PseudoSeg: Designing Pseudo Labels for Semantic Segmentation

Yuliang Zou 1
Zizhao Zhang 2
Han Zhang 3
Chun-Liang Li 2
Xiao Bian 2
Jia-Bin Huang 1
Tomas Pfister 2
1 Virginia Tech
2 Google Cloud AI
3 Google Brain

Motivation

Semantic Segmentation

- Requiring a large amount of dense labels -> expensive
- Performance decreases quickly as we reduce the number of labels
- We want to improve the data efficiency of semantic segmentation

Unlabeled/Weakly-labeled Data to the Rescue

- Fully-labeled data (limited)
- Weakly-labeled data (a lot)
- Unlabeled data (a large amount)

Designing Pseudo Labels for Semantic Segmentation

Overview

- Strong-weak dual branch consistency-based training
- Different decision mechanisms for distinct predictions
- Wisely fusing the predictions to construct well-calibrated pseudo labels

From Localization to Segmentation

- Grad-CAM only localizes partial region of interest
- Propagating Grad-CAM scores with learned feature similarity
- Implemented with dot-product self-attention operation -> Self-attention Grad-CAM (SGC)

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Calibrated Prediction Fusion

- Constructing well-calibrated pseudo labels from two predictions

Experimental Results

Improvement over Supervised Baseline

- Cross-dataset semi-supervised learning setting (VOC+COCO)
- Improving fully-supervised learning also in high-data regime

Improving Fully-Supervised Model with Extra Data

- Cross-dataset semi-supervised learning setting (VOC+COCO)
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Qualitative Results

- Cross-dataset semi-supervised learning setting (VOC+COCO)
- Improving fully-supervised learning also in high-data regime