

# Master-Praktikum - Learning for self-driving cars and intelligent systems - Winter 2019/20

## Weekly Report : Sensor Modality Fusion

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### Accomplished tasks:

- Reviewed papers on Sensor Modality Fusion -

- PointFusion: Deep Sensor Fusion for 3D Bounding Box Estimation

Key Takeaways: Point Fusion Architecture - 3 main components : CNN for RGB image, PointNet for 3D point cloud, Fusion network. Main Dataset used: KITTI ( [http://www.cvlibs.net/datasets/kitti/raw\\_data.php](http://www.cvlibs.net/datasets/kitti/raw_data.php) )

- Deep Continuous Fusion for Multi-Sensor 3D Object Detection

Key Takeaways: Point Fusion Architecture - 2 main streams: one uses ResNet for RGB image to create multi-layer feature maps. The other represents LiDAR point cloud with voxels and then applies ResNet to create multi-layer BEV feature maps. At each layer of two streams the author uses continuous fusion layer to fuse data from both sensors. Main Dataset used: KITTI ( [http://www.cvlibs.net/datasets/kitti/raw\\_data.php](http://www.cvlibs.net/datasets/kitti/raw_data.php) ) and TOR4D(source not found)

- Multi-Task Multi-Sensor Fusion for 3D Object Detection

Key Takeaways: Point Fusion Architecture - based on the architecture in “Deep Continuous Fusion for Multi-Sensor 3D Object Detection”, it adds

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ROI-wise feature fusion. The architecture also exploits two auxiliary tasks to improve 3D detection, namely ground estimation and depth completion.

Main Dataset used: KITTI ( [http://www.cvlibs.net/datasets/kitti/raw\\_data.php](http://www.cvlibs.net/datasets/kitti/raw_data.php) ) and TOR4D(source not found)

- Took a look at the datasets available:
  - KITTI : Raw image data, 3D Velodyne points
  - NUSCENES: Raw image data(6 images per scene: front, front left, front right, back, back left, back right), LiDAR point cloud, radar(5 data per scene: front, front left, front right, back left, back right)
  - LEVEL 5: 29GB (to be explored)
  - Waymo: 1TB (to be explored)
  - TOR4D: (to be found)
- Found some source code available online for PointFusion

### **Tasks planned for next week:**

- Look deeper into the dataset and get familiar with it.
- Try to use the available source code for PointFusion and implement it.

### **Issues / Roadblocks:**

- Faced some difficulty in finding implementations online for the papers referred that could be used as a baseline.
- Faced some issues viewing the dataset provided by Waymo