

Supplementary Materials: Cross-Class Domain Adaptive Semantic Segmentation with Visual Language Models

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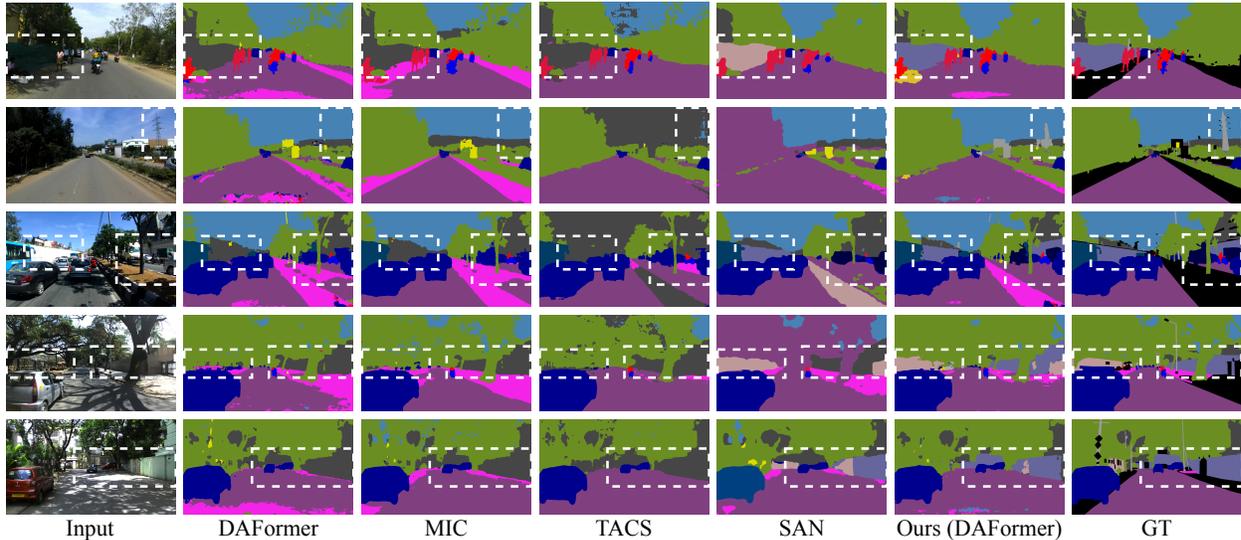


Figure 1: Segmentation results predicted by the previous SOTA UDA methods [3, 4], the VLM-based method [8], the CCDA method [2], and our presented framework on the SYNTHIA \rightarrow IDD benchmark. The novel classes are highlighted by white dashed boxes.

1 OVERVIEW

In this supplementary material, we provide more information to support our proposed method. In Sec. 2, we extend the SOTA comparison on the SYNTHIA \rightarrow IDD benchmark and qualitatively discuss the generalizability of our proposed method with various UDA frameworks. In Sec. 3, we illustrate the potential limitations and promising future directions.

2 ADDITIONAL EXPERIMENTS

In our main paper, we validate the effectiveness and applicability of our method across various UDA frameworks and different CCDA scenarios. To further support the claims made in our main paper, here, we will provide qualitative results of various methods on the SYNTHIA \rightarrow IDD benchmark, as well as the performance gains of our method under different UDA frameworks.

2.1 Comparison with SOTA methods

In our main paper, we only report the quantitative results of our proposed method and previous competitive methods [1–5] on the SYNTHIA \rightarrow IDD benchmark. Thus, in this section, we delve into a qualitative analysis of our proposed elements. As demonstrated in Figure 1, previous UDA methods [3, 4] often recognize novel classes as shared ones. In contrast, our proposed method addresses these issues by relabeling and augmenting pseudo labels with mask proposals for novel classes. For example, in the first row, both

DAFormer [3] and MIC [4] erroneously segment the “wall” as a “building”, due to their visual similarities. Instead, our proposed label alignment and novel class resampling methods provide numerous annotations for these novel classes, enabling our model to learn discriminative features from visually similar classes and consequently distinguish them from images. When comparing with the VLM-based method [8] and the CCDA method [2], our method also exhibits notable advantages in shared classes. Specifically, SAN [8] and TACS [2] tend to generate inaccurate predictions for shared classes, such as misidentifying the “sky” in the second row or the “trees” in the fourth row. However, our method effectively learns novel classes without compromising the segmentation performance on shared classes.

2.2 Generalization for various UDA methods

To further validate the robustness and generalizability of our method with various UDA frameworks [3, 4, 7], we present qualitative segmentation results in Figure 2. These results confirm that the positive impact brought by our method is not limited by UDA frameworks. Firstly, our approach demonstrates significant improvements in handling shared classes. For example, compared to DACS [7], our method notably contributes to restoring the complete visual shapes of shared classes like “road” in the second column and “sidewalk” in the last column. Secondly, our method excels in segmenting novel classes, as evidenced in the third column where “truck” and “terrain” are accurately distinguished from similar-looking shared

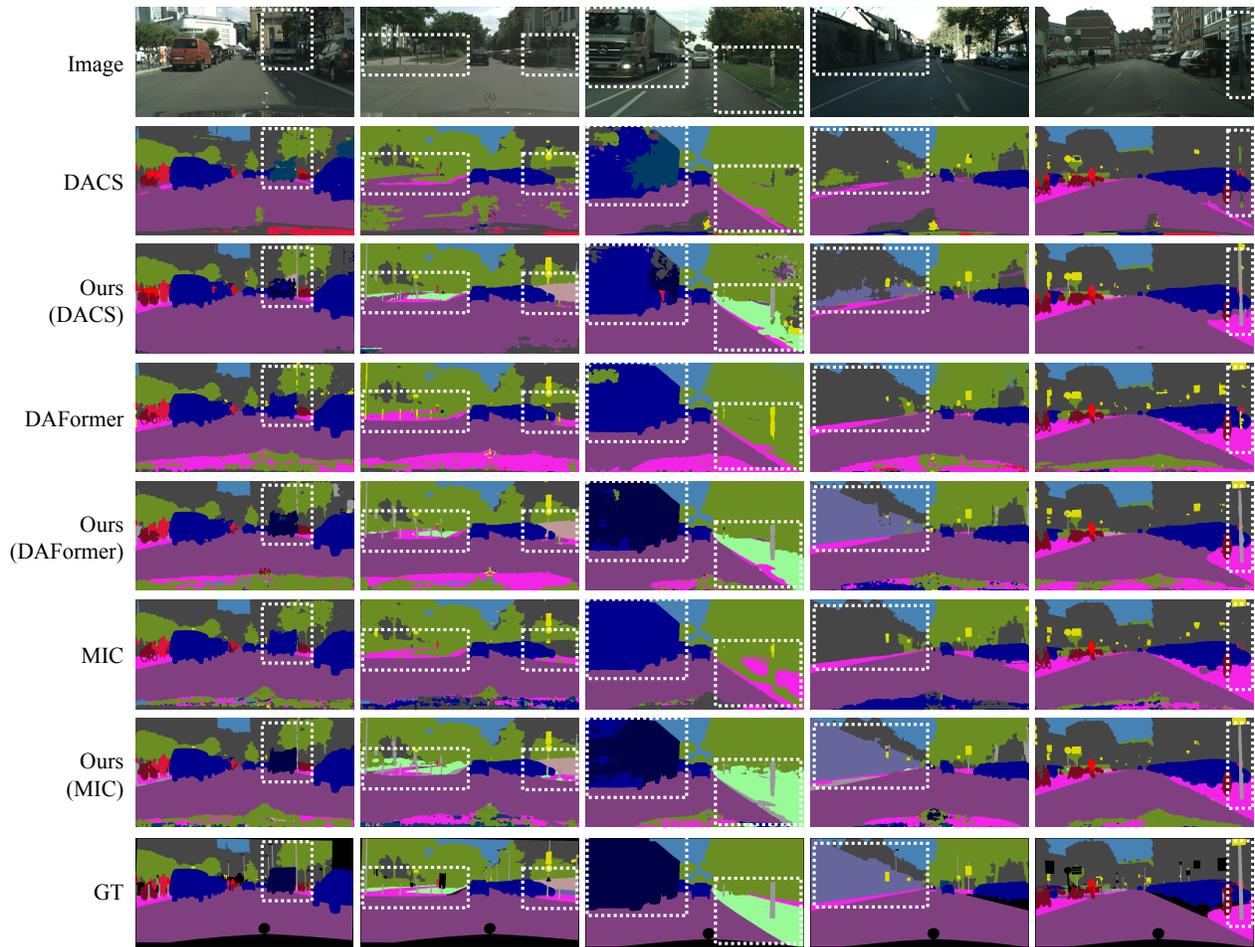


Figure 2: Qualitative results of previous UDA methods [3, 4, 7] and our method with different UDA frameworks on the SYNTHIA → Cityscapes benchmark. The novel classes are highlighted by white dashed boxes.

classes like “car” and “vegetation”, showcasing the robustness of our method in handling intricate semantic differences. These compelling findings collectively affirm the effectiveness of our proposed method and its commendable generalization capabilities across a spectrum of UDA frameworks.

3 LIMITATIONS AND FUTURE WORK

Limitations. In our CCDA setup, the novel classes in the target domain are predetermined. Relying on the names of these novel classes, we employ VLMs [1, 6] to localize the novel classes within unlabeled target images. However, in real-world scenarios, sometimes the names of novel classes are not known in advance. In this case, VLMs can not provide novel-class mask proposals for pseudo labels, leading to the limited applicability of our method in more challenging scenarios.

Future work. In our upcoming research, we aim to devise a method for achieving accurate segmentation of both shared and novel classes, even in cases where the names of the novel classes remain unknown. Specifically, developing a self-promoting approach

tailored for VLMs holds promise as a dependable solution to address the above limitation.

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