A Collaborative Filtering based Approach for Recommender Systems

1810222 KANG Gaoxi

In recent decades, with the continuous development of technology based on information systems and big data, more and more fields have been started the research and applications of personalized recommendation technologies. With the rapid growth of Internet business data, the processing capacity's demand is also in an increasing trend. Accompanied by the fast growth of customer information is that how to use it effectively has become one of the issues that need to be paid attention to.

In this report, we first introduce an overview of recommender systems consisting of its definition, theoretical basis, typical approaches, and implementation. Besides, we present solid background knowledge that is used in these systems such as similarity functions and *k*-Nearest Neighbor, Gradient Descent and Artificial Neural Networks, some standard evaluation metrics for a recommender system. We then applied the previous research to implement three different typical algorithms based on collaborative filtering. They are item-based *k*-Nearest Neighbors (*i*-*k*NN), Alternating Least Square (ALS), and Neural Network-based collaborative filtering recommender systems (NeuNet).

After that, we conduct experiments on a public dataset from Netflix called MovieLens, which contains user information, item information, and the interaction between users and items (e.g., ratings, comments, etc.). The comparison between these algorithms' performance also is considered. Through the experimental results, we found that recommendations from the item-based *k*-Nearest Neighbors approach are less diverse than those from the approach of Alternating Least Square, which can bring "surprise" recommendations to the users. From the statistic point of view, the Root Mean Square Error (RMSE) of the Neural Network based Recommender System is a little better. This result gives us more reference in the practical applications, thus providing a direction on the modern approaches for recommender systems.

Keywords: Recommender System; Collaborative Filtering; Neural Network; *k*-Nearest Neighbors; Alternative Least Square.