3D Object Detection and Re-localization in Indoor Scenes

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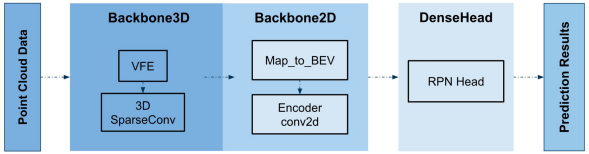
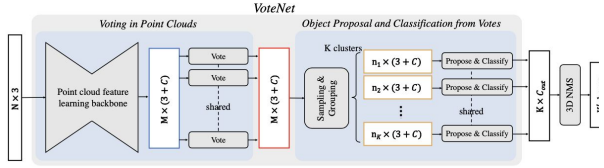
Introduction:

3D object detection in indoor point clouds is a core ingredient in many home intelligent systems. The goal of it is to estimate oriented 3D bounding boxes as well as semantic classes of objects from point clouds.

CenterPoint is a SOTA method targeting outdoor point clouds detection. However, it has seldom been tested in indoor scenes. To this end, we decide to test CenterPoint on two indoor datasets - 3RScan and ScanNet. We also conduct experiments with another SOTA indoor detector VoteNet on 3RScan to have a fair comparison. Our study shows that CenterPoint with some modifications can perform quite well in indoor scenes.



one-staged CenterPoint



VoteNet architecture

Main Results:

	Input	mAP@0.25	mAP@0.5
VoteNet	Geo	30.0	7.4
original CenterPoint	Geo	16.6	2.3
tuned CenterPoint	Geo	**34.0**	**9.4**

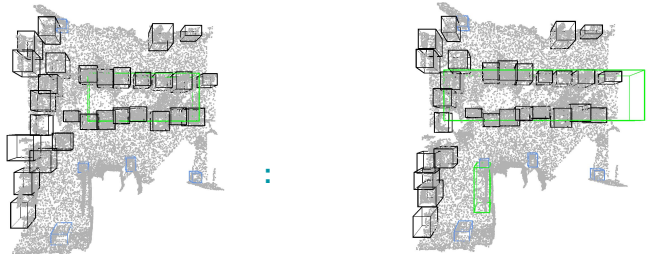
3D object detection results on 3RScan val set.

	Input	mAP@0.25	mAP@0.5
3D-SIS	Geo + 5 views	40.2	22.5
VoteNet	Geo	**58.6**	**33.5**
original CenterPoint	Geo	29.3	13.6
tuned CenterPoint	Geo	45.7	31.2

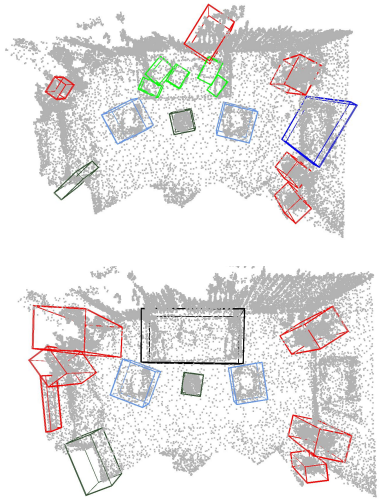
3D object detection results on ScanNetV2 val set.

	Recall	MRE[deg]	MTE[m]
VoteNet	7.94	**9.32**	0.080
CenterPoint	**12.94**	9.52	**0.069**

3D object relocalization results on 3RScan val set.



Visualization on ScanNetV2. Left: CenterPoint prediction, Right: ground truth.



Visualization on 3RScan. Up: CenterPoint prediction, Down: ground truth.

My Contributions:

- Processing of Dataset 3RScan to fit both nets.
- Testing and fine tuning CenterPoint on 3RScan.
- Redefining and conducting the relocalization experiments with CenterPoint and VoteNet on 3RScan.
- Visualization with Open3d