ReID：多粒度网络（MGN）

1. ReID的定义与技术难点
2. ReID模型的评价指标
3. 多粒度网络（MGN）

ReID的定义

- 行人重识别（Person Re-identification）也称行人再识别，简称为ReID，是利用计算机视觉技术判断图像或者视频序列中是否存在特定行人的技术。广泛被认为是一个图像检索的子问题。给定一个监控行人图像，检索跨设备下的该行人图像。

智能安防

智能商业—无人超市

人机交互

相册聚类

ReID的技术难点

实际应用中：

- 无正面照；
- 服装更换；
- 遮挡；
- 图像分辨率低；
- 光线差异；
- 室内室外场景变化；

数据采集时：

- 需跨摄像头采集；
- 数据一般都是视频的连续截图；
- 同一个人最好有多张全身照片；
- 监控大规模搜集涉及到数据，涉及到用户的隐私问题。

ReID模型的评价指标

- 1.Rank1（首位命中率）：搜索结果中最靠前的一张图是正确结果的概率，一般通过实验多次来取平均值。
- 2.mAP（平均均值精度）：

mAP计算演示

- 假设只有两张检索图，图1和图2
- 图1在gallery中有5张图片，图2在gallery中只有3张图片
- 排序：图1对整个gallery进行距离排序，对应的5张图片排序位置分别为1,3,4,8,20。图2对整个gallery进行距离排序，对应的3张图片排序分别为1,3,5
- 单独计算精度：
- 图1：AP=（1/1+2/3+3/4+4/8+5/20）/5=0.633
- 图2：AP=（1/1+2/3=3/5）/3=0.756
- mAP=(0.633+0.756)/2=69.45%

MGN(多粒度网络)

- 论文题目： **Learning Discriminative Features with Multiple Granularities for Person Re-Identification**
- 学习多粒度显著特征用于行人重识别

Learning Discriminative Features with Multiple Granularities for Person Re-Identification

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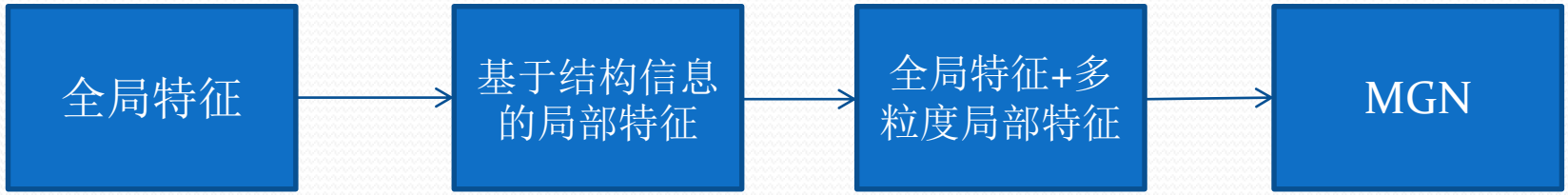
- 论文地址： https://arxiv.org/pdf/1804.01438.pdf

MGN(多粒度网络)



MGN(多粒度网络)

Figure 1: Body part partitions from coarse to fine granularities. We regard original pedestrian images with the whole body as the coarsest level of granularity in the left column. The middle and right column are respectively pedestrian partitions divided into 2 and 3 stripes from the original images. The more stripes images are divided into, the finer the granularity of partitions is.

图像纵向分为不同粒度的区域

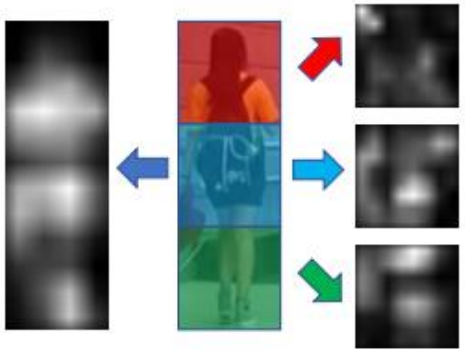
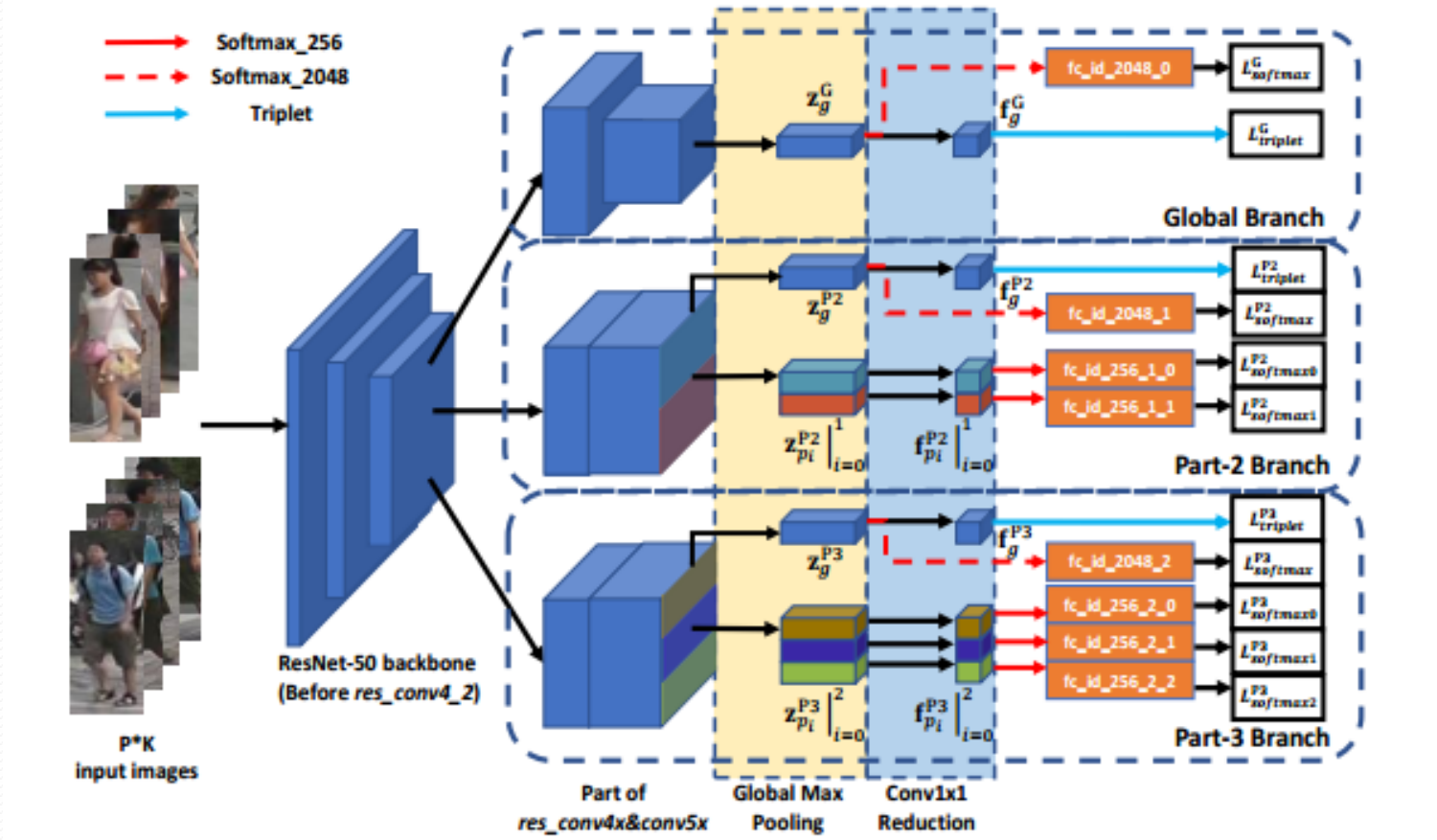


Figure 2: Feature response maps in different granularities extracted from the last output of different models. The response intensity is calculated by the L2-norm of feature vectors from all the spatial locations. Middle Column: a pedestrian image. Left Column: global response map by IDE embedding. Right Column: three local response maps corresponding to three split stripes of the origin image, extracted by part-based model. Best viewed in color.

不同粒度网络的关注点发布

MGN(多粒度网络)—网络结构



MGN(多粒度网络)—损失函数设计

Softmax Loss:

$$L_{softmax} = -\sum_{i=1}^{N} \log \frac{e^{\mathbf{W}_{y_i}^T \mathbf{f}_i}}{\sum_{k=1}^{C} e^{\mathbf{W}_k^T \mathbf{f}_i}}$$

Triplet Loss:

$$L_{triplet} = -\sum_{i=1}^{P}\sum_{a=1}^{K}[\alpha + \max_{p=1\ldots K} \|\mathbf{f}_a^{(i)} - \mathbf{f}_p^{(i)}\|_2 - \min_{\substack{n=1\ldots K \\ j=1\ldots P \\ j\neq i}} \|\mathbf{f}_a^{(i)} - \mathbf{f}_n^{(j)}\|_2]_+$$

实验结果

Methods	Single Query		Multiple Query	
	Rank-1	mAP	Rank-1	mAP
TriNet[14]	84.9	69.1	90.5	76.4
JLML[21]	85.1	65.5	89.7	74.5
AACN[40]	85.9	66.9	89.8	75.1
AOS[16]	86.5	70.4	91.3	78.3
DPFL[7]	88.6	72.6	92.2	80.4
MLFN[4]	90.0	74.3	92.3	82.4
KPM+RSA+HG[30]	90.1	75.3	-	-
PSE+ECN[27]	90.4	80.5	-	-
HA-CNN[22]	91.2	75.7	93.8	82.8
DuATM[31]	91.4	76.6	-	-
GSRW[29]	92.7	82.5	-	-
DNN_CRF[5]	93.5	81.6	-	-
PCB+RPP[36]	93.8	81.6	-	-
MGN(Ours)	**95.7**	**86.9**	**96.9**	**90.7**
TriNet(RK)[14]	86.7	81.1	91.8	87.2
AOS(RK)[16]	88.7	83.3	92.5	88.6
AACN(RK)[40]	88.7	83.0	92.2	87.3
PSE+ECN(RK)[27]	90.3	84.0	-	-
MGN(Ours, RK)	**96.6**	**94.2**	**97.1**	**95.9**

Table 2: Comparison of results on Market-1501 with Single Query setting (SQ) and Multiple Query setting (MQ). "RK" refers to implementing re-ranking operation.

Methods	Rank-1	mAP
SVDNet[35]	76.7	56.8
AOS[16]	79.2	62.1
HA-CNN[22]	80.5	63.8
GSRW[29]	80.7	66.4
DuATM[31]	81.8	64.6
PCB+RPP[36]	83.3	69.2
PSE+ECN[27]	84.5	75.7
DNN_CRF[5]	84.9	69.5
GP-reid[2]	85.2	72.8
MGN(Ours)	**88.7**	**78.4**

Table 3: Comparison of results on DukeMTMC-reID.

Methods	Labeled		Detected	
	Rank-1	mAP	Rank-1	mAP
BOW+XQDA[46]	7.9	7.3	6.4	6.4
LOMO+XQDA[23]	14.8	13.6	12.8	11.5
IDE[47]	22.2	21.0	21.3	19.7
PAN[48]	36.9	35.0	36.3	34.0
SVDNet[35]	40.9	37.8	41.5	37.3
HA-CNN[22]	44.4	41.0	41.7	38.6
MLFN[4]	54.7	49.2	52.8	47.8
PCB+RPP[36]	-	-	63.7	57.5
MGN(Ours)	**68.0**	**67.4**	**66.8**	**66.0**

Table 4: Comparison of results on CUHK03 with evaluation protocols in [50].