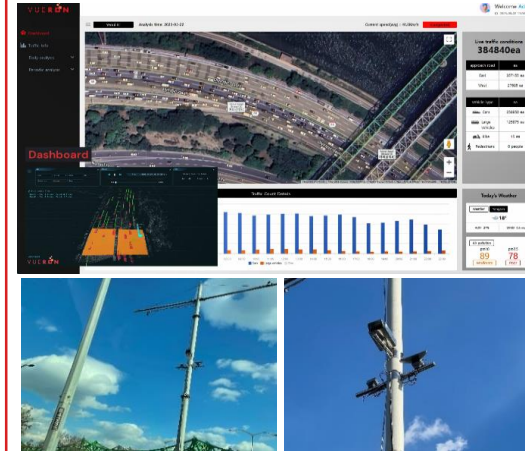
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GUI (F1) [Close]

(g) Off Grid [v] (V) XY View [v] (p) Point On [v]

(t) Obj On [v] (j) Trajectory On [v] (z) Zone On [v]

Player (F2) [Close]

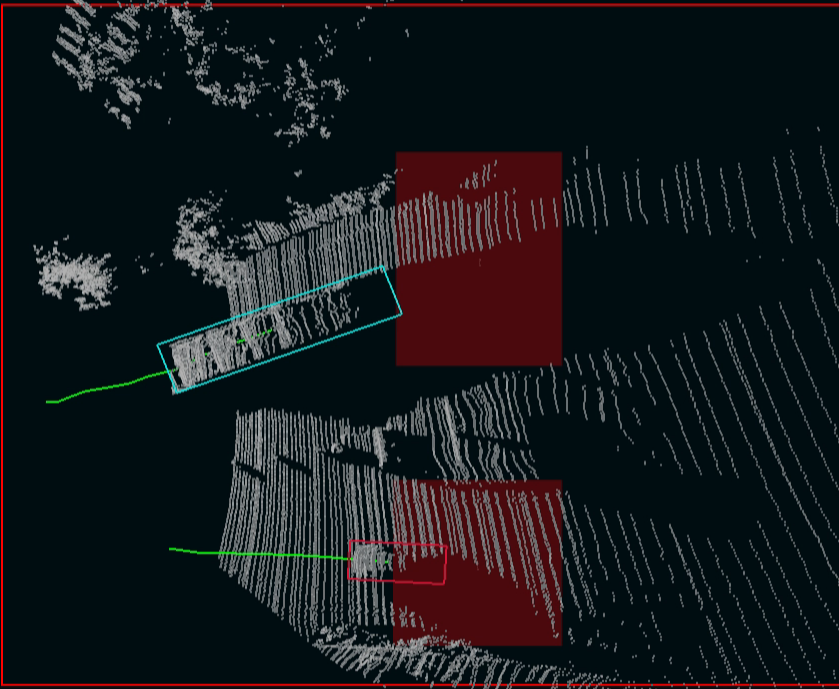
⏮ ⏪ ⏩ ⏭ **Stop** | 2024_02_29_15_51_45.bin

0 3447

2670

Count Info

Car: 1 **Truck: 1**
Bus: 0 **Cyclist: 0**
People: 0



Zone Info(F4) **Zone Set (Ctrl+R)** [Close]

Total: 2

Zone 1

Car: 1 **Truck: 0**
Bus: 0 **Cyclist: 0**
People: 0

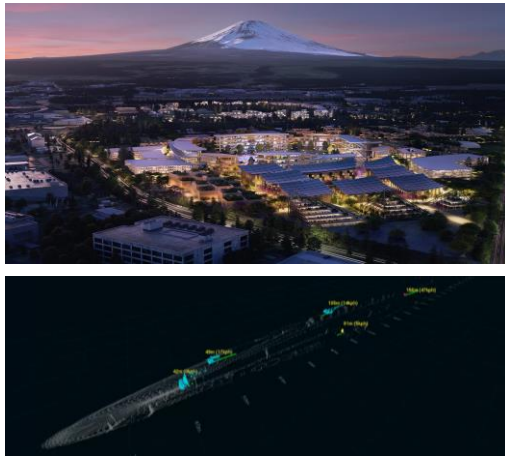
Zone 2

Car: 0 **Truck: 1**
Bus: 0 **Cyclist: 0**
People: 0

Track record-VueTwo

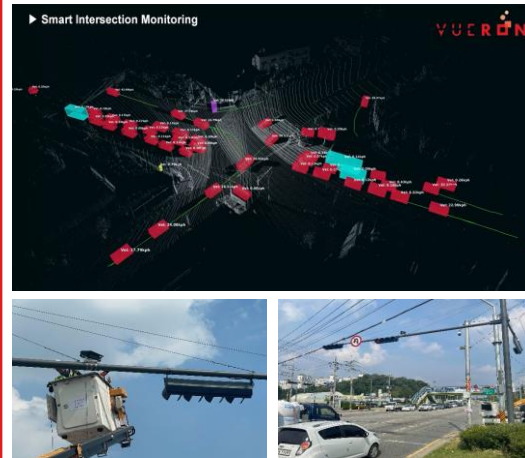
ITS

Smart-Pole



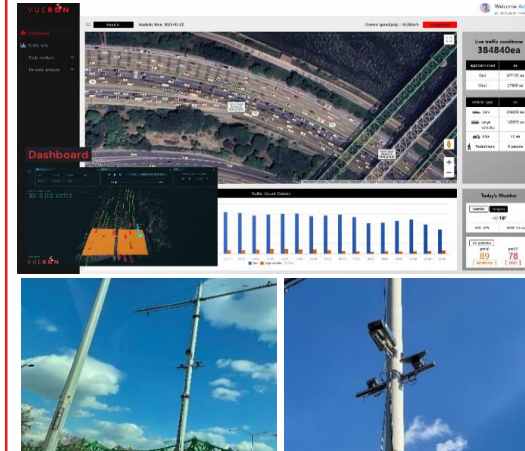
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Thank you

joseph.kim@vueron.com

VUERON 