Trust Aware Recommender Systems

P. Rishith Reddy

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Problem Summary

In this era of information overload, especially in the online world, recommendation systems play a crucial role. In a world filled with many choices these systems try to find the items of interest to the users such as books, movies, news, music or products in general which match with their preferences.

Based on the type of data that the recommendation systems use they can be classified into two major kinds, content-based and collaborative filtering based recommendation systems. Content-based recommendation systems make use of the characteristics and features of the items' to rank them based on the user's preferences. Collaborative filtering recommendation systems rely on the user's past behavior such as purchases or ratings to find similar users or items and utilize this information in order to find the items of interest to the users.

But these recommendation systems, in particular, collaborative recommendation systems face some problems such as cold start (not enough information know at the start), data sparsity and attacks (fake profiles giving biased ratings). It has been shown that by using trust information we can mitigate some of these challenges.

Studies show that users tend to rely on their trustworthy friends or family, and are more likely to accept recommendations made by them than from strangers. Trust-aware recommendation systems employ trust information

to enhance the classical recommender systems to improve accuracy of recommendation as well as the users' experience.

How Trust Information Solves These Problems

For the cold start problem involving users who have no ratings how trust information is useful is that even though we don't have any item ratings, from the data of the trust network we can get information of who the user trusts (along with weights) which lets us look at his trusted trusted friends ratings and predict reasonable rating for the items which are far better than other models which have no basis to predict anything at the start.

When it comes to attacks, it is easily resolved as the users' recommendations are mostly weighted by his trusted social circle and even if attackers make fake profiles and give fake ratings as long as they are not trusted by others their attacks are not effective.

Project Description

The goal of the project is to build a trust aware recommendation system. This system will use trust information to weight the recommendations made by all the users. The system will incorporate trust information to boost the recommendation provided by the trusted users and depress recommendations from non-trusted users.

The implementation will be of a few existing state of the art trust aware recommendation system to which some refinements will be made later. The major focus will be on trust-aware recommendation systems with model-based collaborative filtering methods as their base models with most of them depending on matrix factorization methods.

Based on the trust model introduced to capture trust information we further divide trust-aware recommender systems into three groups: co-factorization methods, ensemble methods, and regularization methods.
I will be implementing some representative systems for each group, which are:

1. Co-factorization Methods:
    a. SoRec: social recommendation using probabilistic matrix factorization. In Proceeding of the 17th ACM Conference on Information and Knowledge Management , pages 931–940. ACM, 2008. DOI: 10.1145/1458082.1458205.
    b. LOCABAL: Exploiting local and global social context for recommendation. In Proceedings of the Twenty-Third International Joint Conference on Artificial Intelligence , pages 2712–2718. AAAI Press, 2013.

2. Ensemble Methods:
    a. STE: Learning to recommend with social trust ensemble. In Proceedings of the 32nd International ACM SIGIR Conference on Research and Development in Information Retrieval , pages 203–210. ACM, 2009. DOI: 10.1145/1571941.1571978.
3. Regularization Methods:
    a. SocialMF: A matrix factorization technique with trust propagation for recommendation in social networks. In Proceedings of the Fourth ACM Conference on Recommender Systems , pages 135–142. ACM, 2010. DOI: 10.1145/1864708.1864736

The project will be segmented into major portions which in turn will have weekly deliverables so that people in charge are kept updated about the progress. The major milestones will be of a particular recommendation system with weekly updates being the progress of that particular recommendation system.

Expected Deliverables

To implement above mentioned systems which takes a database of users, items and user-user trust information as an input and gives a trust incorporated recommendation for any user for any particular item. To make more refinements and improve performance or accuracy.