GLocal-K: Global and Local Kernels for Recommender Systems

Soyeon Caren Han, Taejun Lim, Siqu Long, Bernd Burgstaller, Josiah Poon

Ryan Hull

Problem

Recommendation Systems

- Recommendation Systems are used to provide recommended personalized content to users based on various factors, like user feedback and recorded behavior
- Recommendation systems are an important aspect of many online platforms, including e-commerce, social media, and entertainment services
- **However, developing accurate, effective, and efficient recommendation systems can be extremely challenging due to the complexity of user-item interactions and the large amounts of data involved**

Data

User-Item Matrices

- User-item matrices are commonly used to represent user preferences and item features in recommendation systems, commonly referred to as interactions
- By analyzing these interactions, recommendation systems can make predictions about user preferences based on past interactions and the interactions of other similar users
- Examples of such data include the MovieLens datasets, which consist of ratings given by users to movies

Motivation and Goals

- I am passionate about movies and enjoy giving recommendations to friends and family, so I am interested in understanding how recommendation systems work and how they can be improved to provide more accurate and personalized recommendations
- Replicating and analyzing the GLocal-K approach will allow me to gain hands-on experience with a recommendation algorithm and explore its strengths and limitations
- I expect to learn and be able to create my own recommendation systems and compare different systems accuracies and limitations

Survey on Related Work Pt 1

"A Hybrid Recommender System for Recommending Smartphones to Prospective Customers." Biswas, Pratik K., and Songlin Liu.

- This paper proposes a hybrid recommendation system that combines collaborative filtering and content-based filtering techniques to recommend smartphones to prospective customers
- I chose this paper because it provides a detailed overview of the different types of recommendation systems and the challenges involved in developing hybrid systems that can provide accurate and personalized recommendations

Survey on Related Work Pt 2

"A Comparative Study of Recommendation Systems" Lokesh, Ashwini.

- This paper compares the performance of several recommendation algorithms, including collaborative filtering, content-based filtering, and hybrid approaches, on the MovieLens dataset
- I chose this paper because it provides a comprehensive review of the different types of recommendation systems and their strengths and limitations, and because it includes an evaluation of these systems on a widely-used benchmark dataset that is also used in the GLocal-K example

Summary of the Method

"GLocal-K: Global and Local Kernels for Recommender Systems" Han, Soyeon Caren, et al.

- GLocal-K is a method for collaborative filtering recommendation systems
- It combines global and local kernels to address common issues, such as sparsity/being too general, and being too specific
- The method uses a weighted hybrid of the two kernels to produce recommendations
- The global kernel captures the overall preference of users and items, while the local kernel captures the similarity between users and items based on their characteristics
- The GLocal-K method has shown promising results in various experiments and outperforms other methods

High Level Solution

"GLocal-K: Global and Local Kernels for Recommender Systems" Han, Soyeon Caren, et al.

- The GLocal-K method starts by constructing a user-item matrix and dividing it into training and test sets
- Next, global and local kernels are computed based on the training set
- The global kernel captures the overall preference of users and items, while the local kernel captures the similarity between users and items based on their characteristics
- The two kernels are combined using a weighted hybrid approach to produce recommendations for the test set
- Finally, the performance of the method can be evaluated using standard metrics such as precision, recall, and F1 score

Plan

Timeline Table:

Week 1: Choose dataset and review paper

Week 2: Data pre-processing and feature engineering

Week 3: Implement GLocal-K method

Week 4: Experiment with different hyperparameters and compare results

Week 5: Evaluate results and finalize presentation

Preparation Time:

Writing: 5 days

Presentation: 3 days

References

Han, Soyeon Caren, et al. "GLocal-K: Global and Local Kernels for Recommender Systems." Proceedings of the 30th ACM International Conference on Information & Knowledge Management, 2021, pp. 3063–67. arXiv.org, https://doi.org/10.1145/3459637.3482112.

Biswas, Pratik K., and Songlin Liu. "A Hybrid Recommender System for Recommending Smartphones to Prospective Customers." Expert Systems with Applications, vol. 208, Dec. 2022, p. 118058. arXiv.org, https://doi.org/10.1016/j.eswa.2022.118058.

Lokesh, Ashwini. "A Comparative Study of Recommendation Systems." Masters Theses & Specialist Projects, Oct. 2019, https://digitalcommons.wku.edu/theses/3166.