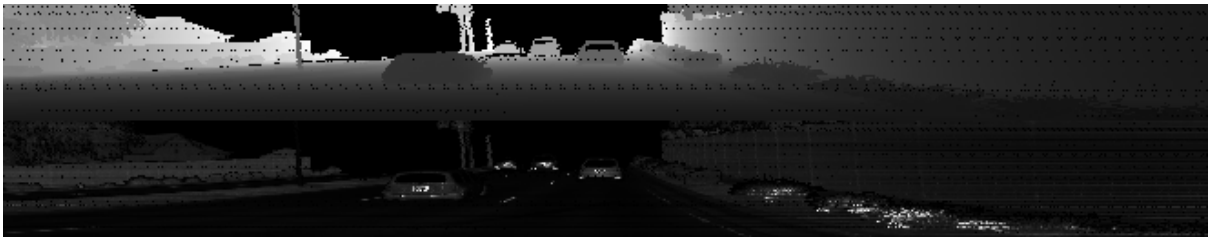
# Section 1 :Compute Lidar Point-Cloud from Range Image

## Visualize range image channels (ID_S1_EX1)



## Visualize lidar point-cloud (ID_S1_EX2)

Analyzing some frames we can observe that we can clearly distinguish different types of vehicles in the pont cloud generated by Lidar.

In figure 1 you can see one of the weak points of this Lidar, Lidar's blind spots (the area around the vehicle where Lidar cannot estimate).

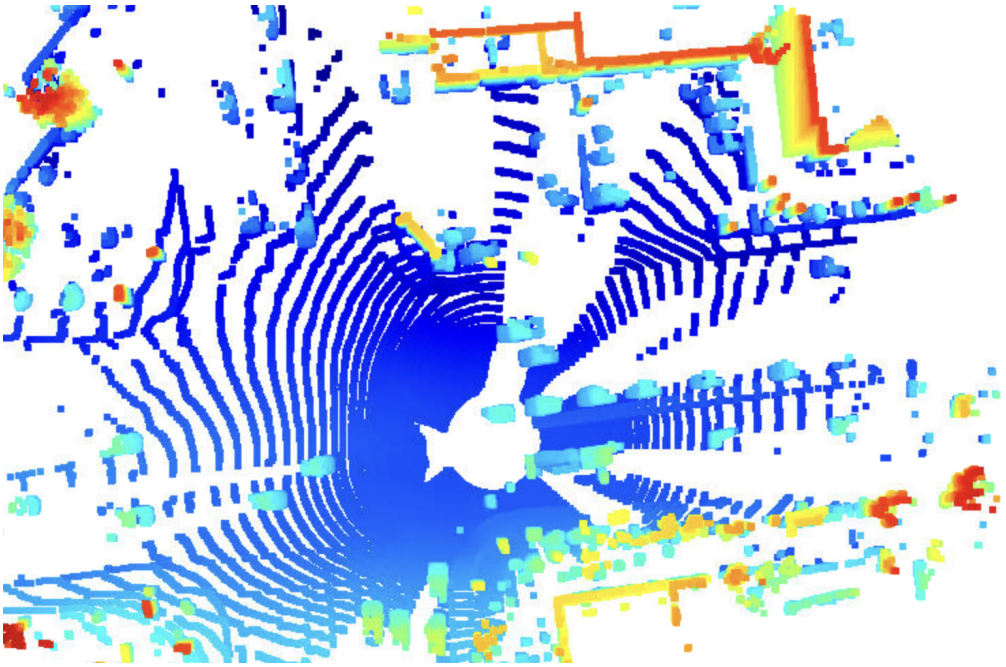


Figure 1

In figure 2 for example we can see a van with a trailer/trailer (even the wheels and lights on the trailer can be identified due to the shape and different intensity of reflection).

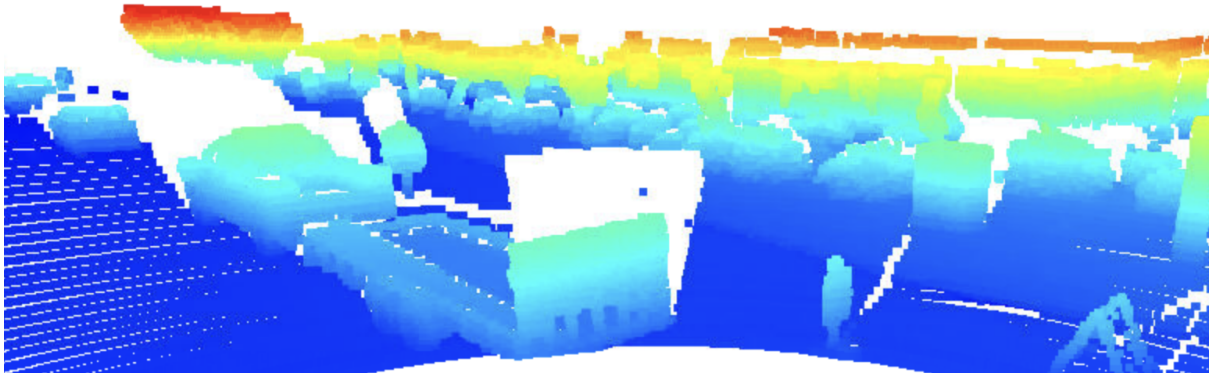


Figure 2

In figure 3 we can identify different types of cars again, there are 4 conventional cars and a van, the resolution of the point cloud of the lidar is so high that we can even identify the side mirror in some of these cars.

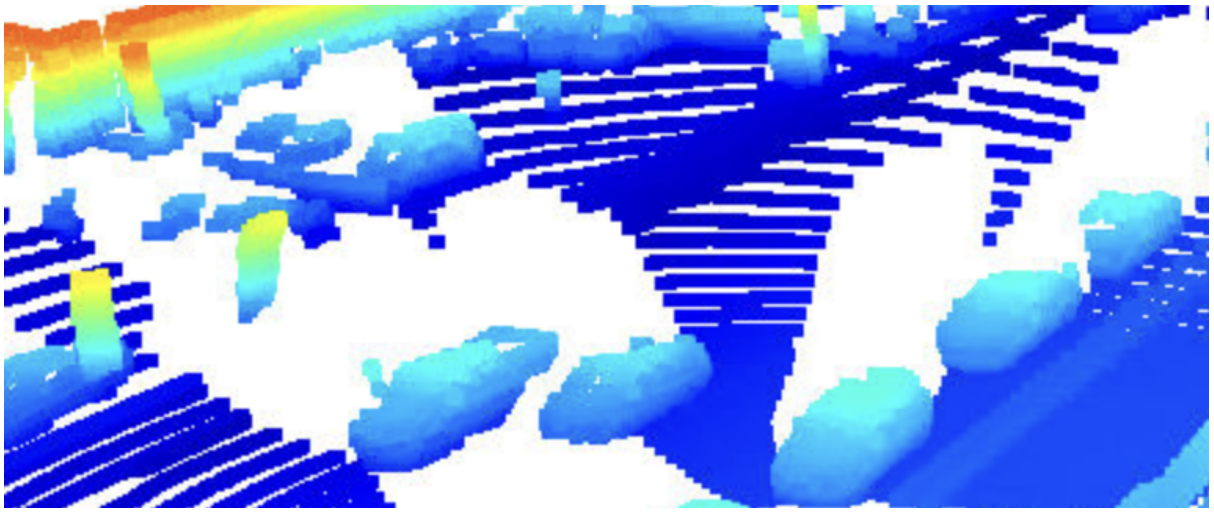


figure 3

In figure 4 we can see a very well defined tree.

Figure 4

In figure 5.a we can see how the glass reflects less light. because we can see the non-reflection and low intensity in the places with car glass. Using the range image viewer (figure 5.b.)  we can also confirm the low reflectivity/intensity of the glass

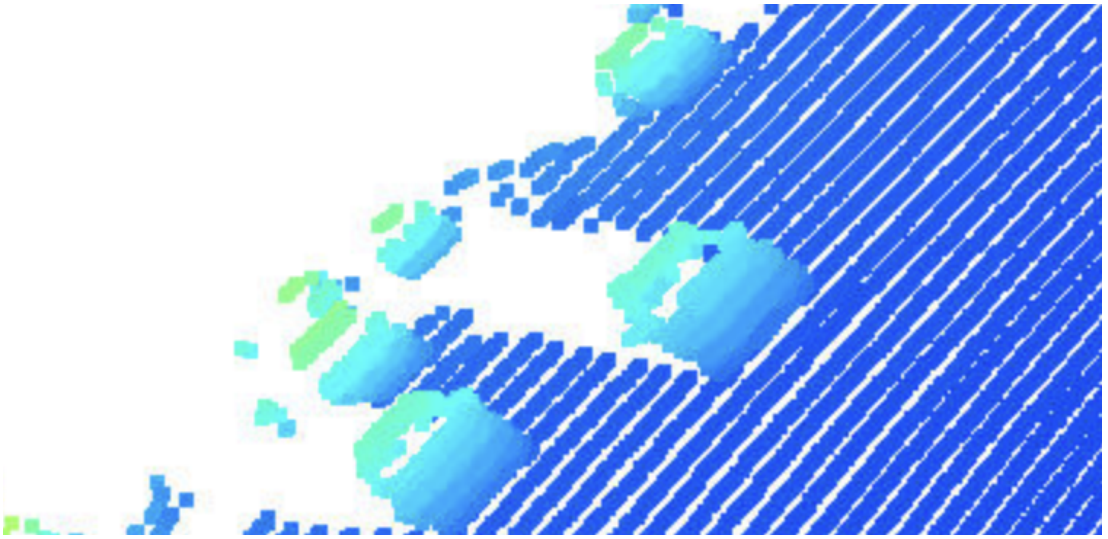


Figure 5.a

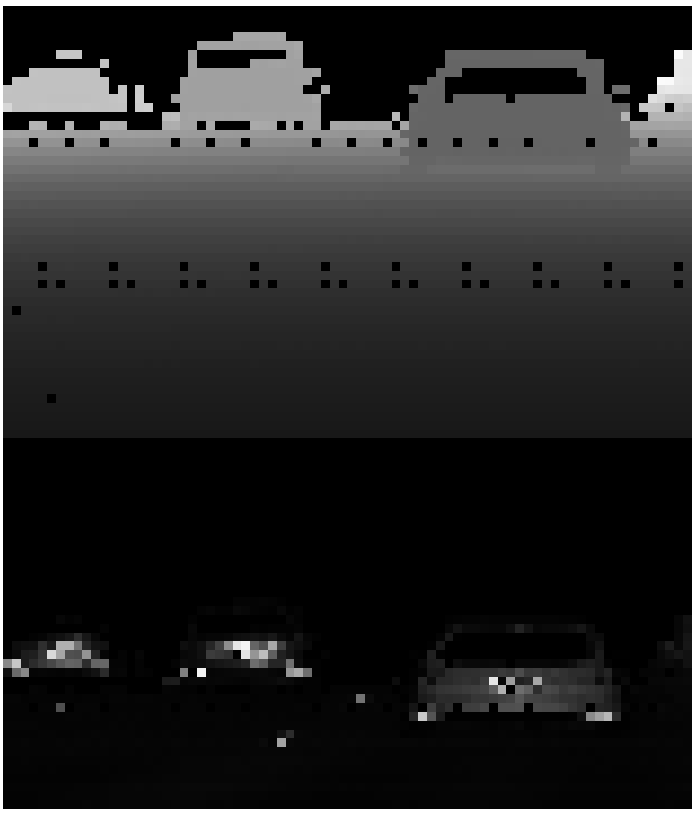


figure 5.b.

In figure 6 we can see the capacity of the lidar. in estimating small objects on the road (perhaps cones), in addition to plants on the side of the road.

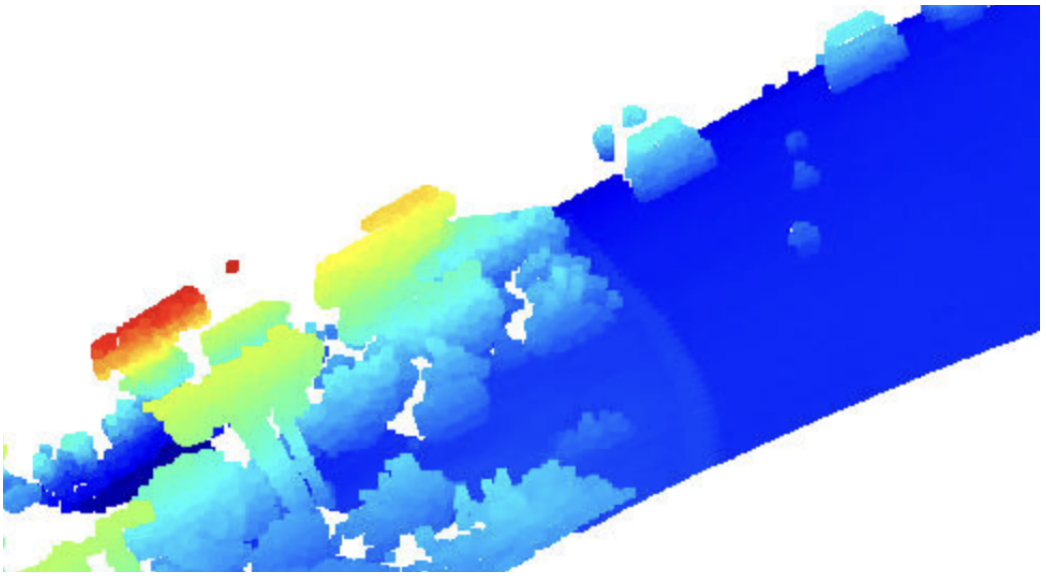
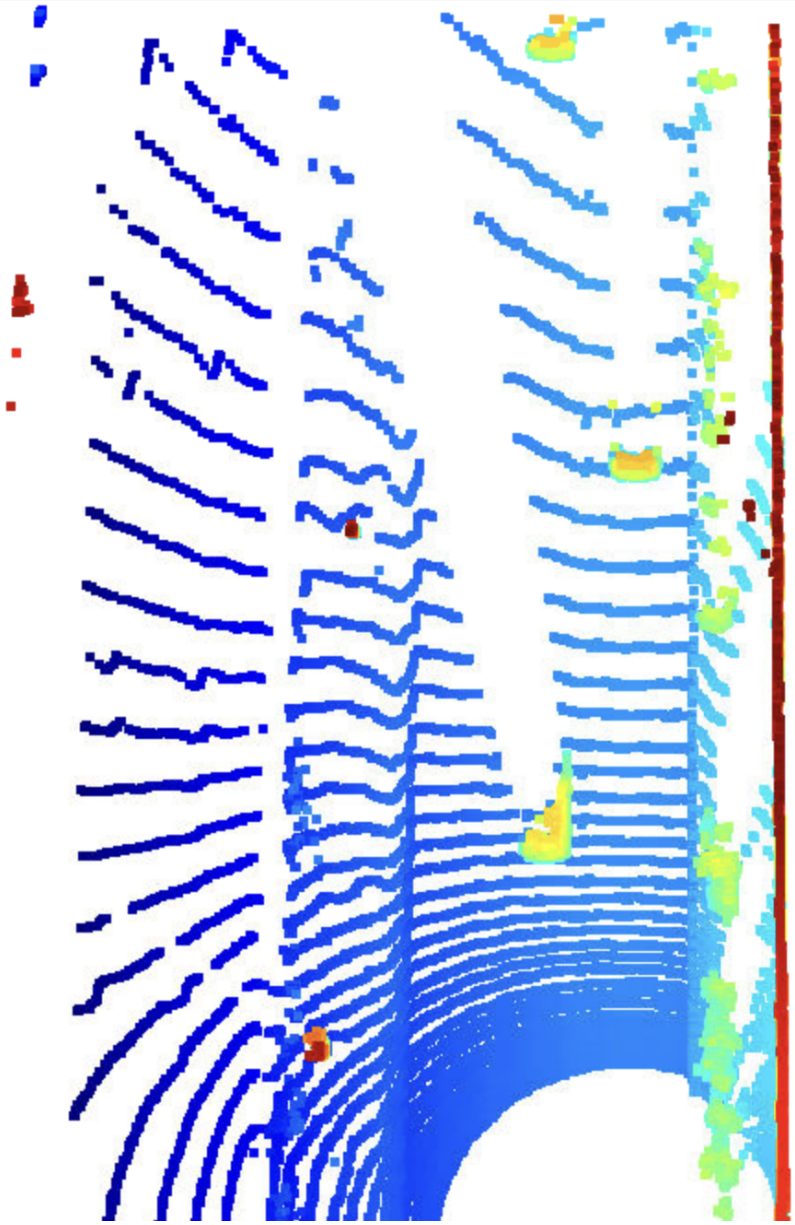
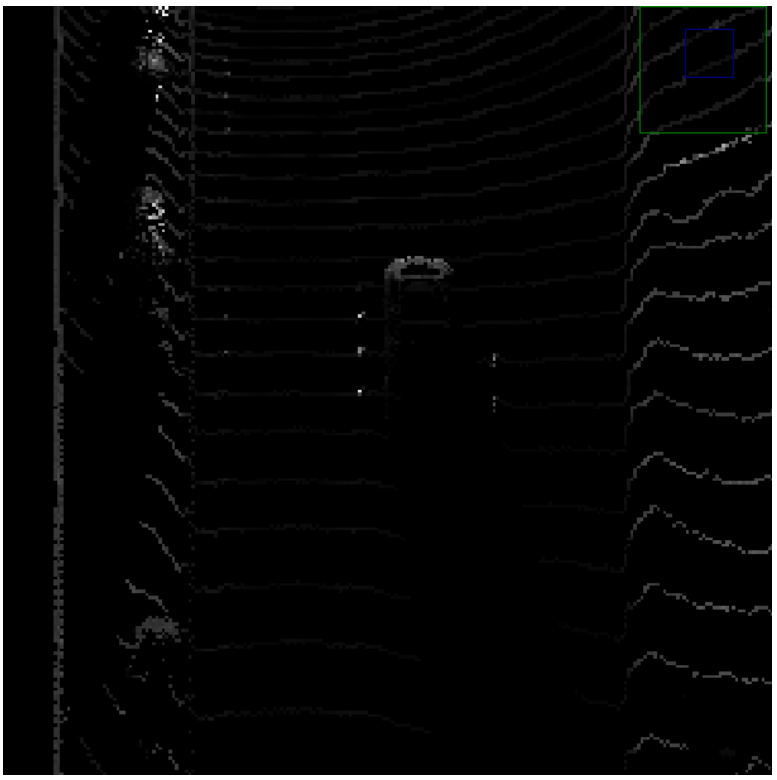


Figure 6

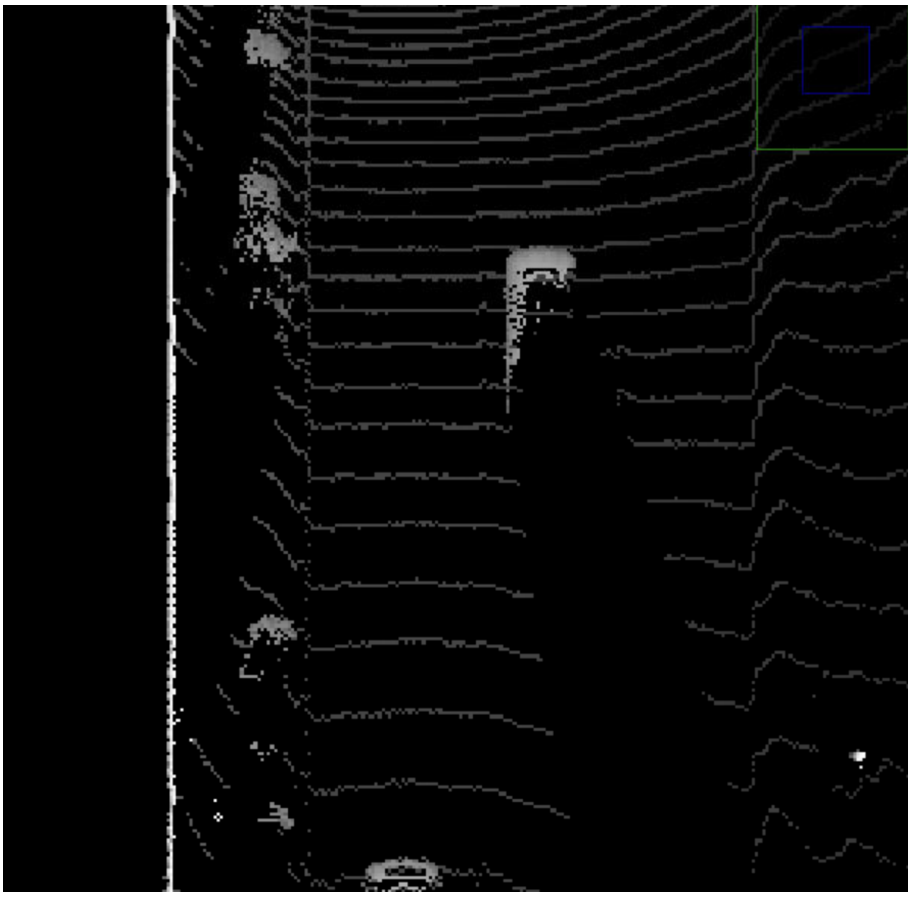
## Section 2 : Create Birds-Eye View from Lidar PCL



### Compute intensity layer of the BEV map (ID_S2_EX2)



## Compute height layer of the BEV map (ID_S2_EX3)



we can see how the height and intensity maps give us different images/information of the objects

## Section 3 : Model-based Object Detection in BEV Image

### Extract 3D bounding boxes from model response (ID_S3_EX2)

## Section 4 : Performance Evaluation for Object Detection

we can see that the model is generally working with good accuracy, it has few errors in the x and y estimates, only the Z axis is less accurate, this axis being the least important.