1. CRF loss

Given an input image $X_t$ and the softmax activation $S_t$ of the decoder, the CRF loss is formulated [10] as,

$$\mathcal{R}(S_t, X_t) = \sum_{r=0}^{r=1} S_t^r \top W (1 - S_t^r),$$

(1)

where $W$ is an affinity matrix where $W[i,j]$ captures the color similarity and proximity between pixels $i,j$ in the image $X_t$. We consider using Gaussian kernel to capture color and spatial similarities [6]. We use the permutohedral lattice [1] for fast computation of $W$. Minimizing Eq.1 pushes the decoder to produce consistent activations for nearby pixels with similar color.

2. Classification performance

Although it is not commonly provided, we present classification performance in Tab.1 for our trained CAM-methods since they are able to do both tasks: classification, and localization. These methods yielded descent classification performance. However, there is a large margin between both datasets showing the difficulty of $YTOv2.2$ dataset.

| Methods                        | YTOv1 | YTOv2.2 |
|-------------------------------|-------|---------|
| CAM [11] (cvpr,2016)          | 85.3  | 73.9    |
| GradCAM [9] (iccv,2017)       | 85.3  | 71.3    |
| GradCAM++ [2] (wacv,2018)     | 84.4  | 72.4    |
| Smooth-GradCAM++ [7] (corr,2019)| 82.6  | 75.2    |
| XGradCAM [3] (bmvc,2020)      | 87.3  | 71.6    |
| LayerCAM [4] (ieee,2021)      | 84.4  | 72.1    |
| TCAM (ours)                    | 84.4  | 72.1    |

Table 1: Classification accuracy (CL) on test set of $YTOv1$ [8] and $YTOv2.2$ [5] datasets.

3. Visual results and demonstrative videos

Fig.1, 2 present more prediction cases over labeled ground truth frames. More illustrative videos can be downloaded from this google-drive link: https://drive.google.com/drive/folders/1SjFed6h3XaxmwrWuYV-h9dhNhwEsRH9P?usp=sharing.

4. Our code

We provide our implementation code using Pytorch\(^1\) framework\(^2\).

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\(^1\)https://pytorch.org

\(^2\)Code: https://github.com/sbelharbi/tcam-wsol-video.
Figure 1: Prediction examples of test sets frames. Left: TCAM (ours). Right: baseline CAM method, LayerCAM [4]. Bounding box: ground truth (green), prediction (red). Second column is predicted CAM over image.

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Figure 2: Prediction examples of test sets frames. Left: TCAM (ours). Right: baseline CAM method, LayerCAM [4]. Bounding box: ground truth (green), prediction (red). Second column is predicted CAM over image.

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