

Feature Representation Learning for Unsupervised Cross-domain Image Retrieval Supplementary Material

Conghui Hu^[0000-0002-4984-3960] and Gim Hee Lee^[0000-0002-1583-0475]

National University of Singapore, Singapore
{conghui,gimhee.lee}@nus.edu.sg

1 Qualitative Retrieval results

Office-Home dataset



Fig. 1: Top 10 retrieval results on Office-Home. Row 1, 6: Retrieval results of ID [3]; Row 2, 7: Retrieval results of ProtoNCE [2]; Row 3, 8: Retrieval results of CDS [1]; Row 4, 9: Retrieval results of PCS [4]; Row 5, 10: Retrieval results of our framework. The green and red boxes indicate correct and incorrect retrievals, respectively.



Fig. 2: Top 10 retrieval results on Office-Home. Row 1, 6, 11: Retrieval results of ID [3]; Row 2, 7, 12: Retrieval results of ProtoNCE [2]; Row 3, 8, 13: Retrieval results of CDS [1]; Row 4, 9, 14: Retrieval results of PCS [4]; Row 5, 10, 15: Retrieval results of our framework. The green and red boxes indicate correct and incorrect retrievals, respectively.

DomainNet dataset

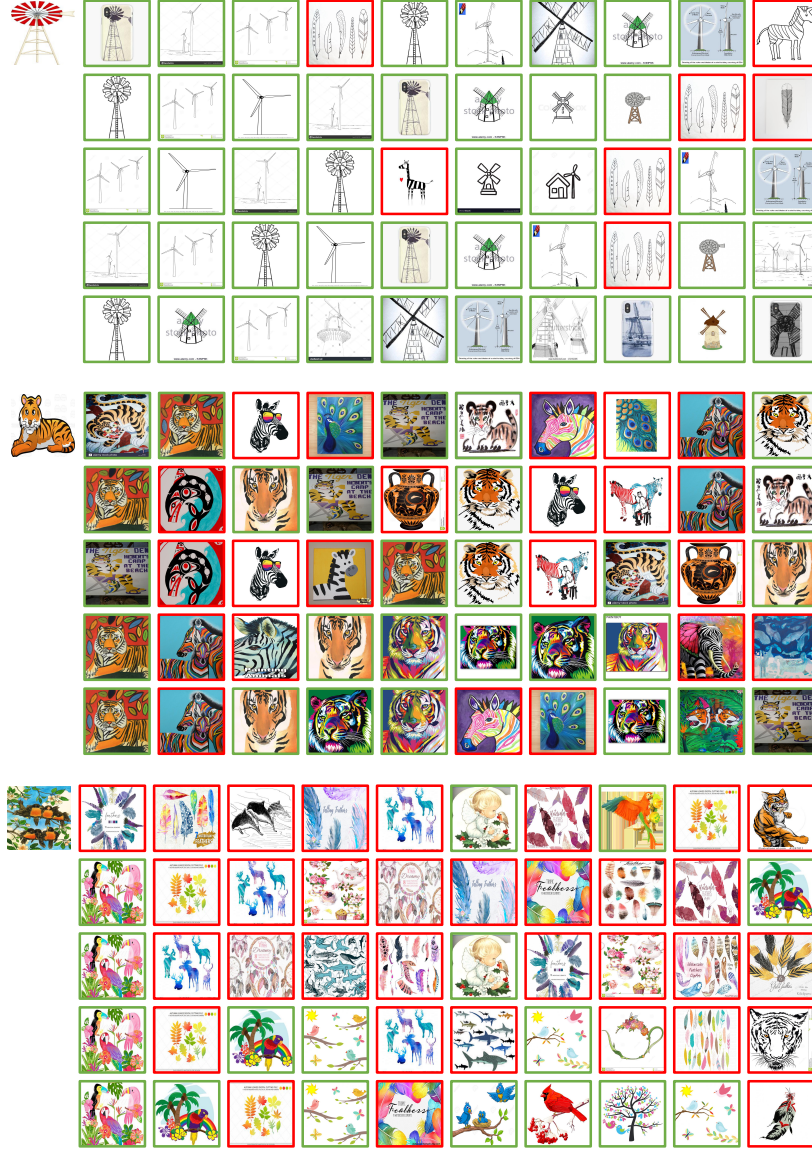


Fig. 3: Top 10 retrieval results on DomainNet. Row 1, 6, 11: Retrieval results of ID [3]; Row 2, 7, 12: Retrieval results of ProtoNCE [2]; Row 3, 8, 13: Retrieval results of CDS [1]; Row 4, 9, 14: Retrieval results of PCS [4]; Row 5, 10, 15: Retrieval results of our framework. The green and red boxes indicate correct and incorrect retrievals, respectively.



Fig. 4: Top 10 retrieval results on DomainNet. Row 1, 6: Retrieval results of ID [3]; Row 2, 7: Retrieval results of ProtoNCE [2]; Row 3, 8: Retrieval results of CDS [1]; Row 4, 9: Retrieval results of PCS [4]; Row 5, 10: Retrieval results of our framework. The green and red boxes indicate correct and incorrect retrievals, respectively.

2 Hyper-parameter Analysis

Here, we analyze the effect of different hyper-parameters on the Clipart-Sketch pair. Grid search can be employed to find the optimal hyper-parameters. From Table 1, we make the following observations: 1) 0.5 is the suitable value for α . The retrieval performance is not optimal when α is set to a smaller or larger value. 2) Warm-up stage with only instance-wise contrastive loss is necessary by setting T_1 to be a value greater than 0. 3) Fixing the increasing weight for cluster-wise contrastive loss at $T_2 = 75$ yields the best results. 4) $\phi = 0.01$ is the desirable temperature for clustering probability calculation. 5) Setting the weight (β) as 0.1 brings the best performance out of our distance-to-distance loss. 6) The retrieval performance remains stable while changing the value of γ

from 0.1 to 1. 7) When the cluster number K is set to 5 which is smaller than the real category number, the retrieval accuracy drops significantly.

Table 1: Cross-domain Retrieval Accuracy (P@200 (%)).
Influence of α in Eq. 4

α	0.1	0.5	1	2
Domains				
Clipart→Sketch	45.63	47.75	47.38	44.97
Sketch→Clipart	46.40	48.39	48.17	45.48

Influence of T_1 in Eq. 4

T_1	0	20	50	100
Domains				
Clipart→Sketch	46.86	47.38	47.87	47.32
Sketch→Clipart	47.00	48.17	48.68	48.41

Influence of T_2 in Eq. 4

T_2	50	75	100	125
Domains				
Clipart→Sketch	47.32	48.25	47.38	46.04
Sketch→Clipart	47.77	49.06	48.17	46.05

Influence of ϕ in Eq. 5

ϕ	0.005	0.01	0.015	0.02
Domains				
Clipart→Sketch	43.48	47.38	46.18	45.06
Sketch→Clipart	43.87	48.17	46.07	45.37

Influence of β in Eq. 11

β	0.075	0.1	0.125	0.15
Domains				
Clipart→Sketch	45.34	47.38	46.23	43.28
Sketch→Clipart	45.66	48.17	46.67	43.24

Influence of γ in Eq. 11

γ	0.1	0.2	0.5	1
Domains				
Clipart→Sketch	47.30	47.52	47.38	47.55
Sketch→Clipart	47.78	47.97	48.17	47.44

Influence of cluster number K

K	5	7	14	21
Domains				
Clipart→Sketch	39.05	47.38	47.45	45.04
Sketch→Clipart	39.40	48.17	48.37	45.32

References

1. Kim, D., Saito, K., Oh, T.H., Plummer, B.A., Sclaroff, S., Saenko, K.: Cds: Cross-domain self-supervised pre-training. In: ICCV (2021) [1](#), [2](#), [3](#), [4](#)
2. Li, J., Zhou, P., Xiong, C., Hoi, S.C.: Prototypical contrastive learning of unsupervised representations. ICLR (2020) [1](#), [2](#), [3](#), [4](#)
3. Wu, Z., Xiong, Y., Yu, S.X., Lin, D.: Unsupervised feature learning via non-parametric instance discrimination. In: CVPR (2018) [1](#), [2](#), [3](#), [4](#)
4. Yue, X., Zheng, Z., Zhang, S., Gao, Y., Darrell, T., Keutzer, K., Vincentelli, A.S.: Prototypical cross-domain self-supervised learning for few-shot unsupervised domain adaptation. In: CVPR (2021) [1](#), [2](#), [3](#), [4](#)