Region-based Entropy Separation for One-shot Test-Time Adaptation

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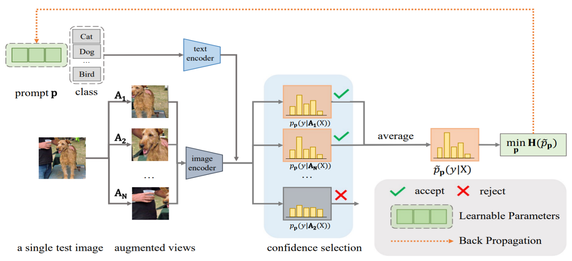
Introduction

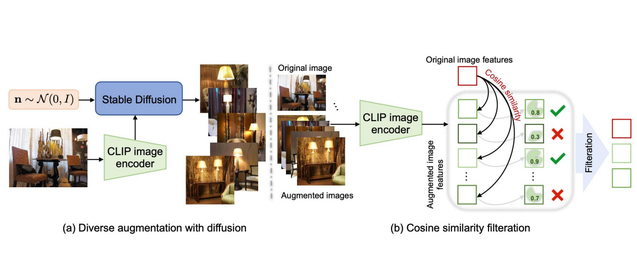
- Optimize the learnable prompt of CLIP[1] by using only a single unlabeled test image.
- Our method jointly performs global entropy maximization and local entropy minimization.
- Experimental results shows that our method outperforms the state-of-the-art methods.

Related Work

All the existing methods fine-tune the model so that the classification results are consistent for augmented views of a given test image.



TPT [2]



DiffTPT [3]

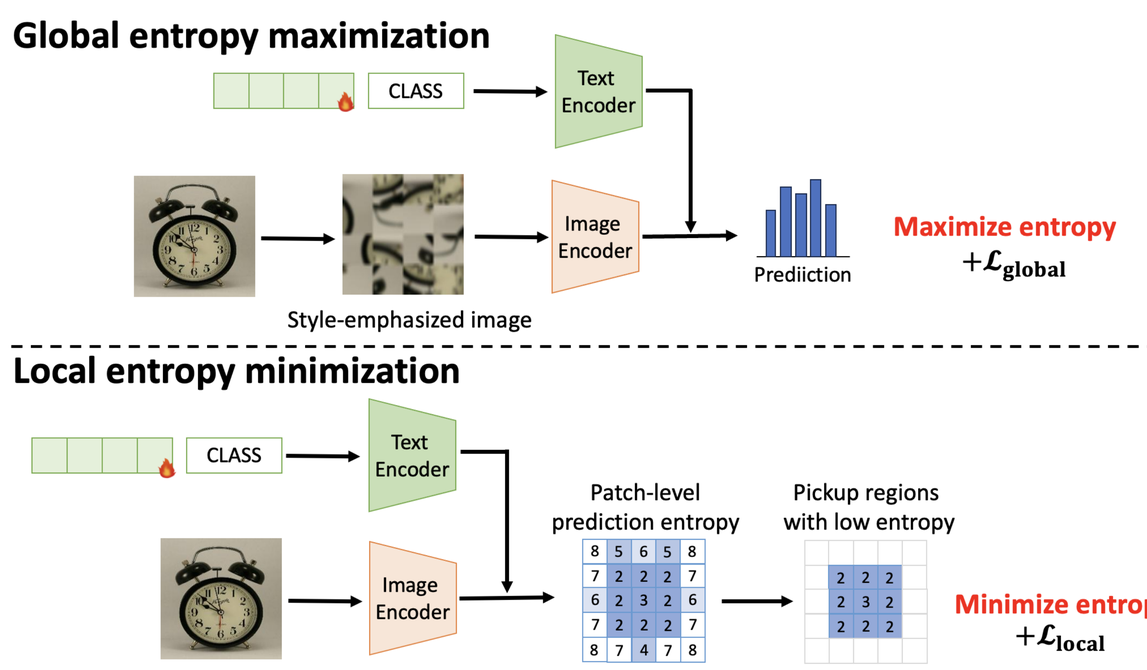
Motivation

Prior works focus on image-level information. However, an image has different attributes depending on regions as shown below.

So, focusing only on image-level features is insufficient.

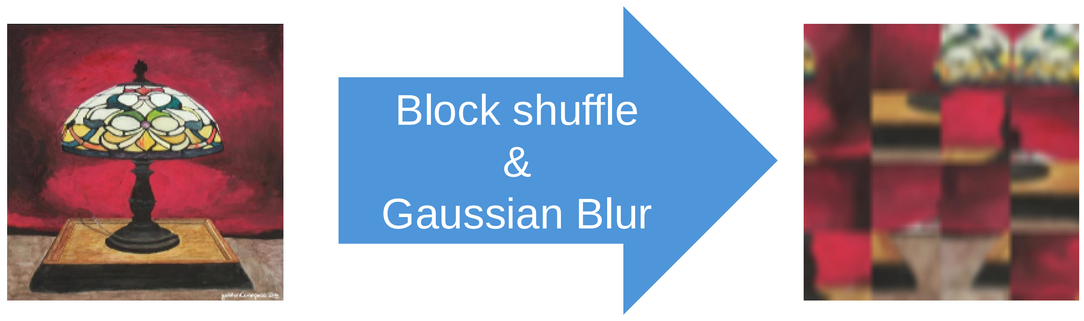
To address this problem, our method applies different learning methods based on the regions in an image.

Method



Global Entropy Maximization

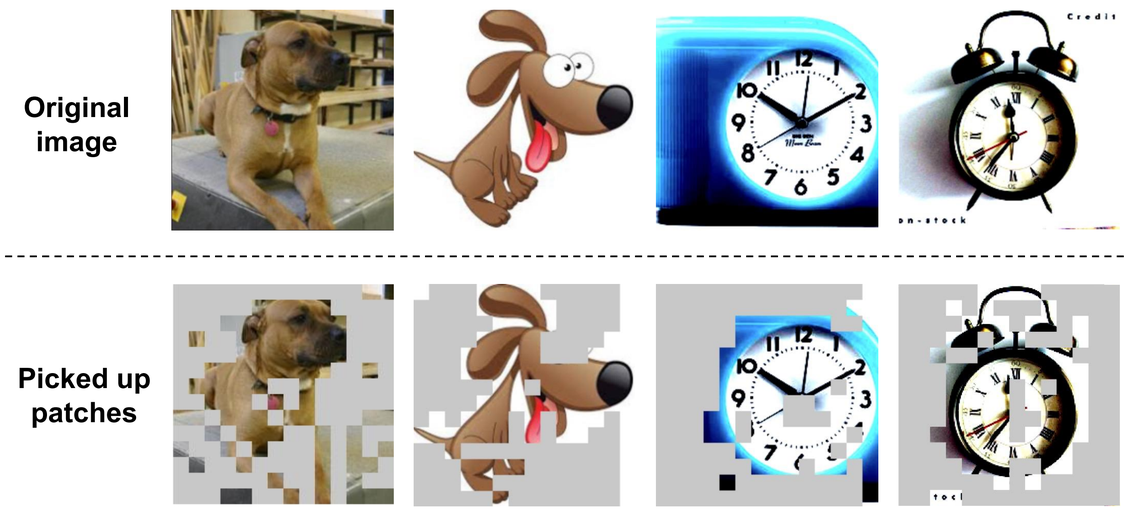
1. Emphasize the style information by destructing class information.



2.Maximize the entropy of predictions for style-emphasized images.

Local Entropy Minimization

Pick up patches with strong class information and apply patch-level entropy minimization.



Results

Table1: Comparison with existing methods

Method	Office-Home	VLCS	PACS	Mean
Zero-shot CLIP[1]	82.30	82.40	96.10	86.93
TPT[2]	76.60	80.23	96.50	84.44
DiffTPT[3]	75.15	82.23	96.28	84.55
Prompt Styler [4]	83.58	82.90	**97.23**	87.89
Ours	**83.70**	**84.18**	**97.23**	**88.40**

Table2: Ablation of style-emphasizing transformation

Block Shuffle	Gaussian Blur	Office-Home	VLCS	PACS
-	-	76.00	81.30	93.80
✓	-	77.43	82.55	94.50
-	✓	79.78	82.95	95.18
✓	✓	**83.70**	**84.18**	**97.23**

[1] A. Radford et al. Learning transferable visual models from natural language supervision. ICML 2021
[2] M. Shu et al. Test-time prompt tuning for zero-shot generalization in vision-language models. NeurIPS 2022
[3] C. Feng et al. Diverse data augmentation with diffusions for effective test-time prompt tuning. ICCV 2023
[4] J. Cho et at. Promptstyler: Prompt-driven style generation for source-free domain generalization. ICCV 2023