

Enhanced Retrieval-Augmented Generation (RAG) Method with Knowledge Graph and Graph Neural Network (GNN) for Automated QA Systems

Authors : Zhihao Zheng, Zhilin Wang, Linxin Liu

Abstract : In the research of automated knowledge question-answering systems, accuracy and efficiency are critical challenges. This paper proposes a knowledge graph-enhanced Retrieval-Augmented Generation (RAG) method, combined with a Graph Neural Network (GNN) structure, to automatically determine the correctness of knowledge competition questions. First, a domain-specific knowledge graph was constructed from a large corpus of academic journal literature, with key entities and relationships extracted using Natural Language Processing (NLP) techniques. Then, the RAG method's retrieval module was expanded to simultaneously query both text databases and the knowledge graph, leveraging the GNN to further extract structured information from the knowledge graph. During answer generation, contextual information provided by the knowledge graph and GNN is incorporated to improve the accuracy and consistency of the answers. Experimental results demonstrate that the knowledge graph and GNN-enhanced RAG method perform excellently in determining the correctness of questions, achieving an accuracy rate of 95%. Particularly in cases involving ambiguity or requiring contextual information, the structured knowledge provided by the knowledge graph and GNN significantly enhances the RAG method's performance. This approach not only demonstrates significant advantages in improving the accuracy and efficiency of automated knowledge question-answering systems but also offers new directions and ideas for future research and practical applications.

Keywords : knowledge graph, graph neural network, retrieval-augmented generation, NLP

Conference Title : ICSLP 2024 : International Conference on Speech and Language Processing

Conference Location : San Francisco, United States

Conference Dates : November 04-05, 2024