A Survey on Friend Recommendation System

[1]JYOTI SHARMA,[2]PINKY TANWAR

[1]M.Tech Student , Deptt. Of CSE

[2]Assistant professor , Deptt. Of CSE

JMIT Radaur,kurukshetra University

ABSTRACT

Recommendation system is used to recommend resources that user may be interested in by mining user's interests and/or preferences. Recommendation system matches user database with available items from item-database and suggest recommendation accordingly. Recommendation Systems provide users personalized assistances and information about products or services of interest to support their decision-making processes. Personalization deals with adapting to the individual requirements, interests, and preferences of each user. Most of the e-commerce sites e.g. Myntra.com, and social networking sites e.g. facebook.com have such recommendation systems. These systems serve two important tasks (1) to help users deal with the excess information by giving them appropriate recommendations (2) to help businesses make more profits by selling more products. Recommendation systems either recommend 'people' (partner, consultant, friend, etc.) or 'things' (movies, songs, books, etc.). Recommender systems typically create a list of recommendations in one of two ways through collaborative or content-based filtering. Collaborative filtering are relies on collecting and analyzing a large amount of information on users' behaviors, activities and predicting what users will like based on their similarity to other users. Content-based filtering methods are based on a explanation of the item and a profile of the user's preference. In this paper we will discuss about the friend recommendation system using different analyses.

Keywords— *Friend Recommendation System, Collaborative Filtering, Content-based Filtering, Different Analyses, Social Sites.*

I. INTRODUCTION

Social network services,e.g, Facebook and Twitter in U.S.A., QQ and Weibo in China, have grown greatly in recent years. Friends recommendation is crucial for the growth of social networks. At the early stage of social networks, the network is small with few users, it is easy to browse over other candidates profiles to make a friend request. In contrast with past, the number of social network users reaches an unbelievable level.

A recommender system is a software tool that supports users in identifying the most interesting items. With the development of Web 2.0, the study of social-based recommender systems started. One challenge with existing social networking services is how to recommend a better friend to a user. Most of them relies on pre-existing user relationships to select friend candidates. e.g, facebook relies on a social link analysis among those who already share common friends and recommends symmetrical users as potential friends. But, this approach may not be the most appropriate.

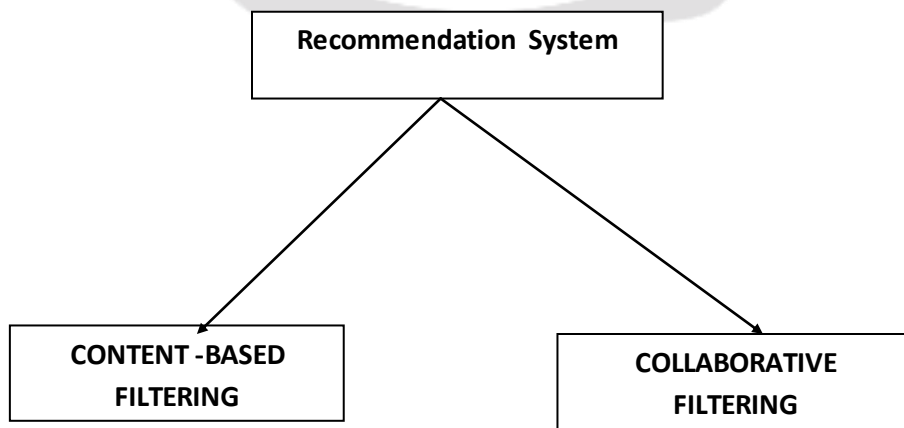Recommender system is generally of two types :- content-based filtering and collaborative filtering.

Figure 1:Different Types of Recommendation System

Content-based filtering :- These methods are based on a description of the item and a profile of the user's preference. These algorithms recommend items that are similar to those that a user liked in the past or is examining in the present. In particular, several candidate items are compared with items previously rated by the user then the best-equivalent items are recommended. This approach has its roots in information retrieval and information filtering research . Essentially, these methods use an item profile characterizing the item within the system. The system generate a content-based profile of users based on a weighted vector of item features. The weights denote the significance of each feature to the user and can be computed from individually rated content vectors using a variety of techniques. Simple approaches use the average values of the rated item vector while other sophisticated methods use machine learning techniques such as Bayesian Classifiers, cluster analysis, decision trees, and artificial neural networks in order to estimate the probability that the user is going to like the item**.**

COLLABORATIVE FILTERING:- Collaborative filtering is the process of filtering information or patterns using techniques which involves collaboration among various agents, viewpoints, data sources, etc. Applications of collaborative filtering involves very large data sets. Collaborative filtering methods have been applied to many non-identical kinds of data including: financial data, such as financial service institutions that combine many financial sources; monitoring and sensing data, such as in mineral exploration, environmental sensing over large areas or multiple sensors; or in electronic commerce and web applications where the focus is on user data, etc. Collaborative filtering can be used for making automatic predictions about the interests of a user by collecting preferences or taste information from numerous users by means of collaboration.
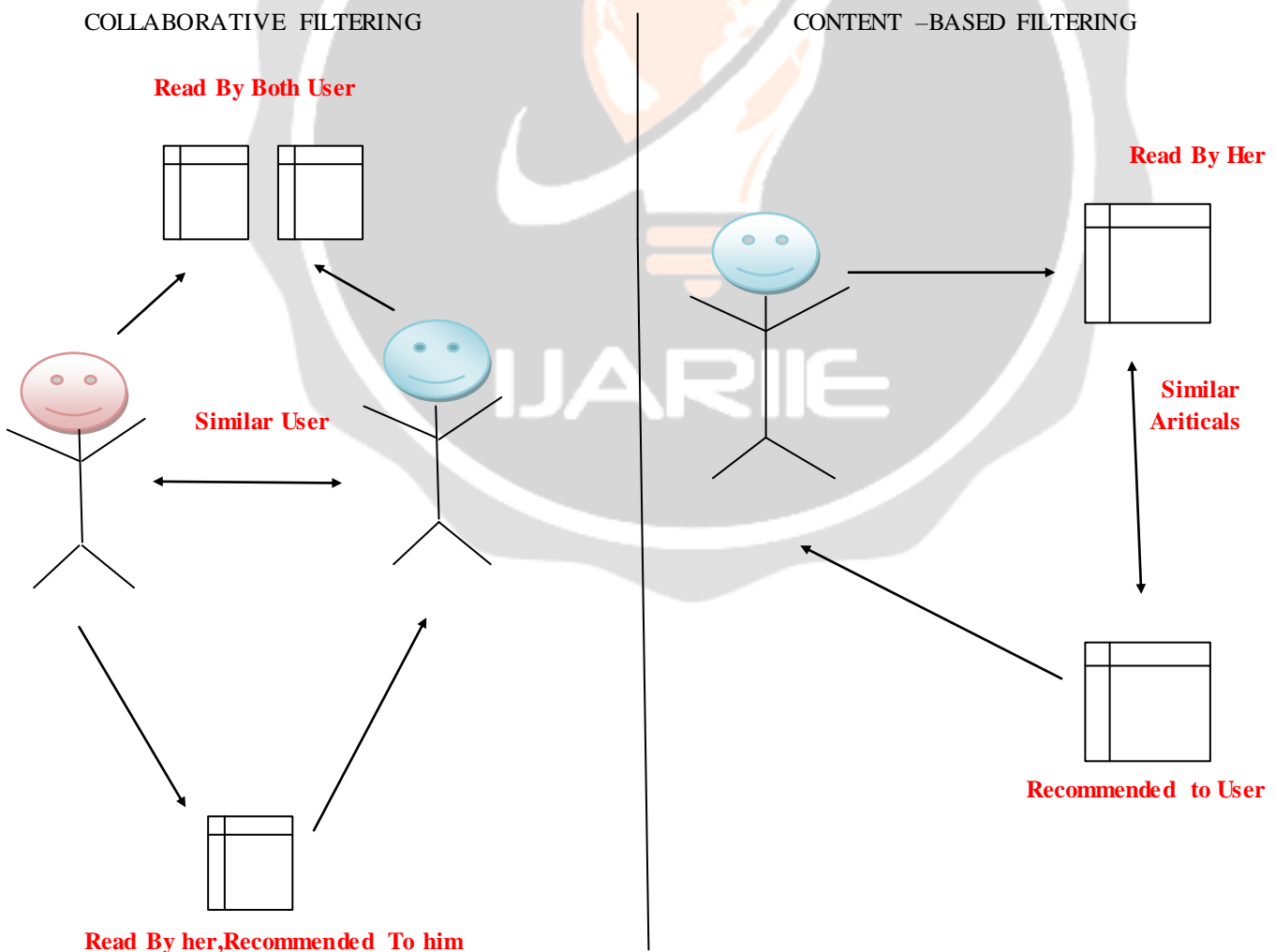

Figure 2: Collaborative and Content-Based Filtering

II. APPLICATIONS OF FRIEND RECOMMENDATION SYSTEM

The most common recommender systems applications include:-
- **Entertainment** - It provide recommendations for movies, music, and IPTV.
- **Content** –It provide recommendation for personalized newspaper, documents, Web pages, e-learning applications, and e-mail filters.
- **E-commerce** –It provide recommendations for consumers of products to buy books, cameras, PCs etc.
- **Services** -It provide recommendations for travel services, experts for consultation, houses to rent, or matchmaking services.

III. TECHNIQUES OF FRIEND RECOMMENDATION SYSTEM

There are different types of technique of friend recommendation which are:
- ➤ *Potential Friend Recommendation in Online Social Network :* First, users' interest is analyzed depending upon in which activities user is interested in. This layer is application dependent. In second layer users' association can be

calculated. In some special domains, extra domain knowledge can also be counted. In last layer, i.e. actual friend recommendation layer dynamic recommending strategy need to be designed as per the following aspects:
- ▪ Personalized and adaptive associations combining rule, based on users' implicit feedback. Sometime both the content association and context association with a weighted average function need to be considered and the specific weights can be adjusted when a user adds a recommended friend with higher content association or higher context association.
- ▪ Neighbourhood choosing strategy, to choose how many associated potential friends to be recommended or what's the lowest recommending confidence. The set of nearest neighbour need to update by randomly choosing a part of k nearest neighbours to recommend as the users may feel boring and not notice the friends recommendation any more if the same set of nearest neighbours are recommended every time.
- ▪ Recommending updating strategy should be improved frequently as users' interests may change as time goes or the environment might change.
- ➤ **Shortest Path Based Potential Common Friend Recommendation in Social Networks :** In this approach, social network is considered as a graph where each user is a node and friendship among any two users is taken as an edge.

In first step top-k shortest path is to be calculated by applying multiple sources Floyd-Warshall algorithm. Pruning strategy is applied to optimize the result. Then potentially common friends are obtained by extending the longest common subsequence algorithm to remove duplicate entities.
- ➤ *A Social Trust Based Friend Recommender for Online Communities:* Social trust based model considers trust members have towards each other as shown through their behaviours in the online social community. These algorithms are based on Social Trust (STrust) and Social Graph (FOAF). Social Trust is composed of two types of trust: popularity trust (*PopTrust*) and engagement trust (*EngTrust*). The popularity trust of a member is the trusting behaviour of other members in the community towards the member, whereas the engagement trust refers to the behaviour of a member towards other members. Trust relationships are asymmetrical (i.e., A trusting B does not necessarily means B trusting A). Trusting behaviour can be active (e.g. commenting a post) or passive (e.g., reading a post).
- ➤ **Friend Recommendation based on the Similarity of Micro-blog User Model:** First, all resources (user profile, interaction, contents) are to be collected. Then for each resource corresponding action is to be taken as follows:
- ▪ For user profile basic information such as user's identity, gender is to be collected.
- ▪ For the content resource, after pre-processing i.e. teaming, stop-word removal and feature selection,text classification method is to be used to predict the topic user is interested in.
- ▪ For interaction resource link strength is to be determined. The link strength between users is calculated from comment relationship and forward relationship :
- o Comment relationship can be divided into two aspects: comment frequency and comment quality i.e. length of the comment.
- o Forward frequency indicates the forward relationship between users.

Interaction based similarity and content based similarity is then calculated. The similarity of micro-blog user model comprises of content based similarity and interaction based similarity with different weights. According to the value of the similarity of micro-blog user model top N users in the ranked list are to be recommended to the target user.

IV. RELATED WORK

Zhi Yu, Can Wang[*],Jiajun Bu, Xin Wang, Yue Wu, Chun Chen [1], In this paper, we propose a novel friend recommendation method ACR-FoF (algebraic connectivity regularized friends-of-friends) that take both success rate and content spread in the network. Using this, our recommendation method naturally extends existing friend recommendation algorithms such as FoF to achieve both recommendation relevance and content spread in a social network.It is different from traditional recommendation methods that mainly examine success rate in recommendation. Experimental results on synthetic data sets and real social network data sets show that ACR-FoF achieves significant improvement in content spread at a very tiny loss on recommendation accuracy.

C. Martinez-Cruz[a,*], C.Porcel[a,*], J.Bernabé-Moreno[b],E.Herrera-Viedma[b,*] [2],. In this paper we develop an ontology to characterize the trust between users using the fuzzy linguistic modeling, so that in the recommendation process we do not take into account users with similar ratings history but users in which each user can trust. We provide a method to aggregate the trust information captured in the trust-ontology and to update the user profiles based on the feedback. This method finds all possible paths between the two users, exploring On2Trust. Finally, it collect the trust information represented in the most relevant paths found between the pair of users.

Zhoubao Sun[a], Lixin Han[a,*], Wenliang Huang[a], Xueting Wang[a], Xiaoqin Zeng[a],Min Wang[a], Hong Yan[b,c] [3], In this paper, we propose a social regularization approach that incorporates social network information to benefit recommender systems. Both users' friendships and rating records are employed to predict the missing values(tags) in the user-item matrix.Mainly, we use a biclustering algorithm to identify the most suitable group of friends for generating different final recommendations. We employ both friendships among users and rating records (tags) to predict the missing values (tags) in the user-item matrix.

Hsiu-Yu Liao, Kuan-Yu Chen, Duen-Ren Liu[*][4], This paper proposes a novel friend recommendation model, namely a hybrid SVM classifier considering user similarity and virtual contact strengths. In the proposed approach, users' contact activities in virtual worlds are characterized into dynamic features and contact types in order to derive their contact strengths.Classification approaches, the SVM friend classifier and the KNN friend classifier are developed to predict friend relationships based on user similarity and contact strengths among users.In the evaluation phase, it was found that diverse activities in VWs make social-based activities and communication-based activities important factors in friend-making.

Zhou Zhang [a], Yuewen Liu [a,*],Wei Ding [b],Wei (Wayne) Huang [a,c], Qin Su[a], Ping Chen[b] [5],In this study, we introduce a new Friend Recommendation system using a User's Total Attributes Information (FRUTAI) based on the law of total probability. the FRUTAI is a universal friend recommendation method and can be applied in different types of social media because it does not distinguish the structure of the network.We compare the newly proposed FRUTAI method/algorithm with other FoF algorithms using a real-world social media network and results show that FRUTAI performs best overall.

Parham Moradi[*], Sajad Ahmadian, Fardin Akhlaghian [6],In this paper, we present a model based collaborative filtering method by applying a novel graph clustering algorithm and also considering trust statements. The collaborative filtering approach is a powerful technology for users to find their interesting information. Trust is a concept that has recently attracted much attention and has been considered in online recommendation systems. This method consists of three phases. In the first phase, the problem space is represented as a graph where the users (items) are corresponding nodes and combinations of the similarity values and trust statements are considered as edges weights. Then, in the second phase, a novel graph based clustering algorithm is applied to group the similar users (items) into several clusters. Finally, in the third phase, for each unseen item, a rate is predicted and the top-N interested items are recommended to the active user.

Nikolaos Polatidis[*],Christos K.Georgiadis[7], In this paper we propose a multilevel recommendation method with its main purpose being to help users in decision making by providing recommendation so better quality. The proposed method can be applied in different online domains that use collaborative recommender systems, thus improving the overall user experience. The main acquirement of our method is to provide recommendations of higher accuracy this comes to a cost. There are cases that the similarity between the two users is returned as zero and a set of recommendations cannot be provided. This is due to the fact that the similarity of uses is enchased only if they can be assigned to a certain level, after satisfying the required constraints, otherwise zero value is returned between them. Therefore, a different similarity measure or recommendation method needs to be uses until enough ratings are submitted to the data base in order to make the proposed-multilevel approach usable.

Ying Liu[a,b,*] Jiajun Yang[a][8],In this paper, we propose two novel methods to overcome the weaknesses in VSRank(vector space model) a state-of-the-art ranking-based algorithm. Firstly, a novel similarity measure is proposed to make better use of negative similarity; secondly, social network information is integrated into the model to smooth ranking. Experimental results on a publicly available dataset demonstrate that the proposed methods outperform the existing widely used ranking-based algorithms and rating-based algorithms considerably. Vector space model is an algebraic model commonly used in information retrieval. It regards a textual document as a bag of words, disregarding grammar and even word order.

Parham Moradi [*], Sajad Ahmadian[9],In this paper, a Reliability-based Trust-aware Collaborative Filtering (RTCF) method is proposed to improve the accuracy of the trust-aware recommender systems. In the proposed method first of all, the initial trust network of the active user is constructed by using combination of the similarity values and the trust statements. Then, an initial rate is predicted for an unrated item of the user. In the next step, a novel trust based reliability

measure is proposed to evaluate the quality of the predicted rate. Then, a new mechanism is performed to reconstruct the trust network for those of the users with lower reliability value than a predefined threshold. Finally, the final rate of the unrated item is predicted based on the new trust network of the user.

Melike Yigit [a], Bilal E. Bilgin [a], Adem Karahoca [b,*] [10],In this study, we propose an extension to the topology based and Friends of Friends (FoF) recommendation systems by taking into account the user actions. The proposed approach (PA) firstly classifying the data has been set into four classes and secondly an equation was computed by using the relationship of users. Our model utilizes not only the relationship of the users but also many actions and many mentions of the users to generate the recommendation to users. We evaluate the performance over precision-recall graphs and receiver operating characteristic (ROC) curves. PA extended topology based and FoF algorithm results compared with the other alternative RSs. As a result, the proposed algorithm performs better than the related studies with considering user's actions, user's mentions and user's relations.

Zhibo Wang, Student Member, IEEE, Jilong Liao, Qing Cao, Member, IEEE et.al [11], In this paper, we present Friendbook, a novel semantic-based friend recommendation system for social networks, which recommends friends to users based on their life styles instead of social graphs. By taking advantage of sensor-rich smartphones, Friendbook discovers life styles of users from user-centric sensor data, measures the similarity of life styles between users, and recommends friends to users if their life styles have high similarity. Upon receiving a request, Friendbook returns a list of people with highest recommendation scores to the query user. We have implemented Friendbook on the Android-based smartphones, and evaluated its performance on both small-scale experiments and large-scale simulations. The results show that the recommendations accurately reflect the preferences of users in choosing friends.

Arlina D'cunha, Vandana Patil[12], In this paper, few friend recommendation techniques with their advantages and disadvantages are discussed along with a proposed method Friend Recommendation is a very general and essential application in social networking. There are different approaches available to help users making friends online and develop their online social circle. One of the approaches for friend recommendation is based on the similarity of Microblog User Model, which can be helpful to the users to the great extent.

Sundong Kim supervised by Jae-Gil Lee[13], In this paper, we propose a friend recommendation problem in which the source user wants to get more attention from a special target. The goal of our friend recommendation is finding a set of nodes, which maximizes user's influence on the target. To deliver this problem, we introduce information propagation model on online social networks and define two measures: influence and reluctance. Based on the model, we suggest an IKA(Incremental Katz Approximation) algorithm to effectively recommend relevant users. Our method is compared with topology-based friend recommendation method on synthetic graph datasets, and we show interesting friend recommendation behaviors depending on the topological location of users.

Yan Xu, Meilin Zhou, and Siyao Han [14] This article proposes a classification-based recommender system model,which takes advantage of the huge number of social data of microblog, extract useful features of users, and then transform recommendation problem to a binary classification problem. Experiments show that mixed features improve recommendation results, especially with small training set. This system focuses on analyzing and extracting multi-dimensional features of microblog users on followee recommendation, and modeling classifiers to distinct recommended users from non-recommended users

Bailing Wang , Junheng Huang et.al [15],This paper presented a collaborative filtering recommendation algorithm (UISA) fusing user-based,item-based and social networks data. The algorithm uses the data of the neighbor relations in social networks, calculating the users' friends not reflected in the rating matrix. At the same time, we can calculate the similarity between items by using the data of item text in social networks, mining similar items not reflected in the rating matrix. In this way, it can fundamentally expand available information capacity of the traditional filtering collaboration recommendation algorithms, improve the recommendation accuracy, alleviate cold start problem.

VI. CONCLUSION

In this paper, We suryed the latest literature review on friend recommender system.We gave brief discussion of friend recommender system and its different techniques that we use in our general life .It mainly focus on the use of recommender system in social network sites for that we used different technologies.In future we will work on how can we recommend friends to another user by using accurate technique,so that we can make friends online.

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