Supplementary Material for "HyperGait: Unleashing the Power of Parsing for Gait Recognition in the Wild via Hypergraph"

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Abstract

In this supplementary material, we first provide more details of the proposed HyperGait framework. Then we provide additional experimental results for 1) computational efficiency analysis, 2) evaluation on additional large-scale benchmark CCPG, and 3) cross-dataset generalization evaluation. At last, we discuss the limitations and potential negative impact of our work.

1. Additional Experimental Results

In this section, we provide additional experimental results to further validate the effectiveness of our proposed HyperGait framework, including computational efficiency analysis, evaluation on more datasets, and cross-dataset generalization experiments.

1.1. Computational Efficiency

We evaluate the computational efficiency of HyperGait on dual RTX 4090 GPUs. As shown in Table 1, our method achieves competitive efficiency compared to other parsing-based or multi-representation methods. Although HyperGait involves hypergraph construction and convolution operations, it maintains reasonable runtime (21.6 ms/sequence) and model size (34.4M parameters), achieving a better balance between performance and efficiency.

1.2. Evaluation on CCPG Dataset

To further validate HyperGait, we conduct experiments on the CCPG dataset, a large-scale gait recognition benchmark with various covariates. As shown in Table 2, HyperGait achieves 82.6% Rank-1 on CL, 87.4% on UP, and 91.2% on DN, demonstrating its robustness in handling cloth-changing scenarios.

Table 1. Computational efficiency comparison on Gait3D.

Method	Runtime (ms/seq)	Params (M)
ParsingGait	19.1	24.3
SkeletonGait++	31.3	25.6
XGait	28.1	67.6
HyperGait	21.6	34.4

Table 2. Performance comparison on CCPG dataset.

Method	R-1(CL)	mAP(CL)	R-1(UP)	mAP(UP)	R-1(DN)	mAP(DN)
Gaitbase-par	81.4	52.3	87.3	67.7	90.8	71.3
ParsingGait	77.3	47.1	80.5	61.1	89.4	66.9
HyperGait	**82.6**	**53.0**	**87.4**	**71.0**	**91.2**	**76.1**

Table 3. Cross-dataset generalization evaluation.

Method	SUSTech1K⇒Gait3D		Gait3D⇒SUSTech1K	
	Rank-1	mAP	Rank-1	Rank-5
GaitPart	14.8	11.0	26.4	48.7
GaitGL	16.8	11.6	33.1	56.1
ParsingGait	23.7	16.8	49.3	71.8
MultiGait^P	23.3	13.1	52.9	74.8
SkeletonGait	30.9	21.4	35.4	53.3
HyperGait	**31.8**	**22.1**	**53.8**	**75.5**

1.3. Cross-Dataset Generalization

To evaluate the cross-dataset generalization capability, we conduct experiments by training on one dataset and testing on another. As shown in Table 3, HyperGait demonstrates the best generalization performance. When trained on SUSTech1K and tested on Gait3D, HyperGait achieves 31.8% Rank-1 and 22.1% mAP, outperforming all com-

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pared methods. Similarly, when trained on Gait3D and tested on SUSTech1K, HyperGait achieves 53.8% Rank-1 and 75.5% Rank-5, surpassing other methods. These results confirm the strong generalization ability of our method.

2. Discussion

Limitations. In this work, we only exploit parsing data in this work, and the potential of multi-modal fusion based on hypergraphs is not fully explored. Furthermore, the performance of gait recognition in the wild still has room for improvement before practical deployment.

Future Work. In future work, we will explore multi-modal gait recognition frameworks that use hypergraph to capture higher-order cross-modal correlations. We will also investigate more efficient hypergraph construction methods and advanced temporal modeling strategies for gait recognition in the wild.