COL780 Fall 2021
Term Project
Person Re-Identification

Due Date: Nov 25, 2021, 11:59 PM

(In groups of 2 or individually)

1 Introduction

Person re-identification (Re-ID) is a well-known problem in computer vision-based surveillance. Re-ID aims to identify the same Person from a variety of non-overlapping viewpoints from multiple cameras. Figure 1 shows a visual sample of Re-ID. Due to the increasing demand for intelligent video surveillance, Re-ID has gained significant interest in the computer vision community.
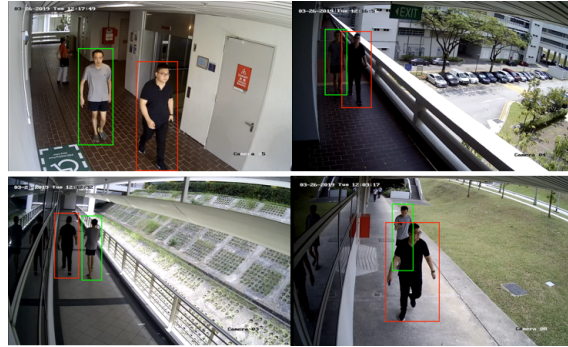

Figure 1: Example of person re-identification from multiple camera feeds.

2 Objective

In this project, you should design a distance metric-based deep learning framework capable of Person Re-ID. Please go over the survey paper [5] to learn about the relevant methodologies. Figure 2 shows a schematic diagram of the distance metric learning paradigm. Your task is to implement any distance metric-based deep Re-ID model and train it on out dataset. Analyze the performance of your chosen method on our dataset. Finally, make design/ methodological changes to improve the result further. You may implement any of our suggested methods such as, AligendReID [6], Cosine metric based Re-ID [4], or the recent transformer-based methods [2, 3], as the baseline. However, you are free to choose any other distance metric learning-based baseline method to implement.
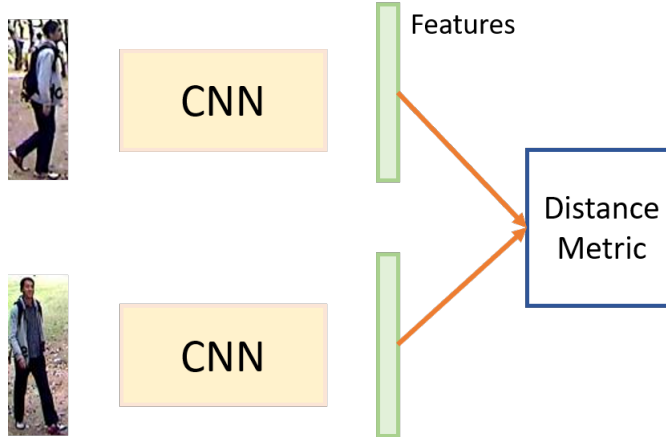
Figure 2: Schematic diagram of a distance metric learning method.

Figure 3: Sample images of a person from our dataset.

3 Dataset and Starter Code

The dataset and the starter code can be downloaded from this IITD git repository:
https://git.iitd.ac.in/csz198406/reid-col780. We have provided the training and validation sets for you and held out the test set for evaluation. Each set contains separate directories for each person. The directories are named with a person id, and they store the images corresponding to the person. Each person has 16 images captured via 2 cameras (8 images each). Figure 3 shows the 16 image samples of person-001. Both the validation and test set contain query and gallery images for assessment. Details about the folder structure is given in the git README. You are free to use the validation set in any way you deem fit during training to improve the model's capability.

4 Evaluation Metric

We would use the mean average precision (mAP) and Cumulative Match Score (CMC) at rank-1 and rank-5 to evaluate your Person Re-ID model on the test set. CMC represents the probability that a correct match appears in the top-k ranked retrieved results. This thread [1] has an explanation of CMC scores through simple examples. While training the model, you can use any suitable metric to select the best model.

5 Resources and Framework

We suggest you use Google Colab with GPU for training your model. Please use either the `PyTorch` or `Keras` deep learning framework. The starter code is in `PyTorch`. In general, you can use any library, including `OpenCV, Numpy, Scipy, and Pandas`. `Faiss` can be used for similarity-based searches in vectors. However, if a library is providing modules specific to the Re-ID (e.g., `torchreid`), then it may not be allowed. Please discuss such libraries with the Instructor/TA before using them.

6 Submission

You are required to submit your source code, readme, and a detailed report in the CVPR paper format mentioning the methodology, results, and analysis in detail. The CVPR template can be downloaded from here. Also, upload your trained model weight files in dropbox/ onedrive/ google-drive and share a link to the model weights. Mention the model weights link in the report. If you work in a team, indicate the contributions of each team member clearly. Zip the code and report in a single zip file, rename the zip file as `<Your-Entry-Number>.zip` (e.g., `2019CSZ8406.zip`), and submit in Moodle.

7 Rubric

1. Implementing the baseline - 4 marks

2. Report and quantitative and qualitative analysis of the baselines - 3 marks

3. Methodological/ Design changes for improving any baseline method - 3 marks

References

[1] R. Ghiass. How is cmc produced? URL https://www.researchgate.net/post/How-is-CMC-produced-recognition-rate-vs-Rank-for-unknown-faces.

[2] S. He, H. Luo, P. Wang, F. Wang, H. Li, and W. Jiang. Transreid: Transformer-based object re-identification. *arXiv preprint arXiv:2102.04378*, 2021.

[3] C. Sharma, S. R. Kapil, and D. Chapman. Person re-identification with a locally aware transformer. *arXiv preprint arXiv:2106.03720*, 2021.

[4] N. Wojke and A. Bewley. Deep cosine metric learning for person re-identification. In *2018 IEEE Winter Conference on Applications of Computer Vision (WACV)*, pages 748–756. IEEE, 2018. doi: 10.1109/WACV.2018.00087.

[5] M. Ye, J. Shen, G. Lin, T. Xiang, L. Shao, and S. C. Hoi. Deep learning for person re-identification: A survey and outlook. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 2021.

[6] X. Zhang, H. Luo, X. Fan, W. Xiang, Y. Sun, Q. Xiao, W. Jiang, C. Zhang, and J. Sun. Alignedreid: Surpassing human-level performance in person re-identification. *arXiv preprint arXiv:1711.08184*, 2017.