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Deep Learning Method with SVM and Semantic Segmentation for Person Re-identification

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Abstract: *Person re-identification is an automated video surveillance technique and has been extensively researched in recent years. The application of person re-identification covers the fields of security, robotics, multimedia, and forensics. The research problem which is often raised on the research topic of person re-identification is the feature representation which easily affected by occlusion (obstacles with other objects). In addition, local feature extraction through bounding boxes still contains the background image, so that it does not focus on parts of the human body. This research proposes a combination of methods between CNN, SVM classification, and semantic segmentation. Cumulative Matching Characteristics (CMC) and mean Average Precision (mAP) are evaluation metrics that will be used to measure re-identification performance.*
Key Words*: Person re-identification; Feature extraction; CNN;*

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I. Introduction

Person re-identification is a basic technique in the field of automated video surveillance and has been extensively researched in recent years [1]. The purpose of person re-identification is to identify the same person from a collection of images taken from several cameras [2]. Video surveillance by humans requires a lot of time and effort, so that surveillance becomes less effective [3]. Therefore, the person re-identification process can automatically improve the quality of supervision significantly [4].

The initial period of person re-identification was known in 1997, and developed rapidly after 2008 [5]. Person re-identification is applied in academic and industrial environments, for example for security, tracking people in public places, and behavioral analysis In addition, Person re-identification is also applied to the fields of robotics, multimedia, and forensics [3]. The emergence of person re-identification is caused by the increasing demand for public security, and camera networks in public places [7].

When applied various methods to person re-identification, the general process flow is: 1) Image input, 2) Image segmentation, 3) Local feature extraction, 4) Feature representation, 5) Feature storage, 6) Detection of people and objects in the image [8]. Input data in the form of images of people who are generally taken from public datasets. Then image segmentation separates the object from the background and divides the human body area [9]. Extraction of local features performed on certain body poses is relatively better than global features [10]. Feature representation is obtained from the whole image [11], and is calculated from several color spaces [8]. Storage of features can be in the form of files such as research experiments [12]. Detection of people and objects in the image is done to find the location of people in the image, and determine the category of objects [13].

The most widely proposed method for generating feature representations is CNN [14], because CNN's success is evident in large-scale visual classification [15]. CNN is a special type of neural network for processing data in the form of a matrix in the image [16]. CNN-based learning methods have an impact on the progress of research on Person Re-identification [12]. CNN model is used because it can give very good results [11]. Meanwhile, in deep learning methods, in general, there is a heavy annotation (data labeling) problem, due to intensive data access [12].

This paper consists of sections 1, 2, 3, and 4. Section 1 discusses the introduction to the topic of person re-identification. Section 2 presents previous studies related to person re-identification. Section 3 discusses the proposed method. Section 4 delivers the conclusion.

II. Related Work

Zhao *et al*. [17] used a region proposal network to detect the body parts. The proposed method from Zhao *et al*. [18]–[20] combines SIFT features and color histograms into an image feature. While the research of Li *et al.* [3] specifically studied parts of the human body (head, shoulders, upper body, and lower body) using a spatial transformer network [21].

Varior *et al.* proposed a Matching Gate method [22] and Long Short-Term Memory (LSTM) [23] to develop S-CNN. Matching Gate performs as a comparison of local features on the horizontal line of the image, and it could determine the emphasis amount for every pattern of local feature [22]. While the LSTM could accept input in the form of horizontal lines, and progressively combines the relevant contextual information [23].

III. Proposed Method

In this section there is a proposed method for person re-identification. As shown in Figure 1, the method which proposed in this study is a combination of methods between CNN, SVM classification, and semantic segmentation. The additional methods are marked with a color and a dashed arrow as shown in the following diagram:

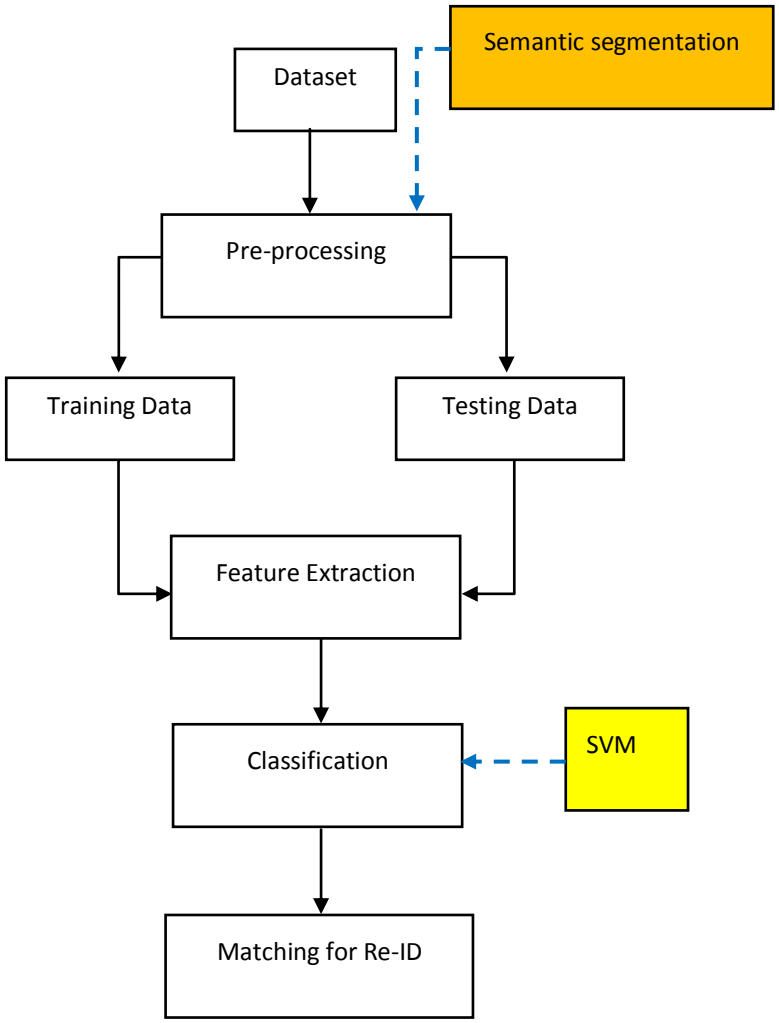

Figure 1: The diagram of proposed method

The datasets used in this research are from public datasets: CUHK03, Market1501 (Market), and DukeMTMC-reID (Duke). The pre-processing technique used is denoising. Feature extraction in this study uses the CNN method. CNN method is applied for training, testing, and semantic segmentation. The classification method used is the Support Vector Machine (SVM). In the final stage, the identity of the same person (re-identification) is done from the images collection.

IV. Conclusion

This research paper aims to build a fundamental on the upcoming experiment of person re-identification. Generally, there are three methods in proposed method: CNN as the primary method, while SVM and semantic segmentation as the additional methods. Based on the proposed method, there is an expectation towards a more robust performance on the upcoming experiment.

References

[1]. X. Y. Jing et al., "Super-Resolution Person Re-Identification with Semi-Coupled Low-Rank Discriminant Dictionary Learning," IEEE Trans. Image Process., vol. 26, no. 3, pp. 1363–1378, 2017, doi: 10.1109/TIP.2017.2651364.

[2]. L. Wu, Y. Wang, Z. Ge, Q. Hu, and X. Li, "Structured deep hashing with convolutional neural networks for fast person re-identification," Comput. Vis. Image Underst., vol. 167, no. December 2016, pp. 63–73, 2018, doi: 10.1016/j.cviu.2017.11.009.

[3]. A. Bedagkar-Gala and S. K. Shah, "A survey of approaches and trends in person re-identification," Image Vis. Comput., vol. 32, no. 4, pp. 270–286, 2014, doi: 10.1016/j.imavis.2014.02.001.

[4]. P. H. Tu et al., "An intelligent video framework for homeland protection," Unattended Ground, Sea, Air Sens. Technol. Appl. IX, vol. 6562, p. 65620C, 2007, doi: 10.1117/12.729215.

[5]. K. Wang, H. Wang, M. Liu, X. Xing, and T. Han, "Survey on person re-identification based on deep learning," CAAI Trans. Intell. Technol., vol. 3, no. 4, pp. 219–227, 2018, doi: 10.1049/trit.2018.1001.

[6]. K. Islam, "Person search: New paradigm of person re-identification: A survey and outlook of recent works," Image Vis. Comput., vol. 101, p. 103970, 2020, doi: 10.1016/j.imavis.2020.103970.

[7]. L. Zheng, Y. Yang, and A. G. Hauptmann, "Person Re-identification: Past, Present and Future," vol. 14, no. 8, pp. 1–20, 2016, [Online]. Available: http://arxiv.org/abs/1610.02984.

[8]. E. Poongothai and A. Suruliandi, "Survey on colour, texture and shape features for person re-identification," Indian J. Sci. Technol., vol. 9, no. 29, 2016, doi: 10.17485/ijst/2016/v9i29/93823.

[9]. L. Bazzani, M. Cristani, and V. Murino, "Symmetry-driven accumulation of local features for human characterization and re-identification," Comput. Vis. Image Underst., vol. 117, no. 2, pp. 130–144, 2013, doi: 10.1016/j.cviu.2012.10.008.

[10]. J. Yin, A. Wu, and W. S. Zheng, "Fine-Grained Person Re-identification," Int. J. Comput. Vis., vol. 128, no. 6, pp. 1654–1672, 2020, doi: 10.1007/s11263-019-01259-0.

[11]. M. M. Kalayeh, E. Basaran, M. Gokmen, M. E. Kamasak, and M. Shah, "Human Semantic Parsing for Person Re-identification," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., vol. 227, pp. 1062–1071, May 2018, doi: 10.1016/S0140-6736(01)37157-X.

[12]. H. Fan, L. Zheng, C. Yan, and Y. Yang, "Unsupervised Person Re-identification: Clustering and Fine-tuning," ACM Trans. Multimed. Comput. Commun. Appl., vol. 14, no. 4, pp. 1–18, 2018, doi: 10.1145/3243316.

[13]. X. Yang, Y. Tang, N. Wang, B. Song, and X. Gao, "An End-to-End Noise-Weakened Person Re-Identification and Tracking with Adaptive Partial Information," IEEE Access, vol. 7, pp. 20984–20995, 2019, doi: 10.1109/ACCESS.2019.2899032.

[14]. H. Yao, S. Zhang, R. Hong, Y. Zhang, C. Xu, and Q. Tian, "Deep Representation Learning with Part Loss for Person Re-Identification," IEEE Trans. Image Process., vol. 28, no. 6, pp. 2860–2871, 2019, doi: 10.1109/TIP.2019.2891888.

[15]. A. Krizhevsky, I. Sutskever, and G. E. Hinton, "ImageNet classification with deep convolutional neural networks," Commun. ACM, vol. 60, no. 6, pp. 84–90, May 2017, doi: 10.1145/3065386.

[16]. I. Goodfellow, Y. Bengio, and · Aaron Courville, Deep Learning, vol. 91, no. 5. 2012.

[17]. H. Zhao et al., "Spindle net: Person re-identification with human body region guided feature decomposition and fusion," Proc. - 30th IEEE Conf. Comput. Vis. Pattern Recognition, CVPR 2017, vol. 2017-Janua, pp. 907–915, 2017, doi: 10.1109/CVPR.2017.103.

[18]. R. Zhao, W. Ouyang, and X. Wang, "Person re-identification by salience matching," Proc. IEEE Int. Conf. Comput. Vis., pp. 2528–2535, 2013, doi: 10.1109/ICCV.2013.314.

[19]. R. Zhao, W. Ouyang, and X. Wang, "Unsupervised salience learning for person re-identification," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., pp. 3586–3593, 2013, doi: 10.1109/CVPR.2013.460.

[20]. R. Zhao, W. Ouyang, and X. Wang, "Learning mid-level filters for person re-identification," Proc. IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., pp. 144–151, 2014, doi: 10.1109/CVPR.2014.26.

[21]. D. Li, X. Chen, Z. Zhang, and K. Huang, "Learning deep context-Aware features over body and latent parts for person re-identification," Proc. - 30th IEEE Conf. Comput. Vis. Pattern Recognition, CVPR 2017, vol. 2017-Janua, pp. 7398–7407, 2017, doi: 10.1109/CVPR.2017.782.

[22]. R. R. Varior, M. Haloi, and G. Wang, "Gated siamese convolutional neural network architecture for human re-identification," Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics), vol. 9912 LNCS, pp. 791–808, 2016, doi: 10.1007/978-3-319-46484-8_48.

[23]. R. R. Varior, B. Shuai, J. Lu, D. Xu, and G. Wang, "A siamese long short-term memory architecture for human re-identification," Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics), vol. 9911 LNCS, pp. 135–153, 2016, doi: 10.1007/978-3-319-46478-7_9.

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