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This dissertation is organized as follows.

Chapter 1 – The background and motivation of the dissertation are introduced.

Chapter2 -- I introduce the fundamental knowledge and techniques that are used in my models from four aspects: recommender systems, neural networks, review-based recommendations, and knowledge-aware recommender systems.

Chapter3 -- I introduce existing works in four aspects that are highly relevant to myself. A number of works have attempted to investigate the reviews or KGs to alleviate the sparsity and cold-start problems in RSs. They can be summarized into four types: review-based methods, KG-based methods, neural attention models, and cross feature learning models.

Chapter4 -- I present the first proposed model which we call Knowledge-aware Attentional Neural Network (KANN). The model exhibits knowledge-level explainability of recommendations by using inner- and outer-attention mechanisms to enable low-order interactions between users and items. Specifically, I first built a review-based KG, which contains review entities and the corresponding context triples. To obtain understandable recommendations, I design a neural network with inner- and outer-attention mechanisms to select important knowledge features from reviews for explaining why a user likes/dislikes an item. I also show knowledge-level explanations based on a case study.

Chapter5 -- I propose the second model, Knowledge-enhanced Multi-task Learning between Reviews and Ratings (KMRR), for enriching user connections in a heterogeneous KG and fusing reviews and ratings in an efficient way. In specific, I first build a heterogeneous KG with users, items, and their corresponding review entities. Then, I use a multi-task framework to fuse reviews and ratings for profiling users and items with rich features. I also adopt a graph attention mechanism to select important review entities for users/items to improve recommendation accuracy.

Chapter6 -- I introduce the third model, called Jointly Learning Propagating Features on the Knowledge Graph (JPKG). For this model, I employ a cross feature learning module to learn cross-features from the rating prediction and graph link prediction tasks for enriching knowledge information and further improving recommendation accuracy. Moreover, I recursively compute the effect of multi-hop neighbors on a user/item in the heterogeneous KG by using a multi-hop propagation mechanism.

Chapter7 -- I discuss the proposed three models and compare their experimental results.

Chapter8 -- I provide the conclusion of this study.