Domain Adaptation in Semantic Segmentation

Vercellone Romeo
Politecnico di Torino

s341967@studenti.polito.it

Nespolo Elena
Politecnico di Torino

s345176@studenti.polito.it

Mallo Giuseppe
Politecnico di Torino

s346884@studenti.polito.it

Lanzillotta Andrea
Politecnico di Torino

s343438@studenti.polito.it

Abstract

This report explore the field of Semantic Segmentation and studies several papers published in recent years. We begin by making a comparison between two models with distinct design goals: DeepLab, which is focused on enhancing segmentation accuracy through advanced convolutional techniques, and BiSeNet, which aims for high-speed inference while maintaining strong segmentation performance. Then, we focus on real-time semantic segmentation on two benchmark datasets: GTA5 and Cityscapes. Creating a dataset of real-world images providing high-quality, pixel-level annotations, like Cityscapes, is highly costly and labor-intesive, whereas GTA5 offers synthetic data that is easier to generate at large scale. Therefore, we believe that the development of new Semantic Segmentation models that are able to shift from synthetic to real-world domains is crucial, and this motivates the use of "Unsupervised Domain Adaptation" (UDA) techniques. We evaluate several methods including Data Augmentation, Image-to-Image Domain Adaptation through "Fourier Domain Adaptation" (FDA) and "Domain Adaptation via Cross-domain Mixed Sampling" (DACS), and "Rare Class Sampling" (RCS). Finally we explore a method to try to improve the model accuracy via a technique called "Context-Aware High-Resolution Domain-Adaptive Semantic Segmentation" (HRDA). The code is available at https://github.com/OTOTOTO02/MLDL2024_project1.