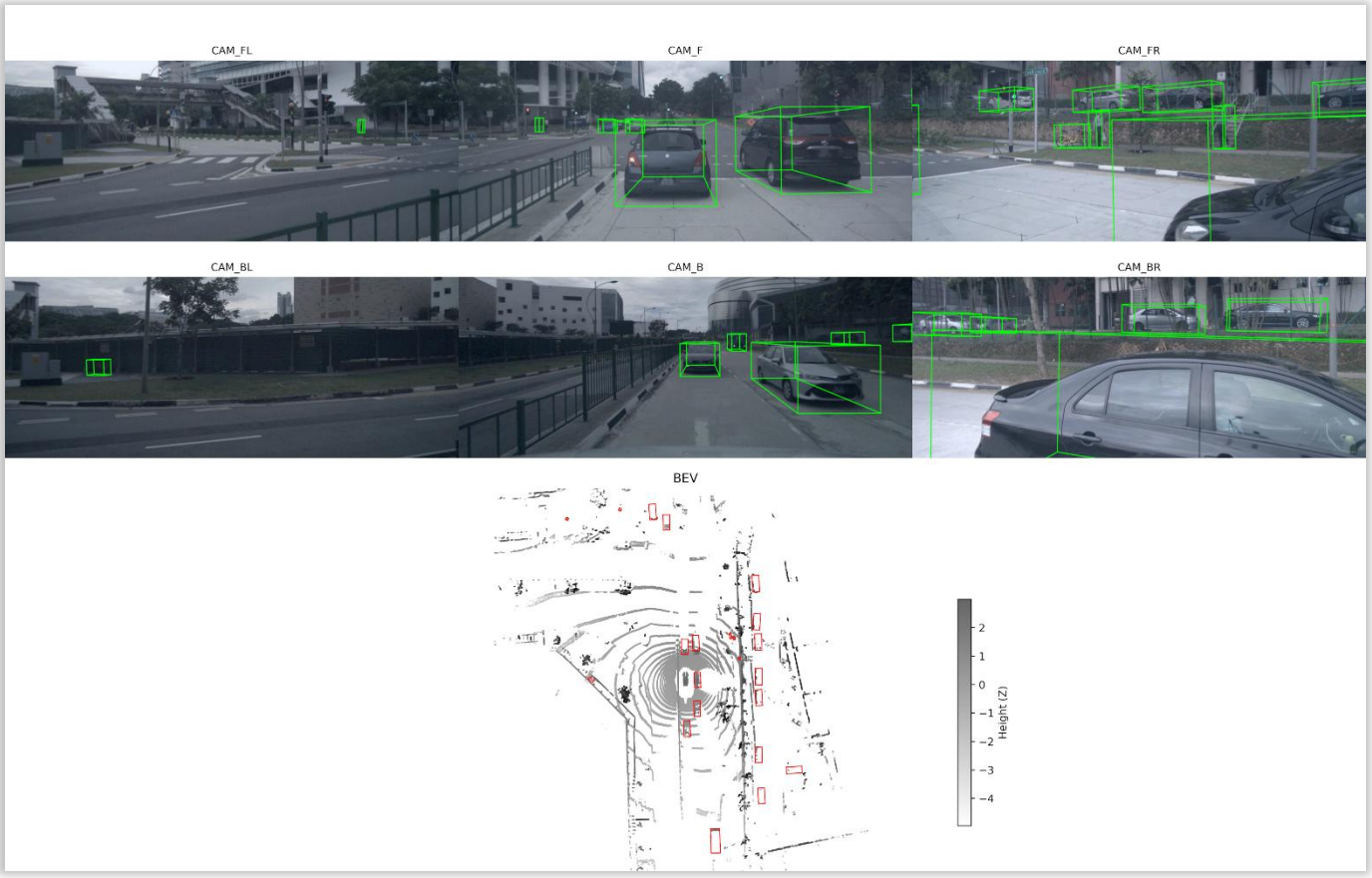
The Data Cards Playbook

code.github.io/datacardsplaybook

Data Cards Template (Beta) | Updated November 2024

NuScenes Dataset

DATASET LINK	DATA PUBLISHER(S)
Provide a link to the dataset:	*Companies or people who created the dataset*
https://www.nuscenes.org/nuscenes https://github.com/nutonomy/nuscenes-devkit	**Motional AD Inc.**



Visualization of a scene in the NuScenes dataset
Top: Six Multi-View Camera images with Bounding Box Predictions shown in Green
Bottom: Aggregated LiDAR point cloud with 3D Bounding Box Prediction shown in Red

Dataset Overview

DATA SUBJECT(S)	CONTENT DESCRIPTION
*Select **ALL APPLICABLE** subjects contained the dataset:* Definition of sensitive data according to GDPR	*Provide a short description of the content of the data and the motivation. This section is open for any description you consider helpful. Ex: what problems you were looking to solve*
• [x] Non-Sensitive Data about people (Pedestrians are captured, but PII is anonymized) • [x] Data about places and objects (Urban street scenes, vehicles, static objects) • [x] Data about natural phenomena (Weather conditions like rain, different lighting) • [x] Data about systems or products and their behaviors (Autonomous vehicle sensor data, ego-motion)	**nuScenes** is a large-scale multimodal dataset designed for autonomous driving research. It provides data from the full sensor suite of an autonomous vehicle (cameras, radar, and lidar) with a 360-degree field of view. The motivation was to address limitations in existing datasets (like KITTI) by providing multimodal data, larger scale, and more complex urban driving scenarios to foster robust detection and tracking algorithms.

DATASET SNAPSHOT

Provide a snapshot of the dataset:

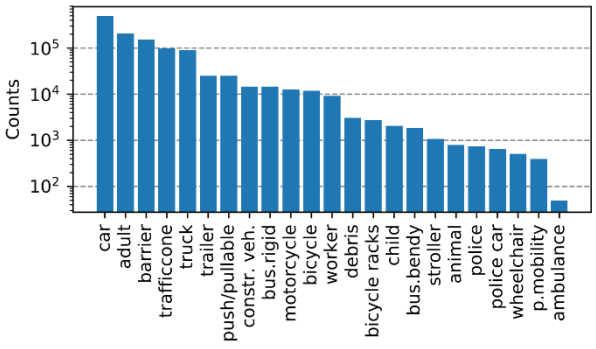
(Use the additional notes to include relevant information, considerations, and links to table(s) with more detailed breakdowns.) The format of how the data is presented is not important, the following are examples

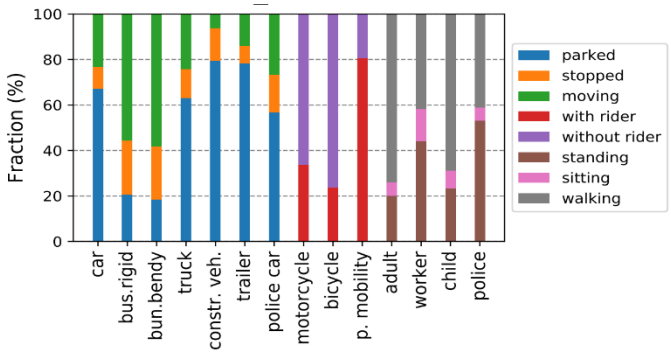
Size of Dataset	• **450GB**
Number of Instances	• **Total Scenes:** 1,000 scenes (each 20 seconds long). • **Camera Images:** 1.4 million images. • **LiDAR Sweeps:** 390,000 sweeps. • **Radar Sweeps:** 1.4 million sweeps. • **Labelled Classes:** 23 classes. • **Number of Labels:** 1.4 million 3D bounding boxes.
Scene Descriptions	• **Locations:** Boston (Seaport, South Boston) and Singapore (One North, Holland Village, Queenstown). • **Lighting:** Day, Night. • **Weather:** Rain, Clear. • **Traffic Density:** Dense traffic to sparse environments. • **Road Type:** Urban intersections, construction zones, narrow streets.
Labelled Classes (List of classes)	1. Animal 2. debris 3. pushable / pullable 4. bicycle rack

	5. ambulance 6. police 7. barrier 8. bicycle 9. bus.bendy 10. bus. 11. car 12. construction 13. motorcycle 14. adult 15. child 16. construction worker 17. police officer 18. personal mobility 19. stroller 20. wheelchair 21. traffic cone 22. trailer 23. truck
Number of Labels	1.4 million 3D bounding boxes

Left: The number of annotations per category.

Right: Attributes distribution for selected categories.





Figures adopted from nuScenes

In the following table, we present the nuScenes annotation distribution across different classes for 3D Boxes and Point Cloud Segmentation. Source: nuScenes

Category	*nuScenes cuboids*	*Cuboid ratio*	*Lidarseg points*	*Point ratio*
animal	787	0.07%	5,385	0.01%
human.pedestrian.adult	208,240	17.86%	2,156,470	2.73%
human.pedestrian.child	2,066	0.18%	9,655	0.01%
human.pedestrian.construction_worker	9,161	0.79%	139,443	0.18%
human.pedestrian.personal_mobility	395	0.03%	8,723	0.01%
human.pedestrian.police_officer	727	0.06%	9,159	0.01%
human.pedestrian.stroller	1,072	0.09%	8,809	0.01%
human.pedestrian.wheelchair	503	0.04%	12,168	0.02%
movable_object.barrier	152,087	13.04%	9,305,106	11.79%
movable_object.debris	3,016	0.26%	66,861	0.08%
movable_object.pushable_pullable	24,605	2.11%	718,641	0.91%
movable_object.trafficcone	97,959	8.40%	736,239	0.93%
static_object.bicycle_rack *	2,713	0.23%	163,126	0.21%

vehicle.bicycle	11,859	1.02%	141,351	0.18%
vehicle.bus.bendy	1,820	0.16%	357,463	0.45%
vehicle.bus.rigid	14,501	1.24%	4,247,297	5.38%
vehicle.car	493,322	42.30%	38,104,219	48.27%
vehicle.construction	14,671	1.26%	1,514,414	1.92%
vehicle.emergency.ambulance	49	0.00%	2,218	0.00%
vehicle.emergency.police	638	0.05%	59,590	0.08%
vehicle.motorcycle	12,617	1.08%	427,391	0.54%
vehicle.trailer	24,860	2.13%	4,907,511	6.22%
vehicle.truck	88,519	7.59%	15,841,384	20.07%
Total	**1,166,187**	**100.00%**	**78,942,623**	**100.00%**
flat.driveable_surface	-	-	316,958,899	28.64%
flat.other	-	-	8,559,216	0.77%
flat.sidewalk	-	-	70,197,461	6.34%
flat.terrain	-	-	70,289,730	6.35%
static.manmade	-	-	178,178,063	16.10%
static.other	-	-	817,150	0.07%
static.vegetation	-	-	122,581,273	11.08%
vehicle.ego	-	-	337,070,621	30.46%
noise	-	-	2,061,156	0.19%
Total	**-**	**-**	**1,106,713,569**	**100.00%**

Attribute Annotations:

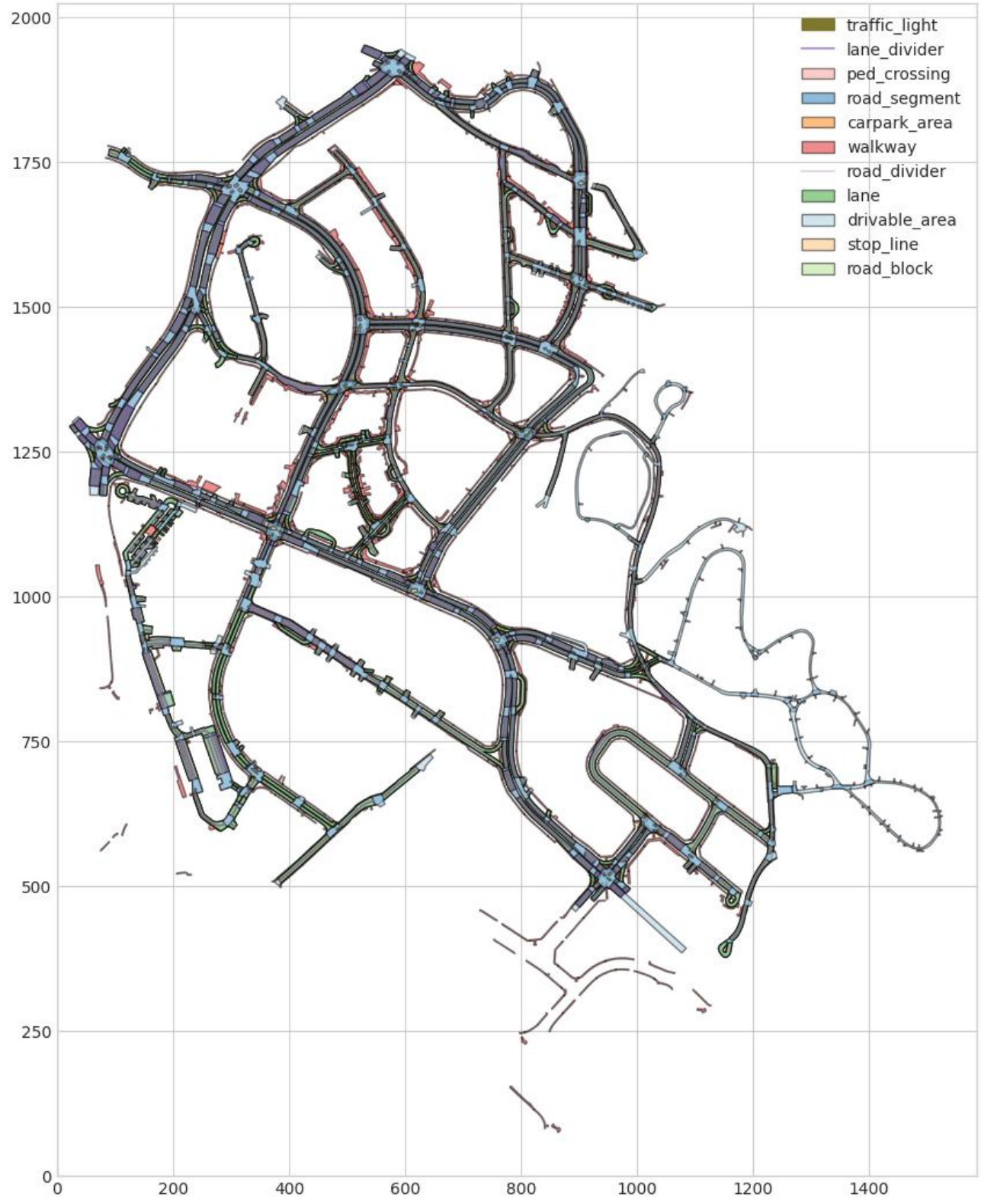
Attribute	***Annotations***
vehicle.moving	149,203
vehicle.stopped	65,975
vehicle.parked	420,226
cycle.with_rider	7,331
cycle.without_rider	17,345
pedestrian.sitting_lying_down	13,939
pedestrian.standing	46,530
pedestrian.moving	157,444
Total	**877,993**

Scene Descriptors and ODD

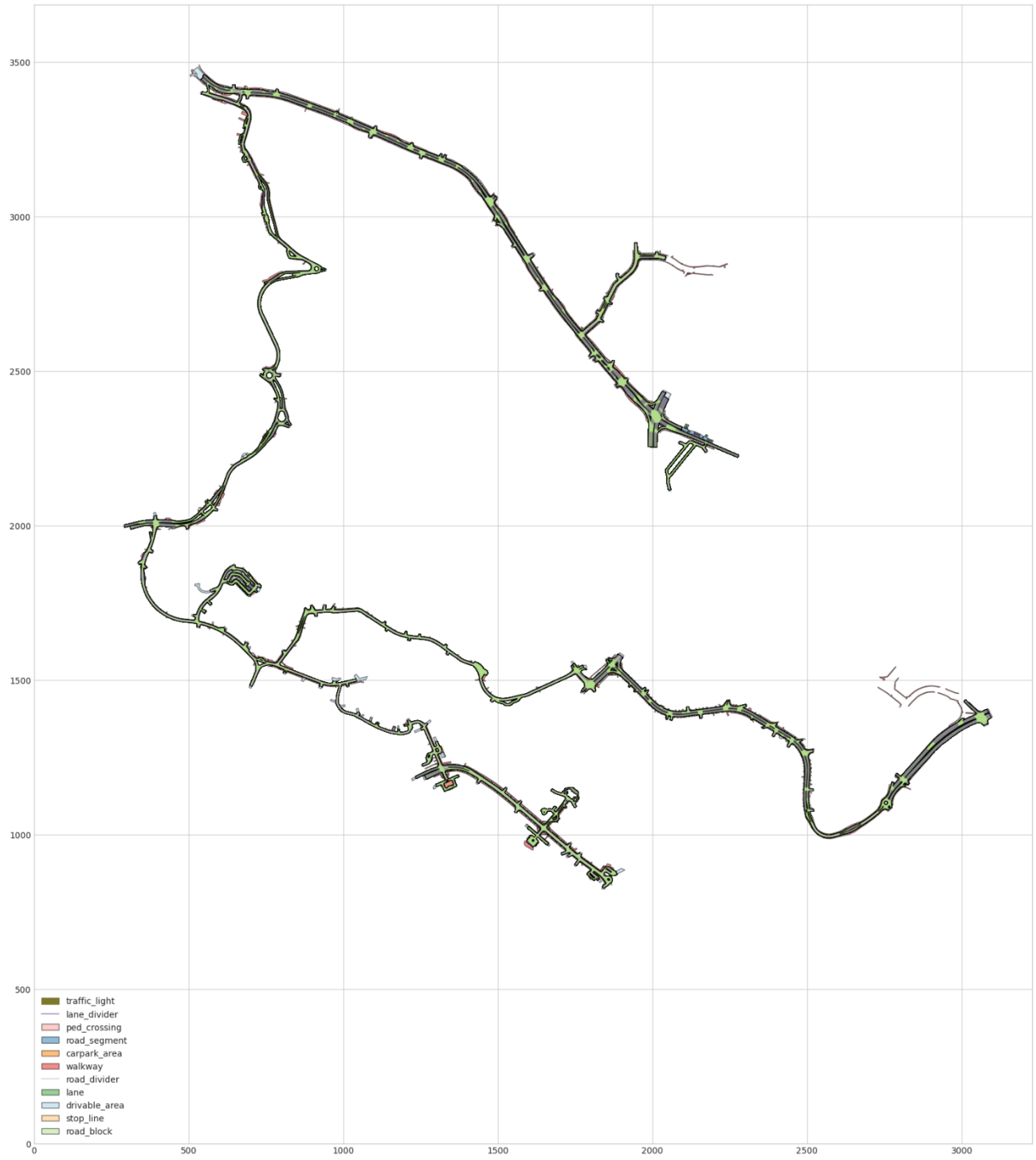
Provide descriptors of the scene that was recorded taking the following parameters and add more as needed

- **Locations:** Boston (Seaport, South Boston) and Singapore (One North, Holland Village, Queenstown).
- **Lighting:** Day, Night.
- **Weather:** Rain, Clear.
- **Traffic Density:** Dense traffic to sparse environments.
- **Road Type:** Urban intersections, construction zones, narrow streets.

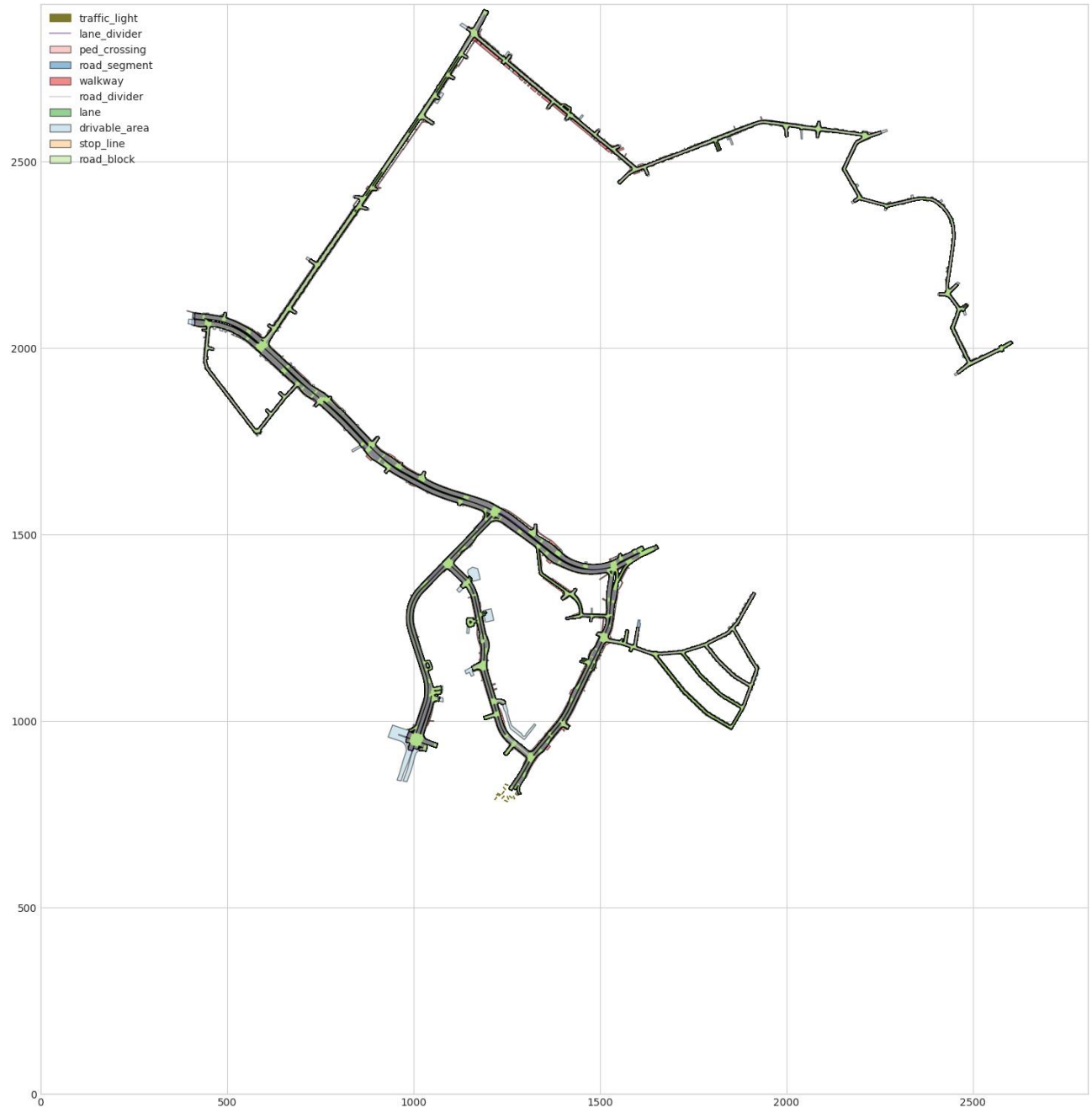
Map View of Singapore Onenorth:



Map View of Singapore Queenstown:



Map View of Singapore Hollandvillage:



Map View of Boston Seaport:

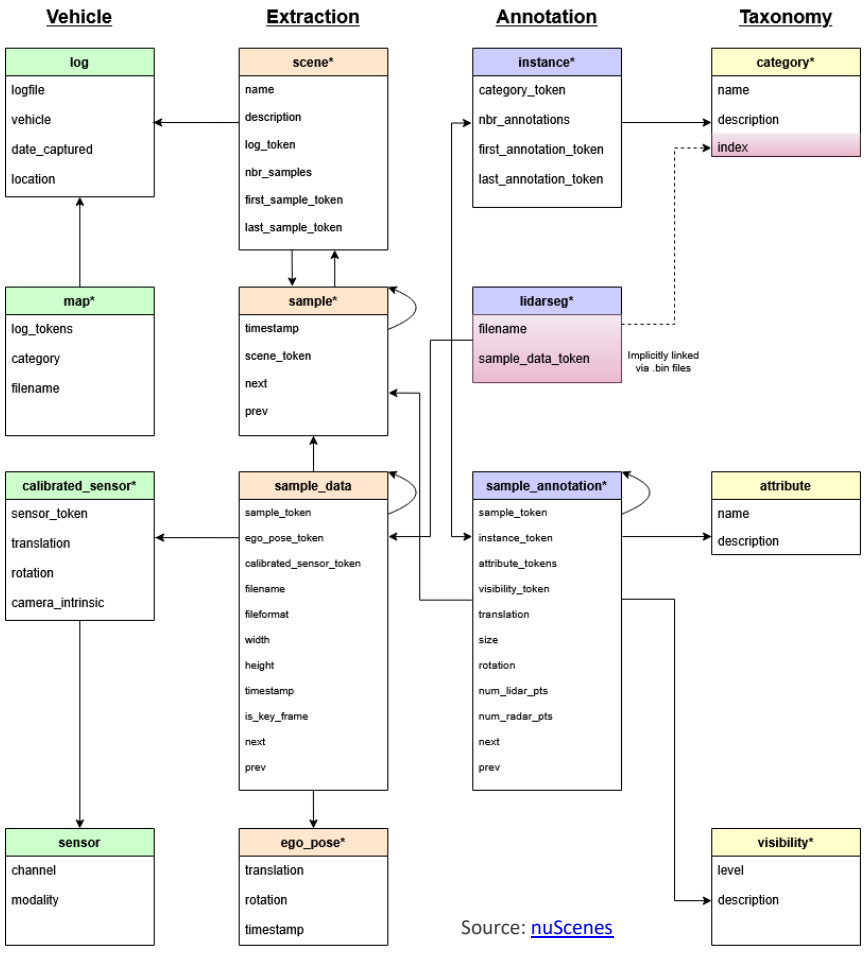
Sensitivity of Data

SENSITIVITY TYPE(S)	FIELD(S) WITH SENSITIVE DATA	SECURITY AND PRIVACY HANDLING
*Select **all applicable** data types present in the dataset:*	*List fields in the dataset that contain S/PII, and specify if their collection was intentional or unintentional.* *Use additional notes to capture any other relevant information or considerations.*	*Summarize the measures or steps to handle sensitive data in this dataset.* *Use additional notes to capture any other relevant information or considerations.*
• [x] **Anonymous Data** (Faces and license plates are blurred in the released dataset) • [x] **Geospatial Data** (GPS coordinates and maps) • [ ] Identifiable Data (Removed via post-processing) • **Others:** Sensor data (LiDAR/Radar point clouds).	• **Field:** Camera Images (raw). • **Intentionality:** Unintentional collection (background pedestrians and other drivers). • **Mitigation:** The released images have faces and license plates blurred to remove PII.	Privacy is protected by actively detecting and **blurring faces** and **license plates** across the entire dataset of 1.4 million images. The data collection was conducted on public roads in compliance with local regulations.

Dataset Version and Maintenance

MAINTENANCE STATUS	VERSION DETAILS	
*Select **one**:*	*Provide details about **this** version of the dataset:*	
Actively Maintained: The dataset has seen multiple releases (v1.0, and subsequent expansions like nuScenes-lidarseg) and hosts an active leaderboard/challenge.	• **Current Version:** 1.0 • **Release Date:** March 2019	

Example of Data Points

PRIMARY DATA MODALITY	EXAMPLE OF DATAPOINT
*Select **one**:*	*List the fields in data points and their descriptions. If you are using a standardised data format you can mention it and provide a link instead of a description* *(Usage Note: Describe each field in a datapoint. Optionally use this to show the example.)*
Image Data Text Data Tabular Data Audio Data Video Data Time Series Graph Data Geospatial Data **Multimodal** Synchronized Lidar, Radar, Camera (RGB), and IMU/GPS data Unknown Others (Please specify)	**Fields:** A single "sample" (keyframe) in the dataset consists of: 1. **Lidar Data:** 1x 32-beam LiDAR point cloud. 2. **Radar Data:** 5x Radar point clouds (Front, Front-Left, Front-Right, Back-Left, Back-Right). 3. **Image Data:** 6x RGB Camera images (Front, Front-Left, Front-Right, Back, Back-Left, Back-Right). 4. **Ego Pose:** 6-DOF localization data for the vehicle. 5. **Annotations:** List of 3D bounding boxes visible in this sample (class, size, location, orientation, attributes). All annotations and meta data (including calibration, maps, vehicle coordinates etc.) are covered in a relational database. The database schemata are shown below, and element in each table can be identified by its unique primary key token. **nuScenes schema** Asterisks (*) indicate modifications compared to the nuImages schema. Tables and fields added in nuScenes-lidarseg have a purple background color.  Source: nuScenes

Access, Retention, & Wipeout

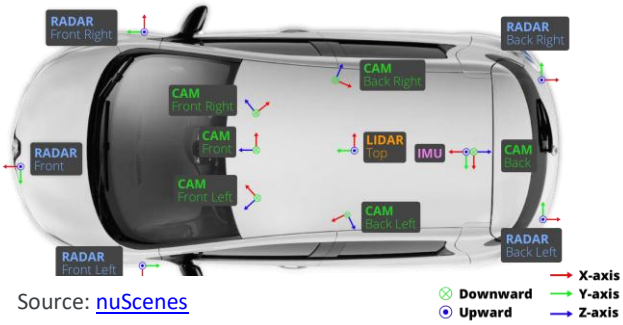
Access

ACCESS TYPE	DOCUMENTATION LINK(S)
*Select **one**:*	*Provide links that describe documentation to access this dataset. Provide terms and conditions if necessary*
Internal - Unrestricted Internal - Restricted **External - Open Access** (Free for non-commercial/academic use via registration) Others (Please specify)	**DOCUMENTATION LINK(S)** • **Official Website:** https://www.nuscenes.org/ • **Paper:** https://arxiv.org/abs/1903.11027 • **Dev-Kit:** https://github.com/nutonomy/nuscenes-devkit • **Term of Use**: Link

Provenance

Collection

METHODOLOGY DETAIL(S)	SOURCE DESCRIPTION(S)	DATA PROCESSING
Provide a description of each collection method used. *Use additional notes to capture any other relevant information or considerations.*	*Provide a description of the source of data.* *It can be software for synthetic data or the description of the vehicle…*	*Summarize how data from different sources or methods aggregated, processed, or connected.*
• **Source:** Real-world driving data collection. • **Platform:** Renault Zoe equipped with a custom sensor suite (1x Lidar, 5x Radar, 6x Cameras, IMU, GPS). • **Is this source considered sensitive or high-risk?** Yes (Cameras) • **Dates of Collection:** 2017 - 2018 • **Primary modality:** Multimodal	Data was collected using two sensor-instrumented Renault Zoe cars driven manually by safety drivers. The routes were carefully selected in **Boston** and **Singapore** to capture diverse driving maneuvers, traffic situations, and rare classes.	• **Synchronization:** Sensors are synchronized via hardware trigger. • **Selection:** Keyframes (samples) are selected at 2Hz. • **Annotation:** Expert annotators labeled 3D bounding boxes for 23 object classes across the keyframes using lidar and camera data. • **Anonymization:** Faces and license plates were blurred.



Source: nuScenes

- 12Hz capture frequency
- Evetar Lens N118B05518W F1.8 f5.5mm 1/1.8"
- 1/1.8'' CMOS sensor of 1600x1200 resolution
- Bayer8 format for 1 byte per pixel encoding
- 1600x900 ROI is cropped from the original resolution to reduce processing and transmission bandwidth
- Auto exposure with exposure time limited to the max. of 20 ms
- Images are unpacked to BGR format and compressed to JPEG
- See camera orientation and overlap in the figure below.

COLLECTION PROCESS

Provide a description or a link to a document that describes the criteria for the recordings or generation of data

The data collection process is detailed under the following Link: Link

Human and Other Sensitive Attributes

SENSITIVE HUMAN ATTRIBUTE(S)	REPRESENTED GROUPS OF PEOPLE
*Select **all attributes** that are represented (directly or indirectly) in the dataset.* *[Note: there are demonstrative examples of potentially relevant signals for a given dataset analysis]*	No matter if you record it as part of your data/labels. If you are recording people, we would like to know what groups of people are present in your data. If possible, provide a distribution
• [x] Geography (Boston, USA; Singapore) • [ ] Socio-economic status • [ ] Gender (Not annotated) • [ ] Age (Not annotated)	• [x] Non-disabled adult • [x] Non-disabled child • [x] Non-disabled elderly • [x] Disabled adult (Potential use of wheelchairs etc., though not explicitly categorized) *Note:* Specific demographic distributions are not provided in the dataset metadata *as personal attributes are not labeled.*

Annotations & Labeling

Fill this section if any human or algorithmic annotation tasks were performed in the creation of your dataset.

ANNOTATION WORKFORCE TYPE	ANNOTATION DISTRIBUTION(S)	ANNOTATION MEANS DESCRIPTION(S)
*Select **all applicable** annotation workforce types or methods used to annotate the dataset:*	*Provide a distribution of annotations for each type of annotation.*	*Describe the means that were used for annotation. It can be an annotation company, an annotation tool that was used by human annotators, a ML model that provides preannotations…*
• **Type:** Third-party vendor • **Details:** Data was annotated by human expert annotators from Scale AI.	• **Annotation:** 100 % Human Annotation	• **Tooling:** Annotators used a web-based 3D visualization tool showing camera and lidar data. • **Method:** Annotators drew 3D bounding boxes, specified attributes • **Link:** https://scale.com/ • **Notes:** Annotator instructions