Learning and Memorizing Representative Prototypes for 3D Point Cloud Semantic and Instance Segmentation – Supplementary Material

In this supplementary material, we provide more detailed experimental results, including:

- Both qualitative and quantitative results on the "Chair" category in PartNet [3];
- More visualization of our approach on S3DIS [1] and ScanNetV2 [2].

1. Experimental Results on PartNet dataset [3]

In Figure 3 in the main paper, to better understand the learned memory prototypes, we do visualization relying on the category of "Chair" in PartNet [3]. PartNet [3] is a consistent dataset of 3D objects with fine-grained and hierarchical 3D part annotations. In this section, we report the quantitative results in Table 1. **Level-1** refers to the coarsest annotation and **Level-3** refers to the most fine-grained annotation as defined in [3]. For fair comparison, all results are evaluated with the same backbone PointNet++ [4]. Our method outperforms the previous methods by a large margin, showing the flexibility of our method to handle various types of input data. Moreover, visualization examples of the results are shown in Figure 1, indicating that our method can handle both rare and common cases well.

Table 1 – Comparison of the per-level performance of our method with the state-of-the-art methods on "Chair" category in PartNet [3]. The performance is evaluated using part-category mAP, with IoU threshold of 0.5. All the results are achieved with the same backbone: PointNet++ [4].

Method	Year	**Level-1**	**Level-2**	**Level-3**
SGPN [5]	2019	72.4	25.4	19.4
PartNet [3]	2019	74.4	35.5	29.0
GSPN [6]	2019	-	-	26.8
Ours	-	**79.9**	**41.2**	**32.5**

2. More Visualization Results

In the main paper, we illustrate the quantitative results on S3DIS [1] and ScanNetV2 [2] datasets in Table 2 and 4, respectively. Visualization examples of both semantic and instance segmentation results on S3DIS and ScanNetV2 datasets are shown in Figure 2 in the following.

References

[1] Iro Armeni, Ozan Sener, Amir R. Zamir, Helen Jiang, Ioannis Brilakis, Martin Fischer, and Silvio Savarese. 3D Semantic Parsing of Large-Scale Indoor Spaces. In *Proc. IEEE Conf. Comp. Vis. Patt. Recogn.*, 2016. 1, 2

[2] Angela Dai, Angel X. Chang, Manolis Savva, Maciej Halber, Thomas Funkhouser, and Matthias Nießner. ScanNet: Richly-annotated 3D Reconstructions of Indoor Scenes. In *Proc. IEEE Conf. Comp. Vis. Patt. Recogn.*, 2017. 1, 2

[3] Kaichun Mo, Shilin Zhu, Angel X. Chang, Li Yi, Subarna Tripathi, Leonidas J. Guibas, and Hao Su. PartNet: A Large-scale Benchmark for Fine-grained and Hierarchical Part-level 3D Object Understanding. In *Proc. IEEE Conf. Comp. Vis. Patt. Recogn.*, 2019. 1, 2

[4] Charles R Qi, Li Yi, Hao Su, and Leonidas J. Guibas. PointNet++: Deep Hierarchical Feature Learning on Point Sets in a Metric Space. In *Proc. Advances in Neural Inf. Process. Syst.*, 2017. 1

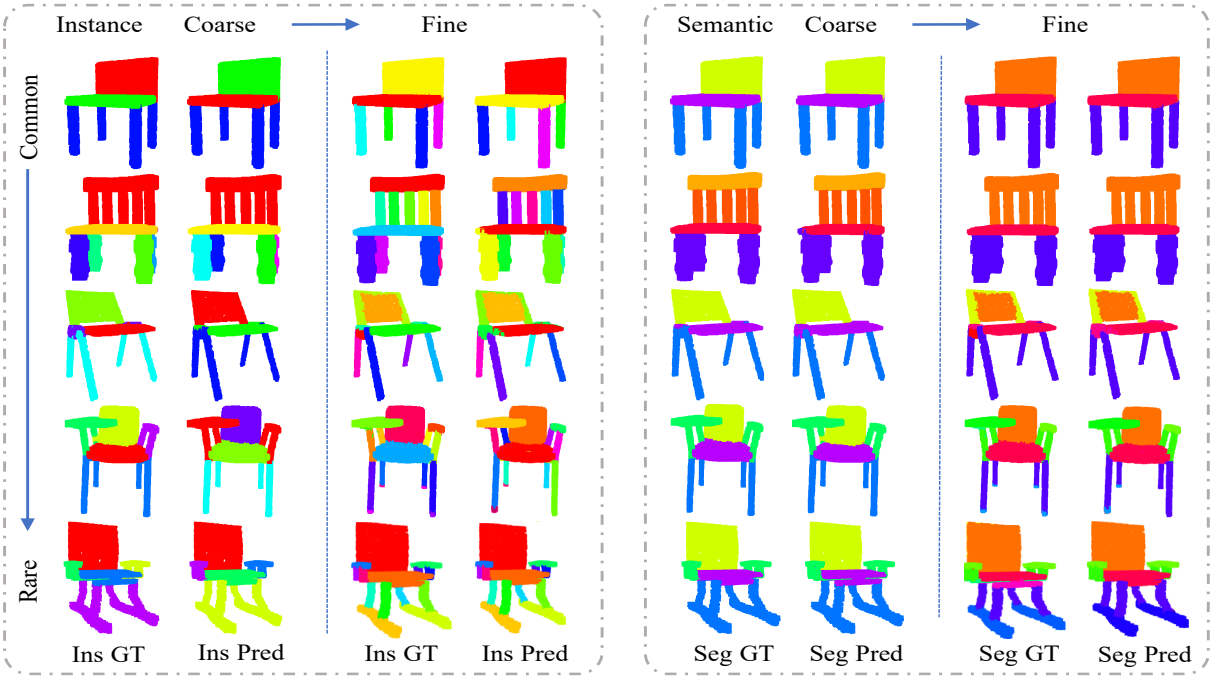

Figure 1 – Visualization of the performance of on PartNet [3]. Both coarse and fine-grained results are provided. Note that different instance are shown with different colors, and the same instance are not necessarily have the same color in ground truth and prediction presentation.

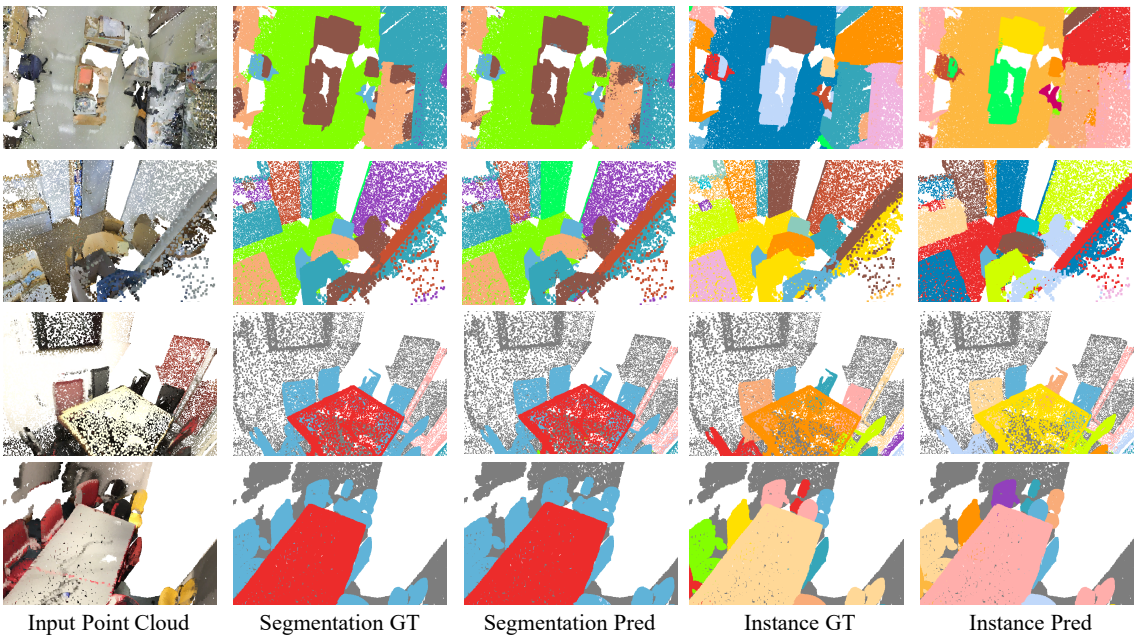

Figure 2 – Visualization of the performance of on S3DIS [1] and ScanNetV2 [2]. Both instance and semantic segmentation results are provided. Note that different instance are shown with different colors, and the same instance are not necessarily have the same color in ground truth and prediction presentation.

[5] Weiyue Wang, Ronald Yu, Qiangui Huang, and Ulrich Neumann. SGPN: Similarity Group Proposal Network for 3D Point Cloud Instance Segmentation. In *Proc. IEEE Conf. Comp. Vis. Patt. Recogn.*, 2018. 1

[6] Li Yi, Wang Zhao, He Wang, Minhyuk Sung, and Leonidas J. Guibas. GSPN: Generative Shape Proposal Network for 3d Instance Segmentation in Point Cloud. In *Proc. IEEE Conf. Comp. Vis. Patt. Recogn.*, 2018. 1