Comparative Analysis of different Recommendation Algorithms used by Several Social Media Networks

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ABSTRACT

Friend recommendation is one of the most trending topics of research in the today's scenarios. Almost every social media platform either Facebook or Twitter is being capable of recommendation of friends to their users. The existing algorithms that has been devised by the platforms for recommendation are not so good and accurate which also leads to decrease in the user base of the applications. The level of accuracy that has been derived using the existing algorithms employed for friend recommendation does not meet the level of accuracy. This paper's main motive is to devise an 2-stage friend recommendation procedure which can provide more accurate results in the first stage which will be based on the relationship of different social networks. The second stage assumes that friends of friends can be friends with each other. Experimentally, it has been proven that the above discussed algorithm provides accurate and better results compared to existing traditional friend recommendation systems.

INTRODUCTION

Social media networks have seen a very drastic increase in the user base since the last decade. Various social media platforms such as Twitter, YouTube and Flickr have already the user base of billion users' who share their daily pics, opinions and videos etc. Users use social media platforms to make new friends. The most important challenge is how the platform can help the users to make friends better. Hence, in the current scenario, the social friend recommendation has become a quite interesting and most trending topic. Also, already a lot of methods has been proposed in this context by various researchers. Content Similarity has been quite widely used in this regard (such as the text or image visual similarity). However, its obvious that many other factors need to be considered while recommending friends to the user., rather than considering the friendships only based on content similarity matching. Consideration of many features for the same will result in the systematic implementation of the friend recommendation system. Generally, users make friends related to the place where they live and work or based on their hobbies and areas of interests. These roles can be considered in various aspects like basket-ball-fan network or football-fan network. These nodes can be of same set of nodes with different connections of their edges. The various aspects related to a user are related to different roles. For instance, a hobby of a user can be connected to the gender and age, whereas the friend circle can be connected to the gender and age.

For modelling of the different network correlations, proposal of alignment of tag and contact network was being done for the purpose of important tag feature selection. The selection of different social signals in different networks keeping various degrees of importance in the mining of the network correlation.

Related Works

A. Friend/Link Prediction in LBSNs

Brown et al. [6] study the influence of spatial proximity on users' social relationships, that is the correlation of the geographical closeness of users' check-ins and social relationships. Scellato et al. [1] study the link prediction space of two users to check whether they will become friends or not, and use a semi-supervised framework to predict new links among friends-of-friends and place-friends.

Pham et al. [2] introduce an entropy-based model to first measure the diversity of co-occurrences and then utilize location entropy to weigh each co-occurrence differently, depending on the popularity of each location. Cheng et al. [7] formulate the friend prediction problem as a binary classification problem. They introduce two models; the first model focuses on predicting friendship of two individuals with only one of their co-occurred places' information. The second model proposes a solution for predicting friendship of two individuals based on all their co-occurred places. Bayrak et al. [8] study the influence of place categories on friend prediction, if friends might visit locations that belong to the same type of location categories e.g., museums, cinemas and so on. Instead of the top-k friend recommendation task, all the methods focus on the link prediction task in LBSNs, that is a binary classification task trying to determine whether two users might become friends or not. Recently, there has been a surge of interest in representation learning for social networks. For example, Deep-Walk [18] learns representations of nodes using a sequence of truncated random walks. The learned representations capture a linear combination of community membership at multiple scales. Gover et al. [19] introduce the node2vec model, to learn a mapping of nodes to a low-dimensional space of features that maximizes the likelihood of preserving network neighborhoods of nodes. They define a flexible notion of a node's network neighborhood and design a biased random walk procedure, which efficiently explores diverse neighborhoods. However, both Deep-Walk and node2vec try to learn non-linear representations of social networks for the multi-label network classification and link predictions tasks and do not produce top-k friend recommendations.

B. Top-k Friend Recommendation in LBSNs

The BPR model is a baseline model that considers a pairwise ranking loss function to generate top-k recommendations [17]. Ding et al. [15] extend the BPR model by first extracting deep features based on a convolutional neural network, and then using a deep neural network to produce friend recommendations. However, the available contextual information at LBSNs is ignored in both studies. Yu et al. [9] introduce a random walk process to find geographically related friends. Raw GPS data are analyzed to extract discriminate GPS patterns. Then, the extracted geographical information and the social network of friends are combined in a heterogeneous information network, performing random walks to provide friend recommendations. Yu et al. [10] infer social relations based on users' preferences on POIs' categories, by evaluating the degree to the preference coverage. Lu et al. [11] present the GIB-FR model, a Bayesian latent model that combines geographical information and user behavior for friend recommendation. In particular, they investigate whether users who share common areas when they participate in social events will have a tendency to associate with each other. Finally, they formulate the recommendation task as a pairwise ranking problem, using the BPR framework. Bagci et al. [12] build a graph based on users' context, that is social relation, personal preferences and current location. To rank the recommendation scores of friends, a random walk with restart approach is employed. User's visited locations in recommendation region are also considered to identify places related to friends, that is potential friends that have check-ins at common locations. In addition, local experts and popular locations are employed in populating the context of the user. To identify the local experts and popular locations in a certain region, a HITS-based algorithm is introduced.

CHALLENGES IN RECOMMENDATION SYSTEMS

There have been various challenges or limitations of the existing recommendation systems that has been present in the currently existing social media networks:

- **Cold start problem**

  Whenever addition of any user joins the particular social network, time is required to fetch information about the user.

- **Accuracy suggestions**

  Accuracy of the content that is getting suggested to the user also matters, as the interest of the user to recommend different users in his/her network to use the same social platform will largely depend on this. The less accurate the recommendations are to the user, lesser the users' interests in the network will be.

- **Increasing size of the dataset**

  Continuously increasing user base of the platforms will perform a better everyday testing of the algorithms used for recommendations.

- **Sparsity**

  Most of the users neglect the feedbacks and the reviews that are being asked for the recommendations of the users' to recommend the product they purchase to their friends or relatives. Since, maximum users neglect this thing, recommendation systems find it difficult to get the relationship.

- **Privacy of the users' data**

  The security of the user's personal data is being a big concern since the personal details of the user should not be manipulated. Also, it should be either encrypted or stored in various secured systems.

- **Scalability and Big Data**

  The processing of the large amount of the users' personal data may lead to compromise between the performance and prediction quality. [1]

ARCHITECTURE OF RECOMMENDATION SYSTEMS

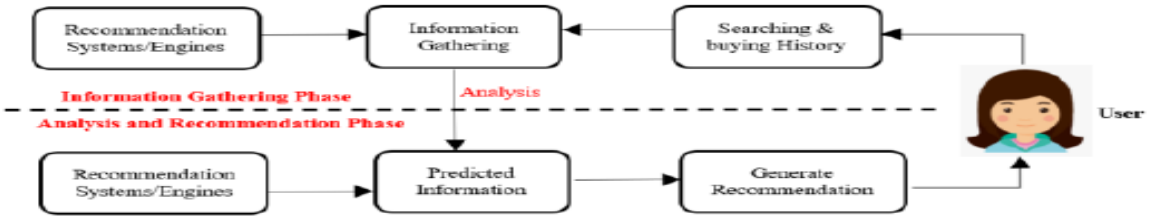

Fig.1 Workflow of RS

The basic architecture of the recommendation systems as involved in various social media networks is being described using the figure above. The main idea of the workflow of the recommendation systems is being divided into 2 phases:

- Information gathering phase
- Analysis and recommendation phase

In the first information collection phase, basically data related to all the users for that particular social network is being collected regarding searching, buying etc. habits. Then comes the phase where analysis of the data obtained in the first phase is being used to predict the user's interests and tastes. This information gained is being taken as base for recommending friends to the user.

COMPARISON OF VARIOUS SOCIAL MEDIA and E-COMMERCE NETWORKS RECOMMENDATION SYSTEM

Platform	Technique Used	How the recommendation system works
Amazon	Item-item collaborative	The recommendation system works basically on the basis of the items rather than users. The visited items is being sorted initially in an item to item matrix. Then the recommendation algorithm is being calculated using cosine similarity.
Facebook	Collaborative filtering (Matrix factorization)	Using the concept of the mutual friends, the users recommendation are being prepared.
Netflix	Machine Learning	Recommendations are based on the user's watch history and total time of the video that is being watched by the user.
Youtube	Deep Neural Network	Takes the users' watch history as the base input and recommend hundreds of videos/users based on the data retrieved.

CONCLUSIONS

In this paper, we studied how the various social media networks and the e-commerce websites are using their own techniques for either recommending new interesting content to the user or the friend recommendations studying the nature and the tastes of the user by collecting data of users' daily activities to get what content the user is basically interested in.

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