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FRIEND-TO-FRIEND SECURED RELATIONSHIP NETWORK BASED ON ONLINE BEHAVIOUR

Balasaheb Tekale, Sanjay Magar, Amit Takalikar, Purshottam Joshi

Balasaheb Tekale , SKNSITS LONAVALA Tq:-maval Dist:-pune Pin:-410401
Sanjay Magar , SKNSITS LONAVALA Tq:-maval Dist:-pune Pin:-410401
Guide: Prof.Rahul Chavan, Dept. of Computer Engineering, SKNSITS college lonavala, Maharashtra,India

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Abstract - *Millions of users have connected Social network sites (SNSs) for creating the social revolution. With same mentality User's social behavior influences them to connect with others. Social networks are constituted Because of its user group's common interest in some social emerging issues. The popular social Networking sites are Facebook, Twitter, LinkedIn, whatsapp, Google plus etc. which are actually online social networking sites. And mainly the large amount of online users and their special interests possess great challenges to support recommendation of friends on social networks for each of the users. However, with the popularity of public cloud services, the main concern of confidentiality is recognized as the problem even for personal individual users. To maintain confidentiality Secret sharing data management approaches for multiple clouds that involves a secret sharing scheme have been proposed. Two important algorithms are used: Data Encryption Standard (DES) and Advanced Encryption Standard (AES). A Friend recommendation framework (FRF) based on the behavior of users on particular SNSs. In the following stages described the proposed system: By measuring the frequency of the activities and states done by the users and updating the dataset according to the activities, applying FP-Growth algorithm to classify the user behavior with some criteria, then apply multilayer thresholding for friend recommendation system. The proposed Friend Recommendation framework shows good accuracy for social graphs used as model dataset.*

Key words: - Social Network Alignment, Friend Recommendation, Social Networking Sites (SNS's), Cloud Computing

1. INTRODUCTION

Since last decade Social networks have experienced dynamic growth. Social websites such as Twitter, YouTube and Flickr have billions of users who share opinions, photos and videos every day. Users make on-line friends through these social networks. One challenging issue is how to help these users to efficiently find new social friends. Social friend recommendation has therefore become a new research topic and several methods have been proposed to conduct recommendation efficiently. As stated that "In on-line social networks, people behave differently in social situations because they carry different latent social roles". For example, a father and a child will respond differently when seeing a toy in a showcase at a shop. We believe that utilizing the individual's social role information is a new research component for recommendation tasks. In the social networking sites, a social entity or user makes connections with other known or unknown social entities, namely friends or partners, and share their news and views through the profound facilities of the sites. Friends could be offline or real-life friends, classmates, neighbors, colleagues, Family members, friends, relatives or anyone having a profile in the OSN sites. Recommending different aspects in SNS's is a new concept to make people socially active. Community recommendation, connection or friendship recommendation, birthday reminder, event recommendation, restaurant or vacation spot recommender systems are common findings in the SNS's. Recommendations of people on social networking sites is better studying because it is different from traditional recommendations of books, movies, restaurants, etc. due to the social security of "friending". For example, before adding a friend, one has to consider a lot of things, whether he or she know the person personally or his or her activities. Match with the person he or she wants to add as a friend. Furthermore, the most challenging part in designing a recommendation system for a social network is the privacy issue of the users. With the ever increasing web crimes and identity theft, people are becoming more and more careful in sharing their personal information. Hence, unless a user can trust the system with their data, the system cannot stand and it will be valueless. Exploitation of social network data is the fragmentation of the crowd of users on social network into number of proprietary and closed social networks. This issue is combined by the fact that each new game or media application tends to build its own social network around it rather than building upon the rich data available about existing social relationships. In this paper, we proposed the framework similar to Facebook where the friend is recommended using online behavior as well as his personal interest among other peoples with a secured sharing.

2. Literature Survey

2.1Theory of Papers

SNS's are an online phenomenon which provides social network based services to support easy message posting,

information sharing and inter-friend communication. A social network is a set of people or groups of people with some pattern of contacts or interactions between them. The patterns of friendships between individuals, business relationships between companies, and intermarriages between families are all examples of networks that have been studied in the past. Social Networking sites (SNS's) provide users with opportunity to connect with their offline friends as well as making new friends with latent ties who otherwise would never have met them. They also supplement their relationships with close relations and help to maintain the social capital [3]. As taking reference from our base paper one thing is discovered that is they can take any random user from any other sub network and recommend them as friend. So many friends or connections could be recommended to a particular user in any social network. [4]. "Connectivity and interaction, traffic activity, malicious behavior, mobile social behaviors" are four issues needed for understanding user behavior in social network [5]. C. Wilson et al [6] mentioned that we can also use "photo comment and wall post as interaction to determine the behavior". Different researchers' have proposed different methods for recommending friend or connection such as clustering method [7-8], "categorizing users' interest" [9], cohesion based recommendation system [14], based on "user social relations and personal information Profiles" [10-11]. In the paper[1]social friend recommendation based on multiple correlation , They study the friend recommendation problem from the viewpoint of network correlation. A person has many Different social roles on-line. In each social role, he/she makes different friends, and these different social roles form different social networks. To consider the effect of different social roles and discover a network alignment method to find the correlations between networks. The second aspect was taking into account is pairwise user similarity preservation to maintain the original data structure. They find that a small number of features can align the tag network to the contact network well, and can provide sufficient information for friend recommendation. Both network alignment and social network structure preservation play an important role in their task[1].In the paper[12], Performance evaluation on data management ,they experimentally evaluated the performance of a data management approach for multiple clouds that use secret sharing schemes by implementing the prototype. An actual particular public cloud service was used as a CSP in the prototype. The result shows that the performance was Feasible for use and that the secret sharing processing time was much less than communication time. We will evaluate the performance with various kind of CSPs in the future.

2.2 Comparative Study

- Kuan et al. : Kuna proposes an algorithm to locate groups using a transitive extension based approach. This research implemented the use of a 1.5Cclique extension method to derive sub structures, or communities, within social networking sites. Results showed that this method was moderately effective in finding community of similar friends. However, this method doesn't provide insight into how these communities are created. That is, it is important to understand what similar interests cause an implementation in these communities. Recent research has studied the potential effectiveness of combining complex network theory and genetic algorithms.

- Silva et al.: Silva treated the recommendation problem as a filtering problem where a genetic algorithm was used to create three indices derived from structural properties of social networks. The result from this study was acknowledged as a baseline to starting work using a new techniques. Study of few recommendation pattern used by websites: Amazon recommendations change regularly based on a so many factors. These factors include time, date and day of purchase, rate or like a new entity, as well as changes in the interests of other customers. Because your recommendations will fluctuate, Amazon suggests you add new things that interest you to your Wish List or Shopping Cart. E-Bay recommends product on bases of features of items. You Tube suggests items based on like/dislikes concept. In.com recommends the songs that are popular, songs from the same movie, similar actor-actress, artist, director etc. RS is used to filter the entity/product according to the user interest and looking at the like-minded-users.

- Collaborative filtering: There are so many popular recommendation algorithms based on collaborative filtering. Collaborative Filtering generates a group of users with similar behaviour, and finds the entity suggested by this group. Rankings from user will be taken from user in two ways explicit ranking and implicit ranking. CF algorithms are divided into two types, memory-based algorithm and model based algorithm.

- Memory-Based algorithm: Memory-Based algorithm simply stores all the user ranking into memory. There are two variants of memory-based recommendation and both are based on the k-Nearest Neighbour algorithm: user-based filtering and entity-based filtering. In User - Based Filtering, Ranking matrix is used to find neighbouring users for the active user. This is done by using cosine or user correlation matrix. After knowing the neighbouring user for active user, entity preferred by neighbouring users will be managed on frequency and ranking of entity. Entities that are not known to active user will be recommended.

Entity Based Filtering finds the most similar entities. Items are known to be similar when the same set of users has brought them or rated them highly. For each item of an active user, the neighbourhood of most similar entity is identified. Collaborative filtering techniques can be expanded to other algorithms such as tag based and attribute aware and trust aware recommender systems. A diffusion based recommendation algorithm is proposed which consider the personal knowledge. A hybrid user profiling strategy is proposed that take advantage of both content based profiles describing long-term information interests that a recommender system can took a long time and interests revealed through tagging activities, with the goal of enhancing the interaction of users with a collaborative tagging system.

3. Algorithm

3.1Association rule mining

The basic concept of association rule mining is stand from the market basket analysis. Let D be the transaction database which composed of the transaction records {T1, T2, ---, Tn} of the customers. Each transaction T consists of the items purchased by the customers in one visit of the market. The items are subset of the set of whole entity I {I1, I2,...., Im} in the market that are assumed for analysis. An item set consists of some collection of items which exist together or a single item from I. In Association rule mining X->Y, represents the dependency relationship between two different entity sets X and Y in database. The dependency is at any time X is existing in any operation, there is a probability that Y may be exist in same transaction. This skill is based on two interesting measures.
Support: this represents the percentage of transactions in D that contain X U Y and it is given by Support(X->7) = *P*(X U Y). Confidence: It gives the percentage of transactions in D containing X that also contain Y and it is given as confidence*(X->Y)* = (/).

3.2 FP-growth

FP-Growth: allows frequent item set discovery without candidate item set generation.
Two step approach:

Step 1: Build a compact data structure called the FP-tree Built using 2 passes over the data-set.

Step 2: Extracts frequent item sets directly from the FP-tree Traversal through FP-Tree

In this section we examine the FP-growth algorithm over a hypothetical dataset for a sailing company. This example is picked up from the textbook Data-Mining Concepts and Techniques (Han & Kamber., 2006). The dataset is a collection of transaction records. Each transaction has a unique ID and each item is represented by an index Ij. The dataset is represented in Table 1. The algorithm starts with the first scan of the database which derives the set of frequent items (1-itemsets) and their support counts (frequencies).Let the minimum support count is 2. The set of frequent items is sorted in the order of descending support count. This resulting set or list is denoted as L. Thus, we have:
L = {I2: 7, I1: 6, I3: 6, I4: 2, I5: 2}
Table 1: Transactional Data for a Sailing Company

TID	List of items Ids
T100	I1, I2, I5
T200	I2, I4
T300	I2, I3
T400	I1, I2, I4
T500	I1, I3
T600	I2, I3
T700	I1, I3
T800	I1, I2, I3, I5
T900	I1, I2, I3

3.3Apriori algorithm

Apriori algorithm is the most organized association rule mining algorithm. It is based on the apriori principle that all the nonempty subsets of a frequent item set must be frequent. It is a two-step process.

- Step 1: The prune step

It scans the entire database to perceive the count of each candidate in Ck where Ck represents candidate k- item set. The count of each item set in Ck is similar with a predefined minimum support count to find whether that item set can be manage in frequent k-item set Lk.

- Step 2: The join step

Lk is natural connected with itself to create the next candidate k+1-itemset Ck+1. The prune step here is the main step which requires scanning the whole database for finding the count of each item set in whole candidate k-itemset. If the database is enormous then it requires more time to find all the frequent item sets in the DB.

4. Recommendation System

In this system we are using three networks for recommending online friend. First is contact network, second is Tag network and we introduce one new network which is interest network. Firstly in contact and Tag network which is based on association rule. That is if 'A' is friend of 'B' , 'B' is friend of 'C', then 'A' is to be recommended to 'C' as a friend. So, we are use one new type of recommendation network interest network. In this type of network Friends is recommended as their point of interest .Because of this users will help to keep us his interest as well as increase his knowledge. We can take any random user from any other sub network and recommend them as friend. So many friends or connections could be recommended to a particular user in any social network.

4.1System Design

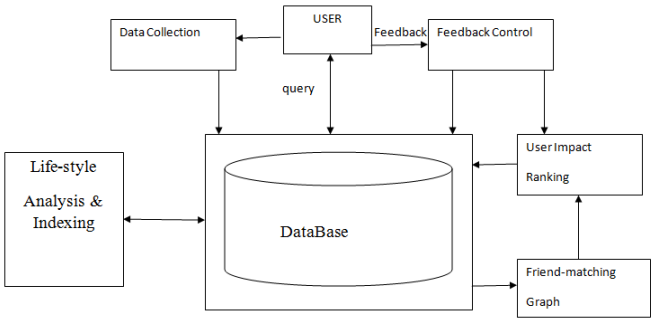

Fig: Recommended System Architecture

4.2User's Online Behavior

In SNS's a user's are considered as social entity or connection. In Facebook, a user p can create a personal profile, add other Facebook friends, and join any community and many more [13]. Determining user's online behavior is a challenging work nowadays as the behavior fluctuates very often. User behavior is very important for this approach of friend recommendation system. In this section, we have defined what user's online behavior is formally.

A. Behavior Definition
Let's consider three set: users (US), activities (AC) and Related activities (RA).
US = {u | users in SNS} = {u1, u2, u3, …… , un}
AC= {a | activities of the users in SNS} = {a1, a2, a3, …,am}
RA = {r | a subset of activities that any user may follow in a session or time duration in SNS}
RA = P (A) (1)
So that,
RA ={{a1},{a2},{a3},…,{an},{a1,a2},{a1,a3},…,{a1, a2, a3,…, an}}

The behavior of the user is completely related to the activities of the users. Users can do different activities. But the behavior will be those activities which are performed by the user in a particular time duration denoted as RA.

4.3. Common Behavior

Common behavior means the common activities of the users. This common behavior is not fixed or pre-defined. For different data set the common behavior will be different. Common behavior will not be only one activity. Two or more activity can make a common behavior. In our methodology the common behavior is the max frequency of the any activity in the dataset. Formally, we can define common behavior as like, B_1 and B_2 has a common behavior of u_1 and u_2, if and only if activities r_1 & r_2 have some common activities.

4.4. Uncommon Behavior

Uncommon behaviors are the uncommon activities of the user apart from the common behavior. Any activity of a user will be considered as uncommon behaviors that are not in the common behavior. For different data set the uncommon behavior will be different. Uncommon behaviors could be one activity or more than one activity.

5. Friend Recommendation Framework

5.1. Sub Network Extraction

SNS's are very large entity and has large-scale databases. Day by day the size of the network is increasing and as the people are joining, there is huge number of information overload happens on these sites. For experiment of our proposed system, we can take the whole network of a random individuals. After having the whole network of a client for who are going to suggest friends, we extract the sub network of 'n' no of people from the expected graph.

5.2. Finding Active Friends

In this system we introduces new features like there interest in which subject or field. Different people have their different types of interest. We can improve the knowledge and hobbies so when user creates an account he/she could submit his/her interest. Once account has been created whenever user logged in people of similar interests are recommended as friends.

6. CONCLUSION

In this paper, we have proposed an interested friend or connection recommendation framework which could be used in any social networking web-sites. The framework is subject to user's online behavior. We have add the user's

online behavior definition also an approach to use the online behavior to recommend friends. The applications of this framework is large and this approach could be used to recommend the friend, community or groups, online games with the users behavior or interest and many more. The FP Growth algorithm could be refitted to identify a new recommendation system having better accuracy.

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