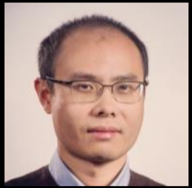
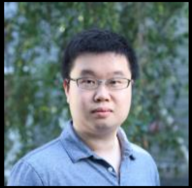
Joint Disentangling and Adaptation for Cross-Domain Person Re-Identification

Yang Zou



Xiaodong Yang



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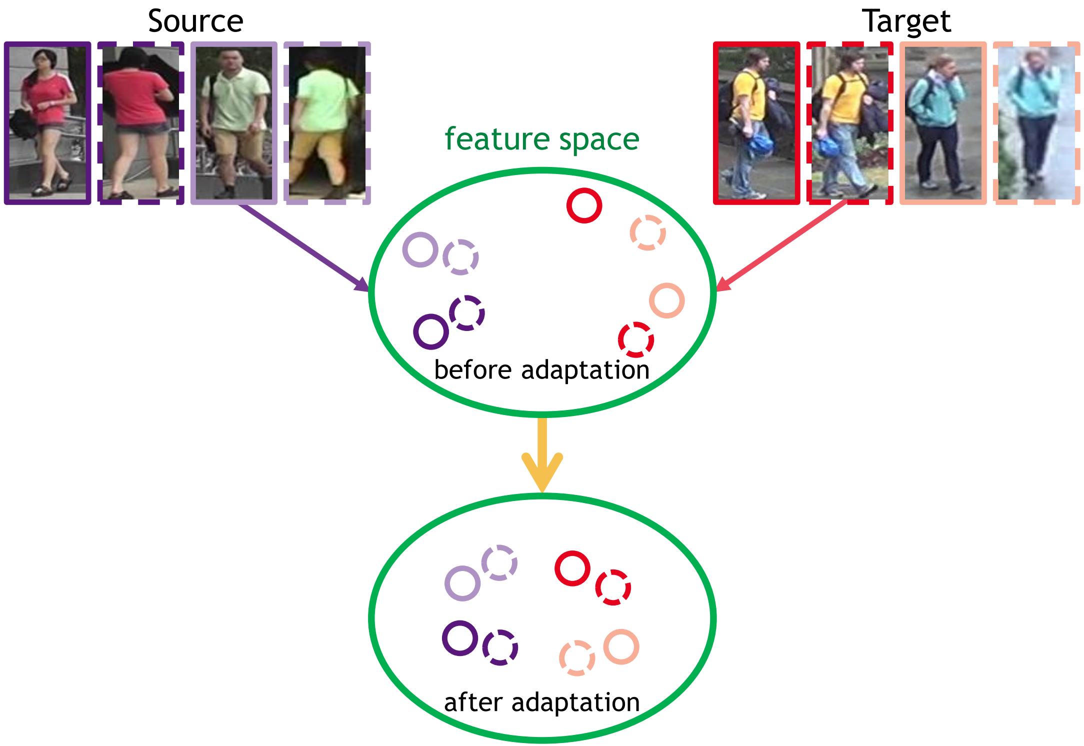
Background: Unsupervised Cross-Domain ReID



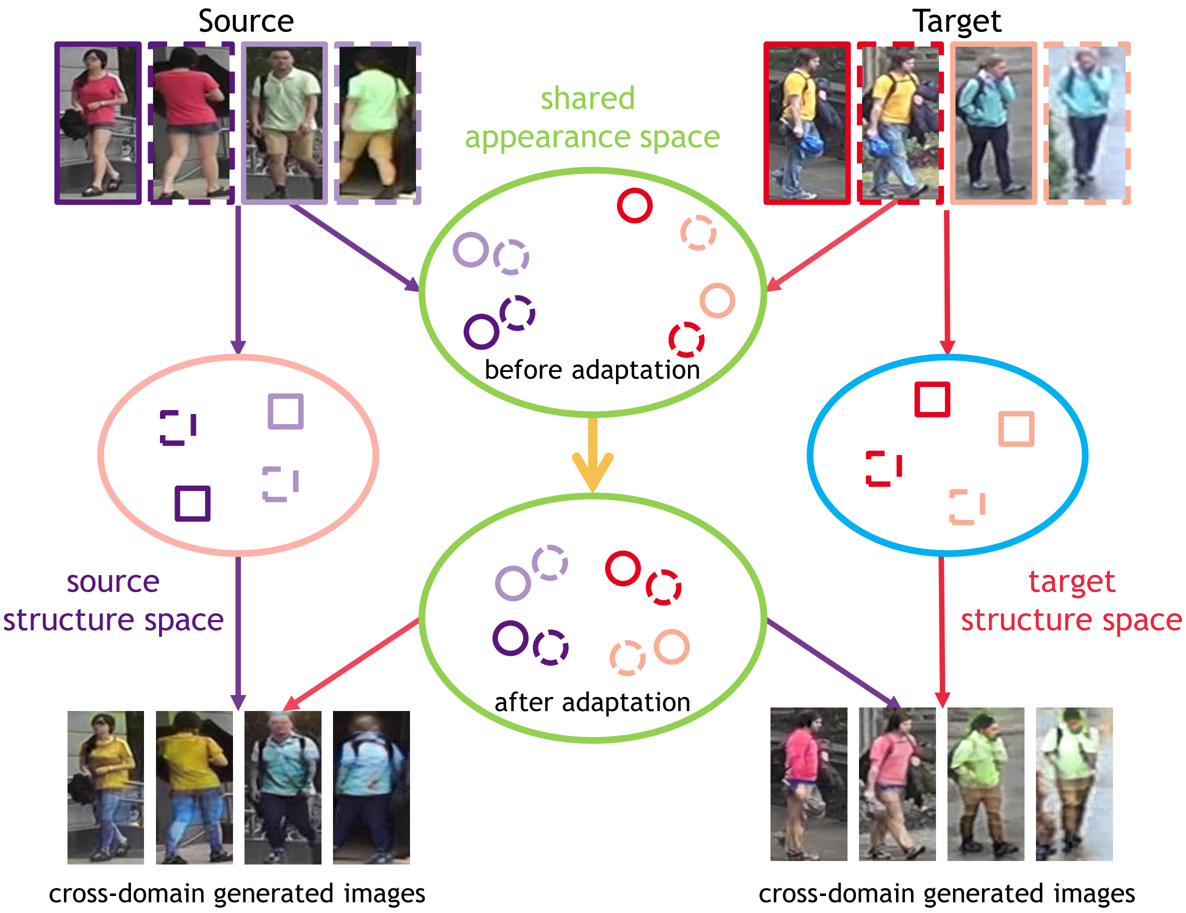
DG-Net [1] (for a single domain)

- id-related features (appearance codes): clothing color, textures, styles, etc.
- id-unrelated features (structure codes): pose, background, illumination, etc.

- source domain
- target domain
- identity in source
- identity in target
- different images of the same identity

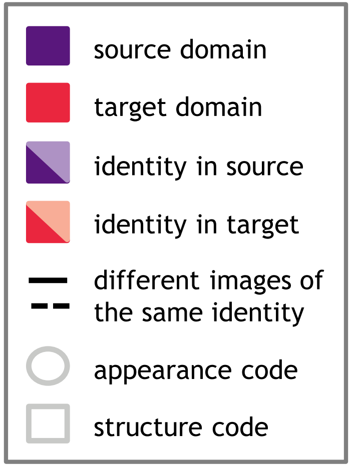
[1] Zheng et al. Joint Discriminative and Generative Learning for Person Re-Identification, CVPR 2019.

Motivation: Joint Disentangling and Adaptation



DG-Net++ (for cross-domain)

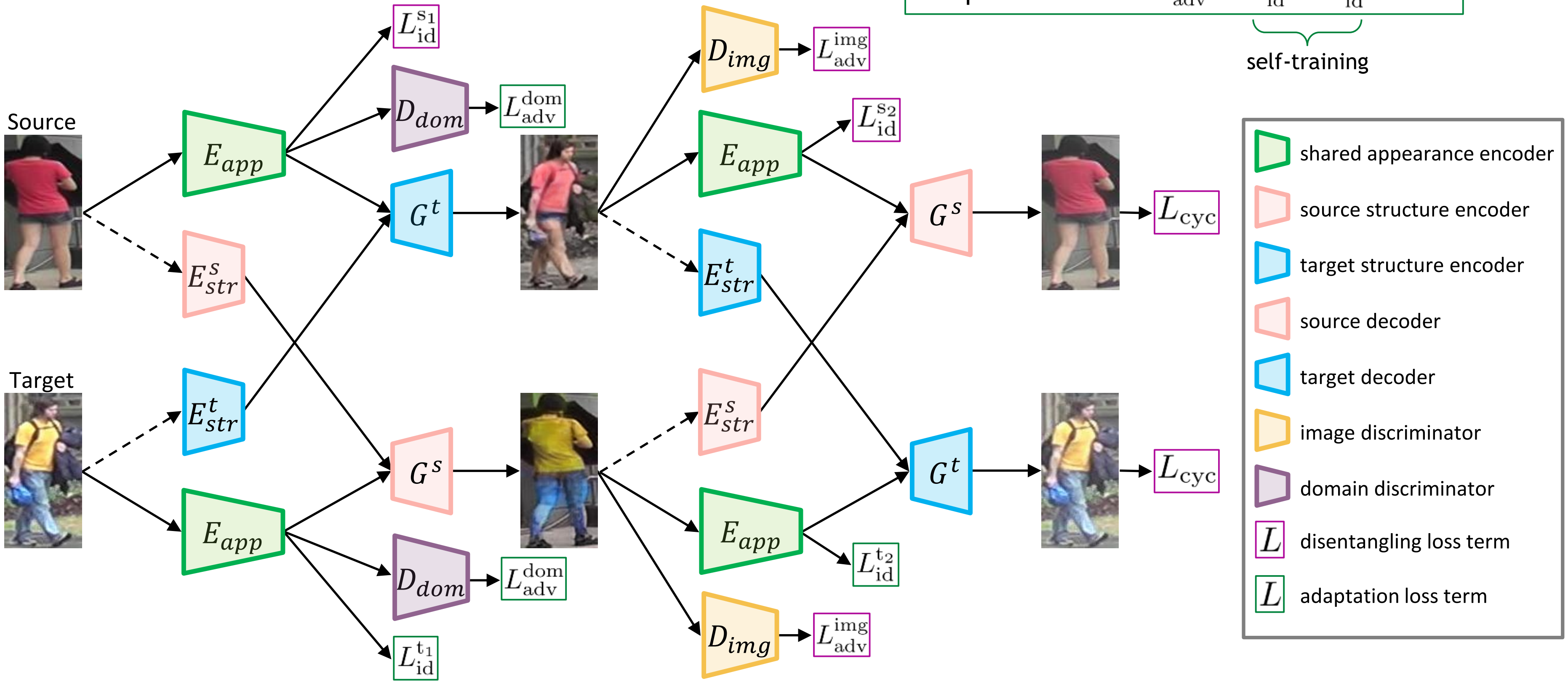
- id-related features (appearance codes):
  clothing color, textures, styles, etc.
- id-unrelated features (structure codes):
  pose, background, illumination, etc.
- conduct adaptation in the id-related feature space exclusively to prevent id-unrelated interference



Approach: DG-Net++

disentangling loss: $L_{\text{adv}}^{\text{img}} + L_{\text{id}}^{s_1} + L_{\text{id}}^{s_2} + L_{\text{cyc}}$

adaptation loss: $L_{\text{adv}}^{\text{dom}} + \underbrace{L_{\text{id}}^{t_1} + L_{\text{id}}^{t_2}}_{\text{self-training}}$



Quantitative Results: Comparison with SOTA

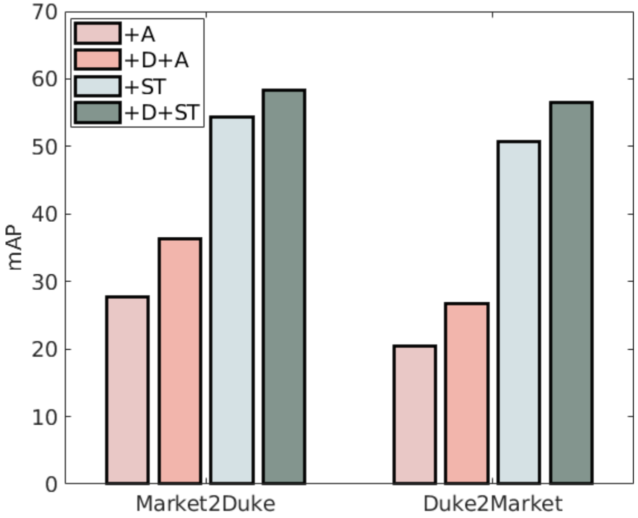
Methods	Market-1501 → DukeMTMC-reID				DukeMTMC-reID → Market-1501			
	Rank@1	Rank@5	Rank@10	mAP	Rank@1	Rank@5	Rank@10	mAP
SPGAN [6]	41.1	56.6	63.0	22.3	51.5	70.1	76.8	22.8
AIDL [55]	44.3	59.6	65.0	23.0	58.2	74.8	81.1	26.5
MMFA [30]	45.3	59.8	66.3	24.7	56.7	75.0	81.8	27.4
HHL [68]	46.9	61.0	66.7	27.2	62.2	78.8	84.0	31.4
CAL [36]	55.4	-	-	36.7	64.3	-	-	34.5
ARN [29]	60.2	73.9	79.5	33.4	70.3	80.4	86.3	39.4
ECN [69]	63.3	75.8	80.4	40.4	75.1	87.6	91.6	43.0
PDA [28]	63.2	77.0	82.5	45.1	75.2	86.3	90.2	47.6
CR-GAN [3]	68.9	80.2	84.7	48.6	77.7	89.7	92.7	54.0
IPL [43]	68.4	80.1	83.5	49.0	75.8	89.5	93.2	53.7
SSG [10]	73.0	80.6	83.2	53.4	80.0	90.0	92.4	58.3
DG-Net++	**78.9**	**87.8**	**90.4**	**63.8**	**82.1**	**90.2**	**92.7**	**61.7**

Methods	Market-1501 → MSMT17				DukeMTMC-reID → MSMT17			
	Rank@1	Rank@5	Rank@10	mAP	Rank@1	Rank@5	Rank@10	mAP
PTGAN [56]	10.2	-	24.4	2.9	11.8	-	27.4	3.3
ENC [69]	25.3	36.3	42.1	8.5	30.2	41.5	46.8	10.2
SSG [10]	31.6	-	49.6	13.2	32.2	-	51.2	13.3
DG-Net++	**48.4**	**60.9**	**66.1**	**22.1**	**48.8**	**60.9**	**65.9**	**22.1**

Methods	MSMT17 → Market-1501				MSMT17 → DukeMTMC-reID			
	Rank@1	Rank@5	Rank@10	mAP	Rank@1	Rank@5	Rank@10	mAP
PAUL [59]	68.5	-	-	40.1	72.0	-	-	53.2
DG-Net++	**83.1**	**91.5**	**94.3**	**64.6**	**75.2**	**73.6**	**86.9**	**58.2**

Quantitative Results: Ablation Study

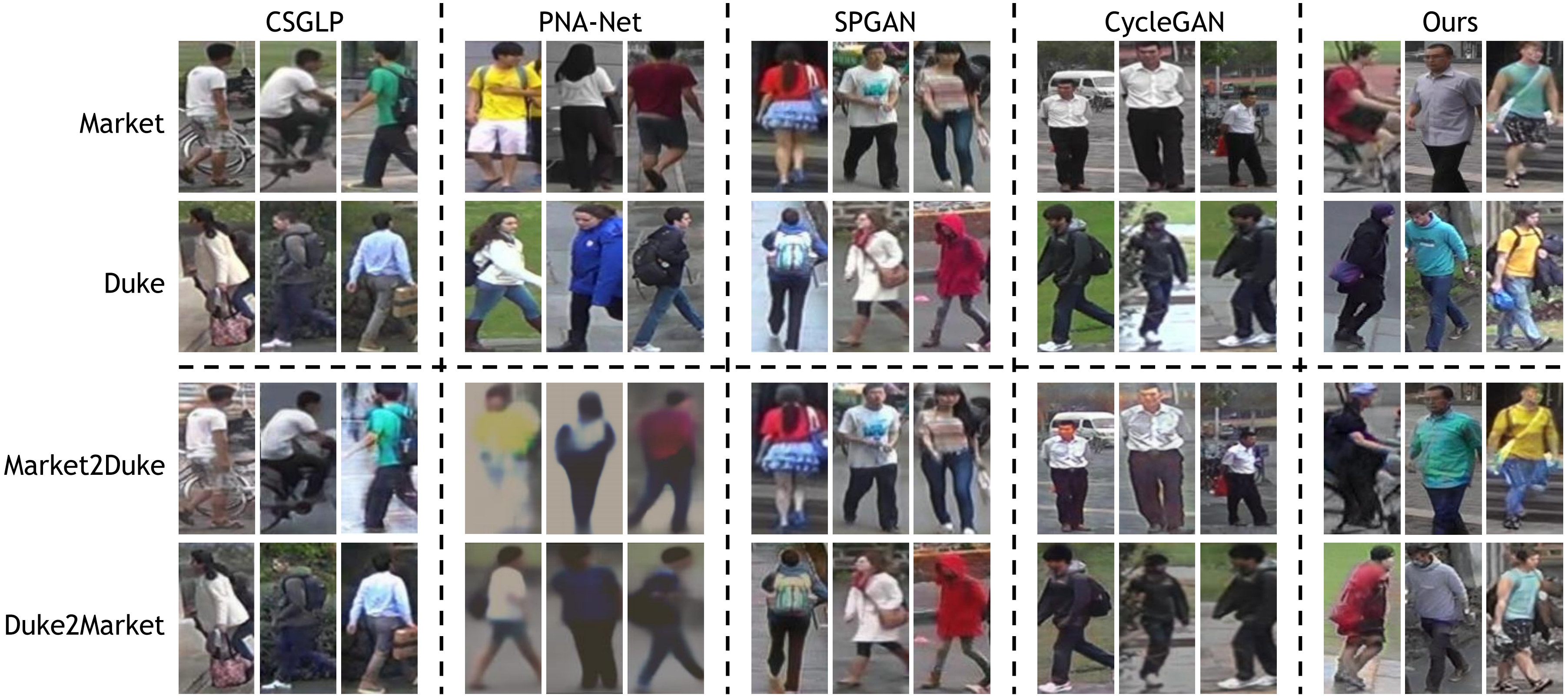
Methods	Market-1501 → DukeMTMC-reID				DukeMTMC-reID → Market-1501			
	Rank@1	Rank@5	Rank@10	mAP	Rank@1	Rank@5	Rank@10	mAP
Baseline	37.4	52.4	58.4	19.3	39.7	57.9	64.3	15.0
+A+ST	71.4	81.8	85.7	57.5	75.7	86.4	90.1	57.1
+D	44.5	60.6	66.7	24.2	50.1	68.0	73.9	26.8
+D+A	53.2	68.7	73.8	36.3	52.2	70.7	77.0	28.6
+D+ST	74.2	82.8	86.5	58.4	78.0	87.1	90.3	56.5
+D+A+ST	**78.9**	**87.8**	**90.4**	**63.8**	**82.1**	**90.2**	**92.7**	**61.7**



- D: disentangling
- A: adversarial alignment
- ST: self-training

Qualitative Results: Image Synthesis

Qualitative Results: Comparison with SOTA



Qualitative Results: Ablation Study

appearance | structure | DG-Net++ | w/o cross-domain disentangling | w/o cross-domain disentangling and pseudo-id

GitHub

See more details in our paper

Joint Discriminative and Generative Learning for Person Re-Identification