A Base-Derivative Framework for Cross-Modality RGB-Infrared Person Re-Identification

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Motivation

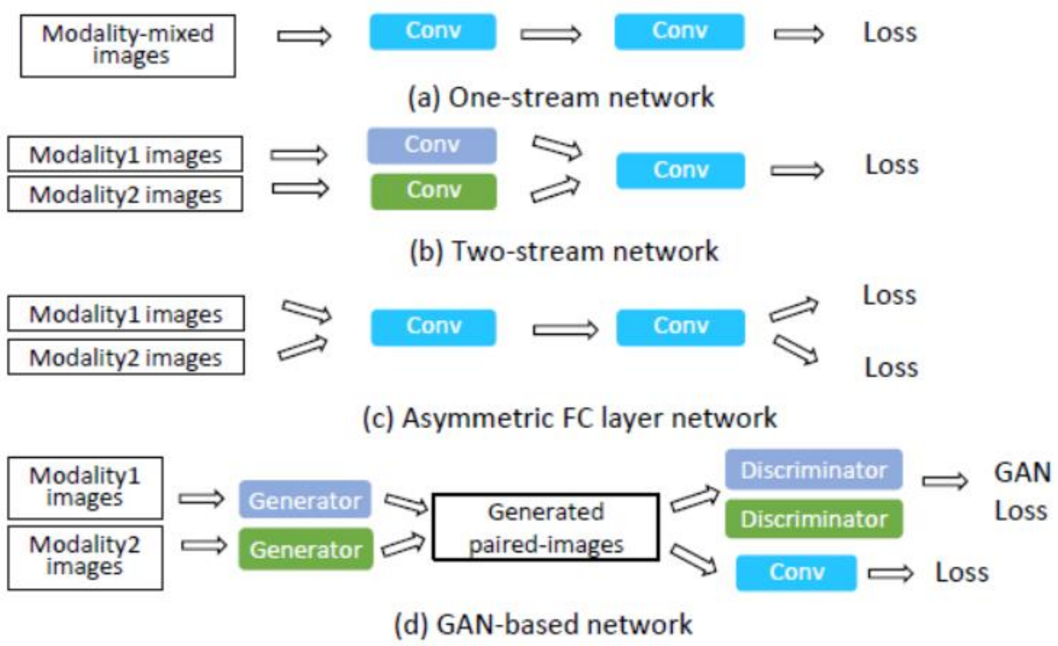

Fig. 1 Different networks for RGB-IR person Re-ID.

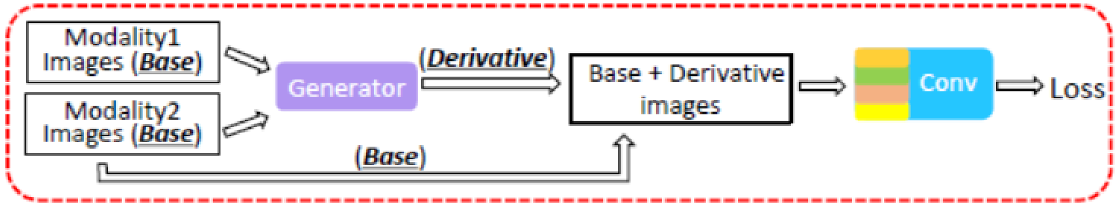

Fig. 2 proposed base-derivative network

Method

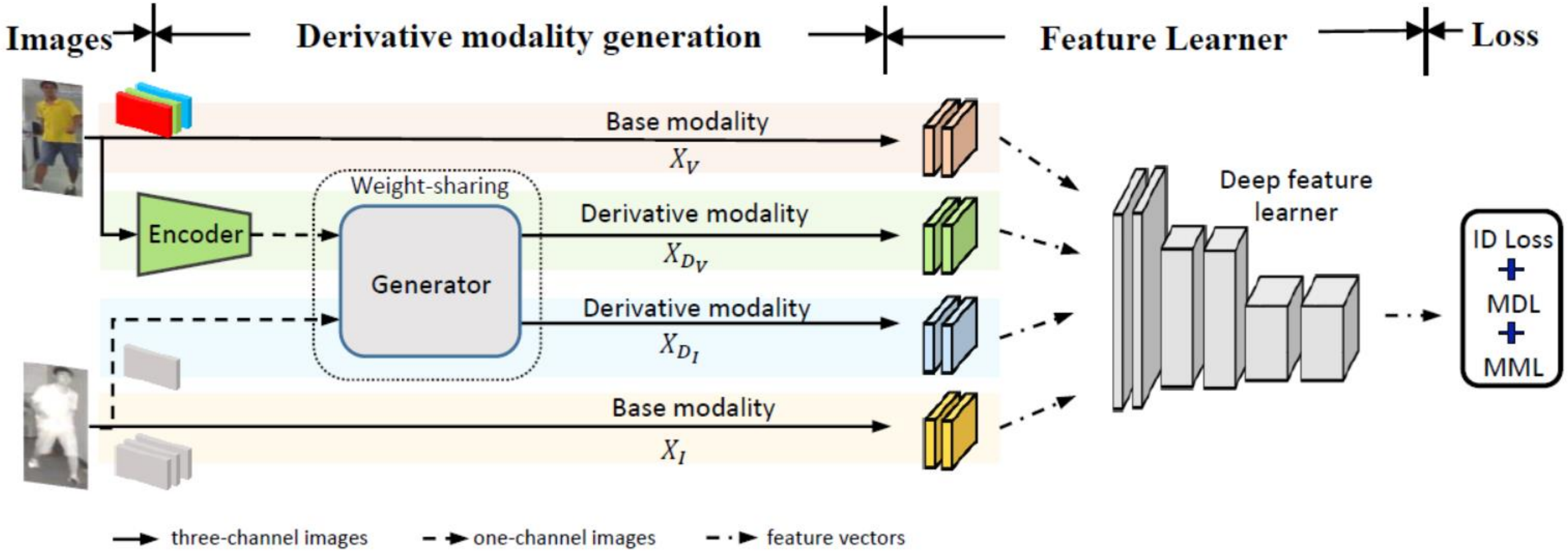

Fig. 3 The overall framework of our base-derivative network.

Method

Multi-mode intra-modality loss :

$$L^{M}{}_{intra-tri} = \sum_{i}^{N} \left[\alpha_1 + \max_{\substack{j=1,\dots,N \\ y_i = y_j}} D\left(f_i, f_j\right) + \min_{\substack{k=1,\dots,N \\ y_i \neq y_k}} D\left(f_i, f_k\right) \right]_+$$

Multi-directional cross-modality loss :

$$L^{M_1 \leftrightarrow M_2}{}_{inter-tri} = L^{M_1 \rightarrow M_2}{}_{inter-tri} + L^{M_1 \leftarrow M_2}{}_{inter-tri}$$

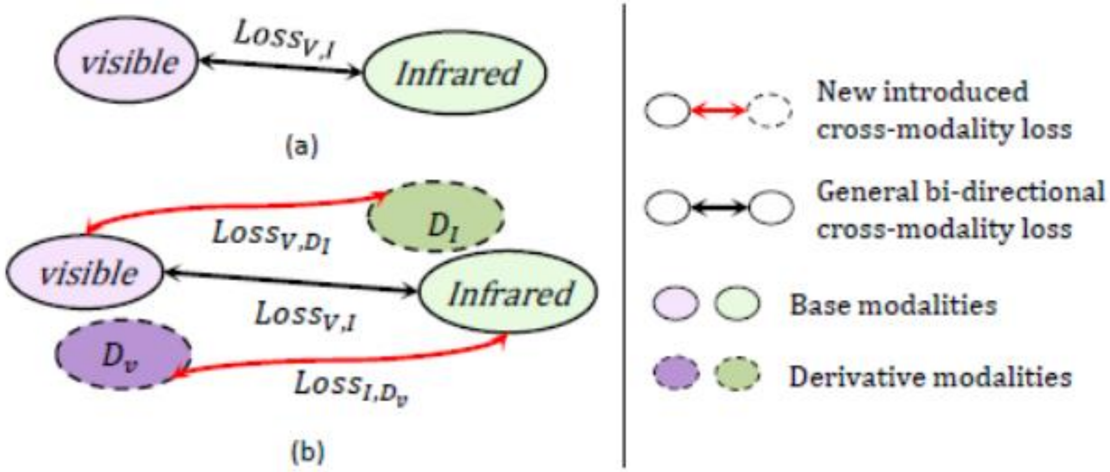

Fig. 4 Cross-modality constraints.

Experiments and Results

Table 1: COMPARISON RESULTS(%) AT RANK r WITH THE STATE-OF-THE-ART CROSS-MODALITY RE-ID METHODS ON THE SYSU-MM01 DATASET.

Methods	All-search				Indoor-search			
	R1	**R10**	**R20**	**mAP**	**R1**	**R10**	**R20**	**mAP**
Zero-Padding [20] $_{ICCV17}$	14.8	54.12	71.33	15.95	20.58	68.38	85.79	26.92
HCML [7] $_{AAAI18}$	14.32	53.16	69.17	16.16	24.52	-	-	30.08
D-HSME [10] $_{AAAI19}$	20.68	62.74	77.95	23.12	-	-	-	-
eBDTR [6] $_{TIFS17}$	27.82	67.34	81.34	28.42	32.46	77.42	89.62	42.46
cmGAN [24] $_{IJCAI18}$	26.97	67.51	80.56	27.8	31.63	77.23	89.18	42.19
D^2RL [12] $_{CVPR19}$	28.9	70.60	82.40	29.20	-	-	-	-
MAC [8] $_{MM19}$	33.26	79.04	90.09	36.22	33.37	82.49	93.69	44.95
MSR [9] $_{TIP19}$	37.35	83.40	93.34	38.11	39.64	89.29	97.66	50.88
AlignGAN [13] $_{ICCV19}$	42.4	85.00	93.70	40.7	45.9	87.6	94.4	54.3
Hi-CMD [23] $_{CVPR20}$	34.94	77.58	-	35.94	-	-	-	-
JSIA [25] $_{AAAI20}$	38.10	80.7	89.9	36.9	43.8	86.2	94.2	52.9
Ours	**51.05**	**87.75**	**94.43**	**49.63**	**55.93**	**91.55**	**96.95**	**63.38**

Table 2: COMPARISON RESULTS(%) WITH THE STATE-OF-THE-ART CROSS-MODALITY RE-ID METHODS ON THE REGDB DATASET.

Methods	visible2thermal			
	R1	**R10**	**R20**	**mAP**
Zero-Padding [20] $_{ICCV17}$	17.75	34.21	44.35	18.90
HCML [7] $_{AAAI18}$	24.44	47.53	56.78	20.08
eBDTR [6] $_{TIFS19}$	34.62	58.96	68.72	33.46
MAC [8] $_{MM19}$	36.43	62.36	71.63	37.03
D^2RL [12] $_{CVPR19}$	43.4	66.10	76.30	44.1
MSR [9] $_{TIP19}$	48.43	70.32	79.95	48.67
D-HSME [10] $_{AAAI19}$	50.85	73.36	81.66	47.00
AlignGAN [13] $_{ICCV19}$	57.9	-	-	53.6
XIV [16] $_{AAAI20}$	62.21	83.13	91.72	60.18
Hi-CMD [23] $_{CVPR20}$	70.93	86.39	-	66.04
Ours	**80.67**	**87.72**	**90.45**	**78.83**

Experiments and Results

Table 3: COMPARISON RESULTS(%) WITH THE BASELINE AND THE AGW USING THE SAME BACK-BONE ON THE SYSU-MM01 AND REGDB DATASETS.

Methods	RegDB		SYSU-MM01			
			all-search		indoor-search	
	R1	mAP	R1	mAP	R1	mAP
Baseline	65.79	64.69	42.83	41.97	47.66	56.50
AGW [22] $_{2020}$	70.05	66.37	47.50	47.65	54.17	62.97
Ours	**80.67**	**78.83**	**51.05**	**49.63**	**55.93**	**63.38**

Table 4: ABLATION STUDY ON THE SYSU AND REGDB DATASET. 'B' MEANS 'BASELINE' AND THE SUPERSCRIPT REPRESENTS DIFFERENT TYPES OF MML AND MDL LOSS.

Methods	Modality				Loss						RegDB		SYSU-MM01			
					ID	MML	MDL						all-search		indoor-search	
	I	V	D_I	D_V			I,V	V,D_I	I,D_V	D_I,D_V	R1	mAP	R1	mAP	R1	mAP
B1	✓	✓	×	×	✓	×	×				45.34	39.79	33.49	33.69	36.82	47.14
B2	✓	✓	×	×	✓	✓	✓	×	×	×	65.79	64.69	42.83	41.97	47.66	56.50
Ours																
B2+MML+MDL^1	✓	✓	✓	×	✓	✓	✓	✓	×	×	79.98	77.76	41.58	42.33	46.02	55.11
B2+MML+MDL^2	✓	✓	×	✓	✓	✓	✓	×	✓	×	75.42	74.17	48.14	47.06	53.97	62.15
B2+MML+MDL^3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	79.21	76.85	50.66	**49.64**	**56.57**	**64.11**
B2+MML+MDL^4	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	**80.67**	**78.83**	**51.05**	49.63	55.93	63.38

Conclusion

- A base-derivative framework for cross-modality person Re-ID is proposed.

- Multi-mode intra-modality loss and multi-directional cross-modality

loss are designed to promote the reduction of intra- and cross-modality discrepancy.

Thanks!