

Proposal of a Graph-based Recommender System

Team 33

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A lot of times, people don't know what they want until you show it to them

--Steve Jobs

1. Purpose

With the proliferation of social media and e-commerce, recommender systems are utilized ubiquitously to predict a user's preference. The recommender system leverages the history data and aims to make personalized suggestions based on every individual user's interest. In other words, a good recommender system will try to narrow down choices by presenting them with the filtered ones that they are most likely to have an interest in.

In this project, we propose to implement a recommender system with collaborative filtering from a perspective of graph to solve this essential matrix completion problem and apply the recommender system to the movie filed.

2. Dataset

Movielens which is a web-based recommender system [1]. In this project we use a subset of its database as our dataset, Movielens 100K, which contains 100,000 ratings (1-5) from 943 users on 1682 movies and each user has rated at least 20 movies.

Besides the rating data, the dataset also provides information about the users (age, gender, occupation and zip code) and the movies (title, release date, genre, etc.) The dataset is already collected, cleaned and packaged for research purposes.

3. Graph Construction and Algorithm

Interaction data can be shown as a bipartite user-item graph with labeled edges indicating ratings. Given that and inspired by the work of [2], we decide to view the recommendation problem as a link prediction problem on a bipartite graph: one set consists of user nodes and the other set consists of movie nodes.

In short, there are two main stages in the link prediction [2]. First, a graph convolutional encoder is built to embed the representation of users and movies, using both a bipartite graph and the node features. Then, the latent features are passed to a bilinear decoder, which forms our predicted rating matrix.

4. Research Questions

- 1) Is graph-based recommender system better than other recommender systems? If yes, why?
- 2) What is the benefit of regarding a matrix completion problem as a link prediction problem?
- 3) How robust is our graph-based recommender system considering the sparsity of edges in the network and the noise in the input information (eg. biased ratings)?
- 4) Implement the graph network and explore potential characteristics of the network.
- 5) Is it possible to scale the model to larger datasets or even multi-model datasets?

[1] Harper F M, Konstan J A. The MovieLens Datasets: History and Context[M]. 2015.

[2] Berg, Rianne van den, Kipf, Thomas N, Welling, Max. Graph Convolutional Matrix Completion[J].