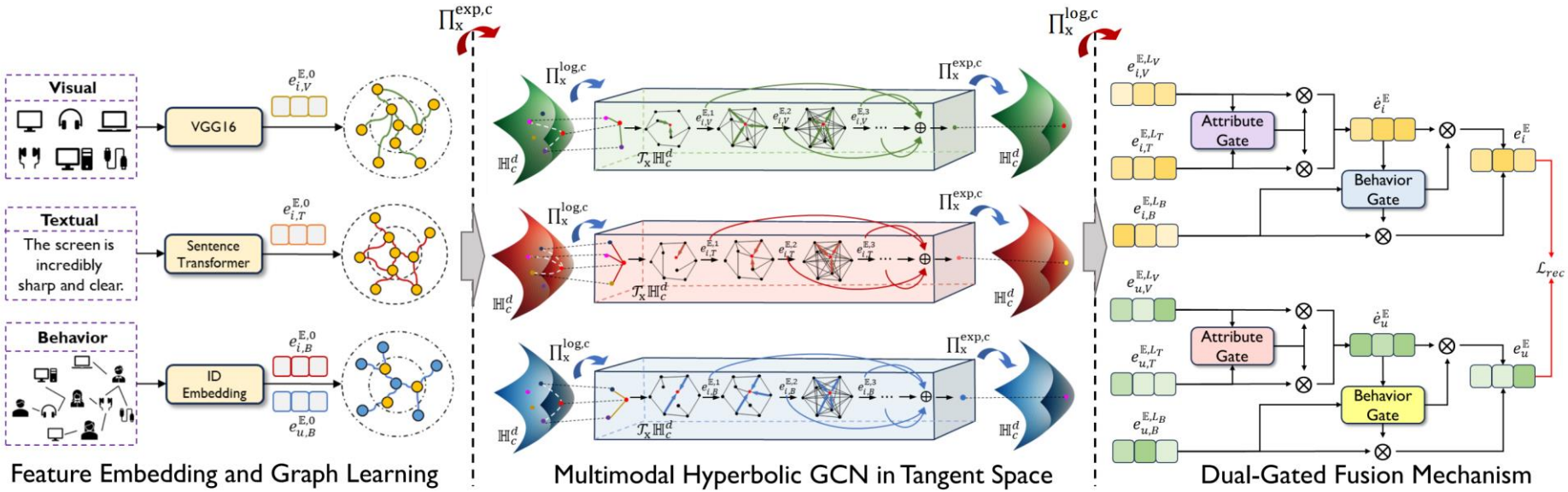
Multimodal Recommendation with Hyperbolic Graph Convolution Network

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Problems & Ideas

- Problems of existing multimodal recommendation approaches:
  - The linear distance metric of Euclidean space is inadequate for efficiently representing the nonlinear distribution of multimodal features at semantic hierarchies.
  - Hierarchical cross-modal alignments between different modalities are difficult to encode effectively in Euclidean geometry.
- Ideas: Hyperbolic graph convolutional network for multimodal recommendation that unifies features in hyperbolic space to capture hierarchical semantic relationships.



Main Contributions

- Contributions:
  - A multimodal hyperbolic graph convolutional network that unifies the semantic graphs of multiple modalities by embedding them into hyperbolic space to learn representations;
  - An adaptive dual-gated fusion mechanism in hyperbolic space is designed;
  - Extensive experiments are conducted on three publicly available real-world datasets. The results demonstrate that the proposed method outperforms state-of-the-art models.

Table 1 Performance Comparison of Different Recommendation Models.

	Baby				Sports				Clothing			
Method	R@10	R@20	N@10	N@20	R@10	R@20	N@10	N@20	R@10	R@20	N@10	N@20
MF-BPR(UAI'09)	0.0357	0.0575	0.0192	0.0249	0.0432	0.0653	0.0241	0.0298	0.0187	0.0279	0.0103	0.0126
LightGCN(SIGIR'20)	0.0479	0.0754	0.0257	0.0328	0.0569	0.0864	0.0311	0.0387	0.0340	0.0526	0.0188	0.0236
HGCF(WWW'21)	0.0563	0.0833	0.0292	0.0371	0.0638	0.0962	0.0342	0.0423	0.0437	0.0652	0.0263	0.0275
HGCH(CIKM'24)	0.0612	0.0947	0.0321	0.0423	0.0692	0.1023	0.0381	0.0477	0.0556	0.0851	0.0315	0.0382
FREEDOM(MM'23)	0.0627	0.0992	0.0330	0.0424	0.0717	0.1089	0.0385	0.0481	0.0629	0.0941	0.0341	0.0420
MGCN(MM'23)	0.0620	0.0964	0.0339	0.0427	0.0729	0.1106	0.0397	0.0496	0.0641	0.0945	0.0347	0.0428
LGMRec(MM'24)	0.0644	0.1002	0.0347	0.0440	0.0720	0.1068	0.0390	0.0480	0.0555	0.0828	0.0302	0.0371
EVEN(AAAI'25)	0.0667	0.1031	0.0353	0.0448	0.0759	0.1143	0.0411	0.0510	0.0662	0.0978	0.0356	0.0436
MIG-GT(AAAI'25)	0.0665	0.1021	0.0361	0.0452	0.0753	0.1130	0.0414	0.0511	0.0636	0.0934	0.0347	0.0422
SMORE(WSDM'25)	0.0680	0.1035	0.0365	0.0457	0.0762	0.1142	0.0408	0.0506	0.0659	0.0987	0.0360	0.0443
HGCM(Ours)	**0.0728***	**0.1107***	**0.0391***	**0.0489***	**0.0812***	**0.1216***	**0.0435***	**0.0539***	**0.0699***	**0.1046***	**0.0382***	**0.0470***
Improv.	+7.06%	+6.96%	+7.12%	+7.0%	+6.56%	+6.39%	+5.07%	+5.48%	+5.59%	+5.98%	+6.11%	+6.09%