Note: Towards Noiseless Object Contours for Weakly Supervised Semantic Segmentation

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June 20, 2022

1 Introduction

This paper proposed a SANCE(segmentation-assisted noiseless contour exploration model) model which utilizes an auxiliary segmentation module to supplement high-level semantic information for contour training by backbone feature sharing and online label supervision.
The conventional CAM has the problem of incomplete estimation. To alleviate that this paper proposed to add an extra segmentation branch sharing the semantic knowledge to the contour branch through the shared backbone feature. Then model refines the segmentation map to generate online label to offer sufficient high-level semantic supervision to the contour branch.

2 Method

First the CAM seeds are obtained offline from a trained classification network.

2.1 Contour Prediction Branch

The contour prediction branch produces a binary contour map illustrating boundaries across different classes. The produced map B is refined by semantic segmentation seed(CAM seeds or online label).

2.2 Auxiliary Segmentation Branch

This branch transfers semantic knowledge to the contour branch through shared backbones. The online label transfers semantic information of segmentation map to the contour branch and boosts the segmentation branch at the same time.

$$M^b = [M \odot (1 - B)]\, \hat{A}^t,$$

where M is the produced segmentation map and Y is the CAM seeds or online label.

2.3 Online Label Generation

Authors find that better seeds with rich high-level semantic information can effectively provide the contour branch with more reliable pixel pairs. The obtained online label is used to supervise the loss function.
The propagated scores M_b are obtained by:

$$M^b = [M \odot (1 - B)]\, \hat{A}^t,$$

where B is the contour map and M is the segmentation map.

2.4 Label Refine Module

Implement dense CRF to suppress the false foreground area.

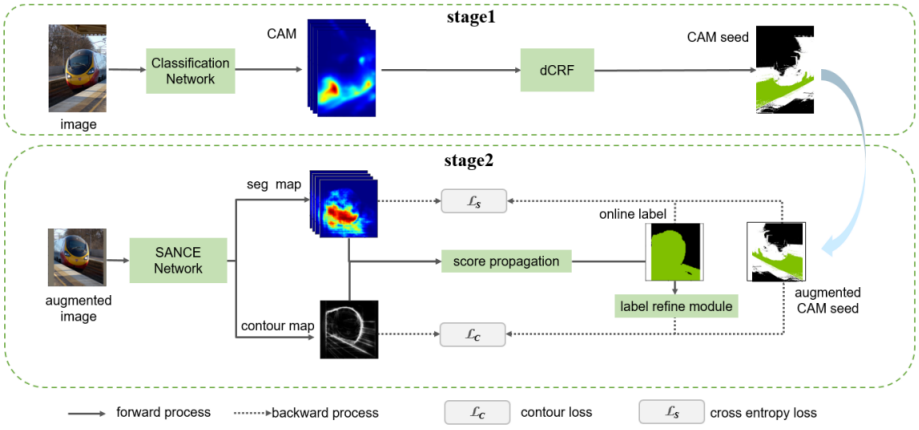

Figure 2. SANCE training process. Given training images, we first obtain their CAM seeds offline from a trained classification network in stage1. Then, we train SANCE with CAM seeds in stage2 by applying data augmentation to training images and CAM seeds. Online label generated from seg map and contour map provides additional training signal to suppress contour noise and expand object areas of seg map. The label refine module refines online label utilizing seg map or saliency map, to make the figure clear, the utilization of these maps is not shown.

3 Summary

This paper proposed the SANCE model to predict object contour map and segmentation map, supervised by CAM seeds and online label simultaneously. This model refine the segmentation predictions with the contour prediction. And experiments show that this model achieved SOTA performance on PascalVOC 2012 and MS COCO 2014 segmentation benchmark.

References