Domain Adaptation through Synthesis for Unsupervised Person Re-identification

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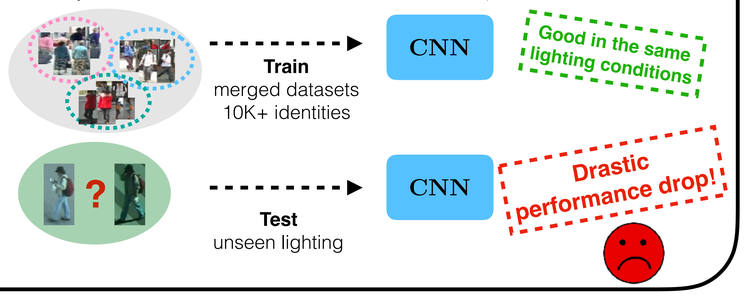
Motivation

Supervised re-identification **does not scale** to large camera networks

- **Poor generalization** properties to unseen camera conditions
- **Merging** all re-identification datasets is **not sufficient** to generalize (in total only tens of different illumination conditions)



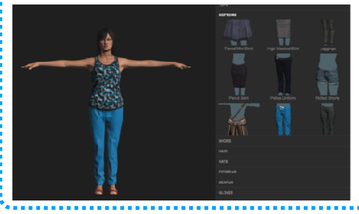
Contributions

- **SyRI** - a new dataset with **100** virtual humans rendered with **140** HDR environment maps - increases generalization capabilities of trained models,
- A novel three-step unsupervised **domain adaptation** using synthetic data.

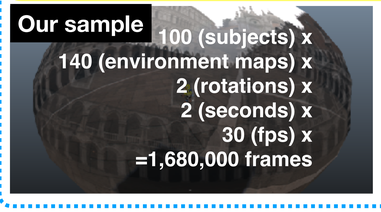
SyRI Dataset

140 HDR environment maps

100 3D virtual humans



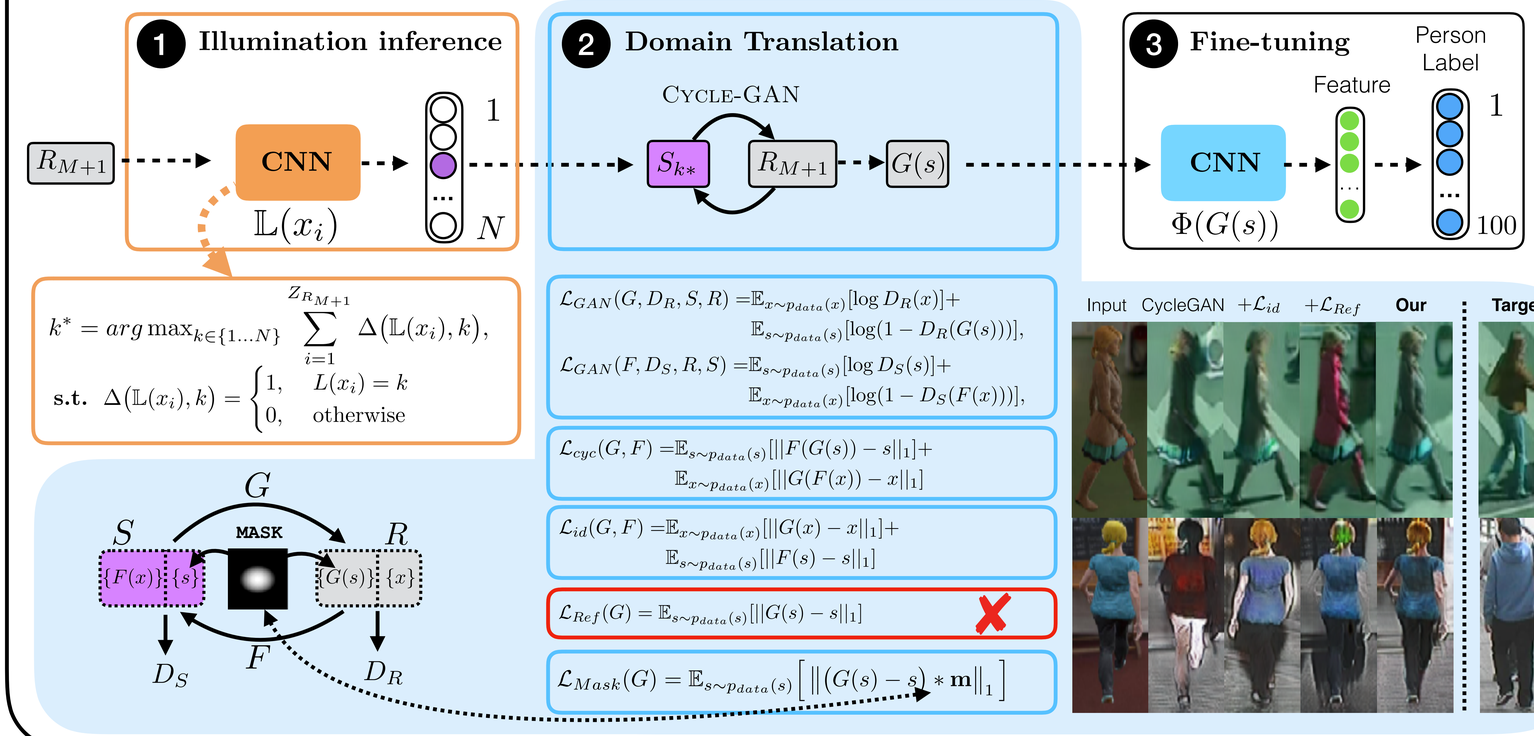
We publish Unreal Engine 4 project!



Domain Adaptation

Given labeled data R_1 … R_M S_1 … S_N how to adapt to target Illumination R_{M+1}?

Three-step process



Results

	Method	VIPeR	CUHK01	iLIDS	PRID	Market
unsupervised	State-of-the-Art	38.5 [12]	**57.3** [44]	49.3 [32]	34.8 [12]	58.2 [12]
	R	32.3	41.6	51.0	7.0	44.7
	R + S	36.4	49.5	54.8	15.0	54.3
	CycleGan	37.0	49.9	53.9	33.0	55.4
	CycleGan + $\mathcal{L}_{id}$	39.9	54.0	55.9	40.0	63.1
	CycleGan+$\mathcal{L}_{Ref}$	41.1	48.4	56.1	28.0	57.5
	Ours	**43.0**	54.9	**56.5**	**43.0**	**65.7**
	R + S*	49.4	71.4	63.2	65.0	83.9

		Method	VIPeR	CUHK01	iLIDS	PRID	Market
unsupervised	hand-craft	GL [20]	33.5	41.0	-	25.0	-
		DLLAP [21]	29.6	28.4	-	21.4	-
		TSR [35]	27.7	23.3	-	-	-
		TL [32]	31.5	27.1	49.3	24.2	-
	CNN	SSDAL [38]	37.9	-	-	20.1	39.4
		CAMEL [44]	30.9	**57.3**	-	-	54.5
		SPGAN [6]	-	-	-	-	57.7
		TJ-AIDL [42]	38.5	-	-	34.8	58.2
		Ours	**43.0**	54.9	**56.5**	**43.0**	**65.7**
supervised	hand-craft	LOMO+XQDA [27]	40.0	63.2	-	26.7	-
		Ensembles [31]	45.9	53.4	50.3	17.9	-
		Null Space [45]	42.2	64.9	-	29.8	55.4
		Gaussian+XQDA [29]	49.7	57.8	-	-	66.5
	CNN	Triplet Loss [4]	47.8	53.7	60.4	22.0	-
		FT-JSTL+DGD [43]	38.6	66.6	64.6	64.0	73.2
		SpindleNeT [46]	**53.8**	**79.9**	**66.3**	**67.0**	**76.9**