Multi-view Hypergraph-based Contrastive Learning Model for Cold-Start Micro-video Recommendation

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1. Background

1. **Rapid Growth** of micro-video platforms (TikTok, Kwai) driving demand for personalized recommendations
2. **Rich Multi-modal Features** in micro-videos:
   - Textual metadata (titles, descriptions)
   - Visual elements (cover images)
   - Dynamic video content
3. **User Engagement** heavily influenced by these diverse features
4. **Unique Challenges** compared to traditional content recommendation

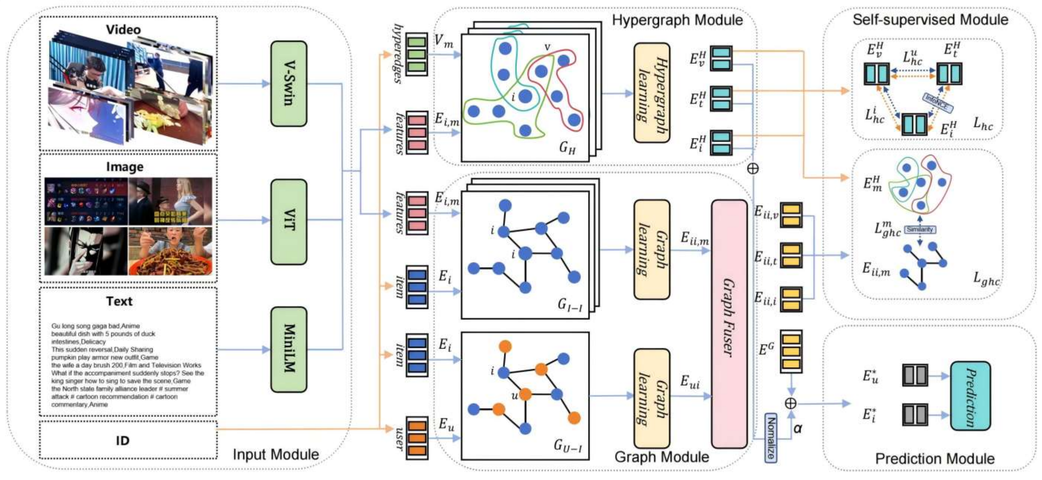
2. Challenges

1. **Over-smoothing Problem**
2. **Long-tail Distribution**
3. **Cold-start Scenarios**
4. **Information Underutilization**

3. Motivation

1. **Beyond Traditional Graphs:**
   Need richer structures to capture higher-order relationships
2. **Multi-view Learning:**
   Different perspectives provide complementary information
3. **Self-supervised Signals:**
   Additional supervision can compensate for sparse interactions
4. **Cold-start Focus:**
   Improving recommendations for new/rarely viewed content benefits both creators and viewers

4. Architecture



■ Our model, **MHCR**, extracts multi-view interaction signals and leverages hypergraph structures to capture higher-order dependencies. Through self-supervised learning, it aligns representations across modalities and structural views, ultimately generating effective recommendations for cold-start micro-videos.

5. Overall Performance

TABLE I
PERFORMANCE METRICS OF DIFFERENT MODELS ON TWO MICROLENS DATASETS

Dataset	Metric	YouTube	VBPR	MMGCN	LightGCN	GRCN	LayerGCN	BM3	Freedom	MGCN	MHCR
MicroLens-50K	R@10	0.0375	0.0544	0.0403	0.0365	0.0631	0.0627	0.0565	0.0656	0.0708	**0.0736**
	R@20	0.0632	0.0888	0.067	0.0534	0.0982	0.0994	0.0918	0.1028	0.1089	**0.1102**
	N@10	0.0178	0.0273	0.0197	0.0284	0.0328	0.032	0.0281	0.0334	0.0363	**0.0383**
	N@20	0.0245	0.0361	0.0264	0.0345	0.0415	0.0414	0.0372	0.0429	0.0459	**0.0477**
MicroLens-100K	R@10	0.0392	0.0624	0.0405	0.0388	0.0682	0.0730	0.0601	0.0654	0.0717	**0.0798**
	R@20	0.0648	0.1002	0.0678	0.056	0.1057	0.1120	0.0975	0.1016	0.1096	**0.1187**
	N@10	0.0188	0.0314	0.0202	0.0306	0.0353	0.0382	0.0305	0.0337	0.0371	**0.042**
	N@20	0.0252	0.0410	0.0271	0.0367	0.0448	0.0480	0.0401	0.0431	0.0467	**0.0519**

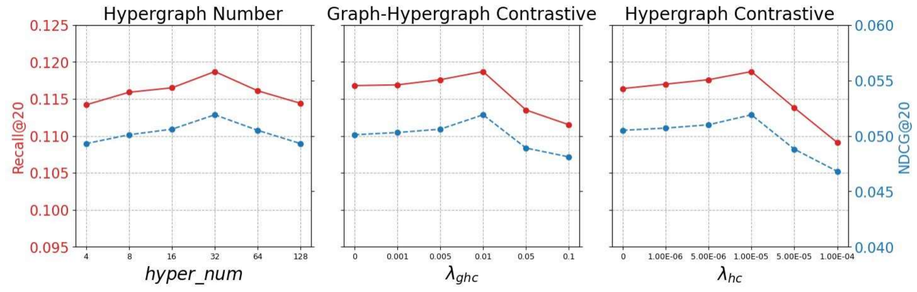
6. Cold-start Performance

■ Cold-start scenarios refer to users who have engaged in fewer than three interactions.

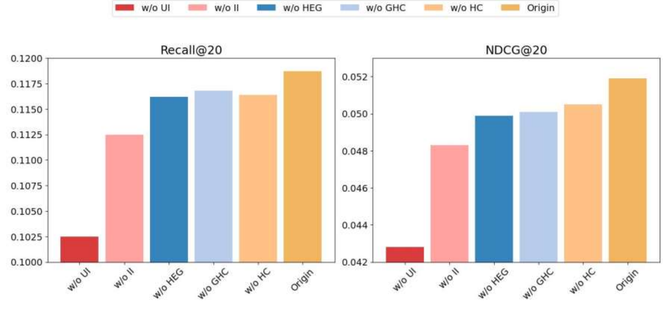
TABLE II
PERFORMANCE COMPARISON OF DIFFERENT MODELS FOR COLD-START USERS ON TWO MICROLENS DATASETS

Dataset	Metric	GRCN	LayerGCN	BM3	Freedom	MGCN	MHCR
MicroLens-50K	R@10	0.0521	0.0527	0.0471	0.053	0.0588	**0.0616**
	R@20	0.081	0.0826	0.0789	0.0839	0.0912	**0.0937**
	N@10	0.0267	0.0267	0.0237	0.0267	0.0299	**0.0321**
	N@20	0.034	0.0341	0.0316	0.0344	0.038	**0.0396**
MicroLens-100K	R@10	0.0562	0.0588	0.0485	0.0544	0.0605	**0.0655**
	R@20	0.0874	0.092	0.0807	0.0882	0.0937	**0.0984**
	N@10	0.0288	0.0299	0.024	0.0275	0.0311	**0.0342**
	N@20	0.0366	0.0384	0.0321	0.0359	0.0396	**0.0423**

7. Sensitivity Analysis



8. Ablation Study



Wechat

Code

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