Master's Thesis: GraphRelate3D: Context-Dependent 3D Object Detection

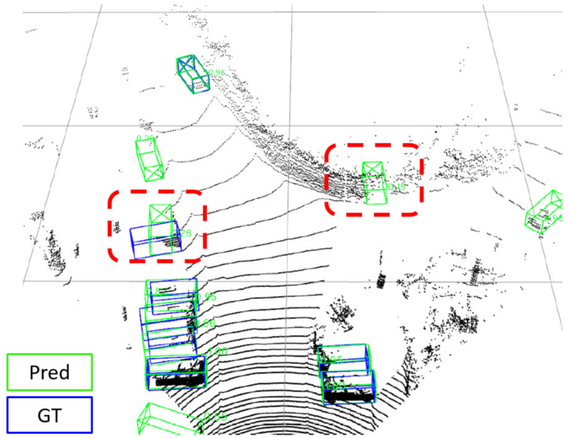
Robotics, Artificial Intelligence and Embedded Systems

Limitations of current 3D detctors:

Due to Occlusions & Sparsity Point Cloud

-> Wrong orientation

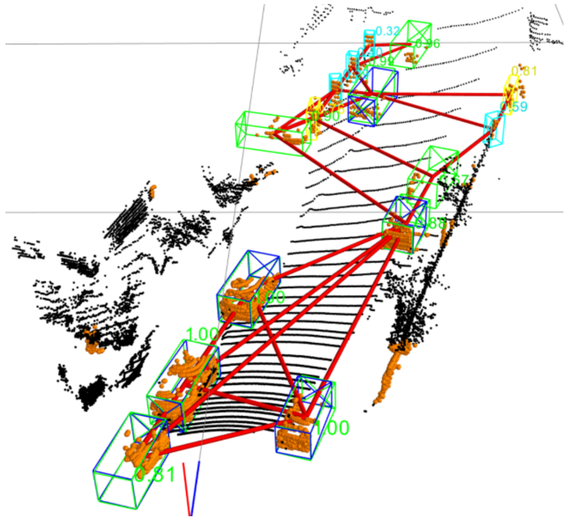
-> False positives



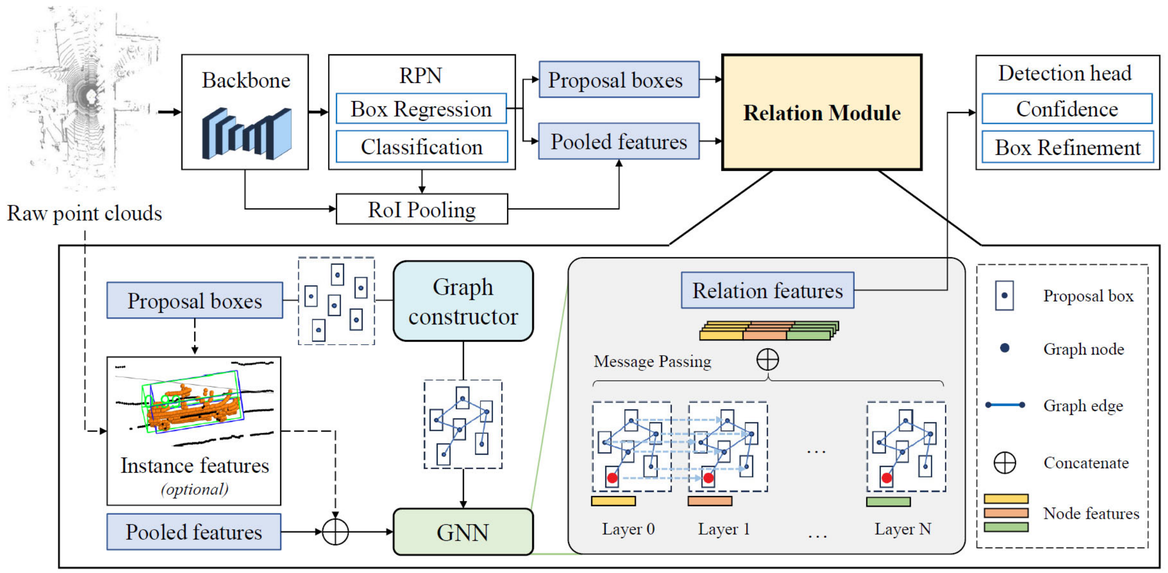
Motivation:

Exploit Object Relation explicitly

- Construct Graphs to model relation
- Learn relation features explicitly
- Message passing with GNN



Pipeline



Results: Comparison with other SOTA methods, the baseline models (PV-RCNN and PartA2), and ours on the KITTI validation set for car class

Method	Car - 3D AP (%) ↑ Easy	Mod.	Hard	Car - BEV AP (%) ↑ Easy	Mod.	Hard
SECOND [23]	87.43	76.48	69.10	89.96	87.07	79.66
CIA-SSD [24]	90.04	79.81	78.80	-	-	-
SSL Point-GNN [5]	91.43	82.85	80.12	93.55	89.79	87.23
PointRCNN [25]	88.88	78.63	77.38	-	-	-
PartA^2	92.28	82.70	80.41	93.33	**89.69**	88.40
PartA^2 Relation (ours)	**92.53**	**83.15**	**80.88**	**95.89**	89.45	**89.19**
Improvement	+0.25	+0.45	+0.47	+2.56	-0.24	+0.79
PV-RCNN	91.91	84.78	82.63	93.17	90.72	88.73
PV-RCNN Relation (ours)	**92.73**	**85.52**	**83.21**	**95.48**	**91.25**	**89.09**
Improvement	+0.82	+0.74	+0.58	+2.31	+0.53	+0.36