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行人重识别——序列重识别

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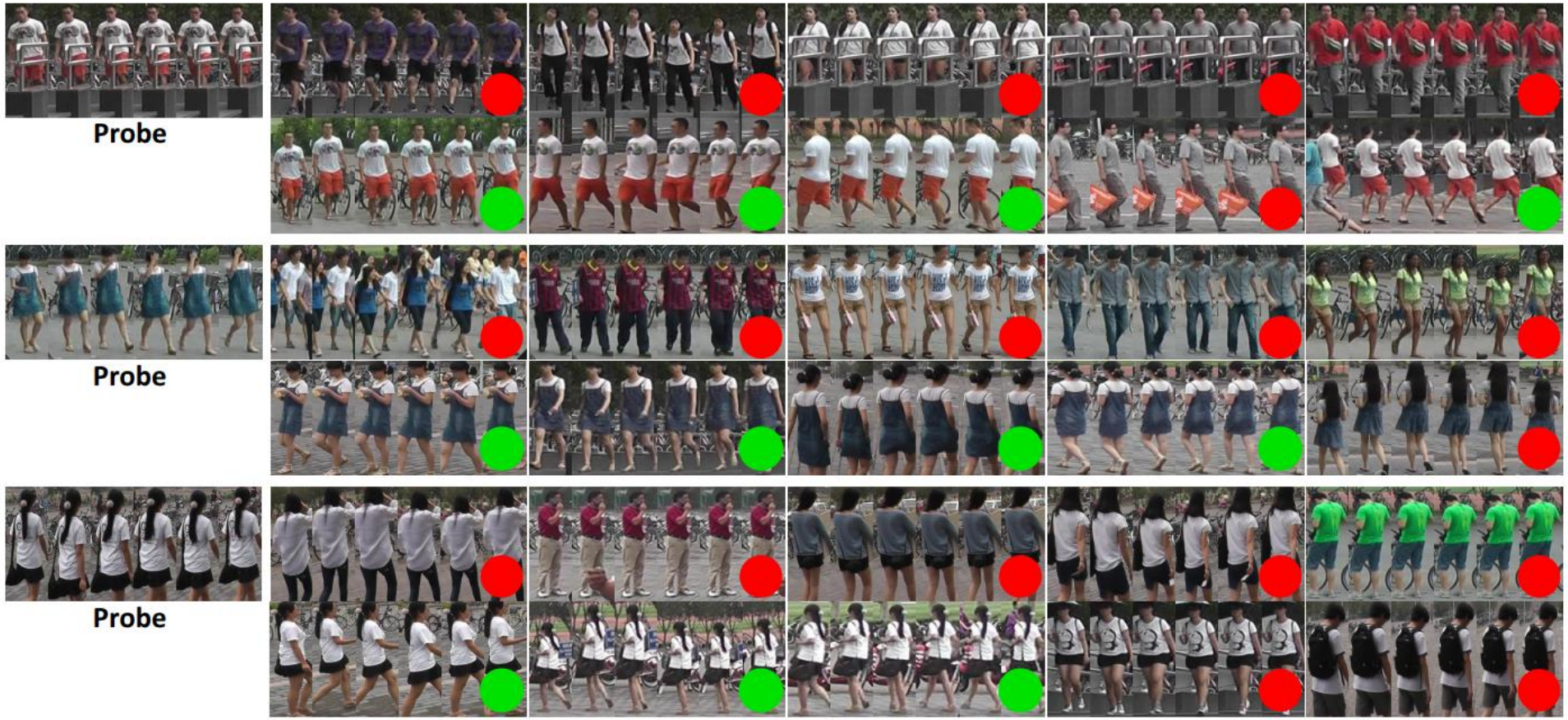
序列重识别

定义



序列重识别也常被称为视频重识别（Video ReID），是指利用一段连续的行人图片序列进行行人重识别任务。或者说是个序列搜索序列的问题。

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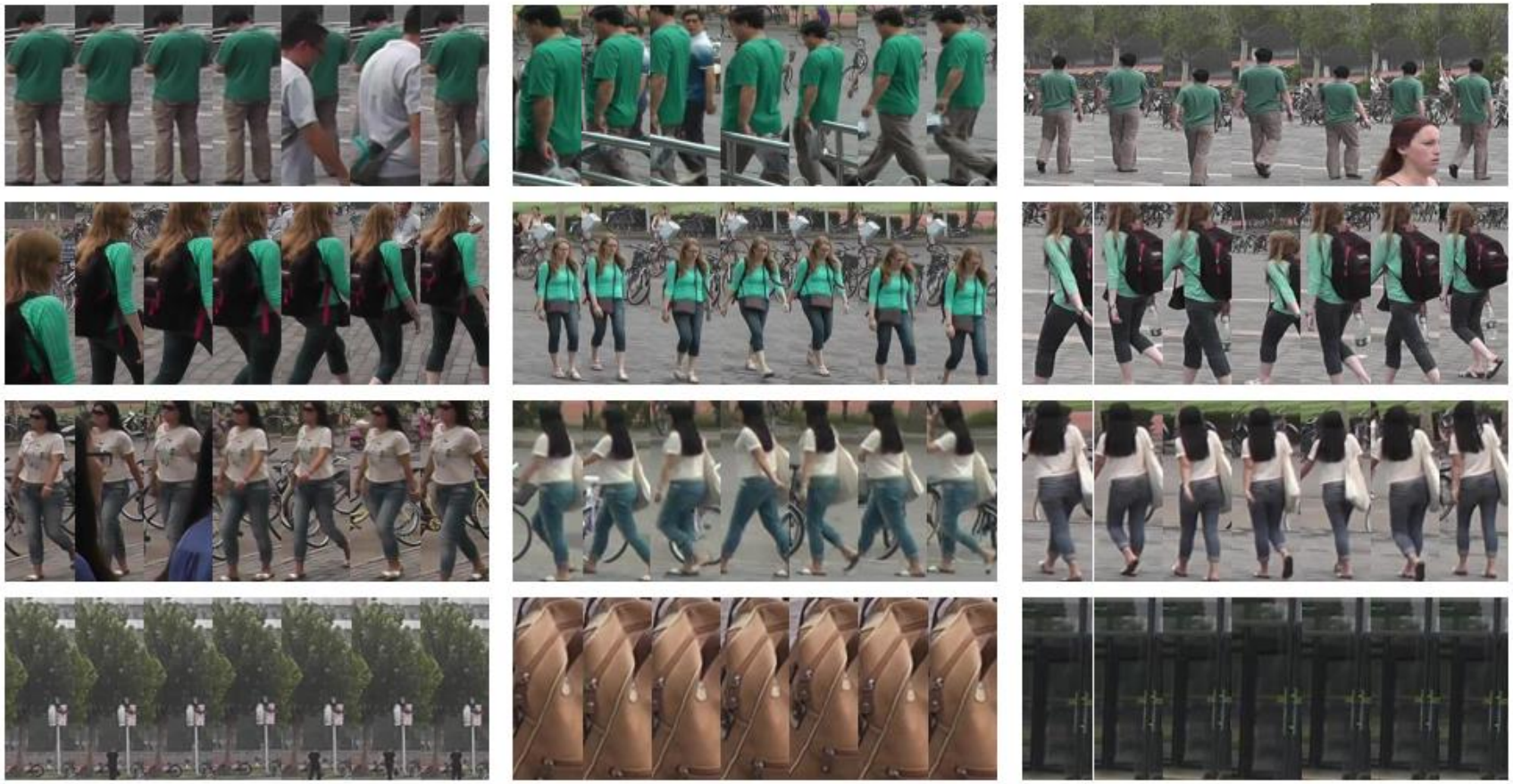
序列重识别

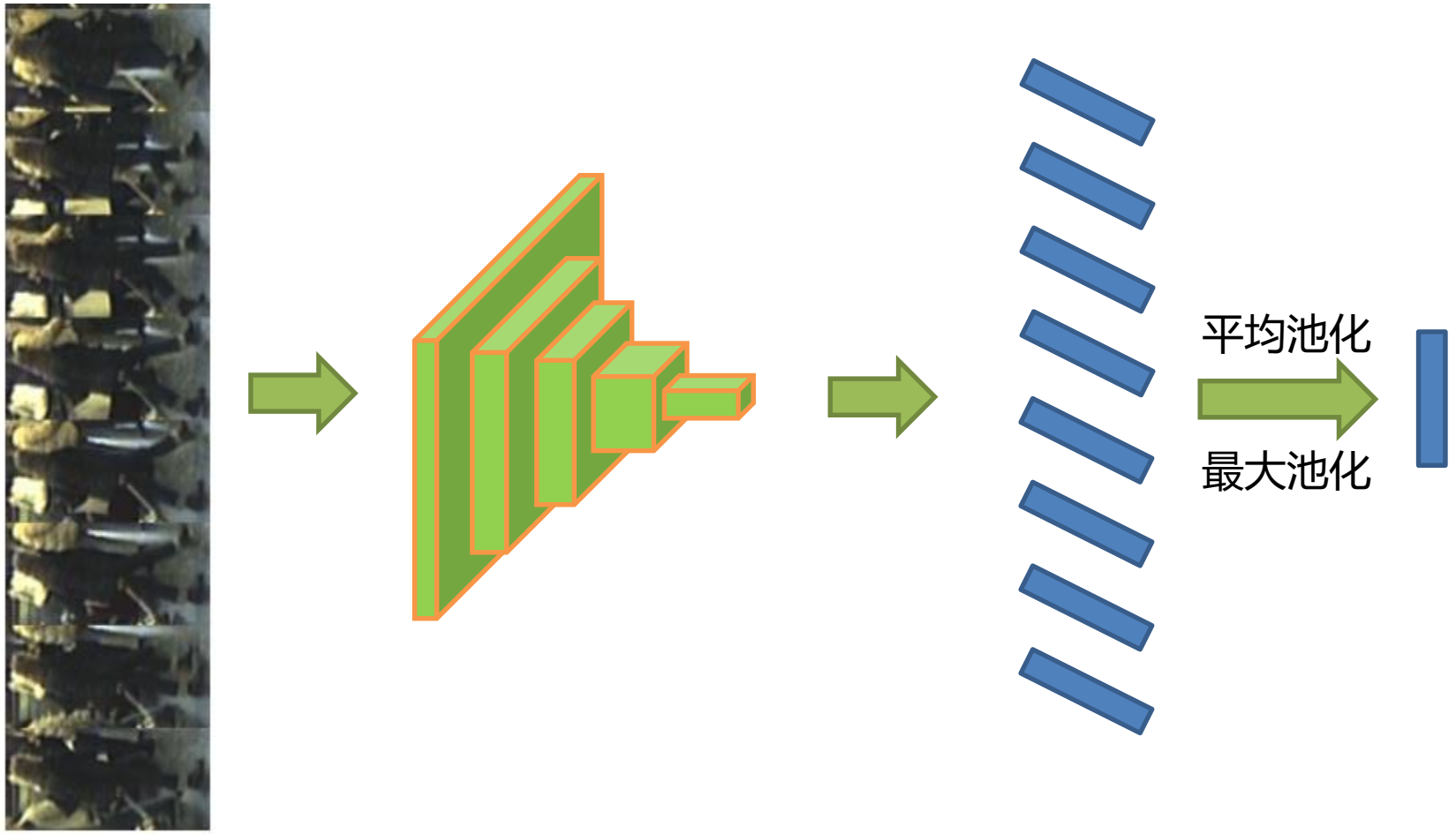
特点



- 姿态变化丰富
- 遮挡现象普遍
- 总有几帧质量好,也有几帧质量差
- 需要考虑如何融合各帧的信息

序列重识别

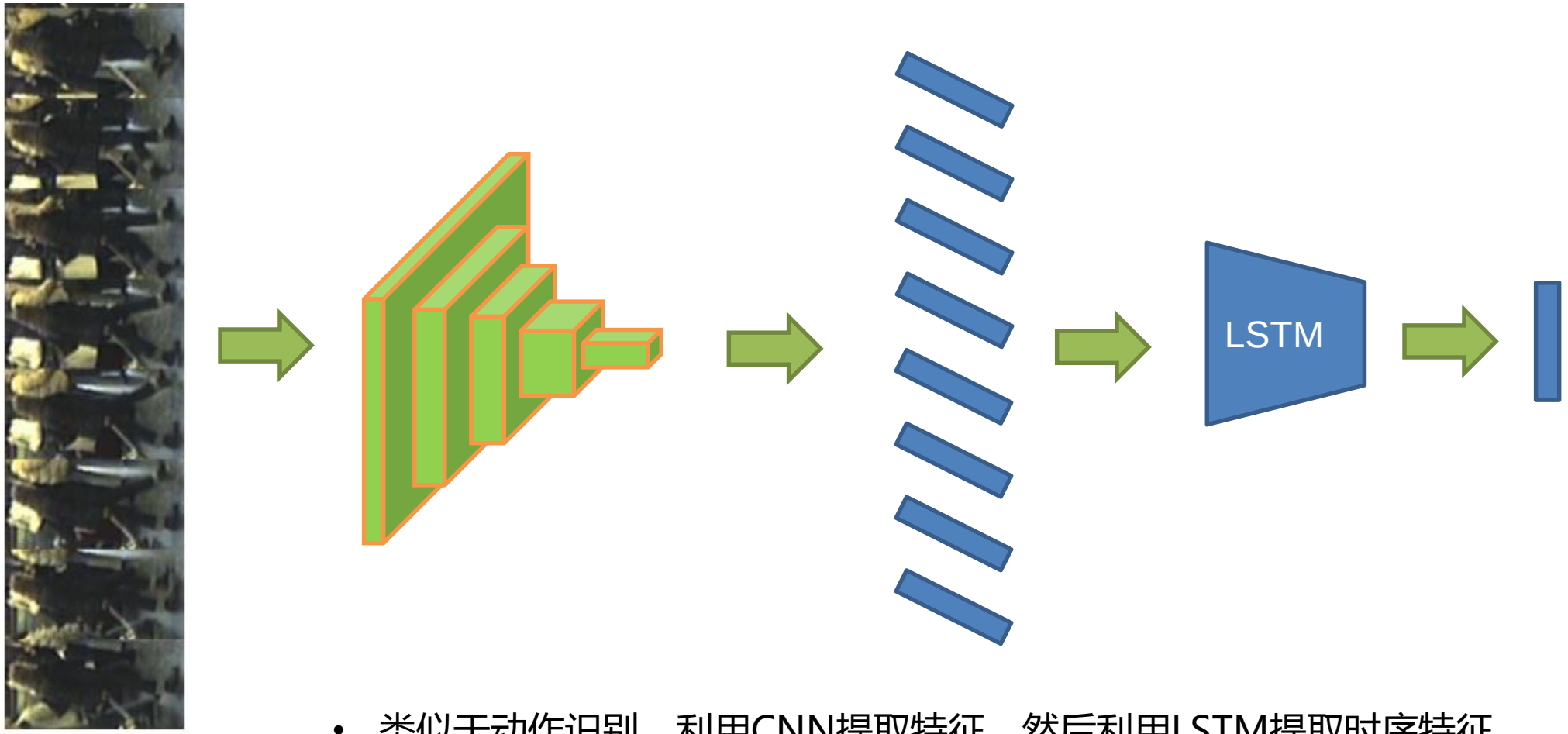
Baseline（单帧→序列）



- 对每一帧图像都提取一个ReID特征
- 直接通过平均池化或者最大池化来得到最终的ReID特征
- 比较简单，性能依赖于单帧ReID的性能

序列重识别

Baseline（CNN+LSTM）



- 类似于动作识别，利用CNN提取特征，然后利用LSTM提取时序特征

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序列重识别

难点

- 如何对多帧特征进行特征融合?
- 如何对每帧图像进行质量判断?
- 如何提取序列图像的运动特征?
- 如何解决序列帧数不统一问题?
- 如何提高序列ReID的运算效率?

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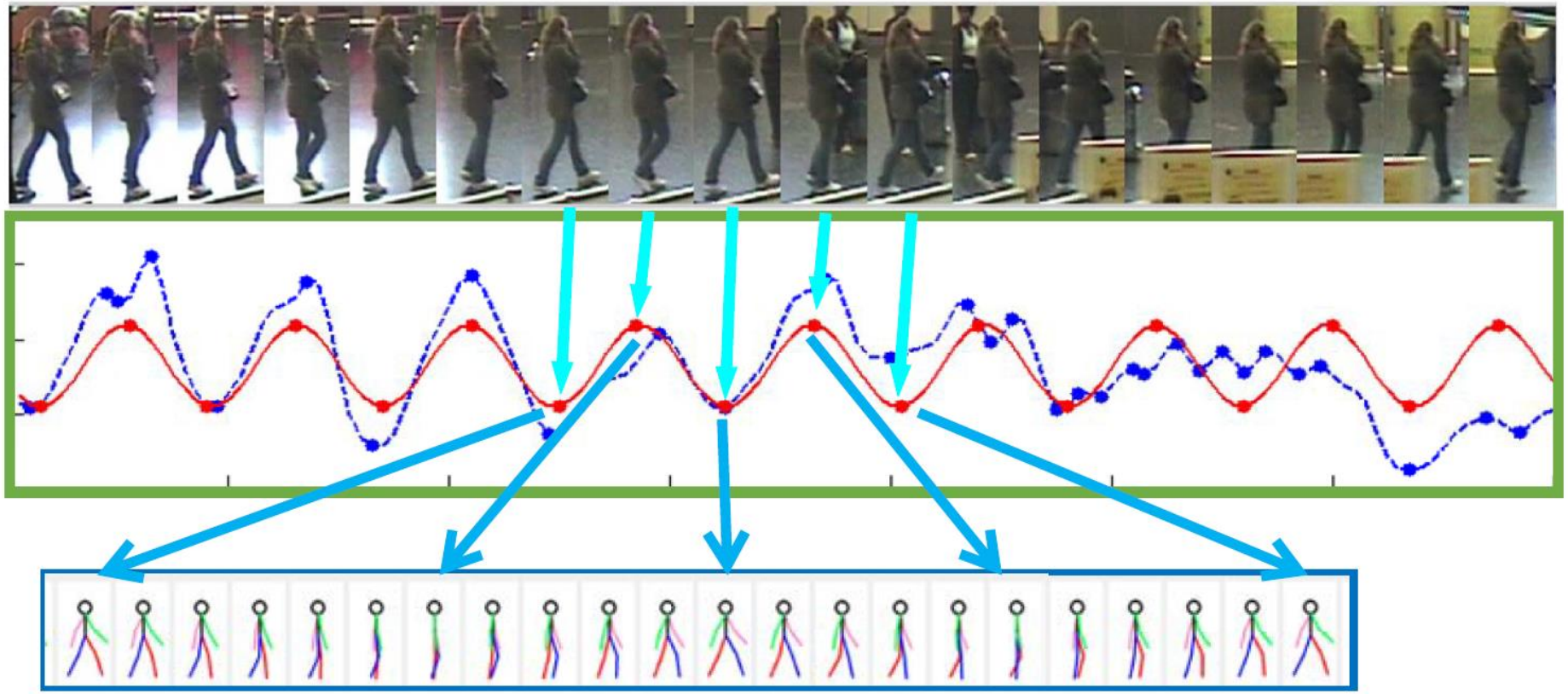
代表算法

- AMOC
- DFGP
- RQEN

序列重识别

AMOC

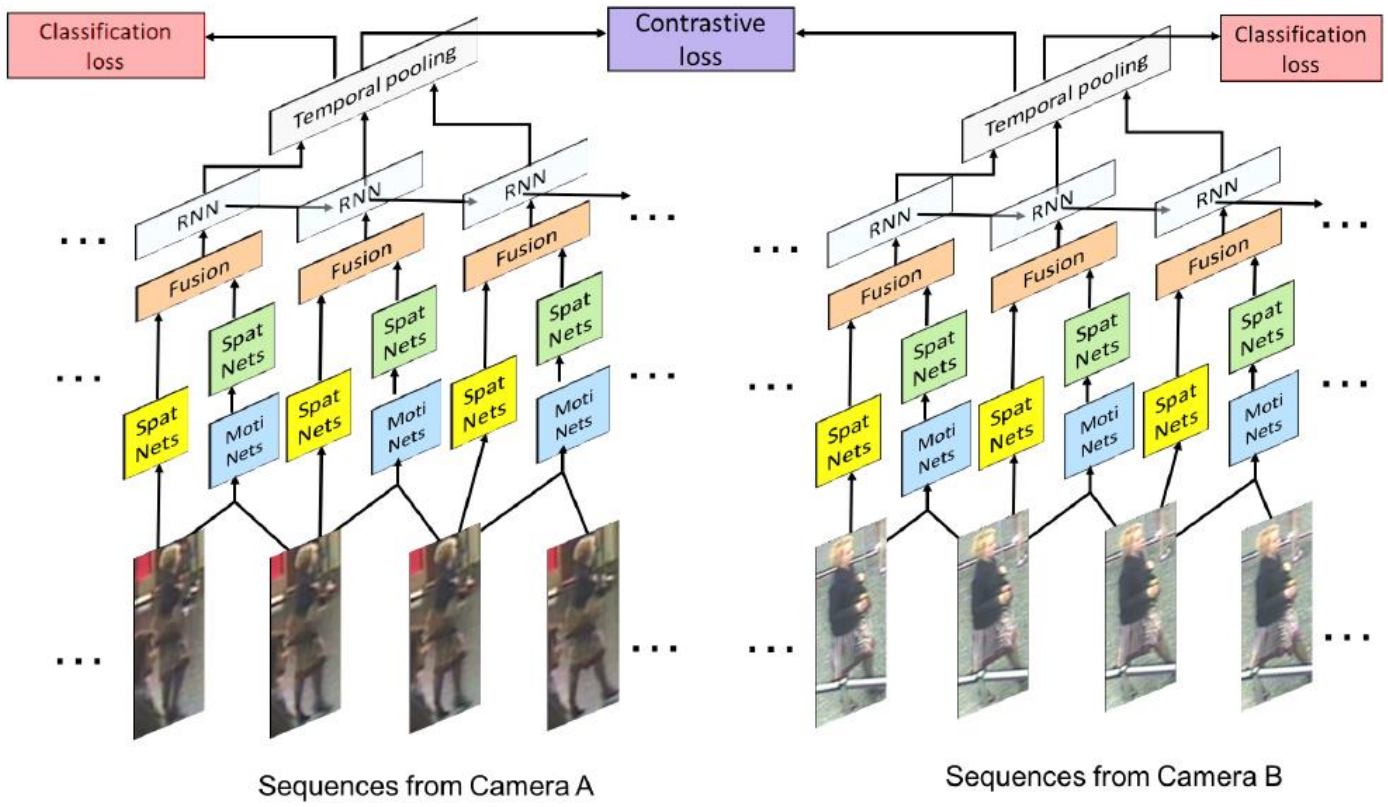


帧与帧之间存在着运动（步态）特征，也有利于ReID任务

Liu H, Jie Z, Jayashree K, et al. Video-based person re-identification with accumulative motion context[J]. IEEE transactions on circuits and systems for video technology, 2017.

序列重识别

AMOC



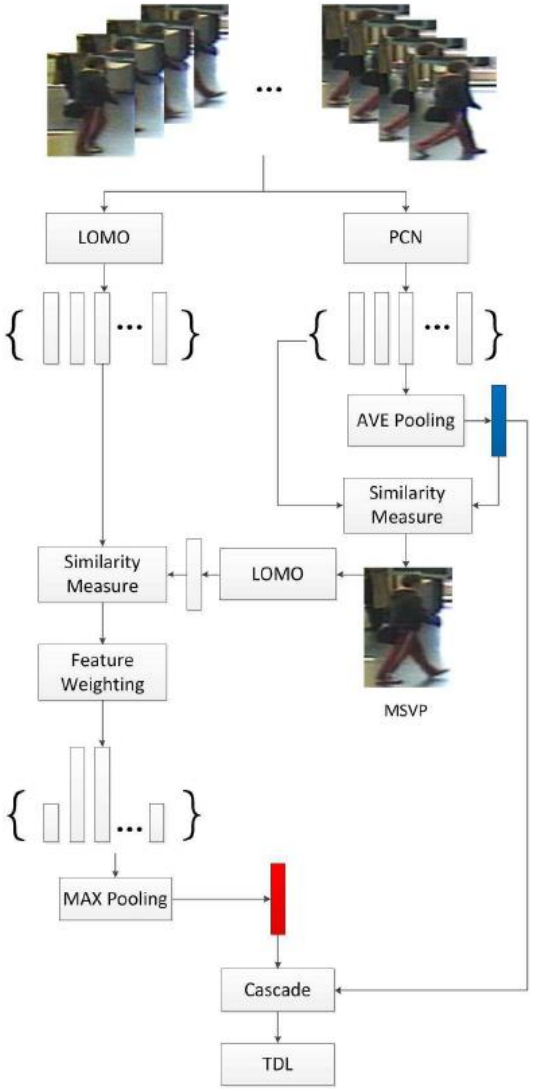
- 包含空间子网络和运动子网络
- 空间子网络提取单帧图像的内容特征
- 运动子网络提取相邻两帧的运动特征
- 融合内容特征与运动特征作为该帧的最终特征
- 利用RNN网络融合所有帧的特征信息
- 利用对比损失判断两个序列是否属于同一个行人ID

Liu H, Jie Z, Jayashree K, et al. Video-based person re-identification with accumulative motion context[J]. IEEE transactions on circuits and systems for video technology, 2017.

序列重识别

DFGP

- 采用传统的LOMO特征提取序列每一帧图像的行人特征
- 利用PCN网络提取每一帧特征，之后平均池化得到序列特征，找到最稳定帧MSVP
- 对MSVP提取LOMO特征，并与序列q计算特征距离，按照距离进行softmin归一化，得到每帧权重
- 特征×权重之后进行最大池化
- 融合池化后的序列特征和最稳定帧的特征作为最终特征



Li Y, Zhuo L, Li J, et al. Video-Based Person Re-identification by Deep Feature Guided Pooling[C]//Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition Workshops. 2017: 39-46.

序列重识别

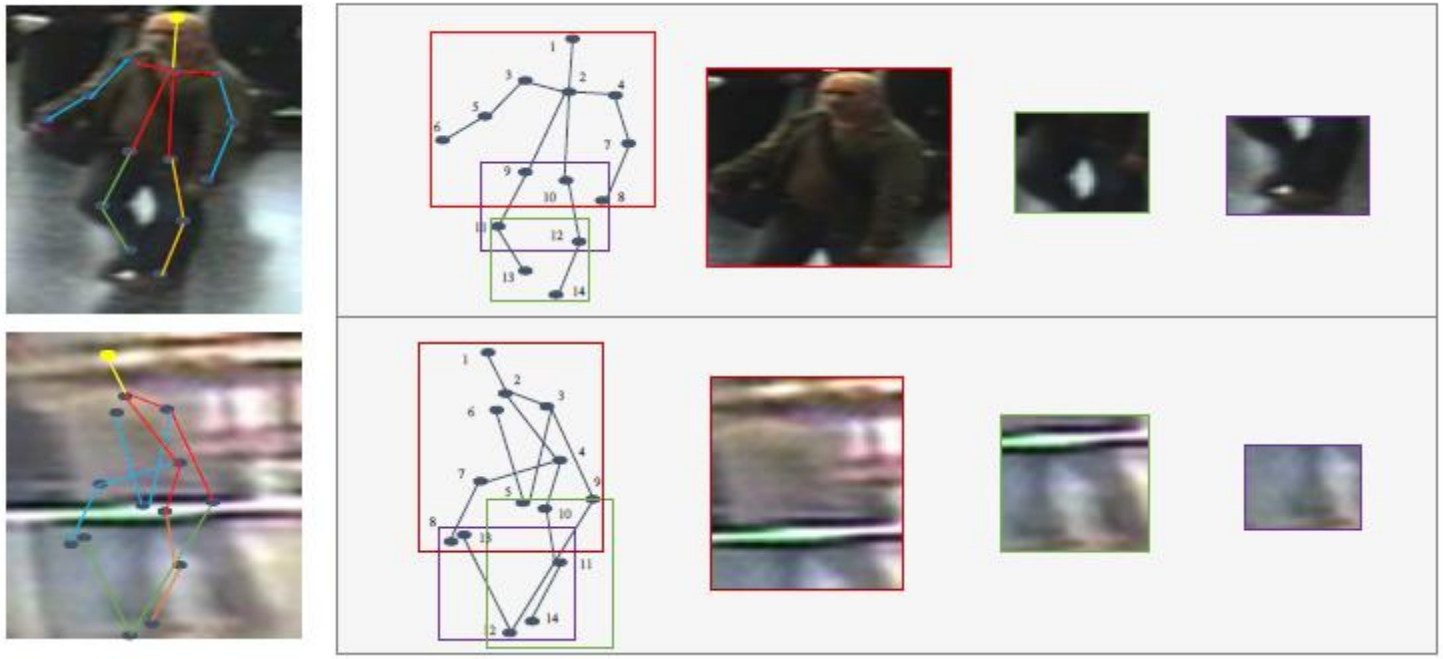
RQEN

遮挡是序列重识别中非常普遍的一个问题，会造成特征分布不均匀

Song G, Leng B, Liu Y, et al. Region-based Quality Estimation Network for Large-scale Person Re-identification[J]. arXiv preprint arXiv:1711.08766, 2017.

序列重识别

RQEN

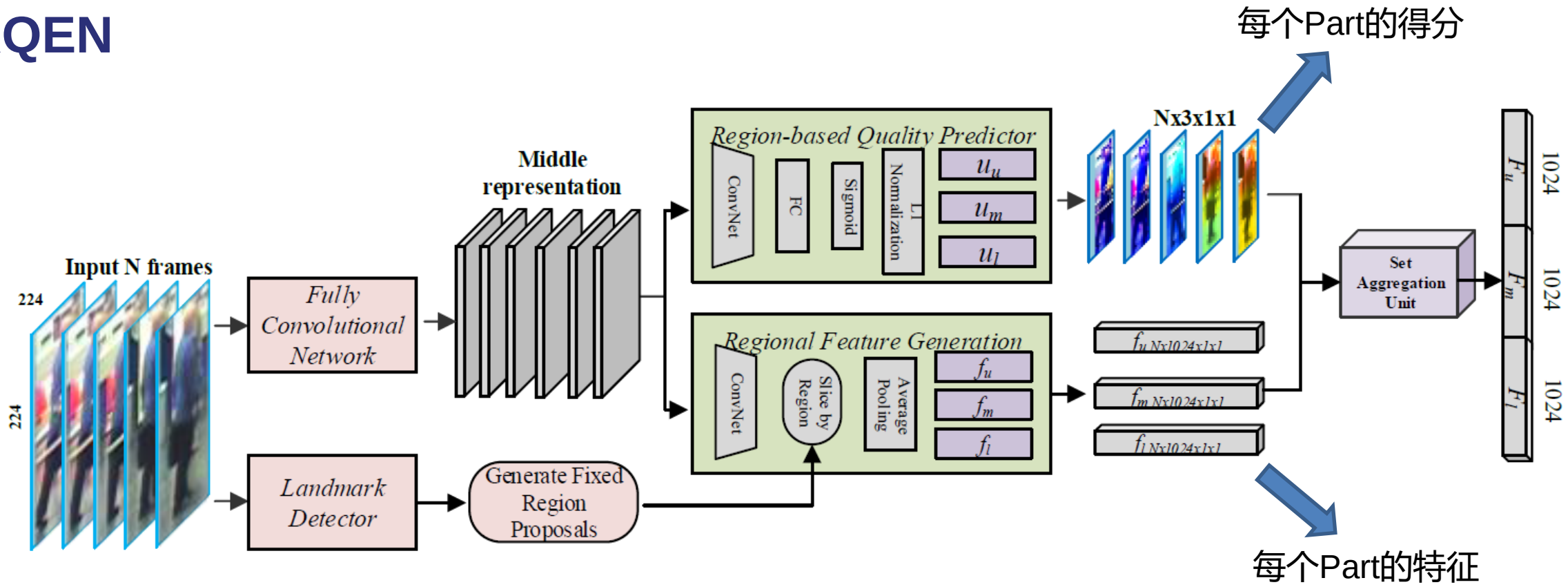


- 对每帧行人提取14个关键姿态点，并分为3个语义part
- 当某个姿态点被遮挡之后，pose map的响应值会非常低

Song G, Leng B, Liu Y, et al. Region-based Quality Estimation Network for Large-scale Person Re-identification[J]. arXiv preprint arXiv:1711.08766, 2017.

序列重识别

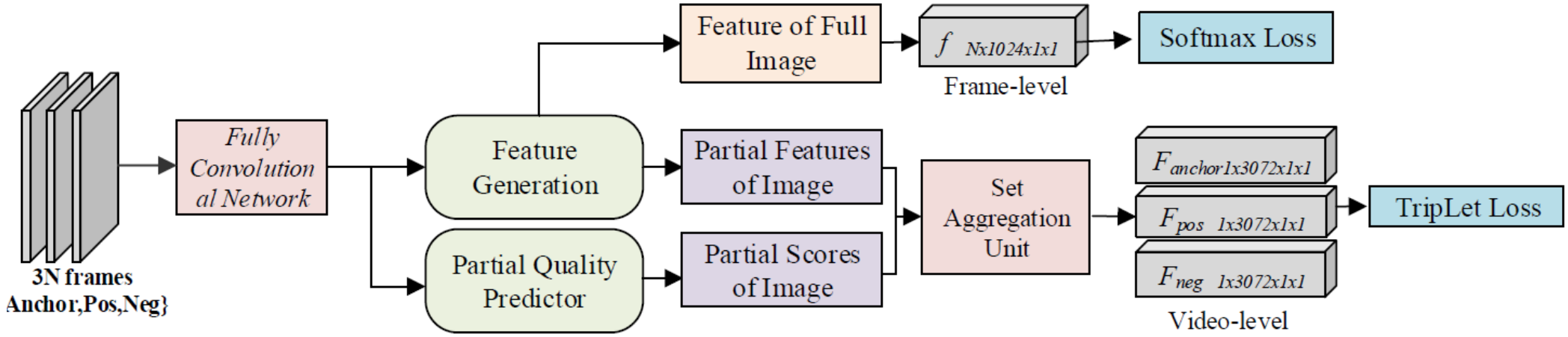
RQEN



Song G, Leng B, Liu Y, et al. Region-based Quality Estimation Network for Large-scale Person Re-identification[J]. arXiv preprint arXiv:1711.08766, 2017.

序列重识别

RQEN



- 全局分支提取全局特征
- 局部分支提取局部特征
- 姿态分支对图像进行质量（遮挡）判断

Song G, Leng B, Liu Y, et al. Region-based Quality Estimation Network for Large-scale Person Re-identification[J]. arXiv preprint arXiv:1711.08766, 2017.

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一些论文

1. Saha B, Ram K S, Mukhopadhyay J, et al. Video Based Person Re-Identification by Re-Ranking Attentive Temporal Information in Deep Recurrent Convolutional Networks[C]//2018 25th IEEE International Conference on Image Processing (ICIP). IEEE, 2018: 1663-1667.
2. Zhang W, Li Y, Lu W, et al. Learning Intra-video Difference for Person Re-identification[J]. IEEE Transactions on Circuits and Systems for Video Technology, 2018.
3. Xie Z, Li L, Zhong X, et al. Image-to-Video Person Re-Identification by Reusing Cross-modal Embeddings[J]. arXiv preprint arXiv:1810.03989, 2018.
4. Chen D, Zha Z J, Liu J, et al. Temporal-Contextual Attention Network for Video-Based Person Re-identification[C]//Pacific Rim Conference on Multimedia. Springer, Cham, 2018: 146-157.
5. Wu Y, Lin Y, Dong X, et al. Exploit the unknown gradually: One-shot video-based person re-identification by stepwise learning[C]//Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2018: 5177-5186.
6. Li S, Bak S, Carr P, et al. Diversity Regularized Spatiotemporal Attention for Video-based Person Re-identification[C]//Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition. 2018: 369-378.
7. Zhang W, Ma B, Liu K, et al. Video-based pedestrian re-identification by adaptive spatio-temporal appearance model[J]. IEEE transactions on image processing, 2017, 26(4): 2042-2054.

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课后思考

1. 单帧ReID系统是否是一个可靠的产品级系统?

2. 限制Video-based ReID方法的工业应用价值的因素是什么?

3. Video-based ReID未来的发展思路有哪些?

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