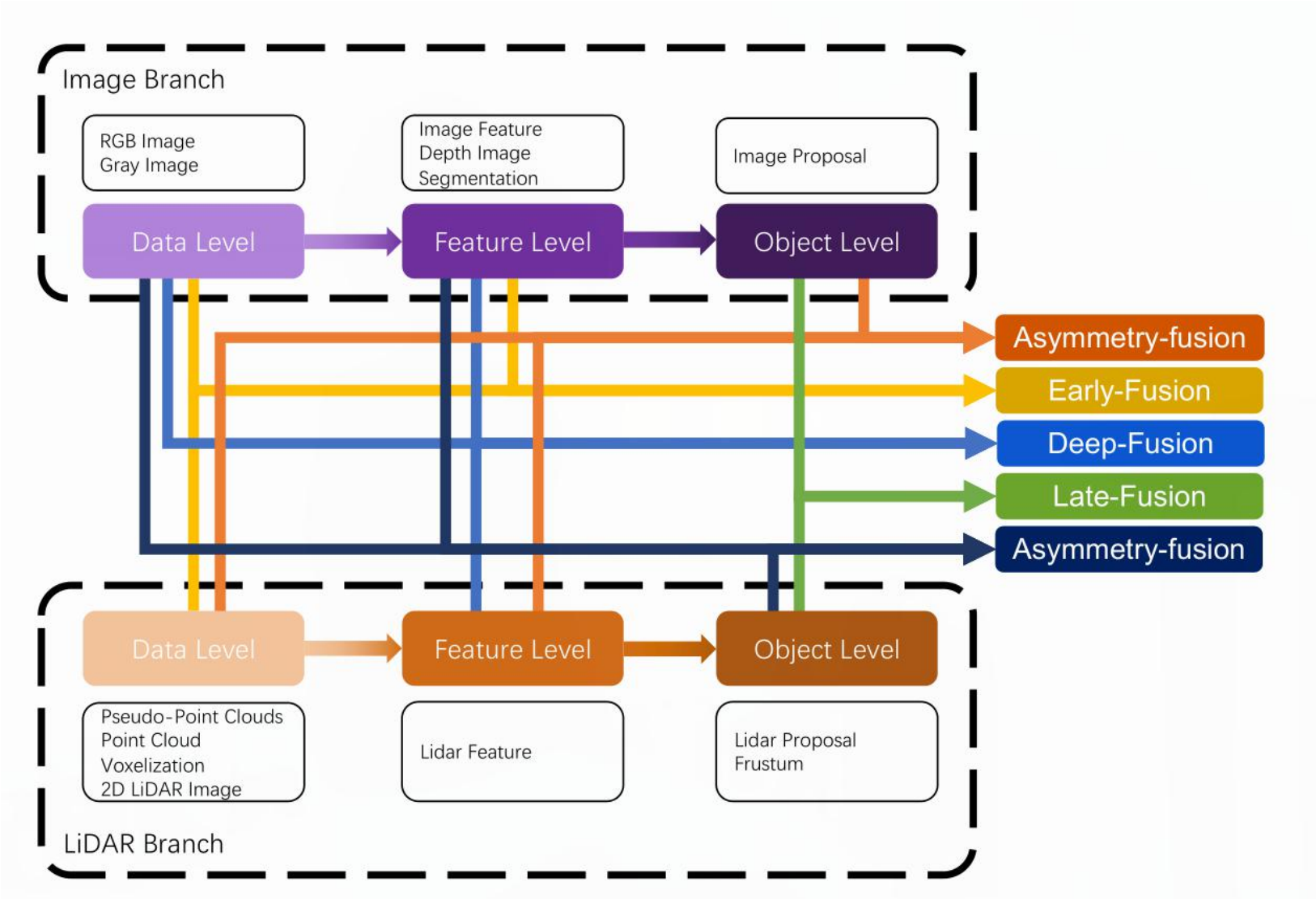
Multi-modal Sensor Fusion

汇报人：罗宏宇

Taxononmy

Fusion is divided into four cateories, as early-fusion, deep fusion, late fusion and asymmetry fusion



Early-fusion

Early-fusion fuses LiDAR data at data-level and camera data at data-level or feature-level

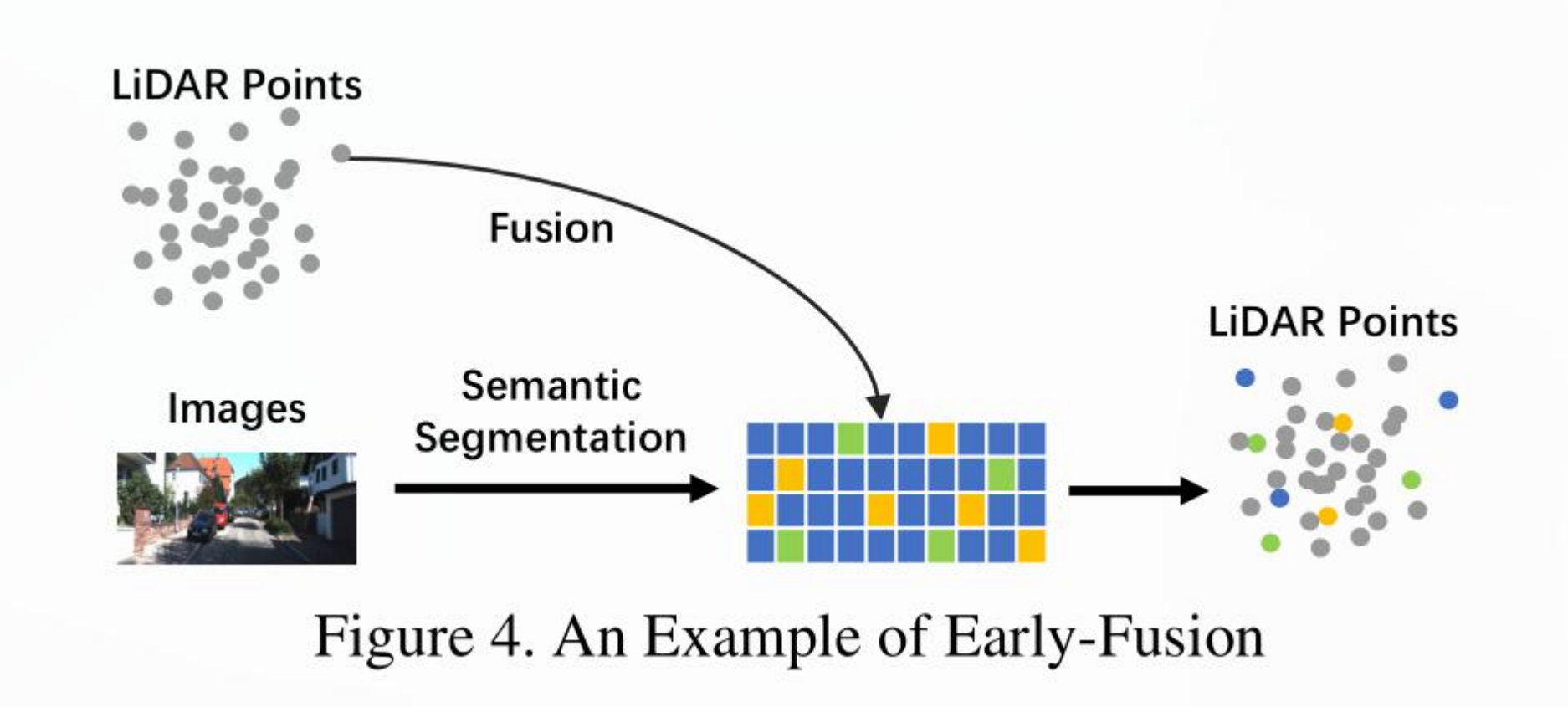


Figure 4. An Example of Early-Fusion

Deep-Fusion

Deep-fusion methods fuse cross-modal data at the feature level for the LiDAR branch but data-level and feature-level for the LiDAR branch but data-level and feature-level for the image branch.

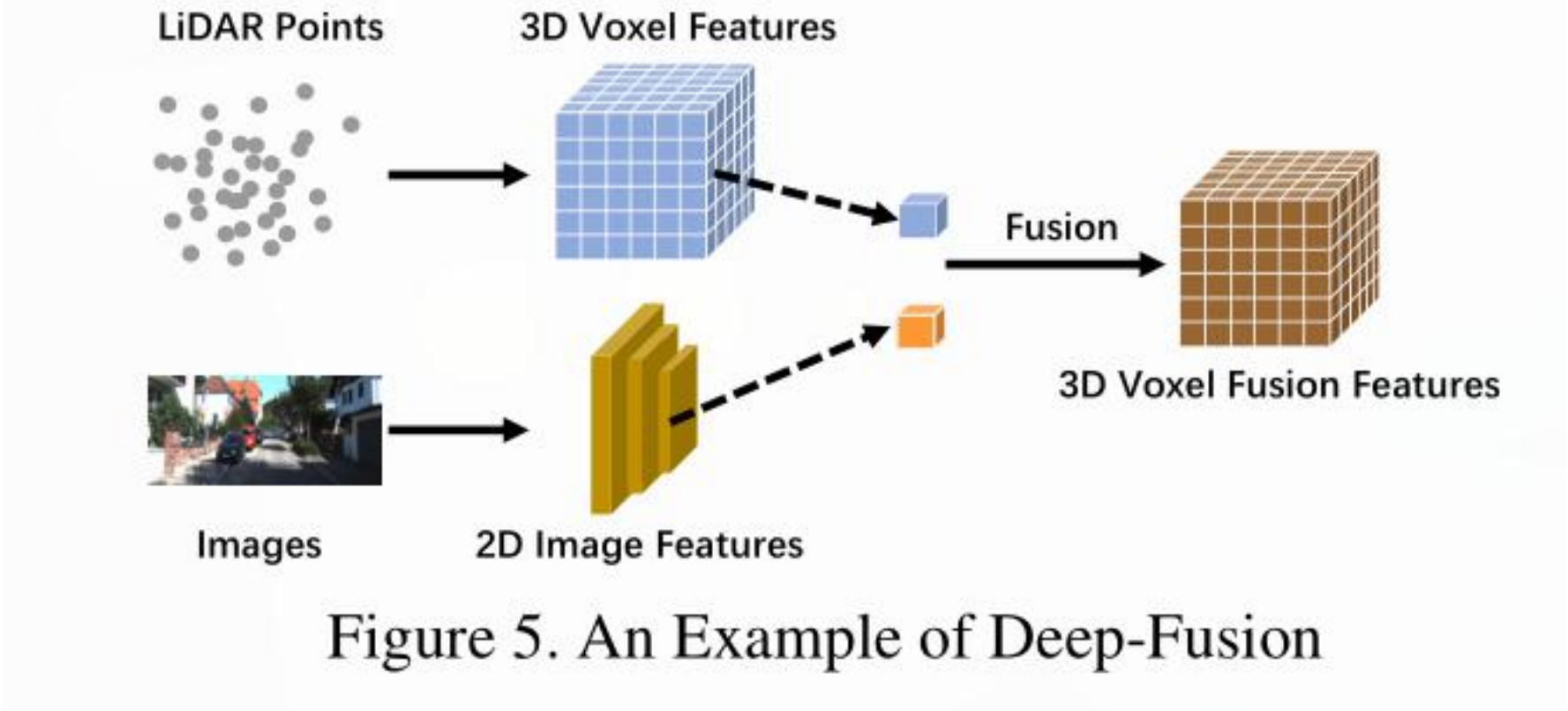
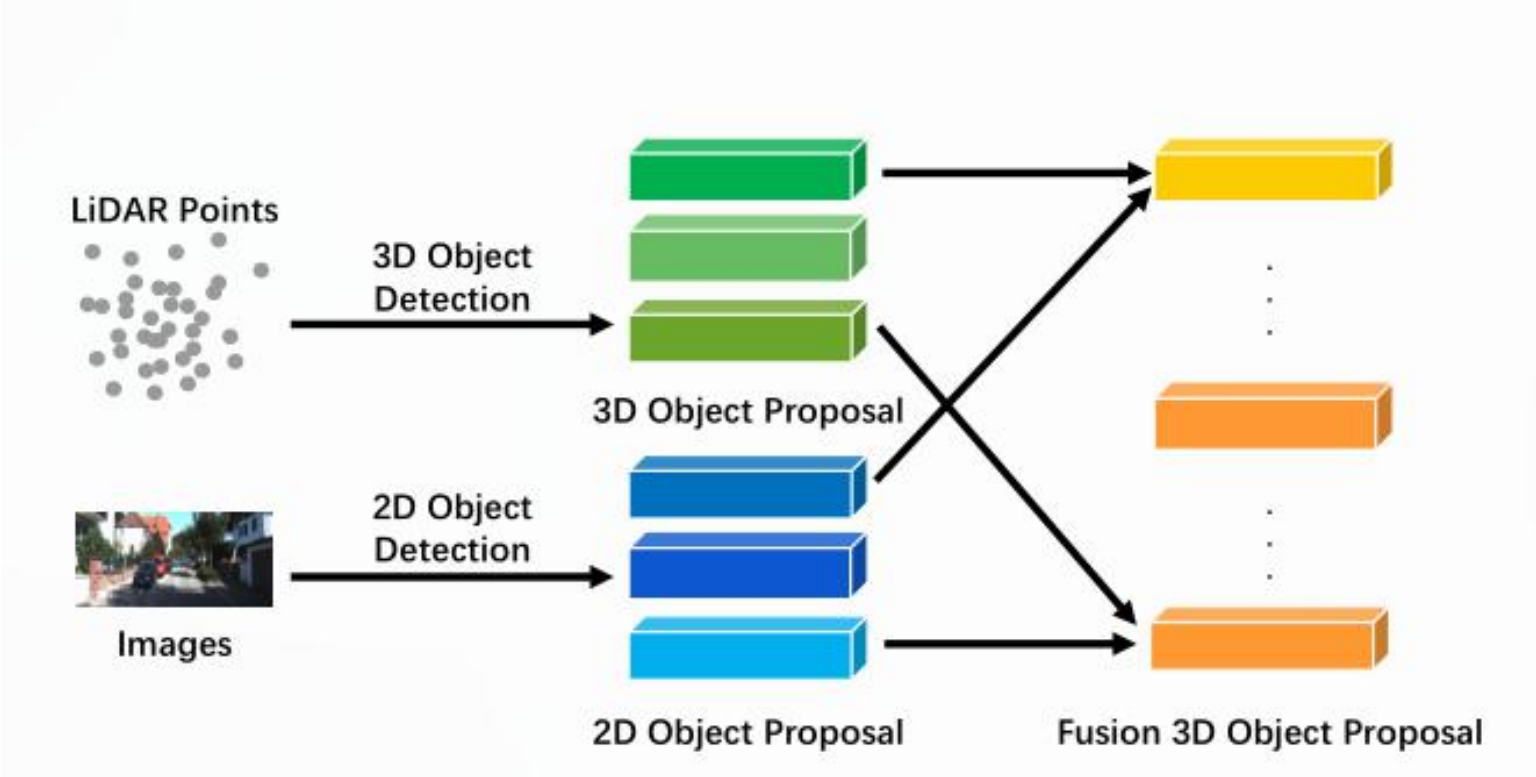


Figure 5. An Example of Deep-Fusion

Late-fusion

Late-fusion, also known as object-level fusion, denotes the methods that fuse the result of pipelines in each modality



Asymmetry-Fusion

Asymmetry-fusion fuses object-level information from one branch while data-level or feature-level from other branches.

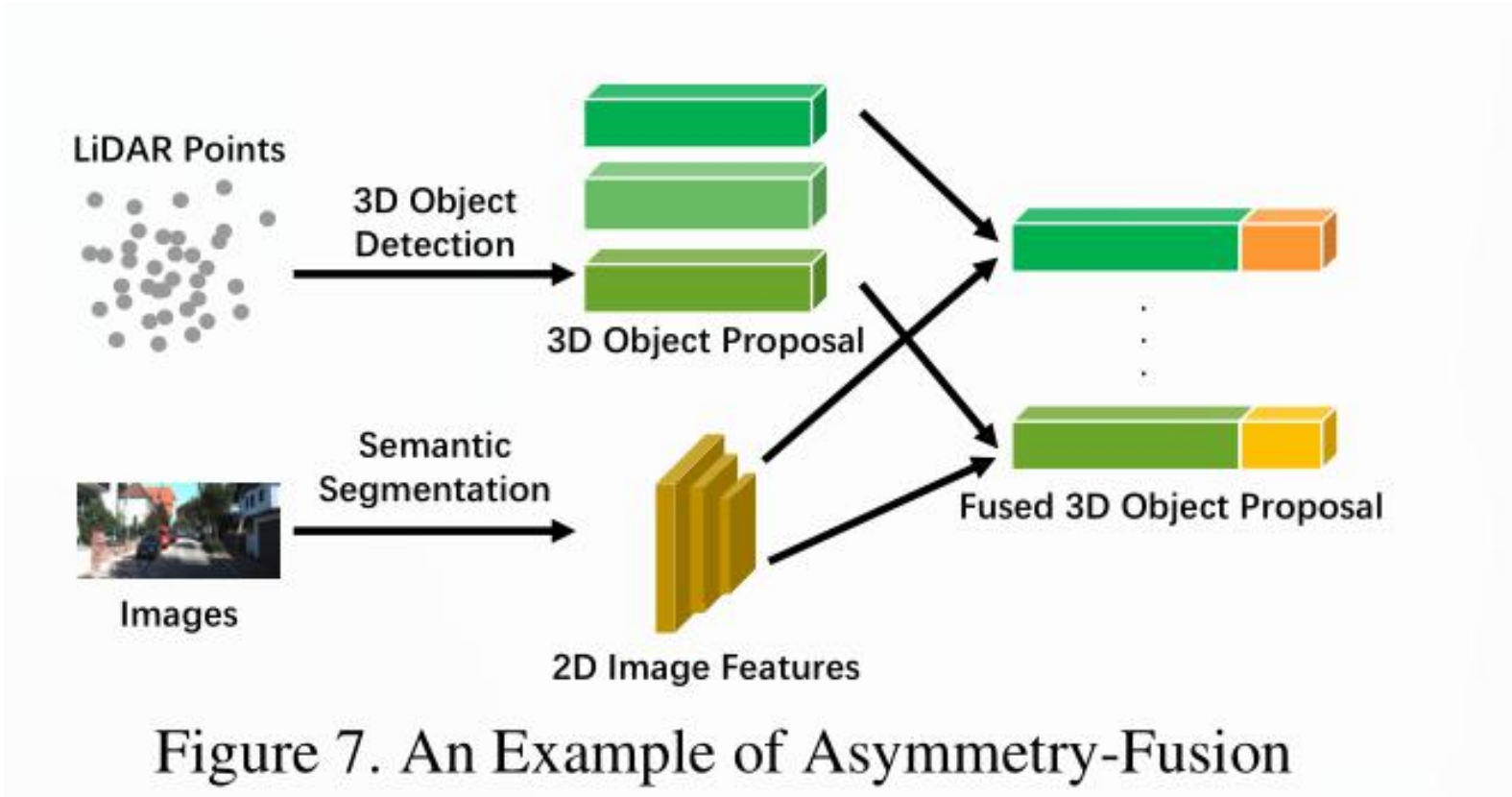


Figure 7. An Example of Asymmetry-Fusion

3d detection task on KITTI

Table 3. Survey of 3D Task Results in KITTI [26] for Test Dataset

Method	Year	Car			Pedestrian			Cyclist		
		Easy	Mod	Hard	Easy	Mod	Hard	Easy	Mod	Hard
Early-Fusion										
PFF3D [87]	2021	81.11	72.93	67.24	43.93	36.07	32.86	63.27	46.78	41.37
Painted PointRCNN [76]	2020	82.11	71.70	67.08	50.32	40.97	37.87	77.63	63.78	55.89
PI-RCNN [90]	2020	84.37	74.82	70.03	-	-	-	-	-	-
Complexer-YOLO [68]	2019	55.93	47.34	42.60	17.60	13.96	12.70	24.27	18.53	17.31
MVX-Net(PF) [69]	2019	83.20	72.70	65.20	-	-	-	-	-	-
Deep-Fusion										
RoIFusion [9]	2021	88.09	79.36	72.51	42.22	35.14	32.92	80.84	64.05	58.37
EPNet [32]	2020	89.81	79.28	74.59	-	-	-	-	-	-
MAFF-Net [105]	2020	85.52	75.04	67.61	-	-	-	-	-	-
SemanticVoxels [22]	2020	-	-	-	50.90	42.19	39.52	-	-	-
MVAF-Net [78]	2020	87.87	78.71	75.48	-	-	-	-	-	-
3D-CVF [102]	2020	89.20	80.05	73.11	-	-	-	-	-	-
MMF [45]	2019	88.40	77.43	70.22	-	-	-	-	-	-
SCANet [49]	2019	76.09	66.30	58.68	-	-	-	-	-	-
ContFuse [46]	2018	83.68	68.78	61.67	-	-	-	-	-	-
PointFusion [92]	2018	77.92	63.00	53.27	-	-	-	-	-	-
SparsePool [85]	2018	-	-	-	37.84	30.38	26.94	40.87	32.61	29.05
Late-Fusion										
CLOCs [55]	2020	89.16	82.28	77.23	-	-	-	-	-	-
Asymmetry-Fusion										
VMVS [40]	2019	-	-	-	53.44	43.27	39.51	-	-	-
MLOD [17]	2019	77.24	67.76	62.05	47.58	37.47	35.07	68.81	49.43	42.84
MV3D [12]	2017	74.97	63.63	54.00	-	-	-	-	-	-
Weak-Fusion										
Faraway-Frustum [104]	2020	87.45	79.05	76.14	46.33	38.58	35.71	77.36	62.00	55.40
F-ConvNet [83]	2019	87.36	76.39	66.69	52.16	43.38	38.80	81.98	65.07	56.54
IPOD [99]	2018	79.75	72.57	66.33	56.92	44.68	42.39	71.40	53.46	48.34
F-PointNet [60]	2018	82.19	69.79	60.59	50.53	42.15	38.08	72.27	56.12	49.01

This Week

- Paper Sharing (周六)——multi-modal fusion in self-driving perception
  - representations for different modal
  - fusion taxonomy and methods
  - performance comparison
  - trend