ASAM OpenLABEL V1.0.0 Webinar
Labeling Geometries and Methods

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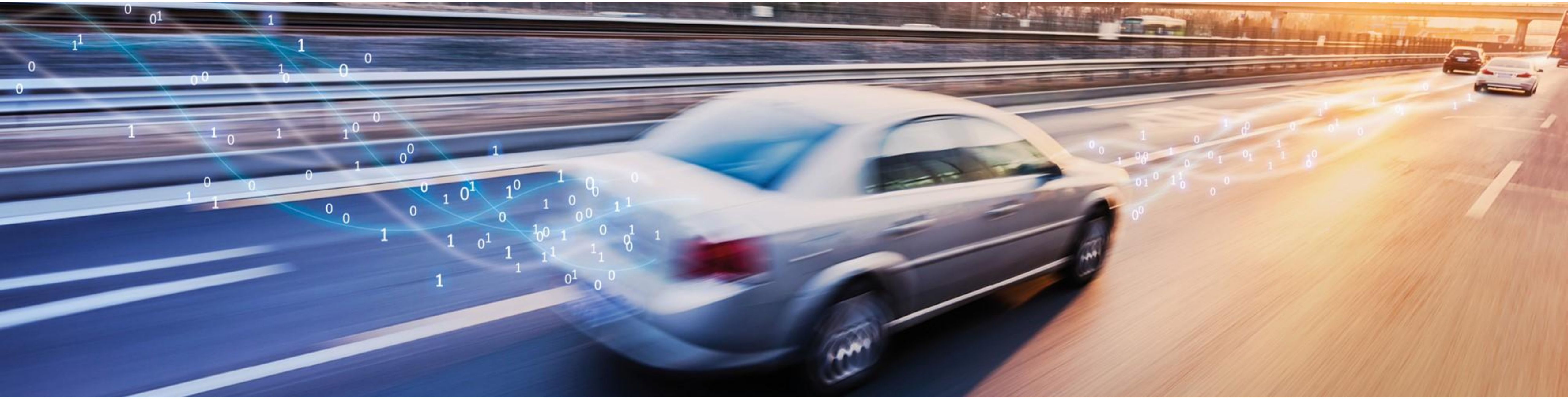
OpenLABEL V1.0.0

17. November 2021
München



ASAM Association for Standardization of Automation and Measuring Systems

Agenda

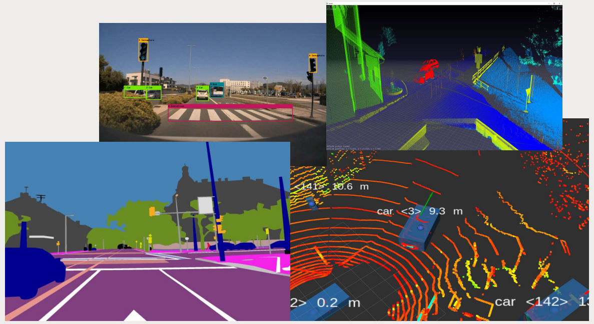
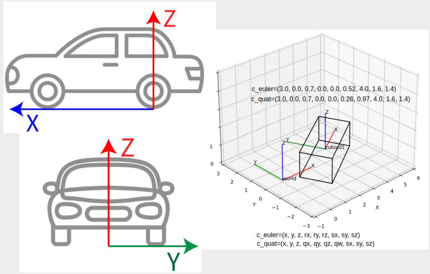
OpenLABEL V1.0.0 Release Webinar

1	**Process towards a joint consensus**
2	**Incorporating best practices from an engineering perspective**
3	**Annotation types covered in the initial release V1.0.0**

Process towards a joint consensus

Finding a joint consensus, driven by the industry demand

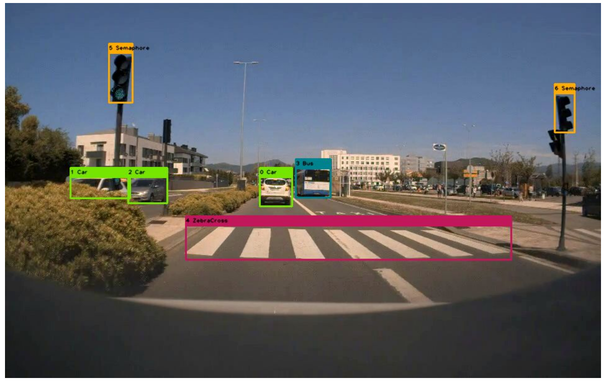
Process

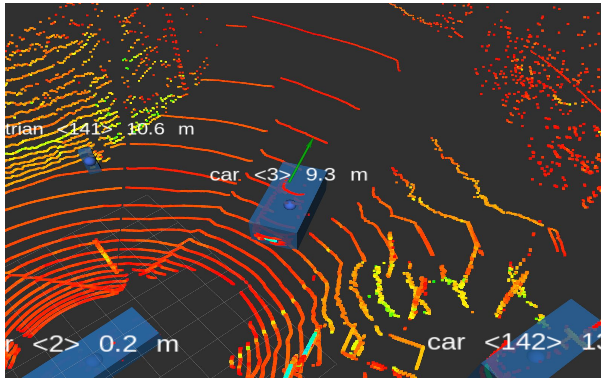
Explore industry demand	Define initial focus areas	Identify joint consensus
 ? ? ? What do we need	 keeping it extendable for future versions	 

Types of annotation covered

Raw data sources: Images, videos, pointclouds...

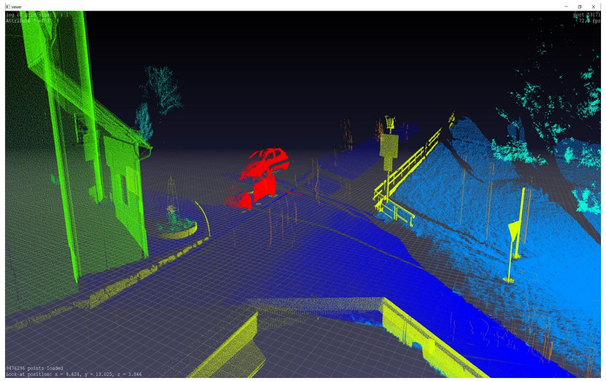
2D Bounding Box





3D Bounding Box (cuboids)

Semantic Segmentation (2D)

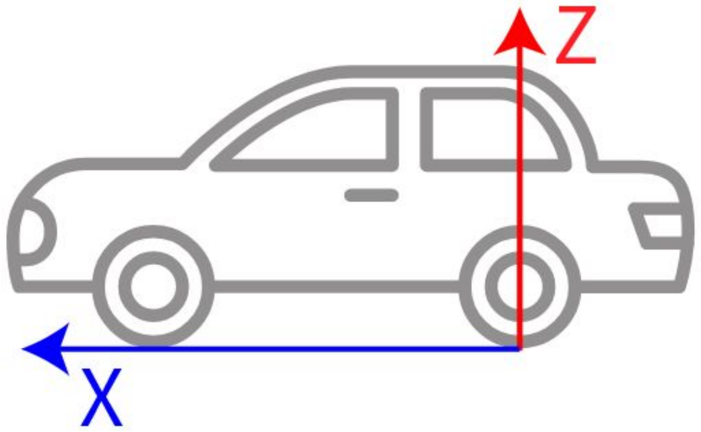


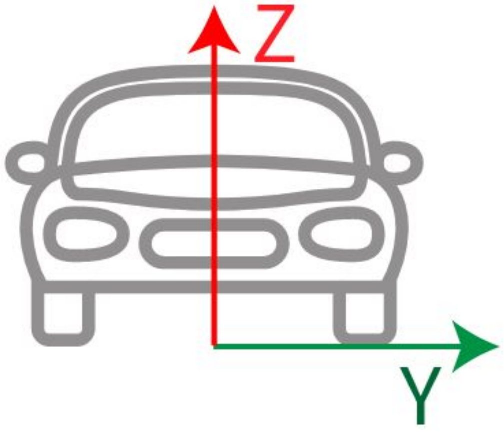
Point cloud segmentation (3D)

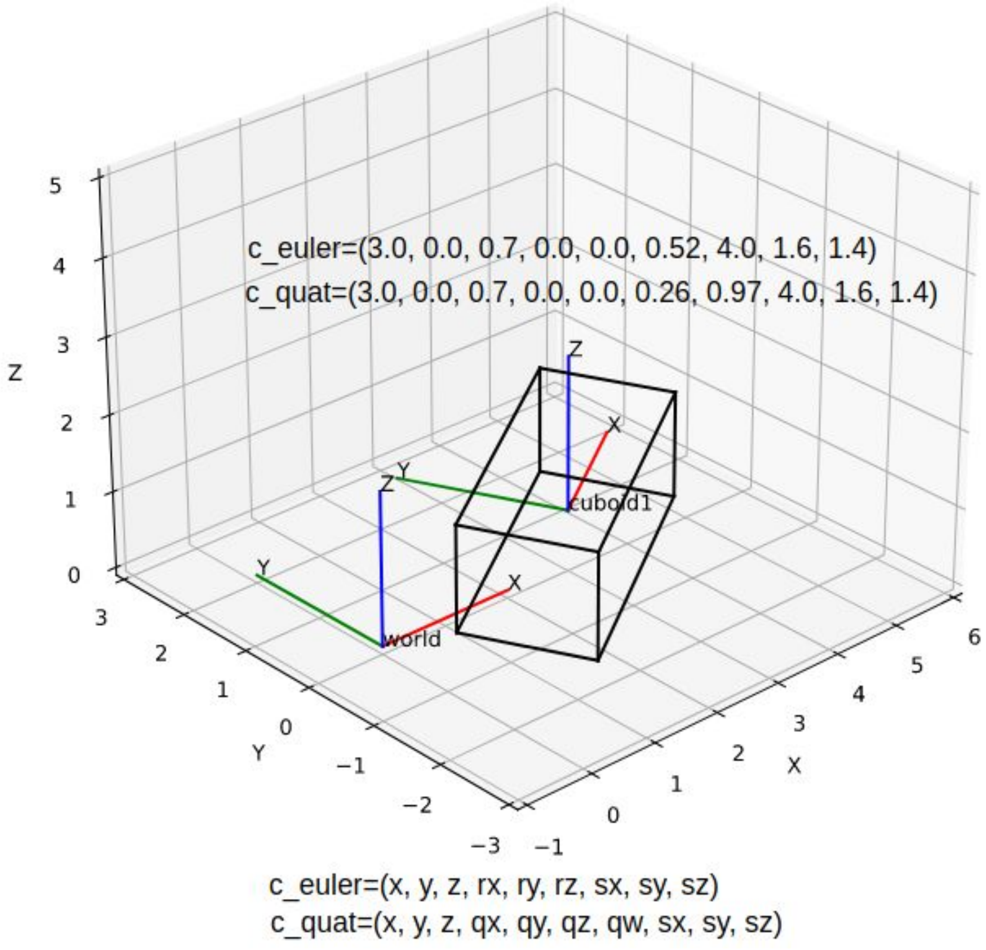
Incorporating best practices from an engineering perspective

Coordinate system, spatial orientations and rotations

Including best practices to reduce common errors and ensuring compatibility





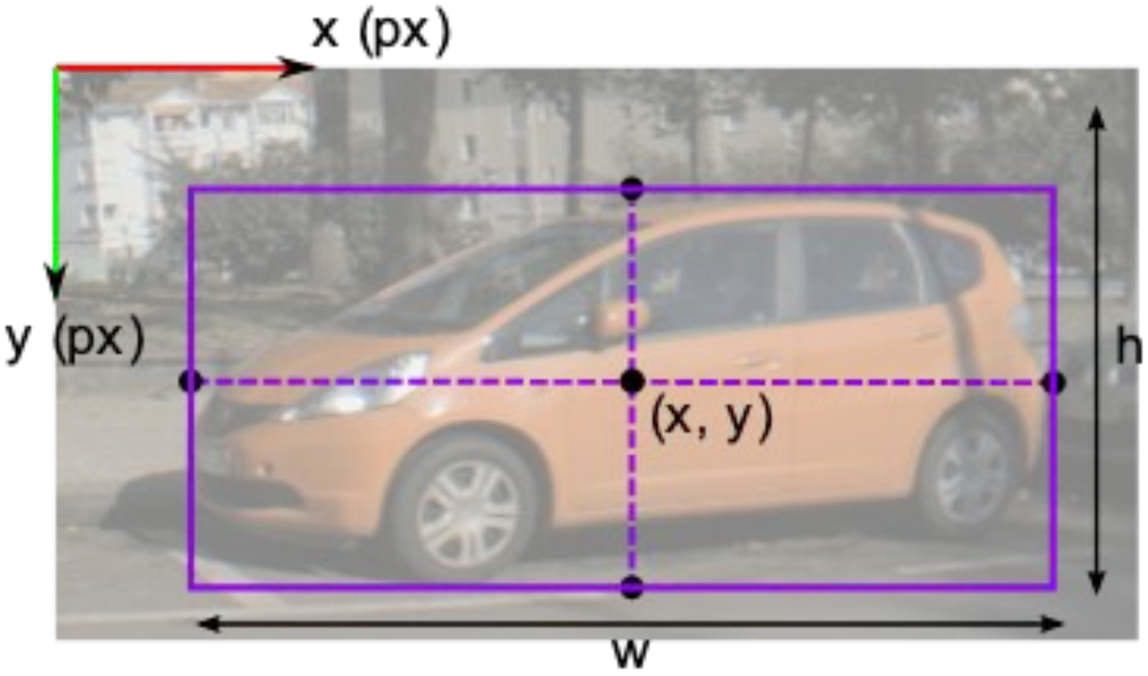


Annotation types covered in the initial release V1.0.0

2D Bounding Box

2D

Bounding boxes are geometric entities which enclose the shape of an object in Cartesian coordinates.
Bounding boxes define minimum and maximum limits at each dimension so the entire object lies within the specified limits.

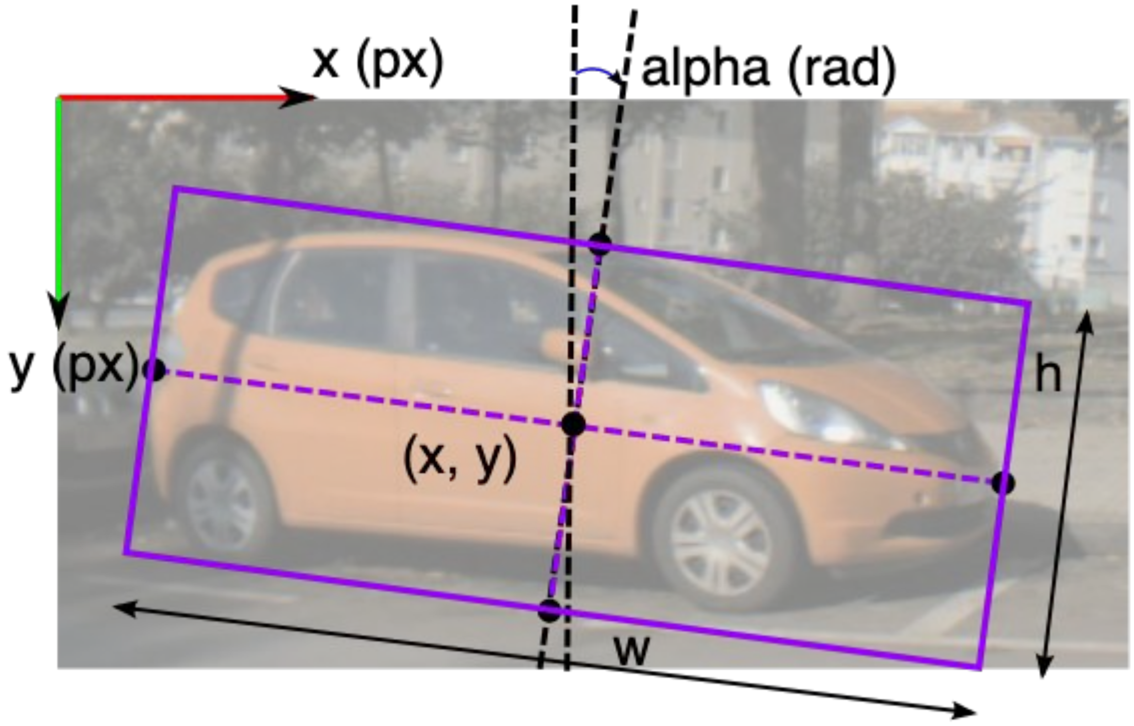


A 2D bounding box is defined as a 4-dimensional vector [x, y, w, h], where [x, y] is the center of the bounding box and [w, h] represent the width (horizontal, x-coordinate dimension) and height (vertical, y-coordinate dimension), respectively.

Rotated 2D Bounding Box

2D

2D rotated bounding box: enclosing an entire object defined by its center position (in pixels), its width and height, and the rotation angle



A 2D rotated bounding box is defined as a 5-dimensional vector [x, y, w, h, alpha], where [x, y] is the center of the bounding box and [w, h] represent the width (horizontal, x-coordinate dimension) and height (vertical, y-coordinate dimension), respectively.

3D Bounding Box (Cuboid)

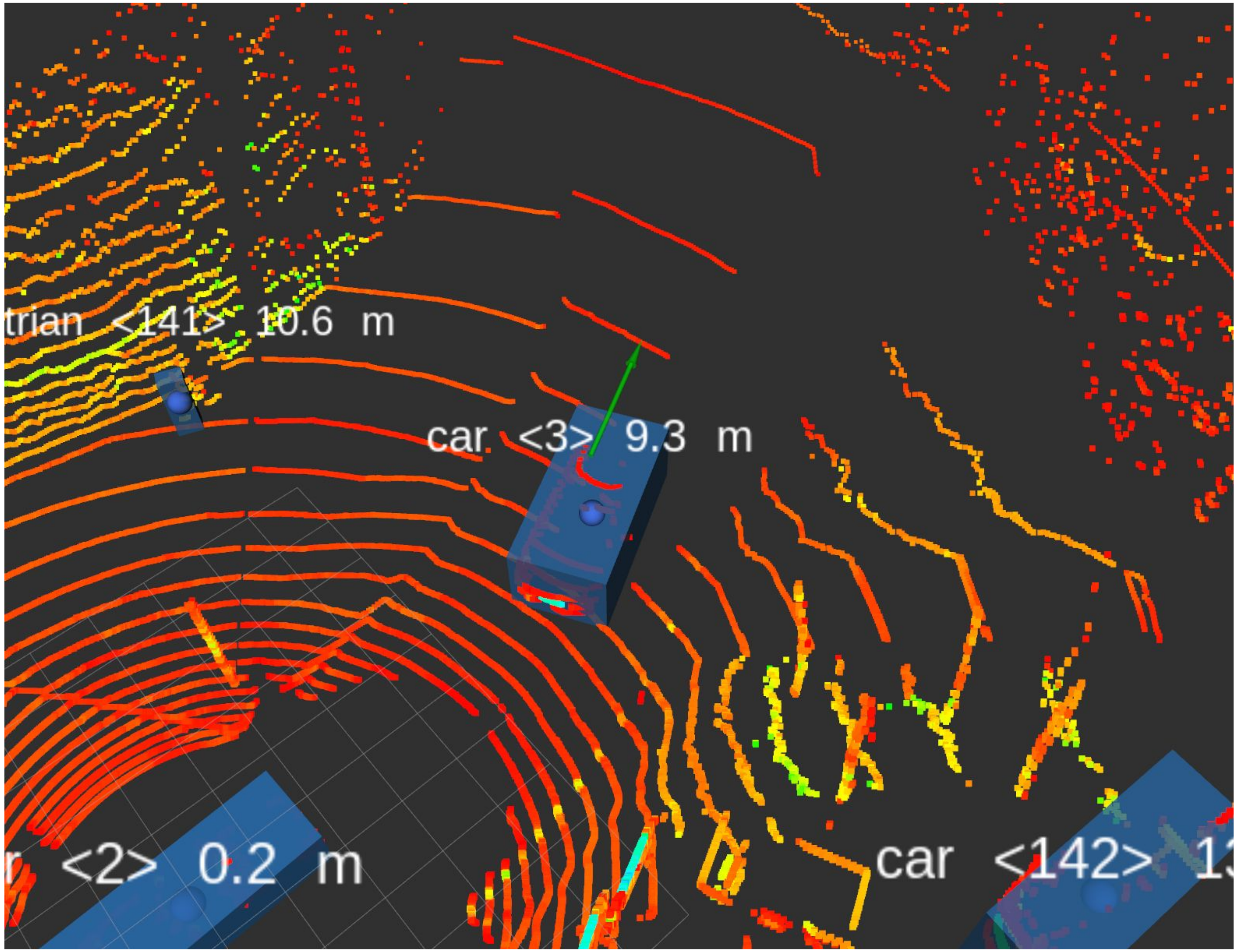
3D

A 3D bounding box is a cuboid in 3D Euclidean space.

It is defined by position (of its center), rotation, and size.

Position and size are defined as 3-vectors, while rotation can be expressed in two alternative forms,

- using 4-vector quaternion notation **or**
- 3-vector Euler notation.



A standardized taxonomy for semantic segmentation

Partial scene segmentation

There are some pixels that have no classes associated with them

Full scene segmentation

All pixels have a class associated. In this case D coincides with P. Note that in the use case, despite the class unlabeled or other indicating all pixels outside of the real classes of interest, there is still a form of full scene segmentation performed.

Single-class per pixel segmentation

This is the case when each labeled pixel is associated with exactly one class.

Multi-class per pixel segmentation

This is the case when at least one labeled pixel is associated with more than one class.

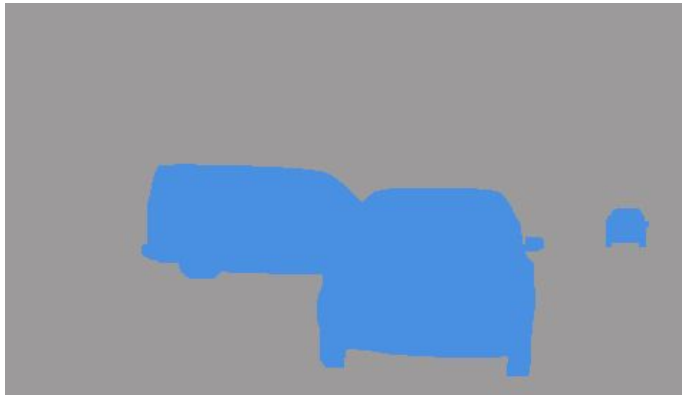
2D Segmentation

Describing the 2D image with more granular annotations

2D Segmentation

Segmenting a subset of the image -> Partial scene segmentation

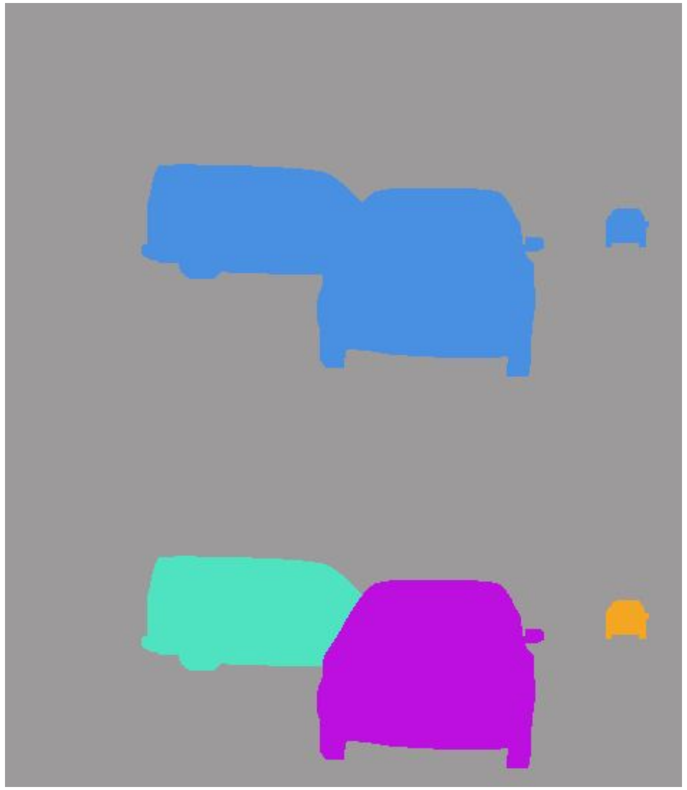
Partial scene



2D Segmentation

Segmenting a subset of the image -> Partial scene segmentation + instance aware

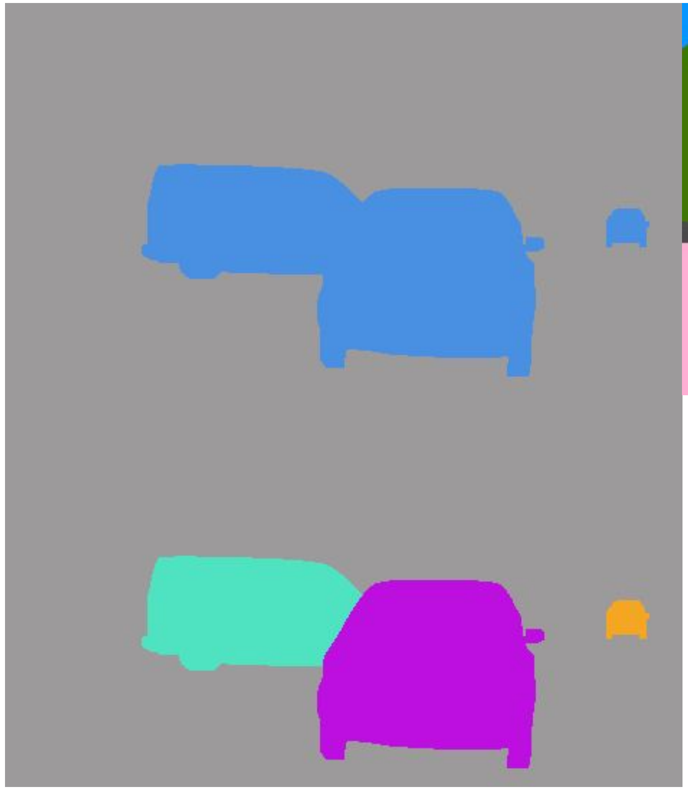
Partial scene



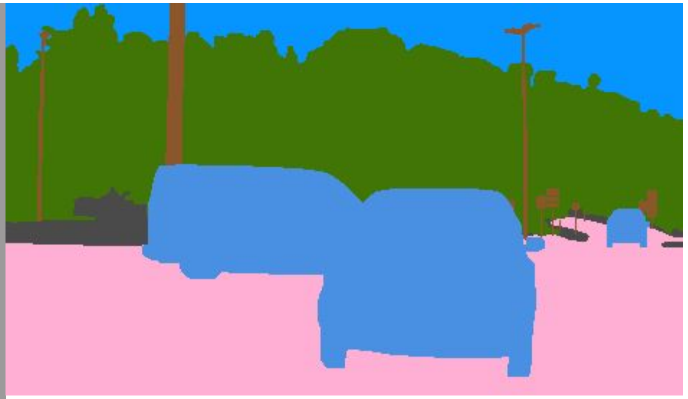
2D Segmentation

Segmenting the whole image -> Full scene segmentation

Partial scene



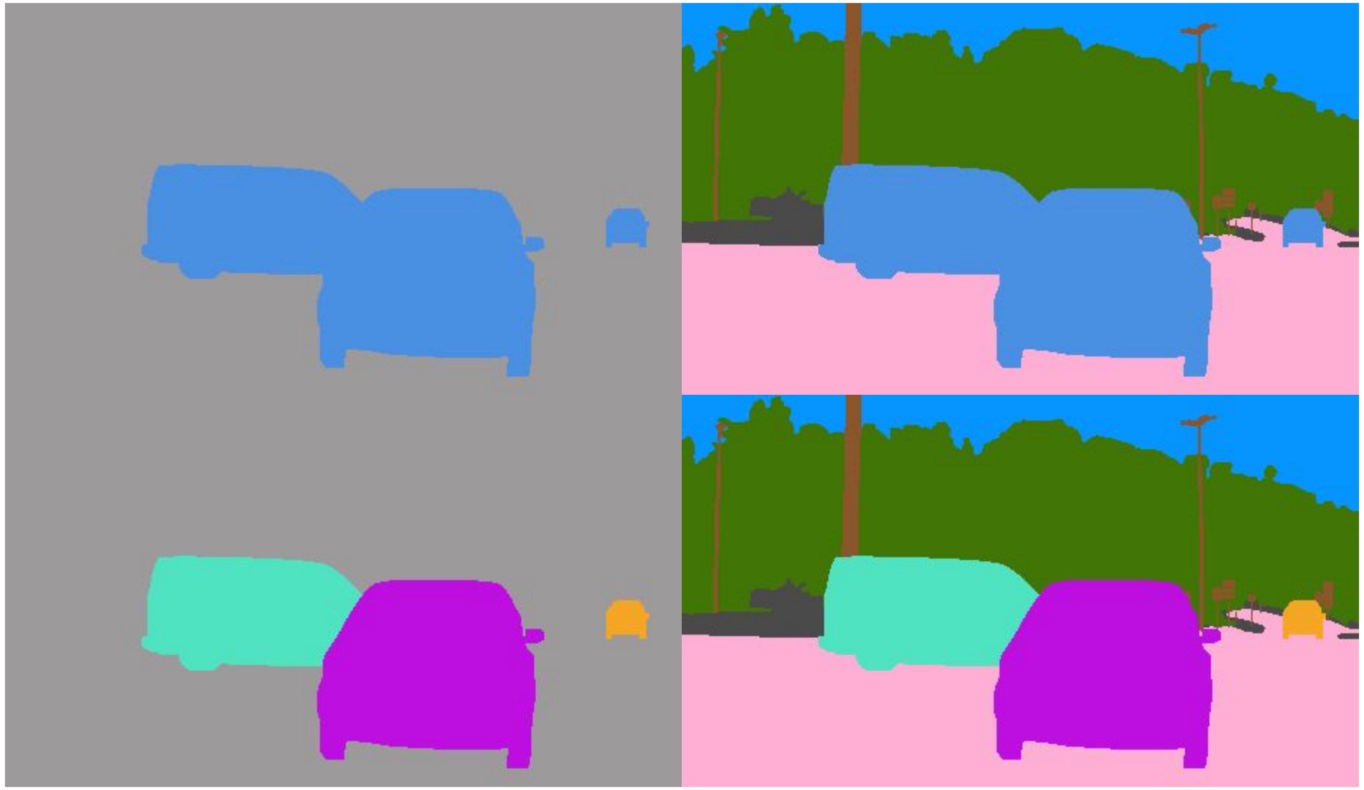
Full scene



2D Segmentation

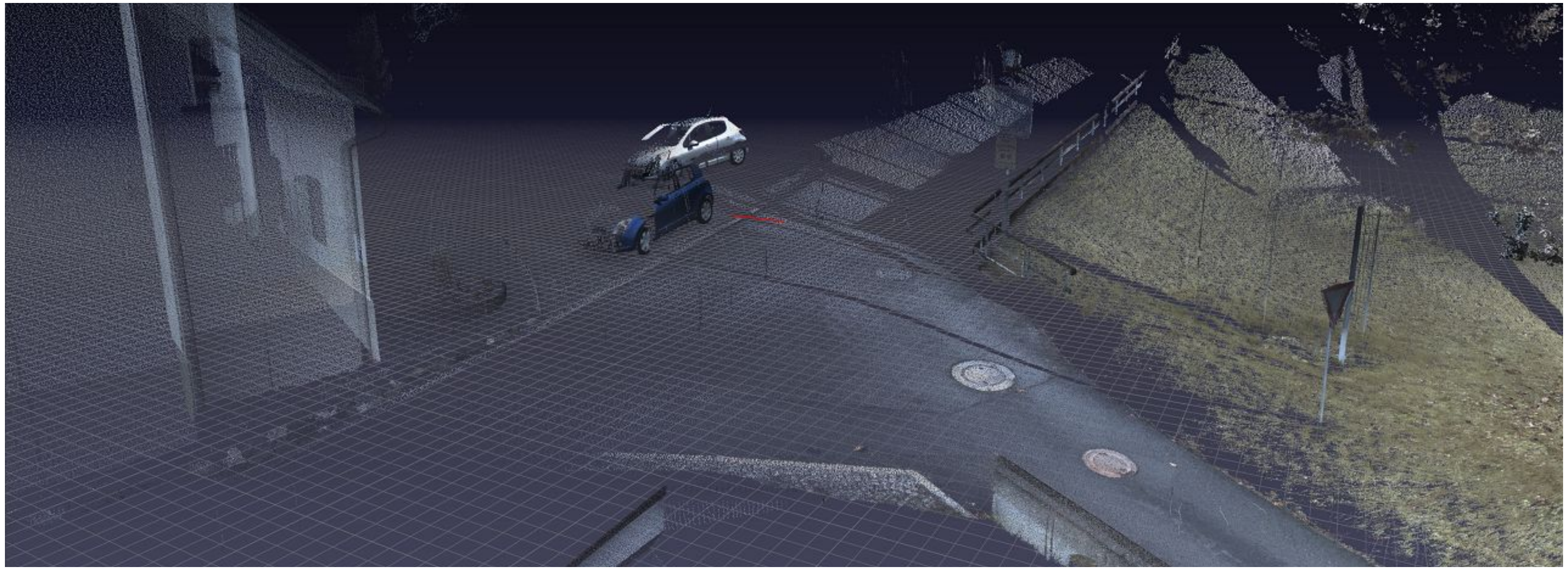
Segmenting the whole image -> Full scene segmentation + instance aware

Partial scene **Full scene**



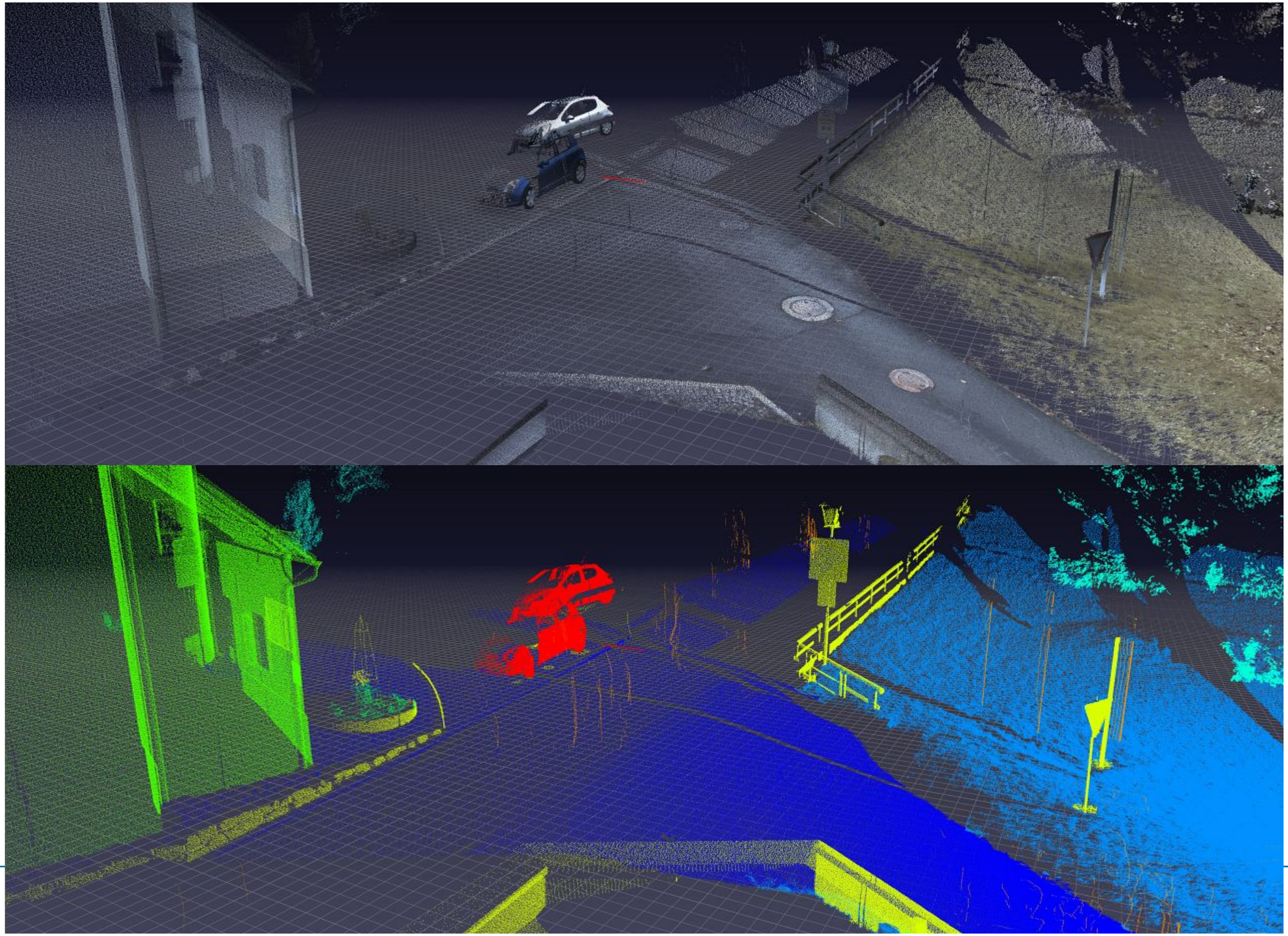
Point cloud segmentation

Representing the world from different sensor modalities



Point cloud segmentation

ASAM OpenLABEL V1.0.0 supports 3D point cloud segmentations.



For questions contact:

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A standardized taxonomy for semantic segmentation

Formal definition

- **Partial scene segmentation**

  $$\exists p_x \in P : (p_x, c_y) \notin R_{seg}$$

- **Full scene segmentation**

  $$\forall p_x \in P, \exists c_y \in C : (p_x, c_y) \in R_{seg}$$

- **Single-class per pixel segmentation**

  $$\forall p_x \in D, \exists! c_y \in C : (p_x, c_y) \in R_{seg}$$

- **Multi-class per pixel segmentation**

  $$\exists p_x \in D, \exists c_1, c_2 \ldots c_k \in C : (p_x, c_1), (p_x, c_2), \ldots (p_x, c_k) \in R_{seg}$$