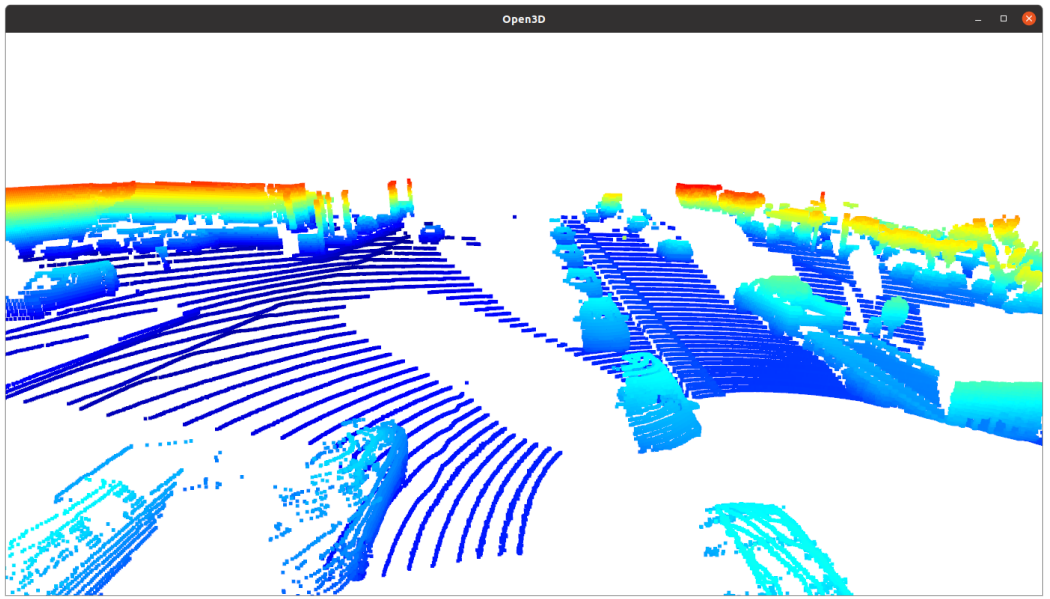
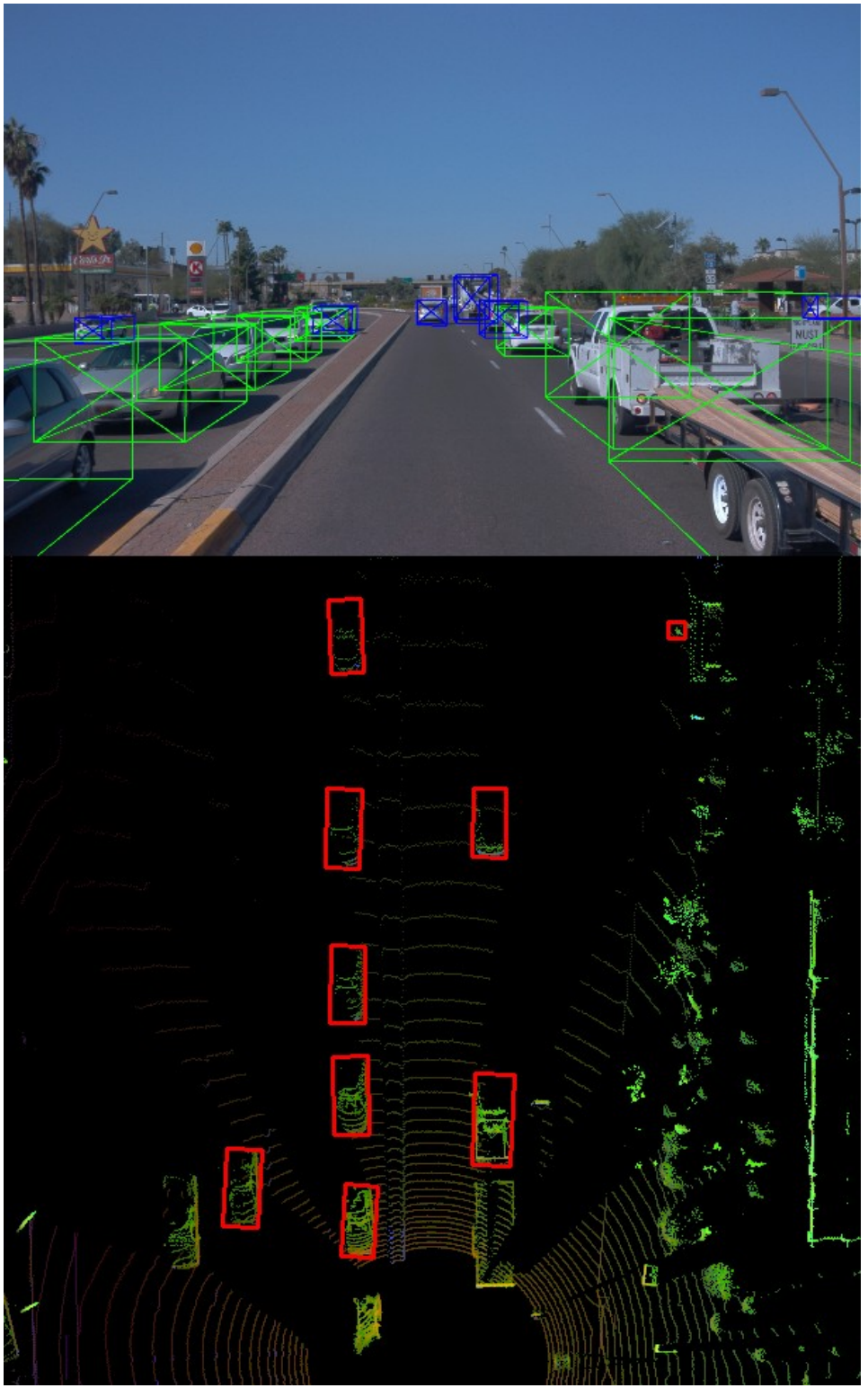
The setup -

In file loop_over_dataset.py,

```
data_filename = 'training_segment-
10963653239323173269_1924_000_1944_000_with_cam
era_labels.tfrecord'
show_only_frames = [0, 200]
exec_data = []
exec_detection = []
exec_tracking = []
exec_visualization = ['show_pcl']
```



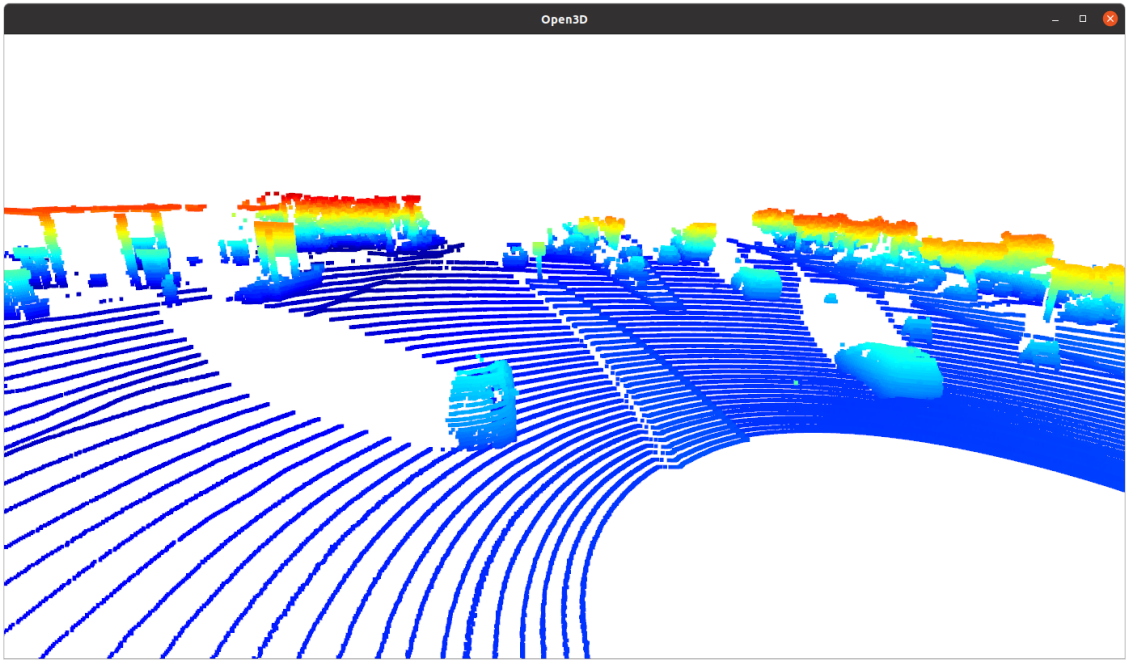


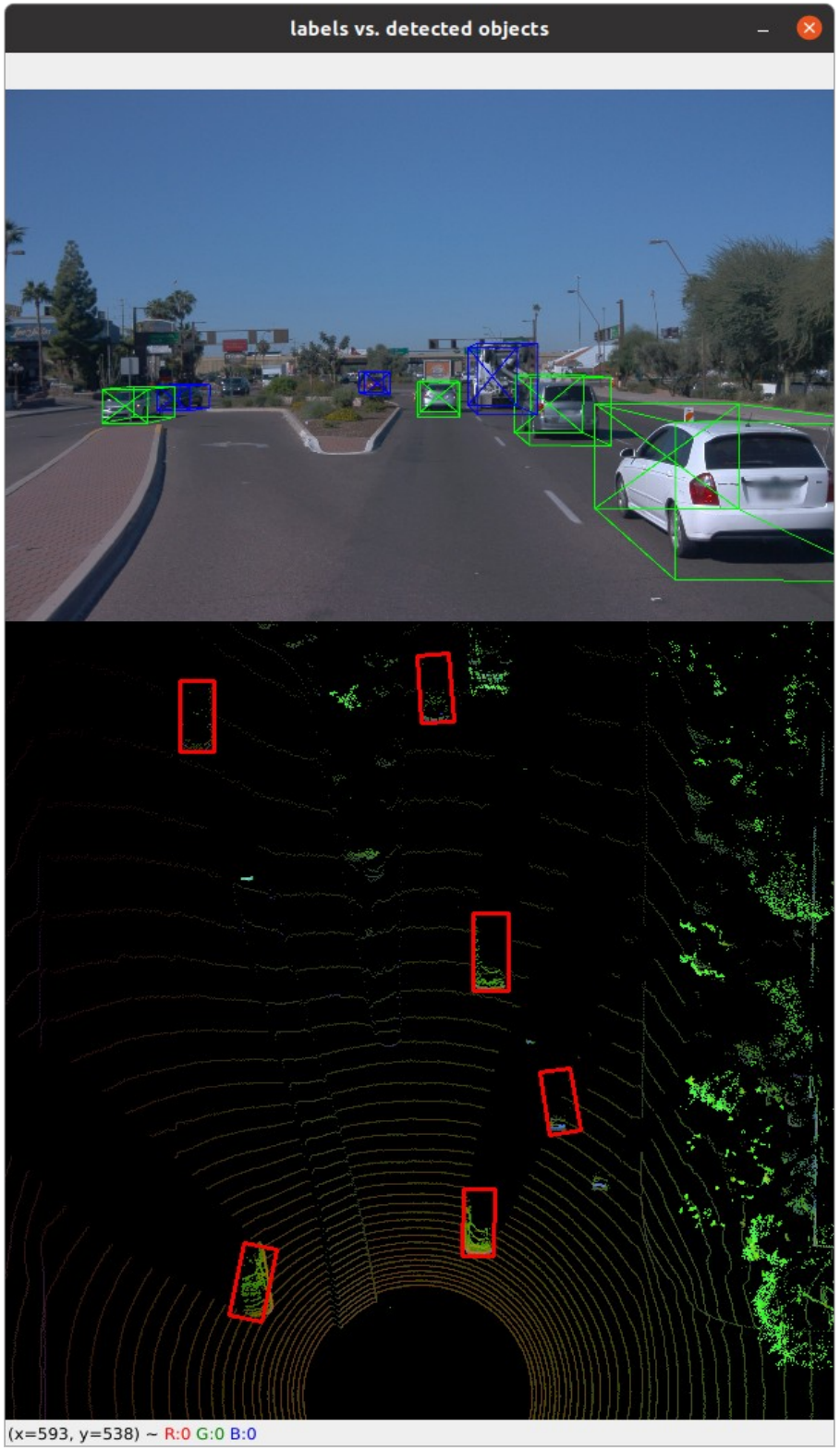
Find and display 6 examples of vehicles with varying degrees of visibility in the point-cloud

Frame No 3

1) The vehicles which are too close show high no lidar scan returns , but the algorithms is not able to detect couple of them.

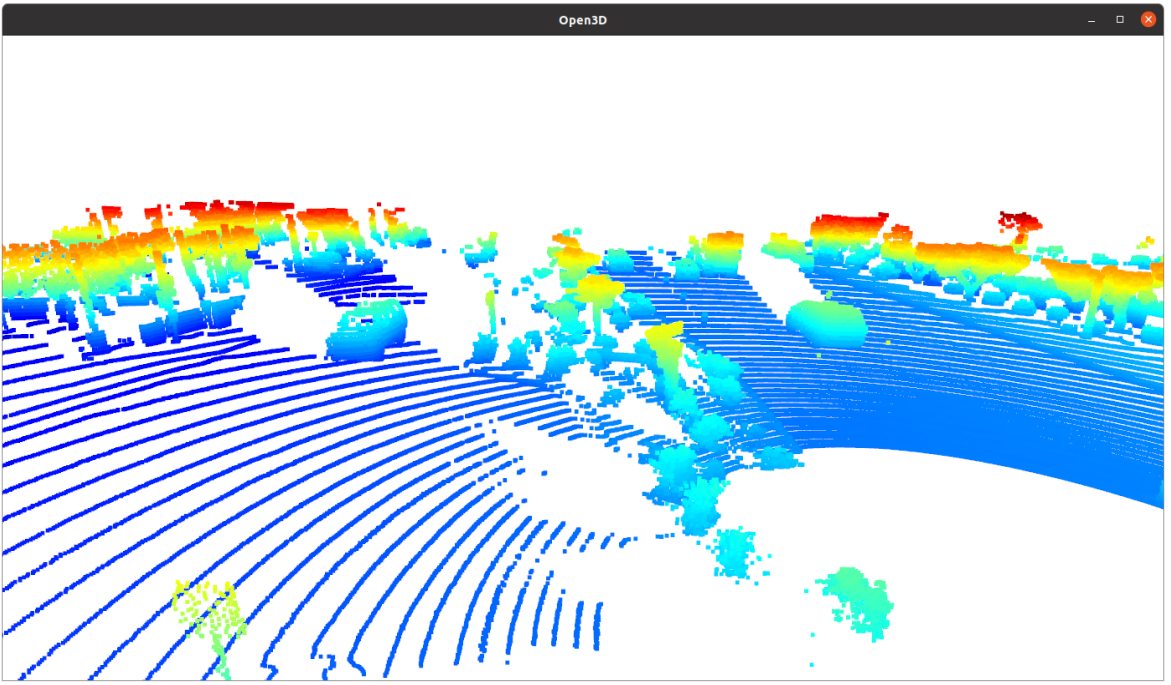
2) The detection algorithm correctly detects the truck in the side lane and dose not mistake the trailer for car.



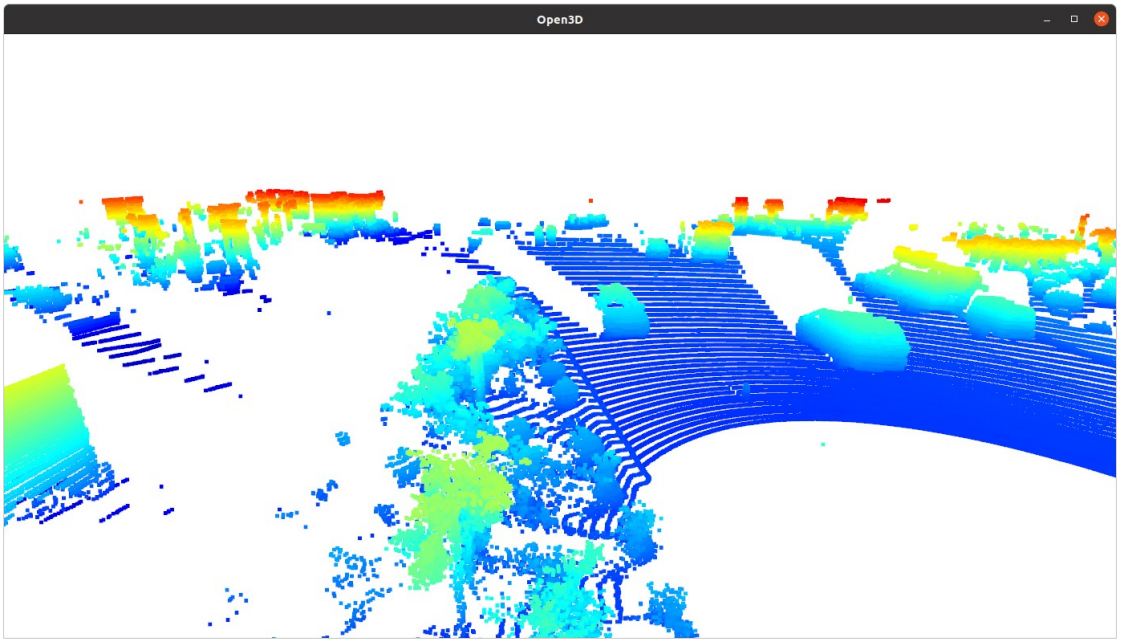


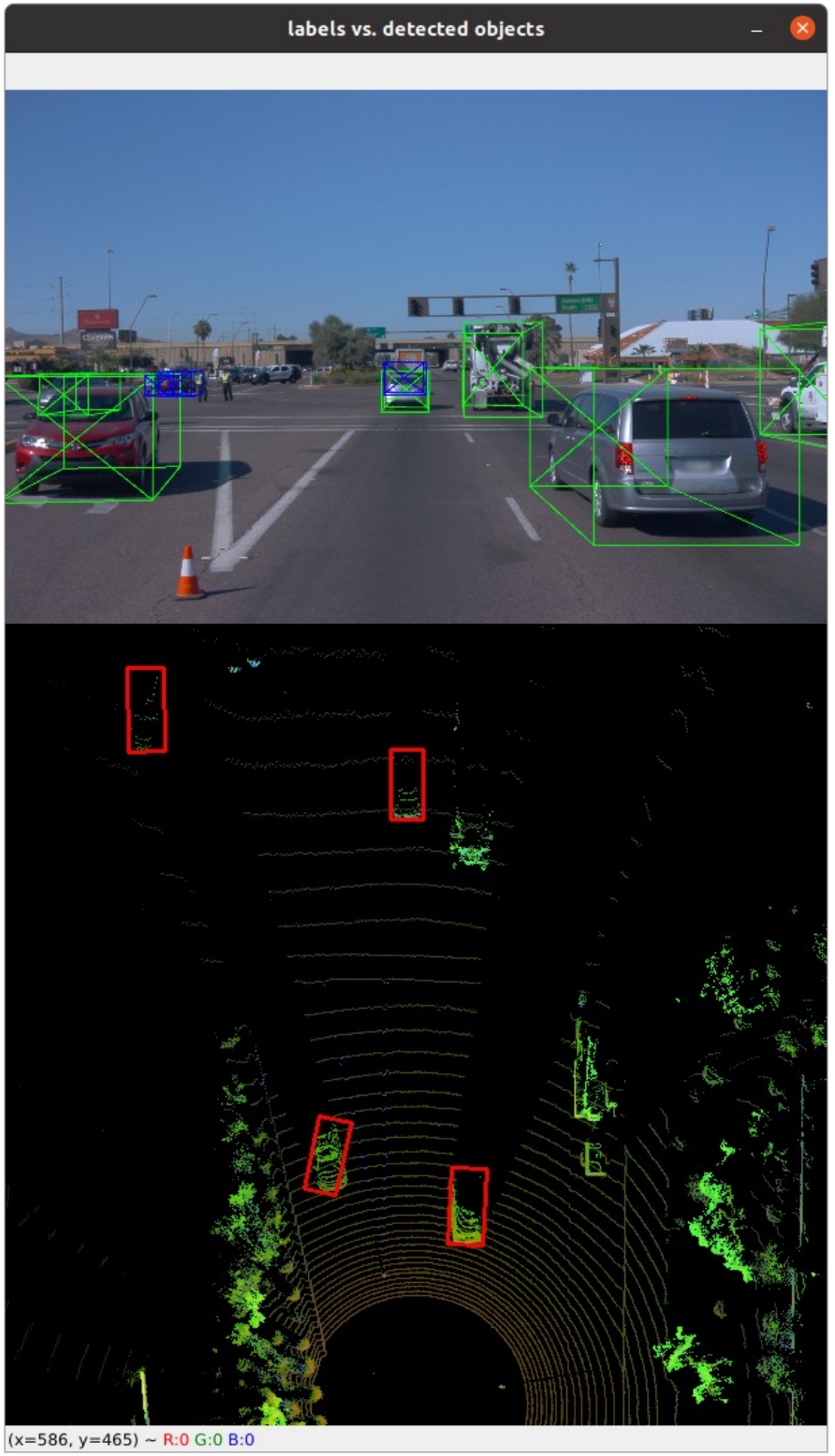
Frame No 65

3) The truck carrying pipes in the side lane never gets detected. The lidar return pattern is dispersed.



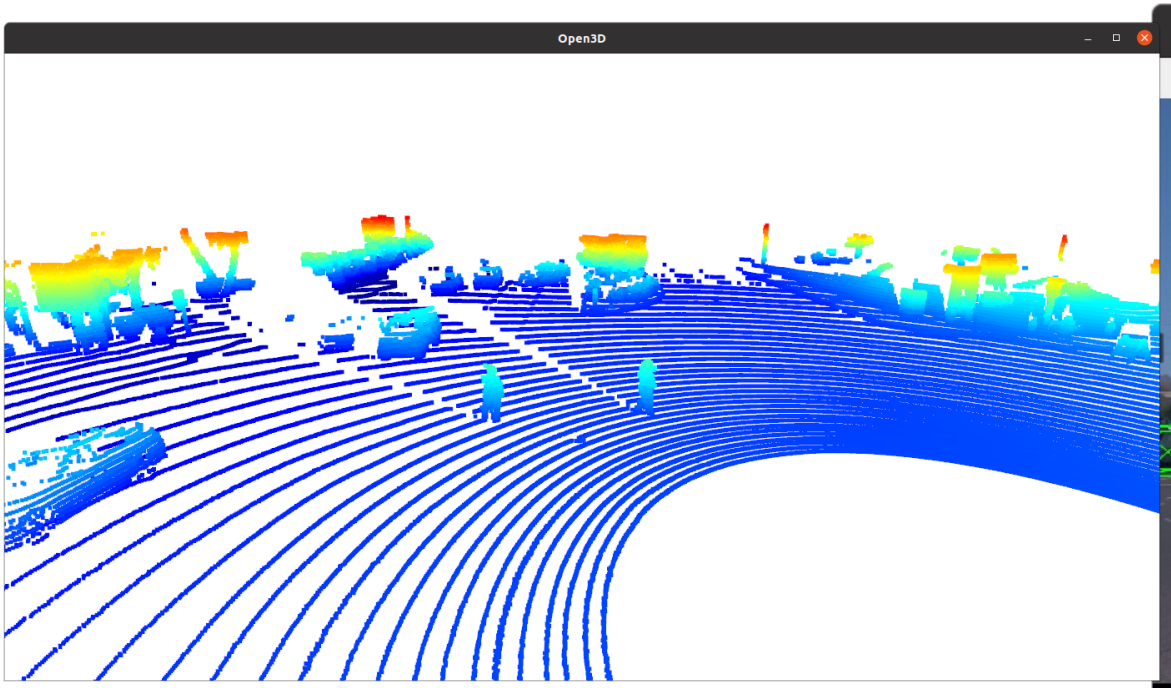
Frame No 95
4) The white truck on left shows distinct lidar returns is not detected by algorithm.
5) Again the truck carrying pipes is not detected by the algorithm.

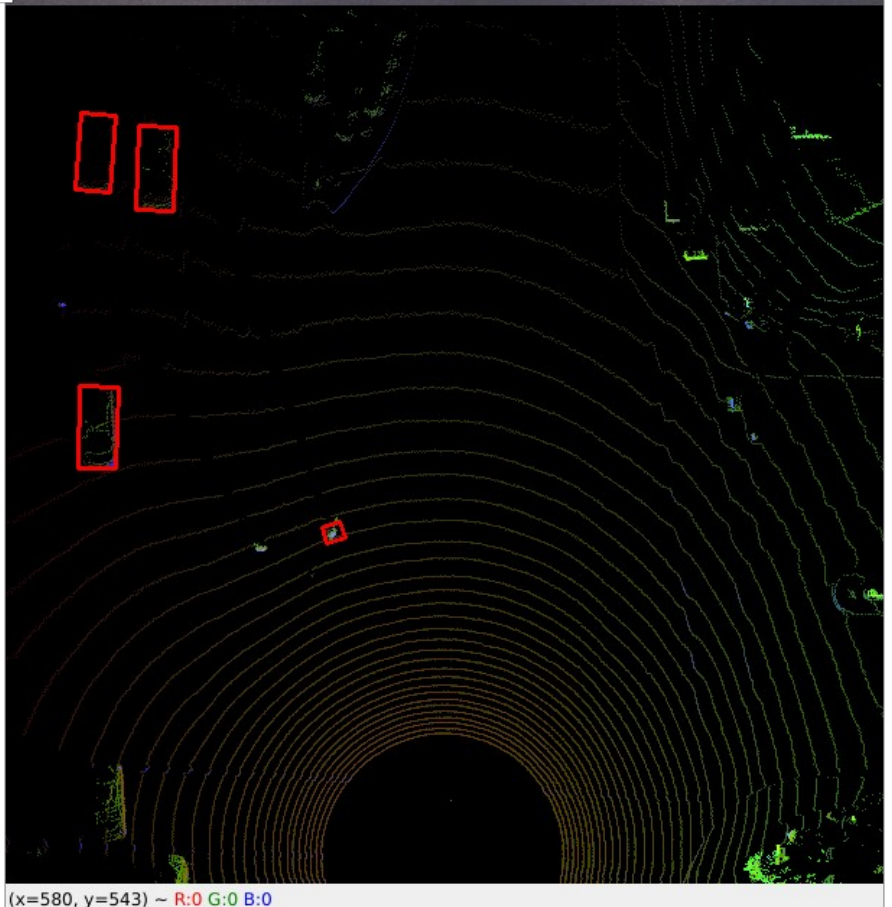




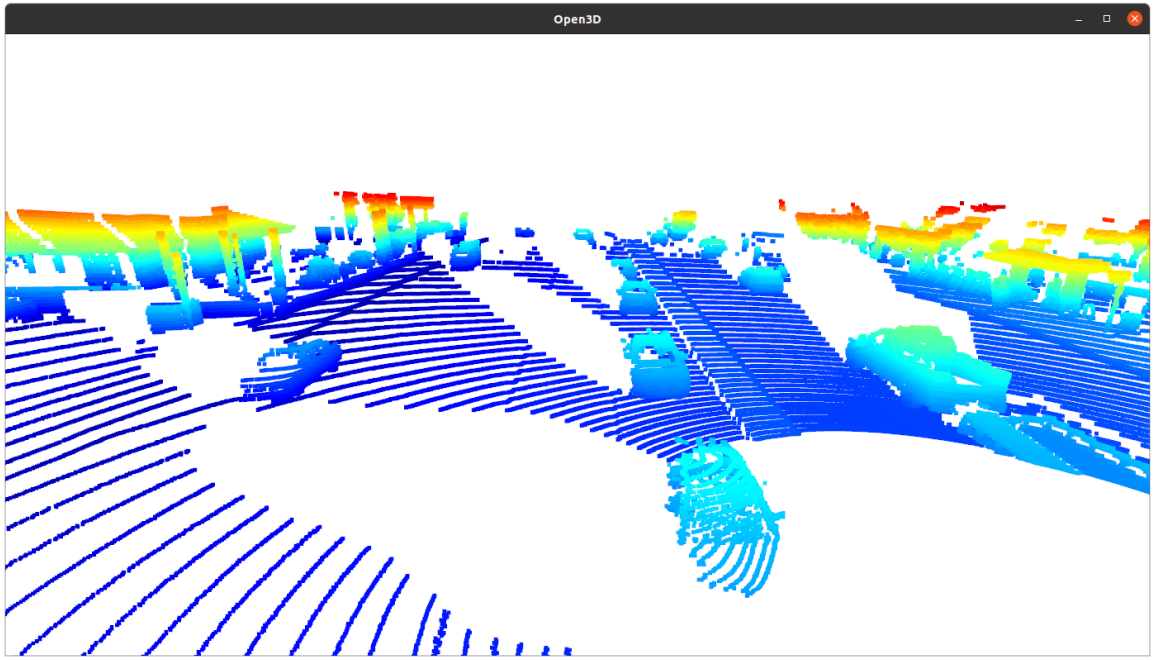
Frame No 116

6) Car merging from on the right is not detected.





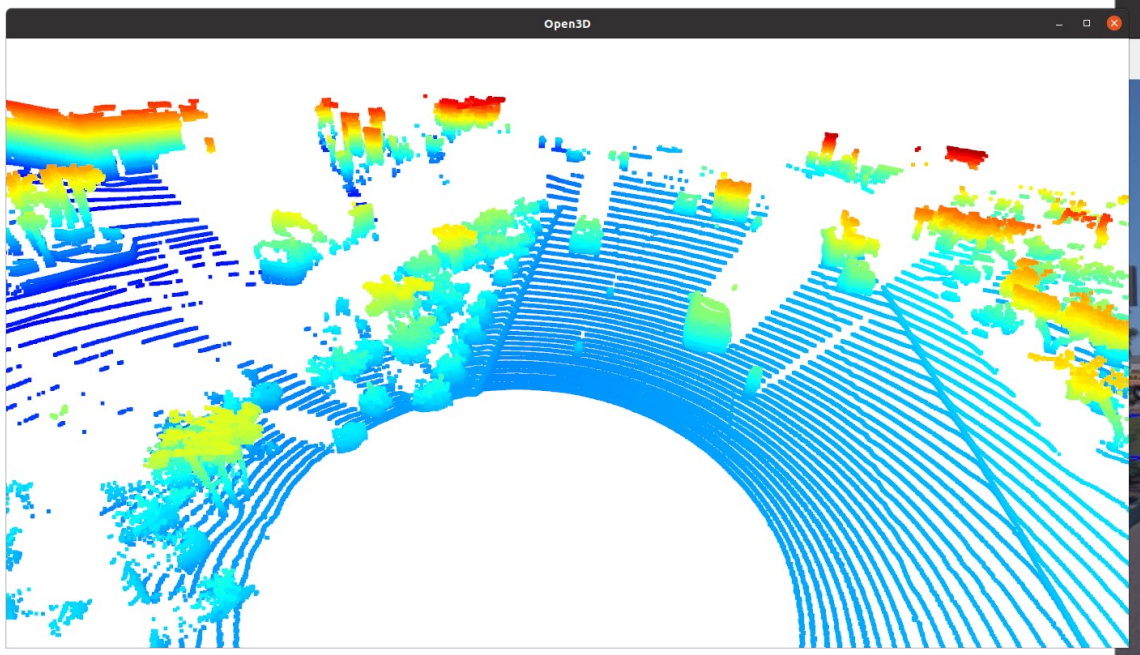
Frame No 193
7) cop car not visible



Frame No 15

8) The two cars on the left have dense lidar returns but are not detected.

9) Cars which are closer has more lidar returns and distinctive features. But cars which are farther show only few lidar returns in the BEV.

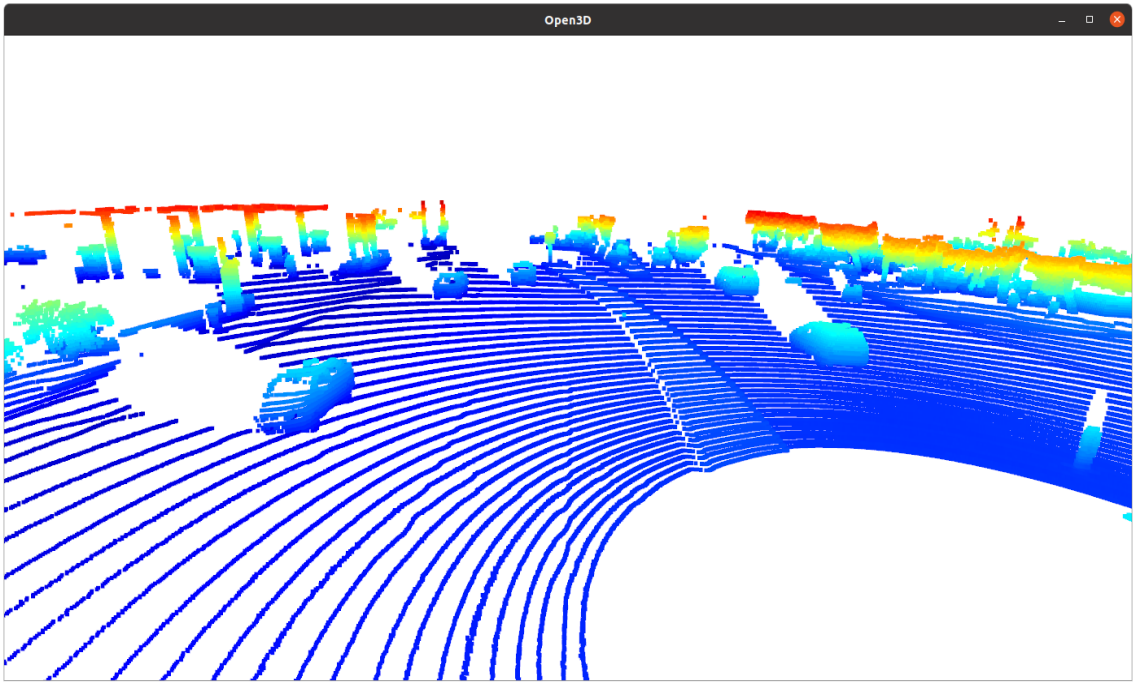


Frame No 109

10) The orange Van right in our lane right in front(in front of the first vehicle) has not lidar returns/ visibility.

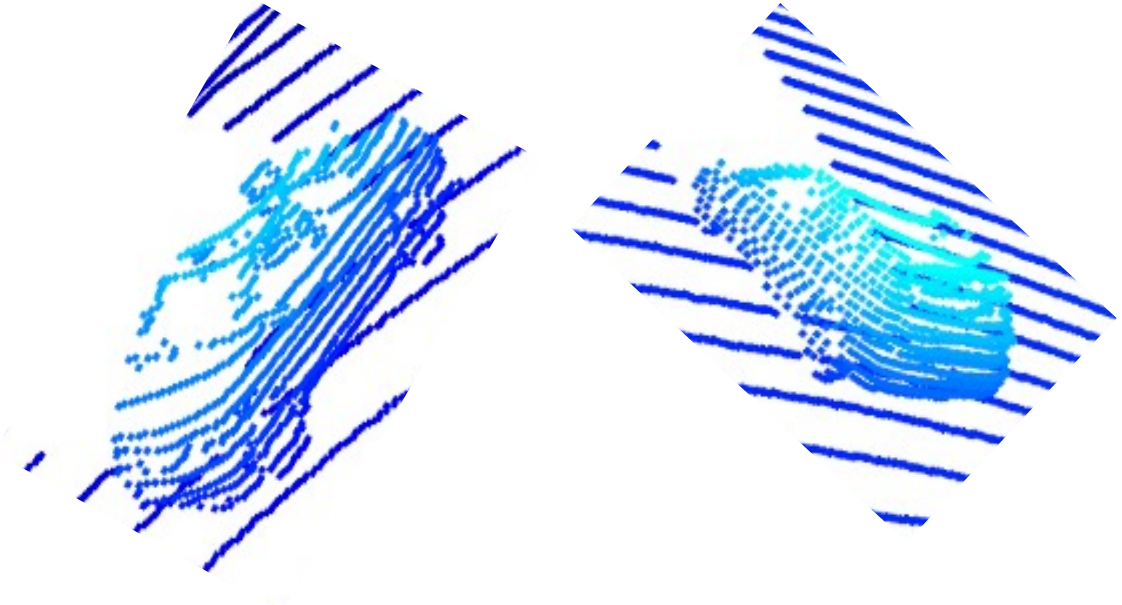
11) There are lidar returns for the 2nd truck in the neighboring right lane (carrying pipes). The algorithm falis to do detect it as vehicle.

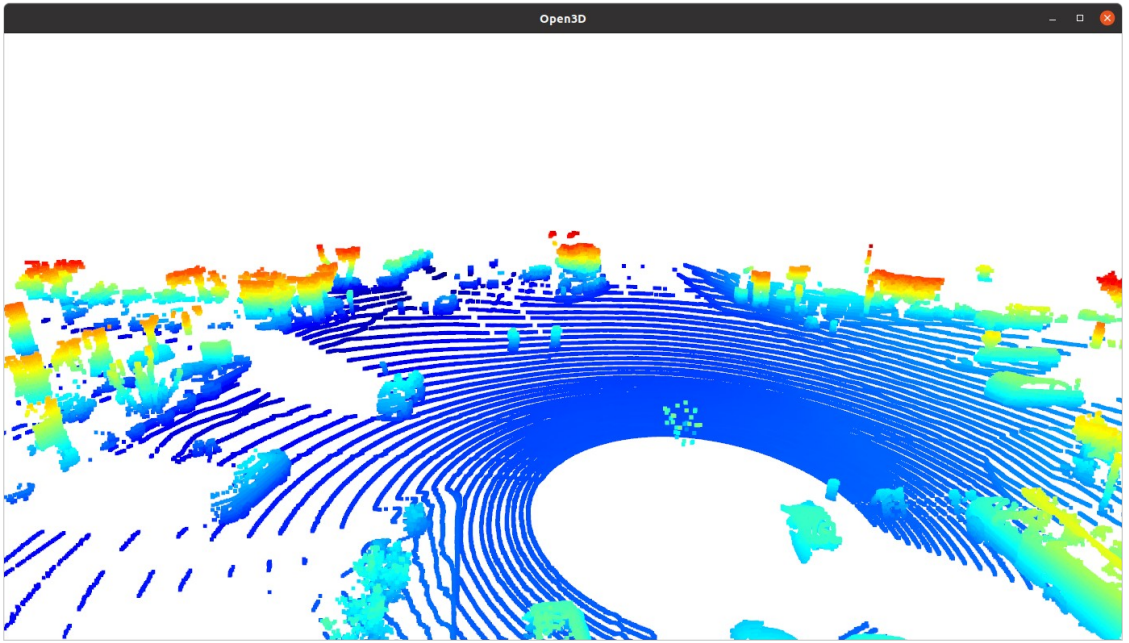
12) The van with trailer in the farthest right lane also shows lidar returns but is hard to detect.



Frame No 50

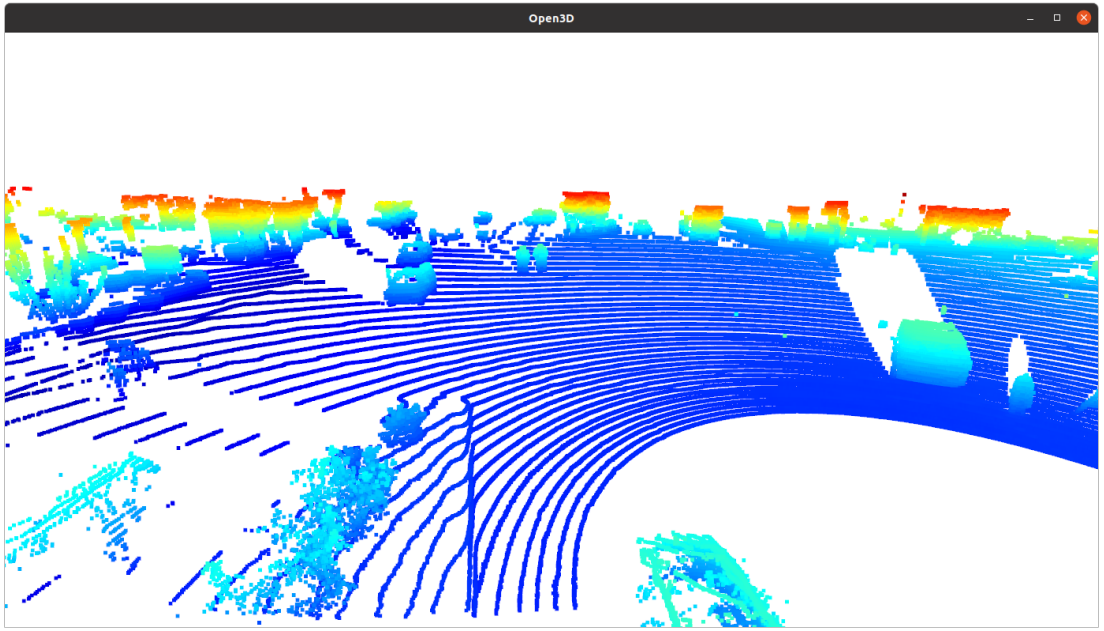
Several cars are clearly visible in both all pcl , bev and camera images.
We can clearly identify oncoming vehicle features from the left car like front hood, windshield , wheels ,
Similarly for the right front vehicle we can see rear windshield , tailgate wheels.

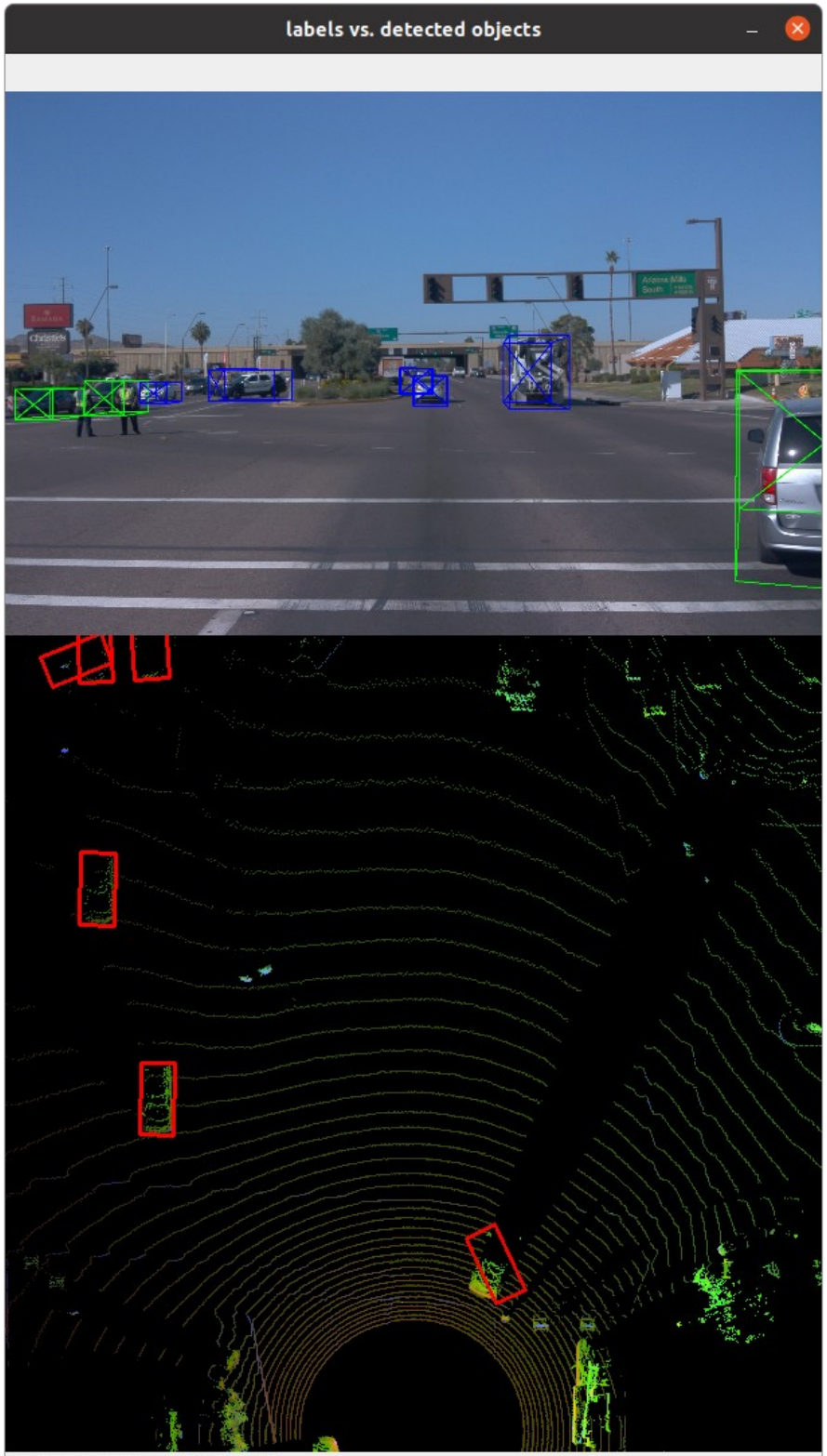




Frame No 171

There are several cars near the cop car. But the pcl visibility is poor.





Frame No 140

The van right in front in the right lane. We can see the bounding box misalignment with the car orientation for several frames. This may lead to missed detection and dangerous situation.

Try to identify vehicle features that appear stable in most of the inspected examples and describe them

Following features appear most stable for the inspected examples. Some of these features like roof and windshield appear as lidar point cloud circular/elongated contour lines in the BEV for feature detection.

For oncoming vehicles - > fascia , front windshield , lidar return contours for the roof of the vehicles.

Vehicles on in the front and side lanes →
rear bumper , truck beds , rear windshield and roof lidar return contours for roof.
Car side doors , and door wind shields.