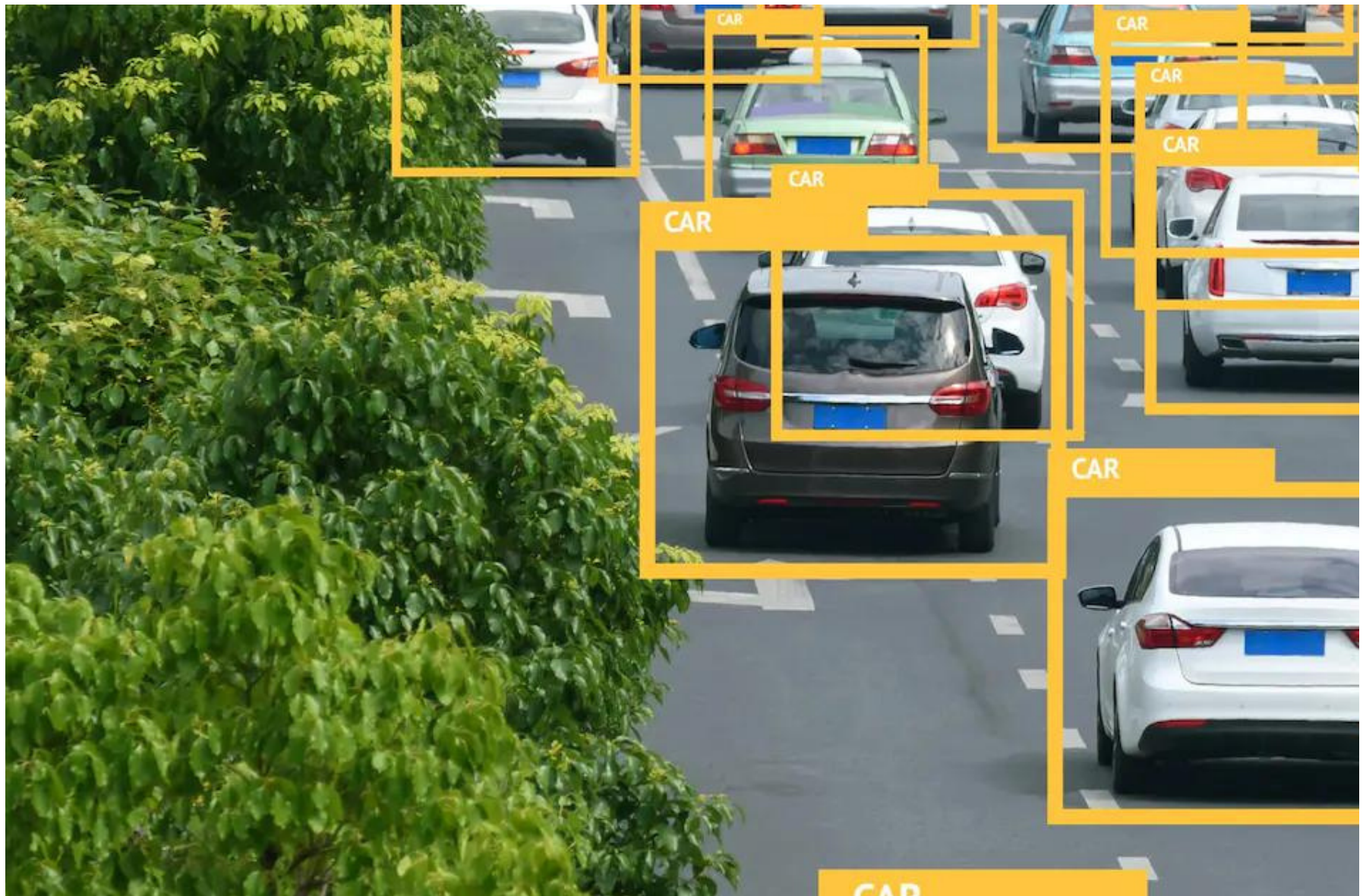# Introduction to KITTI Dataset for Autonomous Driving

Introduction:

The KITTI Vision Benchmark Suite is very important for research on self-driving cars. It has been made by the Karlsruhe Institute of Technology and the Toyota Technological Institute at Chicago.

Content:

The KITTI dataset has different types of data. It has pictures, videos, and data from LiDAR. These things help researchers learn about how cars can drive themselves.

<u>Key Features:</u>

1. **Image Data**: KITTI has pictures that show what it's like to drive on real roads.
2. **LiDAR Data**: This dataset has special data that helps us make 3D maps and find objects on the road.
1. **Annotations**: KITTI's data has notes about what's in the pictures, like where cars and people are.
2. **Driving Scenarios**: KITTI shows driving in cities, on highways, and even in bad weather.
3. **Benchmarking**: KITTI helps us compare different ways of making cars drive themselves, so we can find out which is best.

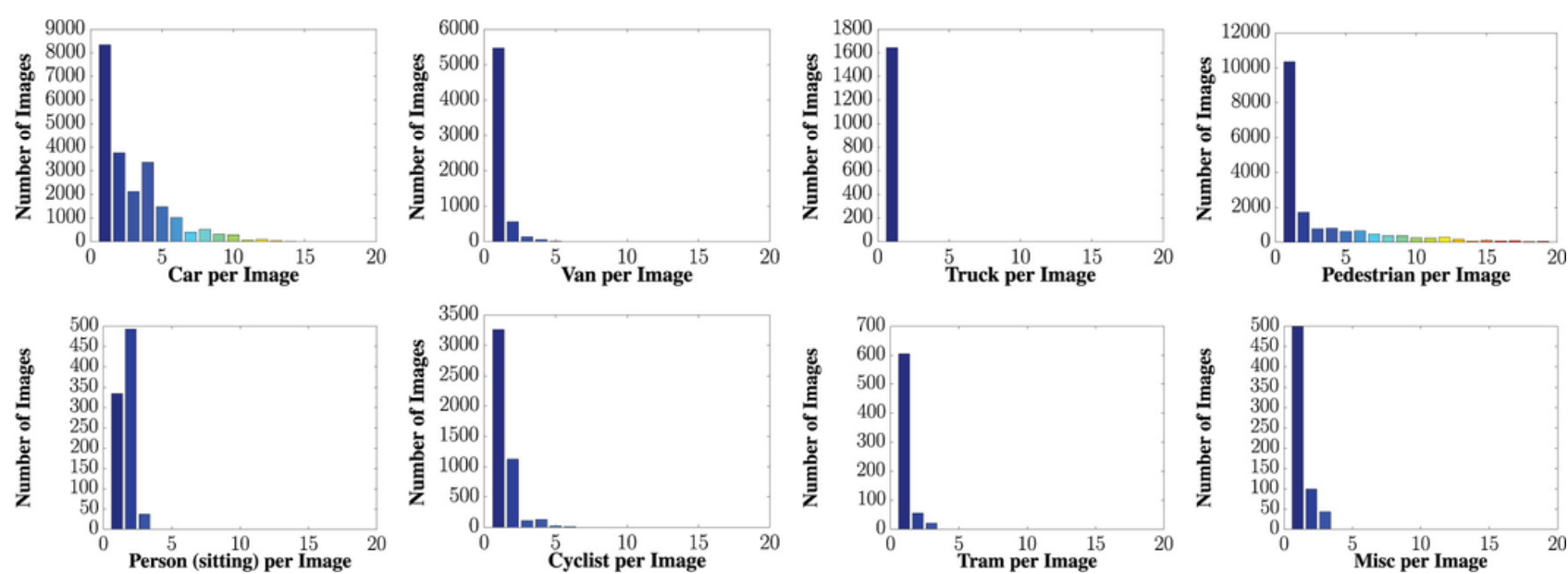The KITTI dataset, recorded from a moving platform around Karlsruhe, Germany. This is how the platform look like whe have :
A camera for images, laser scans, high-precision GPS
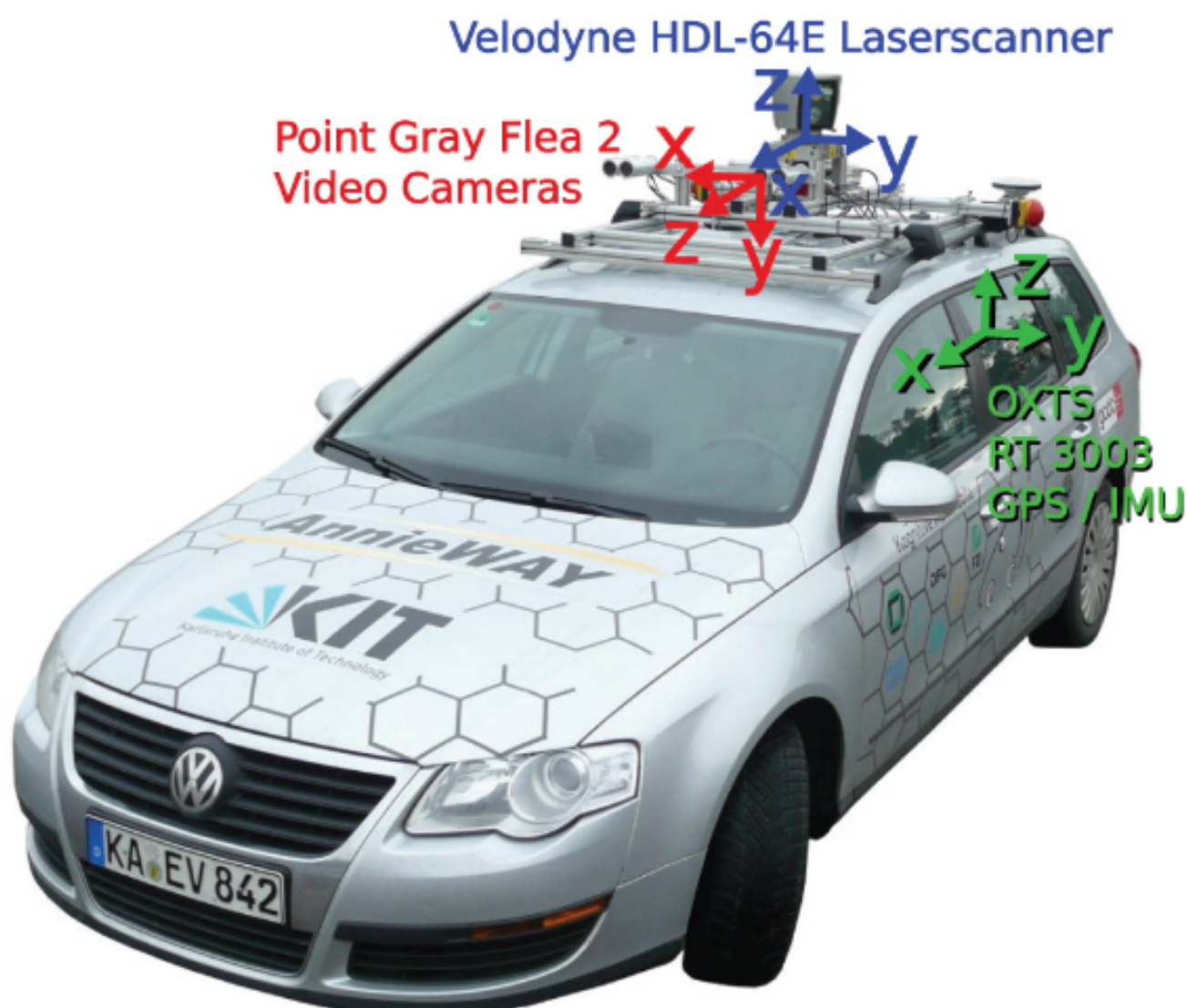
We have Classes in the Dataset (9 classes),
the dataset weighs 12 gigabytes (12GB)
we have more than fourteen thousand (14999) images

- Car
- Pedestrian
- Van
- Cyclist
- Truck
- Misc
- Tram
- Person Sitting

Number of object labels per class and image. This figure shows how often an object occurs in an image.

KITTI Object Detection · 9 classes

pedestrian

person sitting

dont care

misc

car

cyclist

truck

tram

van

Here is an Overview of the dataset

For the class Car for example we have ,more than six tausend (6000) images, and in these images , we have detect more than 20 000 object, the average number of objects detected in each image is 4.3

Class	Images	Objects	Count on image average	Area on image average
car rectangle	6684	28742	4.3	8.93 %
dont care rectangle	5365	11295	2.11	0.89 %
van rectangle	2145	2914	1.36	4.56 %
pedestrian rectangle	1779	4487	2.52	3.05 %
cyclist rectangle	1141	1627	1.43	2 %
truck rectangle	1036	1094	1.06	3.47 %
misc rectangle	778	973	1.25	2.88 %
tram rectangle	349	511	1.46	7.22 %
person sitting rectangle	99	222	2.24	3.73 %

Co-Occurrence Matrix

Co-occurrence matrix is an extremely valuable tool that shows you the images for every pair of classes: how many images have objects of both classes at the same time. For example ,we have nine hundred and ninety-one (991) images, which have the car and cyclist classes at the same time

	car	cyclist	dont care	misc	pedestrian	person sitt...	tram	truck	van
car	6684	991	5042	748	982	53	320	1032	2035
cyclist	991	1141	979	58	434	34	100	60	307
dont care	5042	979	5365	487	1046	82	278	800	1587
misc	748	58	487	778	88	4	0	155	376
pedestrian	982	434	1046	88	1779	82	58	135	458
person sitting	53	34	82	4	82	99	21	0	53
tram	320	100	278	0	58	21	349	44	45
truck	1032	60	800	155	135	0	44	1036	361
van	2035	307	1587	376	458	53	45	361	2145

Applications:

Object Detection (2D and 3D): With KITTI, researchers can teach computers to find objects like cars and people on the road.

Semantic Segmentation: This means teaching computers to understand what's in pictures in detail. KITTI helps with this.

Path Planning: It helps make plans for cars to follow so they can drive safely and efficiently.

Conclusion:

KITTI is really important for making cars that can drive themselves better. It helps us learn about different things like finding objects and making good maps. With KITTI, we can make self-driving cars safer and smarter.