VN-Legal-KG: Vietnam Legal Knowledge Graph for Legal Statute Identification on Land Law Matters

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Abstract. *Legal Statute Identification* (LSI) is a critical task within the realm of law, involving the identification of relevant statutory laws based on the natural language descriptions found in legal documents. Traditionally, this challenge has been approached as a single-class text classification problem. However, due to the inherent complexity of legal information, characterized by intricate connections and associations between various legal entities and concepts, we propose that a graph-based representation offers a more suitable and informative solution. In response to this need, our paper introduces VN-Legal-KG, an innovative Legal Statute Identification Knowledge Graph tailored to meet the specific requirements of Vietnamese users seeking clarity on Land Law matters. Leveraging cutting-edge graph neural network techniques, we also present a link prediction mechanism integrated into VN-Legal-KG, which addresses the LSI task as a multi-label classification problem, better aligning with real-world legal practices. Through experimentation with real-world data, our approach demonstrates favorable performance when compared to previous models reported in the literature.

Keywords: Legal Statute Identification · Multi-Label Classification · Deep Learning · Knowledge Graph · Graph Neural Networks · Heterogeneous Graph · Graph Attention Network

1 Introduction

Legal Statute Identification (LSI) is a specific judicial task of classifying legal statutes to describe facts or evidence of a legal scenario. Legal documents or facts are described in different forms and formats, distinguishing each other in length and legal context. This has raised many challenges for recent research to find an approach for a model to fully wrap up the whole juridical content [12]. The existing methods need to make the most of the relationship between judicial documents and facts, which is a considerable source of knowledge for estimating legal document similarity [7].

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CombiGCN: An Effective GCN Model for Recommender System

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Abstract. Graph Neural Networks (GNNs) have opened up a potential line of research for collaborative filtering (CF). The key power of GNNs is based on injecting collaborative signal into user and item embeddings which will contain information about user-item interactions after that. However, there are still some unsatisfactory points for a CF model that GNNs could have done better. The way in which the collaborative signal are extracted through an implicit feedback matrix that is essentially built on top of the message-passing architecture of GNNs, and it only helps to update the embedding based on the value of the items (or users) embeddings neighboring. By identifying the similarity weight of users through their interaction history, a key concept of CF, we endeavor to build a user-user weighted connection graph based on their similarity weight.

In this study, we propose a recommendation framework, CombiGCN, in which item embeddings are only linearly propagated on the user-item interaction graph, while user embeddings are propagated simultaneously on both the user-user weighted connection graph and user-item interaction graph graphs with Light Graph Convolution (LGC) and combined in a simpler method by using the weighted sum of the embeddings for each layer. We also conducted experiments comparing CombiGCN with several state-of-the-art models on three real-world datasets.

Keywords: Recommender System · Collaborative Filtering · Collaborative signal · Graph Convolution Network · Embedding Propagation

1 Introduction

Recommendation systems play an important role in online businesses because of the economic benefits they bring by suggesting suitable products or services to customers. That motivation has driven research to improve algorithms to offer powerful recommendation engines, typically collaborative filtering (CF). Concurrent with the rise of deep learning, especially the use of GNNs to learn representations of users and items (as known as embeddings), many recent studies have focused on enriching embeddings by encoding them with collaborative signals, which carry information about user-item interactions [1–5]. These signals

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