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## **A Method for Recommending Resources Across Virtual Academic Communities based on Knowledge Graph and Prompt Learning**

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# A Method for Recommending Resources Across Virtual Academic Communities based on Knowledge Graph and Prompt Learning

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## 1. INTRODUCTION AND RESEARCH QUESTIONS

Virtual academic communities can effectively increase scholars' academic exposure, promote enhanced academic innovation and accelerate the research process<sup>[1]</sup>. With its rapid development, the problem of information overload is becoming more and more serious, and how to provide effective resource services for researchers is the current challenge<sup>[2]</sup>. Previous studies<sup>[3-4]</sup> have focused on two aspects of knowledge association and knowledge recommendation. In terms of knowledge association, most researchers have studied a single virtual academic community as the object. However, the knowledge information of a single virtual academic community is often inadequate, and researchers need to spend a lot of time and effort to find the optimal solution of knowledge among multiple platforms, which leads to a lot of time and effort loss. In terms of knowledge recommendation, the current research neglects to model the relationship between academic resources in virtual academic communities, which leads to the model missing this part of information in learning and affects the effectiveness of recommendation.

Therefore, this study will further improve the deficiencies in the study of virtual academic community resource services. We propose we propose a **method for recommending resources across virtual academic communities (MRRVAC)** based on knowledge graph and prompt learning. We use knowledge graph to associate resources in multiple virtual academic communities. And based on the knowledge graph, we use prompt learning to achieve resource recommendation.

## 2. RESEARCH FRAMEWORK

Our proposed method uses more complex multivariate relationships for modeling, which effectively remedies problems such as the single traditional recommendation relationship. The research framework is proposed herein (Figure 1).

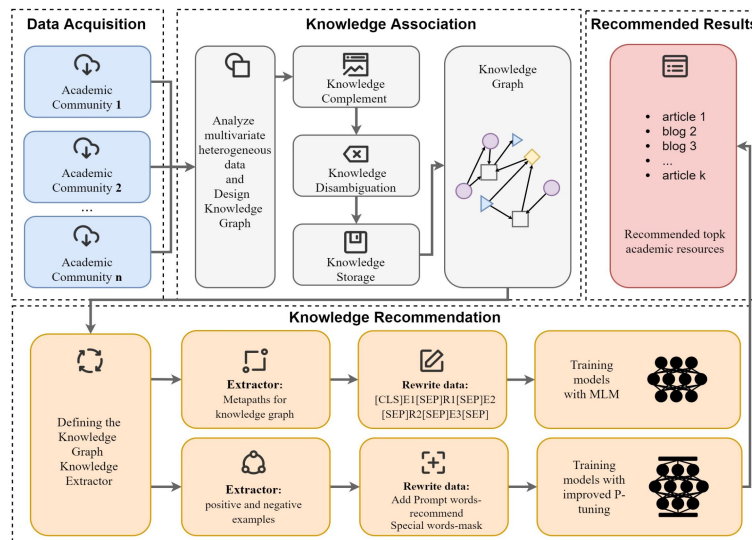


Figure 1. Research framework

We crawled a total of 21326 ScienceNet blogs from December 2015 to June 2022 and 14635 Zhihu articles from September 2013 to June 2022.

### 3. RESULTS AND MAJOR FINDINGS

Our model all outperformed the recommendations of the other five models. It was validated by an average improvement of 0.296% and 0.271% on two metrics. And the ablation experiment shows that our model is also reasonable in the design of each module.

**Table 1. Comparison of Recommended Results and Ablation Experiments**

Model	HR@K(%)				NDCG@K(%)			
	5	10	15	20	5	10	15	20
Matepath2RS	0.114	0.153	0.212	0.250	0.101	0.143	0.193	0.232
CF	0.112	0.142	0.197	0.238	0.153	0.174	0.218	0.240
Matepath2vec	0.231	0.321	0.394	0.572	0.125	0.207	0.261	0.354
Matepath2vec-Bert	0.315	0.426	0.674	0.853	0.146	0.267	0.356	0.449
GAT	0.226	0.336	0.387	0.492	0.135	0.201	0.252	0.329
<b>MRRVAC</b>	<b>0.495</b>	<b>1.028</b>	<b>1.130</b>	<b>1.315</b>	<b>0.453</b>	<b>0.750</b>	<b>0.809</b>	<b>0.896</b>
- w/o BERT-encoder	0.133	0.352	0.400	0.417	0.288	0.344	0.375	0.387
- w/o awp	0.237	0.342	0.470	0.605	0.226	0.300	0.376	0.447
- w/o both	0.310	0.574	0.738	1.164	0.265	0.402	0.488	0.669
- w/o knowledge	0.012	0.033	0.071	0.109	0.018	0.037	0.057	0.074
- w/o template train	0.009	0.034	0.066	0.080	0.015	0.031	0.052	0.062
- w/o both	0.006	0.033	0.056	0.076	0.009	0.024	0.040	0.052

### 4. CONTRIBUTIONS

We propose a method for recommending cross-virtual academic communities based on knowledge graphs and prompt learning. The method uses knowledge graphs to correlate resources in different virtual academic communities and uses prompt learning to achieve recommendations that help researchers access information effectively. We conduct experiments on real data, and the results show that it outperforms other virtual academic community recommendation methods, verifies the effectiveness of the model recommendation.

### ACKNOWLEDGEMENT

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