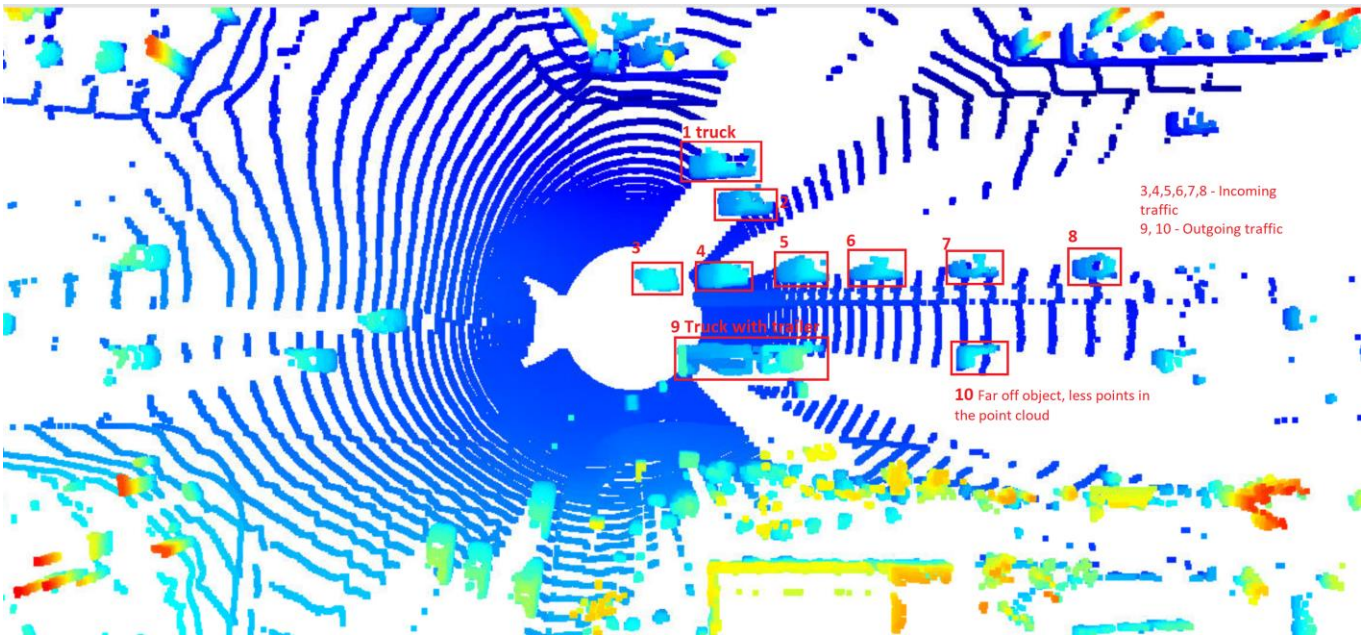
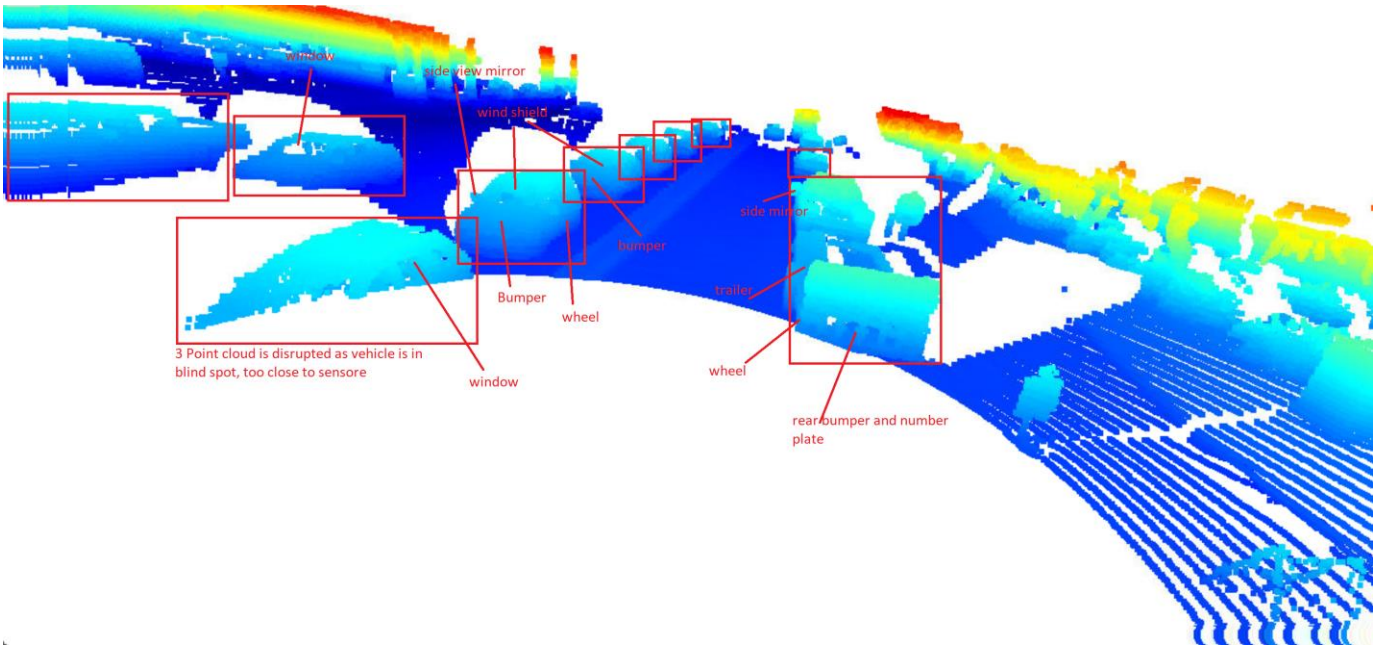
Project: 3D Object Detection

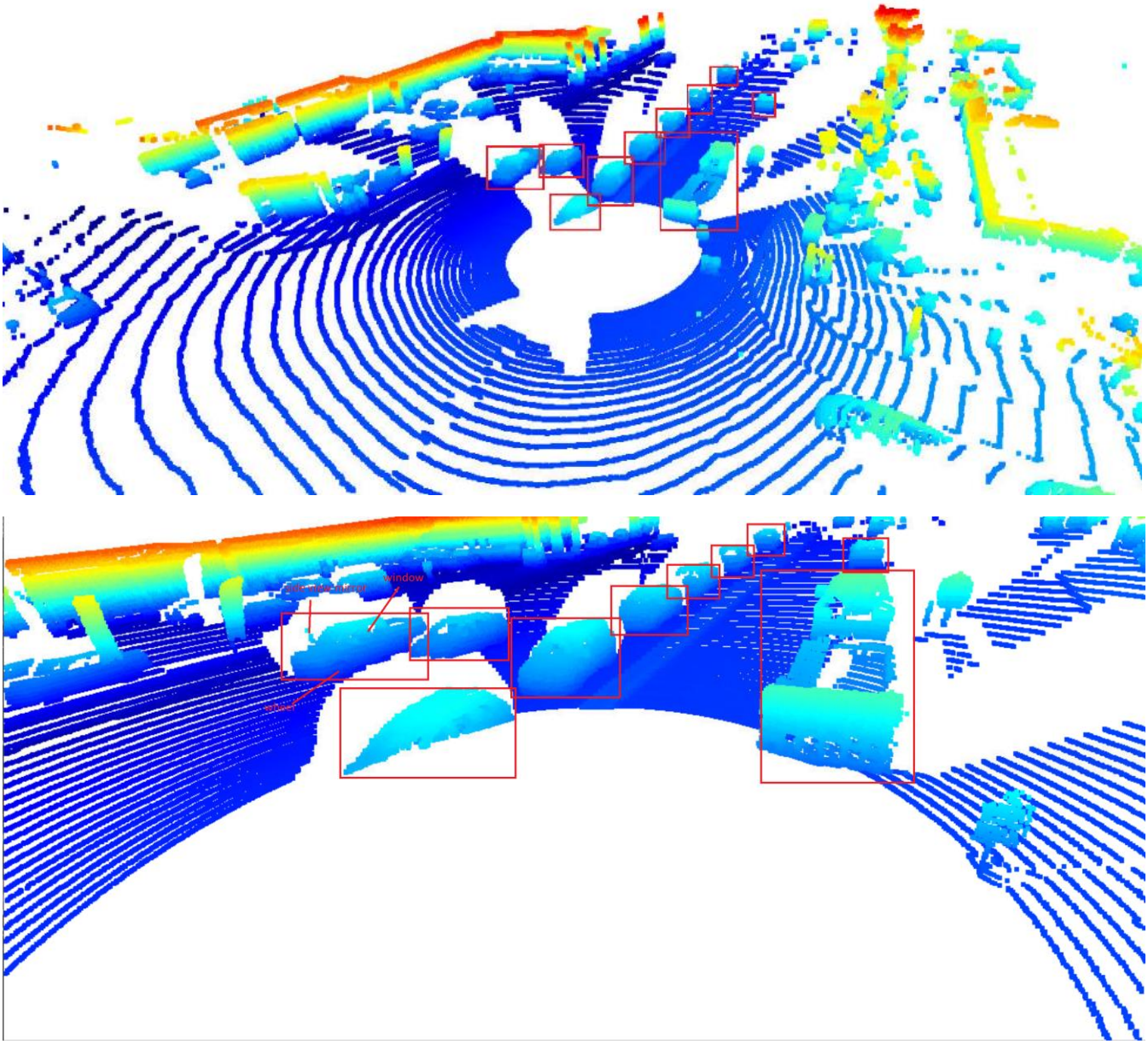
Section 1 : Compute Lidar Point-Cloud from Range Image

In the ten objects marked with red boxes in the images below, we see that as the objects go farther away from the LIDAR, the visibility of these objects in the Point Cloud becomes fainter.

Some of the features that are clearly visible are wind shields, wheels, bumpers, back mirrors and windows in vehicles moving towards the LIDAR and back bumper and number plates in vehicles moving away from the LIDAR.

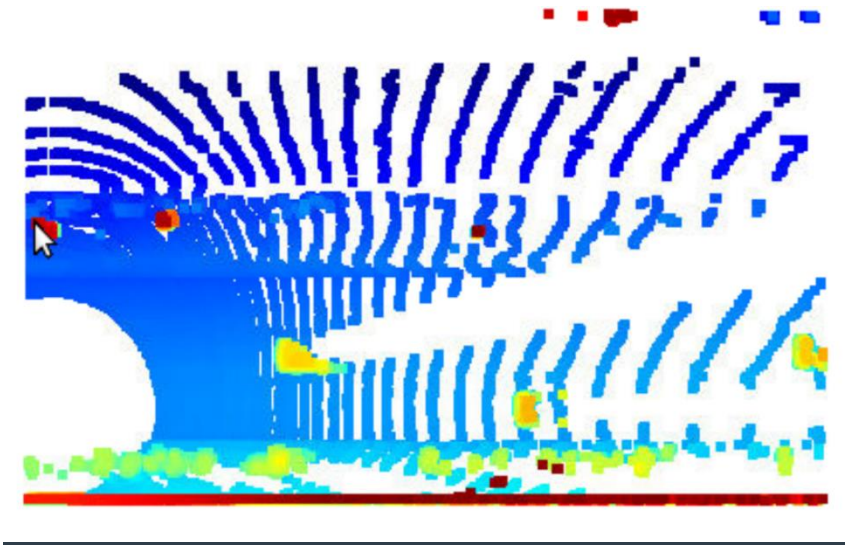


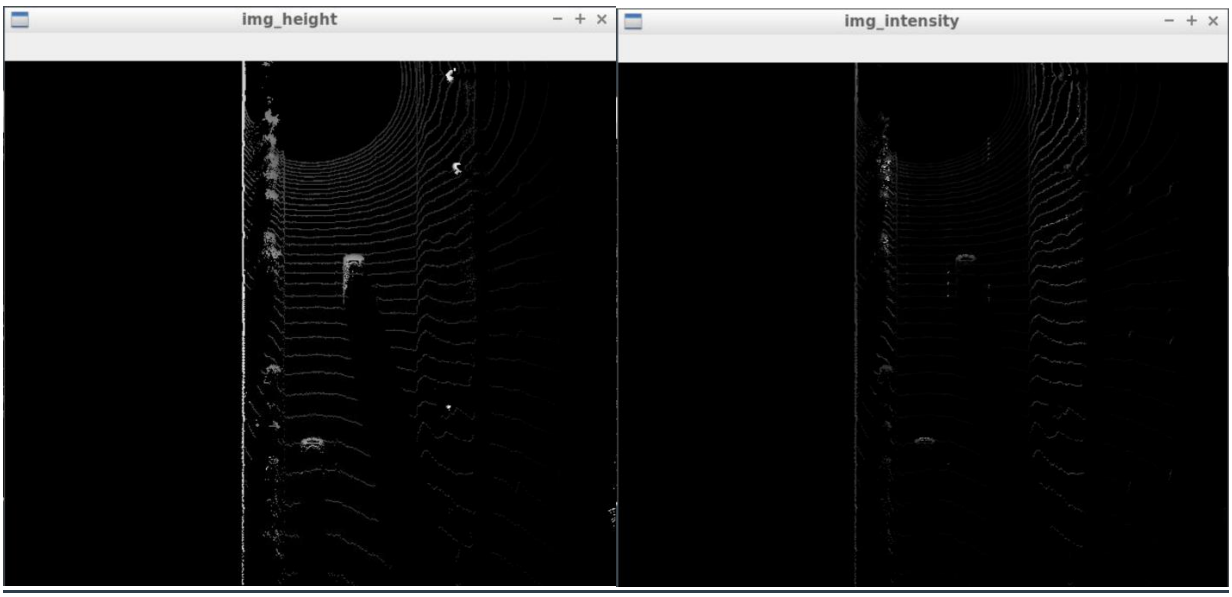




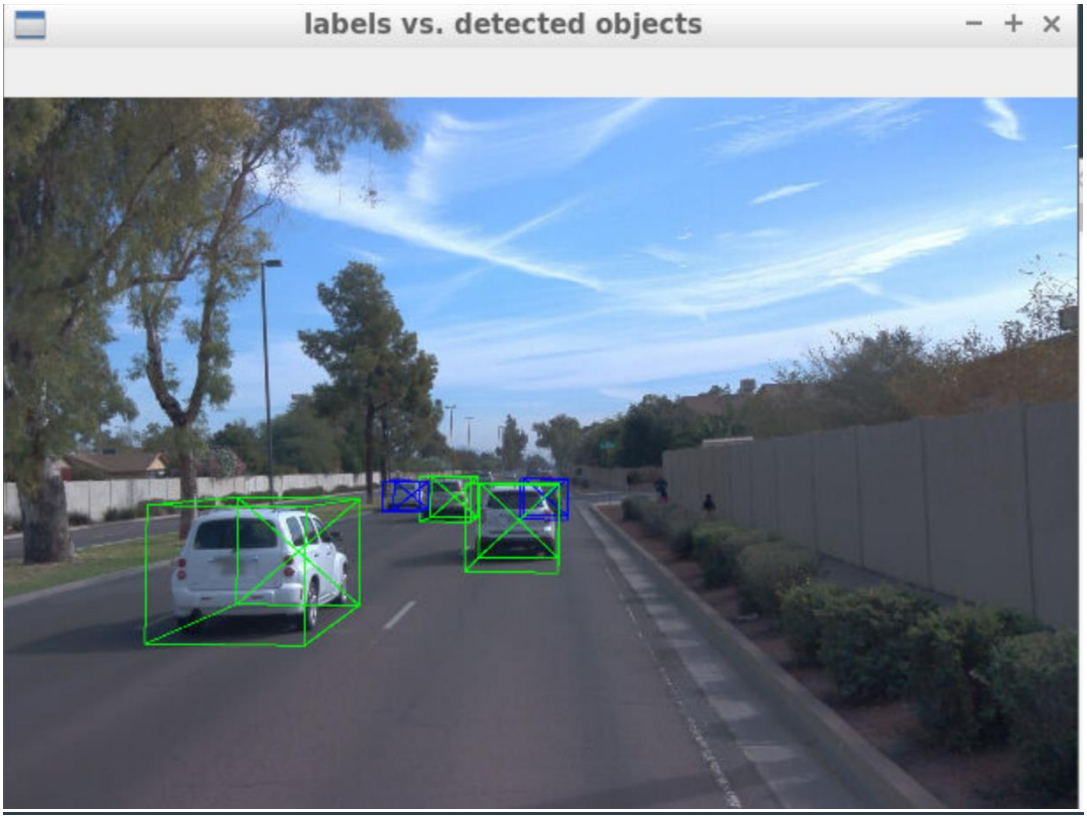
In the range image, the vehicles which are closer appear darker and in the intensity images, reflective surfaces such as vehicle number plates are clearly distinguishable

Section 2 : Create Birds-Eye View from Lidar PCL





Section 3 : Model-based Object Detection in BEV Image



```
(sdc-c2) root@08f7d411272a:/home/workspace# python loop_over_dataset.py
student task ID_S3_EX1-3
using ResNet architecture with feature pyramid
student task ID_S3_EX1-4
Loaded weights from /home/workspace/tools/objdet_models/resnet/pretrained/fpn_re
snet_18_epoch_300.pth

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processing frame #50
computing point-cloud from lidar range image
computing birds-eye view from lidar pointcloud
student task ID_S2_EX1
student task ID_S1_EX2
student task ID_S2_EX2
student task ID_S2_EX3
detecting objects in lidar pointcloud
student task ID_S3_EX1-5
:::Detections:::
[[9.7223872e-01 3.5127075e+02 2.1875238e+02 1.0574490e+00 1.6241086e+00
  2.0172737e+01 4.7542793e+01 1.3822034e-02]
 [6.2091374e-01 3.1184229e+02 3.5521008e+02 1.1316251e+00 1.7765539e+00
  2.0849136e+01 4.6748154e+01 8.4769009e-03]]
:::Detections:::
student task ID_S3_EX2
loading object labels and validation from result file
loading detection performance measures from file
^[------------------------------
```

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processing frame #51
computing point-cloud from lidar range image
computing birds-eye view from lidar pointcloud
student task ID_S2_EX1
student task ID_S1_EX2
student task ID_S2_EX2
student task ID_S2_EX3
detecting objects in lidar pointcloud
student task ID_S3_EX1-5
:::Detections:::
[[ 9.0935498e-01  3.5153265e+02  2.1939409e+02  1.0489278e+00
   1.6082902e+00  2.0308041e+01  4.8363377e+01  1.2367926e-02]
 [ 8.0556726e-01  3.1226596e+02  3.5451572e+02  1.1078370e+00
   1.7661636e+00  2.0709120e+01  4.8925690e+01  6.6410162e-02]
 [ 7.8161055e-01  3.5299170e+02  6.0305402e+02  1.2087984e+00
   1.6976428e+00  1.9822773e+01  5.0056713e+01 -3.2651678e-02]]
:::Detections:::
student task ID_S3_EX2
loading object labels and validation from result file
loading detection performance measures from file
reached end of selected frames
```

Section 4 : Performance Evaluation for Object Detection