# Two-phase Pseudo Label Densification for Self-training based Domain Adaptation -Supplementary Material-


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## A Appendix

### A.1 Train/Val performance curve analysis

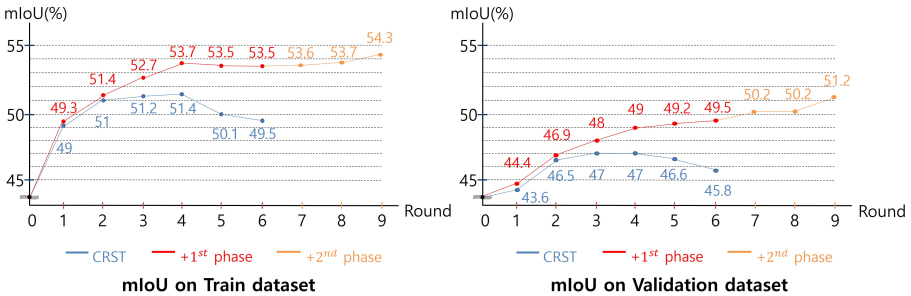


Fig. 1: mIoU value is plotted per each round on GTA to Cityscapes.

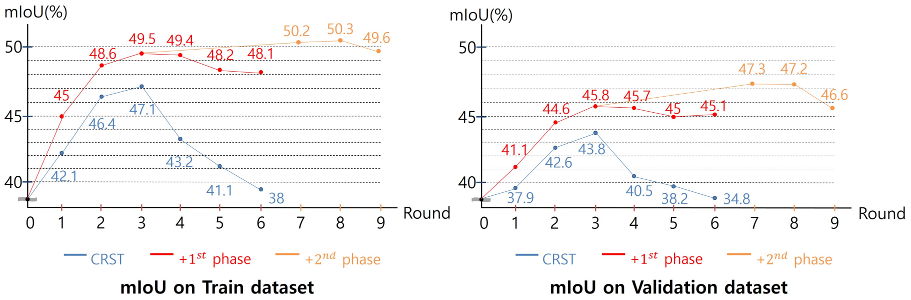


Fig. 2: mIoU value is plotted per each round on SYNTHIA to Cityscapes.

To better understand the effect of TPLD, we conduct performance curve analysis in Fig. 1 and Fig. 2. We train the model a total of 9 rounds, 6 rounds for the 1st phase training, and the rest 3 rounds for the 2nd phase training. First, consider the blue curve, which indicates the CRST baseline performance. Notably, as each round passes, performance increases to a certain degree, but then starts to degrade. This tendency holds for both GTA and SYNTHIA datasets. We see this is because an adequate model learning is not capable with the original formulation; In practice, the pseudo label becomes denser as round passes [1,2]. Though, if it is not effectively utilized, the noisy prediction is instead accumulated in the label as round passes, inhibiting the effective model learning of subsequent rounds. However, when the proposed 1st phase pseudo label densification approach is applied (i.e., red curve), the performance degradation is mitigated, demonstrating the efficacy of 1st phase training. We argue that using both voting-based densification and bootstrapped self-training loss brings rich training signals and some extent of regularization effect simultaneously. Moreover, we observe the second phase training (i.e., orange curve) further improves the performance, implying that the 2nd phase is complementary to the 1st phase.

## References

1. Zou, Y., Yu, Z., Kumar, B.V., Wang, J.: Unsupervised domain adaptation for semantic segmentation via class-balanced self-training. In: Proc. of European Conf. on Computer Vision (ECCV). pp. 289–305 (2018) 2
2. Zou, Y., Yu, Z., Liu, X., Kumar, B.V., Wang, J.: Confidence regularized self-training. In: Proc. of Int'l Conf. on Computer Vision (ICCV) (October 2019) 2