A Hyperbolic-to-Hyperbolic Graph Convolutional Network
Supplementary Material

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1. Comparison of the computation time

Optimizing the transformation matrix in Eq. (11) requires QR decomposition, which takes extra time. We compare the computation time of HGNN [1] and the proposed H2H-GCN. The results are presented in Table. 1. For a fair comparison, we set the same parameters for both methods, such as the number of graph convolutional layers, the embedding dimension, and the number of centroids. We calculated the time required for each epoch on the D&D, PROTEINS, and ENZYMES datasets. The relative time increment increases with the increase of embedding dimension. Overall, the extra time is acceptable

	D&D	PROTEINS	ENZYMES
layers	2	2	2
dim.	32	128	64
centroids	300	300	40
HGNN [1] (s/epoch)	58.8	21.5	12.2
H2H-GCN (s/epoch)	71.2	34.8	15.3
TIME INC (%)	+21.1%	+61.7%	+25.4%

Table 1. Comparison of the computation time.

References

[1] Qi Liu, Maximilian Nickel, and Douwe Kiela. Hyperbolic graph neural networks. In *Advances in Neural Information Processing Systems (NeurIPS)*, pages 8230–8241, 2019. 1

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