Supplementary Materials: CDAD-NET: Bridging Domain Gaps in Generalized Category Discovery

Sai Bhargav Rongali[1*] Sarthak Mehrotra[1*] Ankit Jha [2] Mohamad Hassan N C[1]
Shirsha Bose[3] Tanisha Gupta[1] Mainak Singha[1] Biplab Banerjee[1]
[1]Indian Institute of Technology Bombay, India
[2]INRIA, Grenoble, France [3]Technical University of Munich, Germany
{rongalisaibhargav002, sarthak2002.mehrotra, ankitjha16, mohdhassannc, shirshabosecs, tanishagupta072, mainaksingha.iitb, getbiplab}@gmail.com

1. Contents of the supplementary materials

In the supplementary material, we provide detailed description of dataset splits, further experimental results, including:

1. In Table 1, we provide the dataset splits for the GCD settings for PACS [3], OfficeHome [7], DomainNet [4], CIFAR-10 [2], CIFAR-100 and ImageNet-100 [1] datasets.

Table 1. The dataset splits (labeled and unlabeled) for the AD-GCD and within-domain GCD experiments.

Dataset	$\lvert\mathcal{Y}_{\mathcal{L}}\rvert$	$\lvert\mathcal{D}_{\mathcal{L}}\rvert$	$\lvert\mathcal{Y}_{\mathcal{U}}\rvert$	$\lvert\mathcal{D}_{\mathcal{U}}\rvert$
PACS [3]	4	1.4K	7	2.4K
Office-Home [7]	40	7K	65	7.5K
DomainNet [4]	250	365.1K	345	134.5K
CIFAR-10 [2]	5	12.5K	10	37.5K
CIFAR-100 [2]	80	20K	100	30K
ImageNet-100 [1]	50	31.9K	100	95.3K

2. In Figure 1, we ablate CDAD-NET by varying the number of patches in the masked input image on the OfficeHome Dataset (Art → Real World). We observe that as the number of masked input patches increases the classification performance decreases significantly for `All`, `Old` and `New` classes.

3. In Tables 2, 3 and 4, we perform experiments for all the combinations on the PACS, OfficeHome and DomainNet datasets, respectively. Also, we showcase the list of combinations used in DomainNet dataset in following manner:
   (a) Real world → Sketch
   (b) Painting → Real World

*Equal Contribution

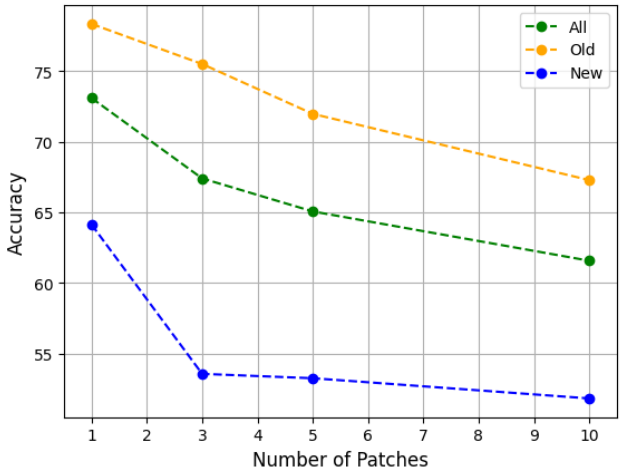

Figure 1. Variation of accuracies with the variation in number of patches introduced in the masked input image for the OfficeHome Dataset (Art → Real World).

   (c) Sketch → Clip Art
   (d) Sketch → Painting
   (e) Quickdraw → Real World
   (f) Sketch → Quickdraw
   (g) Painting → Quickdraw
   (h) Painting → Infograph
   (i) Real World → Clip Art

In tables, we emphasize our findings using **bold** text. Additionally, we highlight cells containing the highest and second-highest values with shades of green and red, respectively.

References

[1] Jia Deng, Wei Dong, Richard Socher, Li-Jia Li, Kai Li, and Li Fei-Fei. Imagenet: A large-scale hierarchical image database. In *2009 IEEE conference on computer vision and pattern recognition*, pages 248–255. Ieee, 2009. 1

Table 2. Detailed comparison of our proposed CDAD-NET on AD-GCD with respect to the referred literature for the PACS dataset

Method	PACS																	
	Photo → Cartoon			Art Painting → Cartoon			Art Painting → Photo			Art Painting → Sketch			Cartoon → Art Painting			Cartton → Photo		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	56.44	55.26	57.97	44.95	51.56	36.33	82.97	98.90	69.66	38.50	42.40	27.88	50.65	61.60	37.86	79.66	93.06	68.49
SimGCD [8]	34.21	43.03	22.69	40.36	44.96	34.39	58.06	72.6	45.92	40.34	46.9	22.36	44.35	75.83	7.60	47.02	83.55	16.59
GCD+OSDA [5]	52.90	58.25	45.93	52.63	54.09	50.72	75.33	97.2	57.04	42.86	42.24	44.53	52.54	64.64	38.43	66.31	87.83	48.38
SimGCD+OSDA [5]	34.13	44.85	20.16	20.03	34.09	11.68	55.99	73.10	41.70	35.10	31.34	45.32	44.31	70.96	13.20	44.97	60.15	32.30
CDAD-NET	**69.03**	**63.45**	**76.30**	**70.82**	**68.65**	**73.65**	**99.40**	**99.60**	**99.23**	**52.05**	**52.38**	**51.14**	**92.09**	**89.03**	**95.66**	**99.28**	**99.34**	**99.23**

Method	PACS																	
	Cartoon → Sketch			Photo → Art Painting			Photo → Sketch			Sketch → Art Painting			Sketch → Cartoon			Sketch → Photo		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	41.38	42.42	38.58	80.41	79.61	81.34	43.80	40.11	54.10	34.07	40.06	27.08	43.55	51.69	32.93	54.90	58.01	52.32
SimGCD [8]	42.75	51.42	19.15	49.62	87.26	5.69	30.86	37.68	12.31	29.90	48.80	7.97	40.14	68.44	3.23	36.20	29.24	42.00
GCD+OSDA [5]	43.93	45.14	40.64	60.90	75.68	43.81	34.70	33.42	38.18	34.27	32.01	36.90	38.76	40.19	36.90	45.51	35.92	53.50
SimGCD+OSDA [5]	35.49	40.31	22.37	51.51	80.84	17.27	23.23	17.30	39.36	24.00	11.51	38.58	19.96	34.43	10.20	26.71	11.50	47.65
CDAD-NET	**51.74**	**53.01**	**48.30**	**92.30**	**90.10**	**95.60**	**49.66**	**43.30**	**56.95**	**90.53**	**86.67**	**95.03**	**72.10**	**73.55**	**70.21**	**99.34**	**99.47**	**99.23**

Table 3. Detailed comparison of our proposed CDAD-NET on AD-GCD with respect to the referred literature for the OfficeHome dataset

Method	OfficeHome																	
	Real World → Clipart			Product → Real World			Art → Clipart			Art → Product			Art → Real World			Clipart → Art		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	26.49	39.47	28.38	62.42	77.32	60.87	27.01	39.94	28.96	64.04	72.32	62.04	64.93	75.98	58.86	52.25	62.19	44.75
SimGCD [8]	40.22	48.33	46.12	67.47	84.32	37.80	41.57	49.23	47.19	59.78	75.00	58.69	75.89	86.55	60.37	57.10	66.79	49.93
GCD+OSDA [5]	44.54	52.08	40.18	70.51	89.44	59.02	46.21	53.24	44.38	73.76	81.88	68.73	75.55	87.42	65.29	61.88	72.26	48.90
SimGCD+OSDA [5]	53.16	56.63	48.73	38.31	93.29	77.70	53.96	57.23	49.86	72.71	81.57	55.72	77.62	93.77	71.09	71.09	78.58	49.39
CDAD-NET	**49.52**	**62.44**	**42.91**	**83.28**	**95.64**	**75.64**	**48.46**	**60.10**	**44.01**	**83.05**	**92.58**	**81.74**	**83.03**	**95.69**	**76.70**	**66.25**	**76.59**	**62.22**

Method	OfficeHome																	
	Clipart → Product			Clipart → Real World			Product → Art			Product → Clipart			Real World → Art			Real World → Clipart		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	63.26	72.72	59.08	62.07	74.09	67.86	53.92	62.72	49.00	29.28	37.73	27.78	55.40	66.08	46.22	30.55	39.47	28.27
SimGCD [8]	57.03	72.65	47.50	60.81	78.95	70.42	60.84	69.57	45.64	39.22	43.12	50.98	67.62	81.31	50.88	40.49	46.51	38.81
GCD+OSDA [5]	70.69	79.25	64.93	69.18	75.68	77.29	65.39	75.17	53.79	43.48	51.26	40.42	77.45	83.93	53.71	45.14	53.43	41.21
SimGCD+OSDA [5]	69.35	79.03	60.84	71.99	79.32	70.30	74.20	81.57	62.77	52.85	54.75	61.05	86.03	89.47	63.88	53.1	56.31	49.11
CDAD-NET	**82.96**	**91.47**	**85.09**	**80.51**	**84.86**	**83.14**	**69.10**	**79.85**	**64.11**	**43.49**	**55.54**	**39.05**	**78.23**	**85.37**	**61.82**	**48.62**	**61.27**	**42.48**

Table 4. Detailed comparison of our proposed CDAD-NET on AD-GCD with respect to the referred literature for the DomainNet dataset

Method	DomainNet														
	Real World → Sketch			Painting → Real World			Sketch → Clipart			Sketch → Painting			Quickdraw → Real World		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	26.17	34.09	22.65	35.21	39.94	27.27	25.21	39.94	11.27	44.44	48.67	30.52	29.30	35.98	22.17
SimGCD [8]	29.93	42.70	25.60	36.97	48.98	32.47	29.69	44.98	17.89	46.71	48.57	36.12	31.62	39.44	26.88
GCD+OSDA [5]	45.71	50.60	38.39	39.36	41.66	34.70	32.74	47.66	19.80	583.15	58.29	52.15	35.38	45.84	29.71
SimGCD+OSDA [5]	48.16	50.32	45.46	41.34	42.01	36.80	35.97	49.34	21.56	60.72	65.68	58.42	39.63	47.88	32.79
CDAD-NET	**58.07**	**63.51**	**55.79**	**45.74**	**42.15**	**38.56**	**39.68**	**51.15**	**27.64**	**73.42**	**76.49**	**67.70**	**43.40**	**51.28**	**38.34**

Method	DomainNet											
	Sketch → Quickdraw			Painting → Quickdraw			Painting → Infograph			Real World → Clipart		
	All	Old	New	All	Old	New	All	Old	New	All	Old	New
GCD [6]	26.35	32.19	19.64	27.36	32.72	17.39	16.17	24.09	12.65	35.62	39.49	31.79
SimGCD [8]	24.22	38.39	21.44	24.15	35.41	19.56	20.93	22.70	15.60	39.21	45.94	41.27
GCD+OSDA [5]	29.41	40.83	25.32	47.67	60.22	44.35	18.71	20.60	13.39	45.74	53.67	35.68
SimGCD+OSDA [5]	35.10	46.97	37.09	42.14	43.36	36.54	16.00	20.32	9.46	47.97	53.34	45.56
CDAD-NET	**57.23**	**52.58**	**46.83**	**52.49**	**54.48**	**48.79**	**26.07**	**29.51**	**15.79**	**60.28**	**67.15**	**58.42**

[2] Alex Krizhevsky, Geoffrey Hinton, et al. Learning multiple layers of features from tiny images. 2009. 1

[3] Da Li, Yongxin Yang, Yi-Zhe Song, and Timothy M Hospedales. Deeper, broader and artier domain generalization. In *Proceedings of the IEEE international conference on computer vision*, pages 5542–5550, 2017. 1

[4] Xingchao Peng, Qinxun Bai, Xide Xia, Zijun Huang, Kate Saenko, and Bo Wang. Moment matching for multi-source domain adaptation. In *Proceedings of the IEEE/CVF international conference on computer vision*, pages 1406–1415, 2019. 1

[5] Kuniaki Saito, Shohei Yamamoto, Yoshitaka Ushiku, and Tatsuya Harada. Open set domain adaptation by backpropagation. In *Proceedings of the European conference on computer vision (ECCV)*, pages 153–168, 2018. 2

[6] Sagar Vaze, Kai Han, Andrea Vedaldi, and Andrew Zisserman. Generalized category discovery. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition*, pages 7492–7501, 2022. 2

[7] Hemanth Venkateswara, Jose Eusebio, Shayok Chakraborty,

and Sethuraman Panchanathan. Deep hashing network for unsupervised domain adaptation. In *Proceedings of the IEEE conference on computer vision and pattern recognition*, pages 5018–5027, 2017. 1

[8] Xin Wen, Bingchen Zhao, and Xiaojuan Qi. Parametric classification for generalized category discovery: A baseline study. In *Proceedings of the IEEE/CVF International Conference on Computer Vision*, pages 16590–16600, 2023. 2