Tell Me What I Want (what i really really want)

Graph Neural Networks for Social Recommendation

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Introduction

We examine datasets from product review websites with social components to create a product recommendation network using Graph Neural Networks (GNNs). The objective is to generate accurate product recommendations for different users based on their own rating histories and the rating histories of people they trust, where trust is conveyed through following other users. Using GNNs, we aim to see better results than other networks designed for social recommendations like PMF, Soec, SoReg etc. The problem is one of structured prediction: it uses the connections between users on a platform to create predictions based on their previous interactions and social network.

Data

- Douban
  - Chinese online database and social networking service that allows users to rate products
- Epinions
  - consumer review site with friend component
- user-user connection graphs, user-rating dictionary

Limited by Brown's department GPU clusters, we had to downsample both datasets, anticipating decreased performance. Preprocessing involved the clearing of users uninvolved in two-way social connections, clearing of users without ratings, ratings without users, etc. To make the data compatible with the model, we pickle the data.

	Epinions	Douban
Social Ties	17,603	1,248
Users	1,796	557
Ratings	3,039	6,474
Items	2,383	5,331
Max ratings/user	43	230

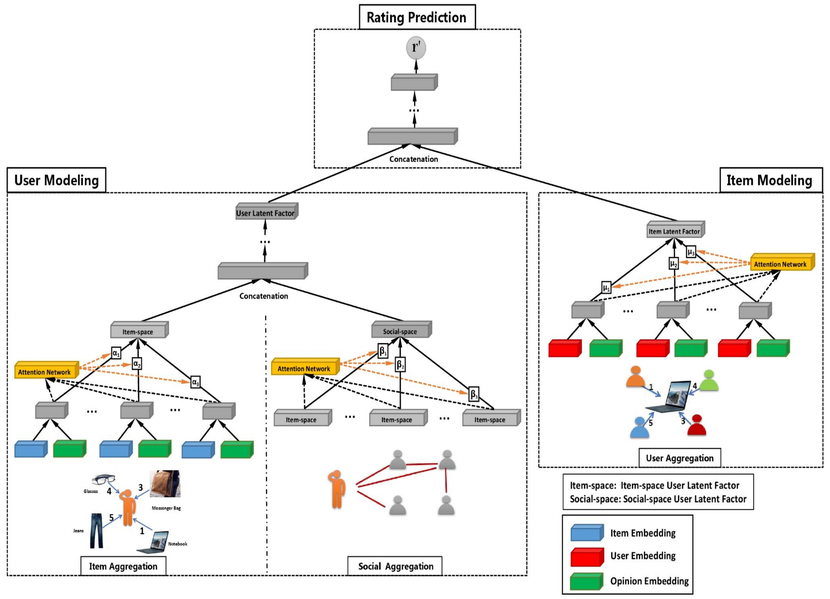


Figure 1. overall architecture of the proposed model. It contains three major components: user modeling, item modeling, and rating prediction.

Methodology

The architecture of the model contains three main components: user modeling, item modeling, and rating prediction.

- user modeling
  - learns latent factors of users from social graph and user-item graph, using an item and a social aggregation to combine information
- item modeling
  - learns latent factors of items using a user aggregation
- rating prediction
  - learns model parameters by integrating user and item modeling components.

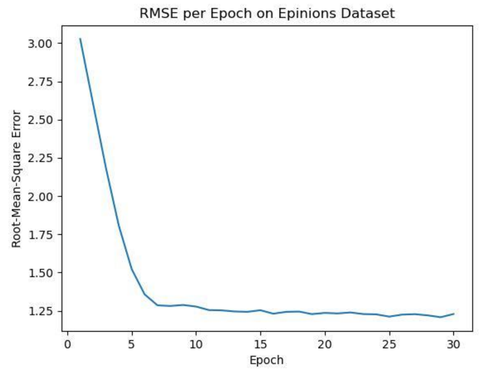
In the aggregation of social and user-product relations, the model also learns an attention metric.

To train the model, the user-value and social components are combined into one embedding form to be passed through the main body of a neural network.

Results

Metric/Dataset	Epinions	Douban
Val RMSE	1.2289	1.0916
Val MAE	1.0839	0.9222
Test RMSE	1.2541	1.0535
Test MAE	1.1053	0.8898

Reported using industry-standard loss metrics of root mean-squared error and mean absolute error on the final predictions (predicted ratings of a user on a product, based on rating history and social connections) and the corresponding ground truth ratings. These were trained with 30 epochs.



Discussion

The model obtains MAE and RMSE slightly greater than those of the other social recommenders as expected. Nonetheless, the success of the model on a downsampled dataset conveys the effectiveness of GNNs. It is important to note that though the model fully trains, there is a disconnect in the model, creating an issue of missing gradients. If the missing gradients are fixed and the model is run on a computer with greater memory, we believe our results would be comparable to those found in the paper.