Image-Image Domain Adaptation with Preserved Self-Similarity and Domain-Dissimilarity for Person Re-identification

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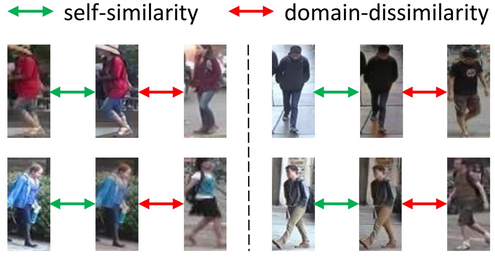
Problem

Person re-ID models trained on one dataset often fail to generalize well to another due to dataset bias.

Motivation

- Style transfer bridges the dataset gap by transferring persons in dataset A to dataset B.

- Self-similarity and domain-dissimilarity



Self-similarity: a translated image, despite of its style changes, should contain the same underlying identity with its corresponding source image.

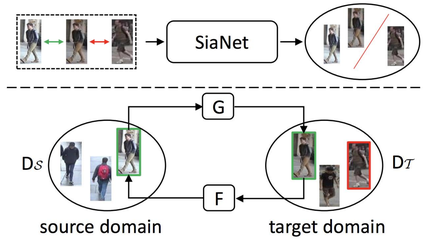
Domain-dissimilarity: a translated image should be different from any image in the target dataset in terms of the underlying ID.

Method

- "Learning via translation" framework

Step 1: source-target image translation **Step 2**: feature learning

- Similarity Preserving cycle-consistent Generative Adversarial Network (SPGAN)



SPGAN consists of two components: SiaNet (top) and CycleGAN (bottom)

SiaNet constrains the mapping functions

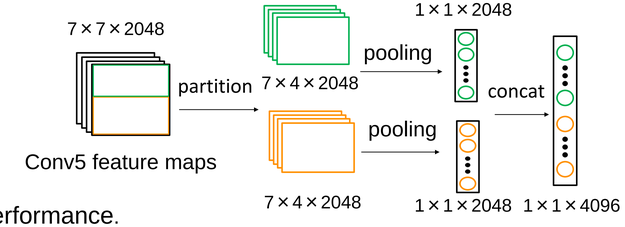
- Visualization

Image-image translation by **SPGAN**

Experiment

- Local Max Pooing (LMP)

It works on a well-trained re-ID model and can reduce the impact of noisy signals.



- Performance.

We adopt ID-discriminative Embedding (IDE) as feature learning method.

➢ Comparison with baselines

Methods	DukeMTMC-reID					Market-1501				
	rank-1	rank-5	rank-10	rank-20	mAP	rank-1	rank-5	rank-10	rank-20	mAP
Supervised Learning	66.7	79.1	83.8	88.7	46.3	75.8	89.6	92.8	95.4	52.2
Direct Transfer	33.1	49.3	55.6	61.9	16.7	43.1	60.8	68.1	74.7	17.0
CycleGAN (basel.)	38.1	54.4	60.5	65.9	19.6	45.6	63.8	71.3	77.8	19.1
CycleGAN (basel.) + L_{ide}	38.5	54.6	60.8	66.6	19.9	48.1	66.2	72.7	80.1	20.7
SPGAN ($m = 0$)	37.7	53.1	59.5	65.6	20.0	49.2	66.9	74.0	80.0	20.5
SPGAN ($m = 1$)	39.5	55.0	61.4	67.3	21.0	48.7	65.7	73.0	79.3	21.0
SPGAN ($m = 2$)	41.1	56.6	63.0	69.6	22.3	51.5	70.1	76.8	82.4	22.8
SPGAN ($m = 2$) + LMP	**46.9**	**62.6**	**68.5**	**74.0**	**26.4**	**58.1**	**76.0**	**82.7**	**87.9**	**26.9**

➢ Comparison with the state of the art

Methods	Market-1501			
	Setting	Rank-1	Rank-10	mAP
Bow	SQ	35.8	60.3	14.8
LOMO	SQ	27.2	49.1	8.0
UMDL	SQ	34.5	59.6	12.4
PUL	SQ	45.5	66.7	20.5
CAMEL	MQ	54.5	-	26.3
SPGAN	SQ	51.5	76.8	22.8
SPGAN	MQ	57.0	80.3	27.1
SPGAN+LMP	SQ	**58.1**	**82.7**	**26.9**

Methods	DukeMTMC-reID		
	Rank-1	Rank-10	mAP
Bow	17.1	34.9	8.3
LOMO	12.3	26.6	4.8
UMDL	18.5	37.6	7.3
PUL	30.0	48.5	16.4
SPGAN	41.1	63.0	22.3
SPGAN+LMP	**46.9**	**68.5**	**26.4**

SQ: single-query; MQ: multiple-query.

Reference

1. A. Torralba and A. A. Efros. Unbiased look at dataset bias. In CVPR, 2011.
2. J. Zhu et.al. Unpaired imageto-image translation using cycle-consistent adversarial networks. In ICCV, 2017.

The code is available at https://github.com/Simon4Yan/Learning-via-Translation.