An Improved Social Networks Security Based on Semantic-Based Friend Recommendation

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Abstract- *In this paper, we have presented a literature review of the modern friend recommendation services. Existing social networking services recommend friends to users based on their social graphs, which may not be the most appropriate to reflect a user's preferences on friend selection in real life. 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 Smartphone, 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. Inspired by text mining, we model a user's daily life as life documents, from which his/her life styles are extracted by using the Latent Dirichlet Allocation algorithm. We further propose a similarity metric to measure the similarity of life styles between users, and calculate users' impact in terms of life styles with a friend matching graph. Upon receiving a request, Friendbook returns a list of people with highest recommendation scores to the query user. Finally, Friendbook integrates a feedback mechanism to further improve the recommendation accuracy. Here a semantic based friend recommendation is done based on the users' life styles. By using text mining, we display a user's everyday life as life archives, from which his/her ways of life are separated by using the Latent Dirichlet Allocation algorithm. At that point we discover a similarity metric to quantify the similarity of life styles between users, and as certain users' effect as far as ways of life with a similarity matching diagram. At last, we incorporate a feedback component to further enhance the proposal precision.*

Keywords: friend book, activity recognition, Friend recommendation, life style, social networks, mobile sensing, social networks, Matching Graphs.

1. INTRODUCTION

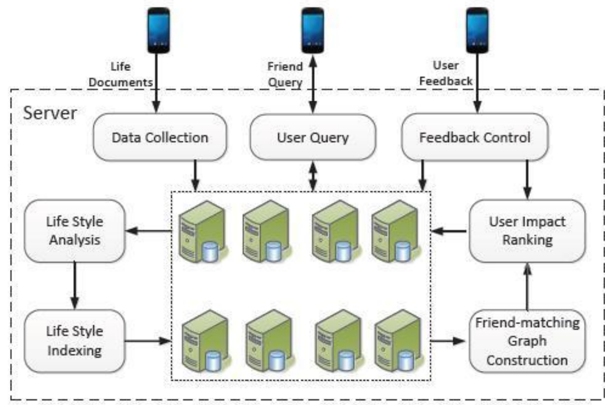
In this paper, we present Friendbook, a novel semantic-based friend recommendation system for social networks, which recommends friends to users based on their life styles instead of social graphs. By taking advantage of sensor-rich smartphones, Friendbook discovers life styles of users from user-centric sensor data, measures the similarity of life styles between users, and recommends friends to users if their life styles have high similarity. existing social networking services recommend friends to users based on their social graphs, which may not be the most appropriate to reflect a user's preferences on friend selection in real life. 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 Smart phones, 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. Inspired by text mining, we model a user's daily life as life documents, from which his/her life styles are extracted by using the Latent Dirichlet Allocation algorithm. We further propose a similarity metric to measure the similarity of life styles between users, and calculate users' impact in terms of life styles with a friend-matching graph. Upon receiving a request, Friendbook returns a list of people with highest recommendation scores to the query user. Finally Friendbook integrates a feedback mechanism to further improve the recommendation accuracy. We have implemented Friendbook on the Android-based smart phones, and evaluated its performance on both small scale experiments and large-scale simulations. A social network is a system where users (nodes) are joined with one another by relationship (edges). The edges are undirected and the quantity of edges demonstrates the quantity of companions a user's has. A percentage of the remarkable interpersonal organizations are Facebook, Google plus LinkedIn and so forth. Each client keeps up a profile. There are numerous properties in the profile which can be utilized to anticipate the quality of ties between diverse users.

Few years ago, people typically made friends with others who live or work close to themselves, such as neighbors or colleagues. We call friends made through this traditional fashion as G-friends, which stands for geographical location-based friends because they are influenced by the geographical distances between each other. With the rapid advances in social networks, services such as Facebook, Twitter and Google+ have provided us revolutionary ways of making friends. According to Facebook statistics, a user has an average of 130 friends, perhaps larger than any other time in history One challenge with existing social networking services is how to recommend a good friend to a user. Most of them rely on pre-existing user relationships to pick friend candidates. For example, Facebook relies on a social link analysis among those who already share common friends and recommends symmetrical users as potential friends. Unfortunately, this approach may not be the most appropriate based on recent sociology findings The vast majority of the friend advise system depends on previous users connections to pick friend candidates. For example, Facebook depends on a social connection examination among the individuals who as of now impart basic friends and suggests symmetrical users as potential friends. Existing social networking services prescribe friends to users based on their social graphs, which may not be the most appropriate to reflect a user's favorites friend selection in real life. With the quick advancement of social network, approval systems in different fields design, in order to fulfil some disagreeable tastes.Social Networking sites can help us in getting important information of users, such as age, gender, location, language, actives, likes etc. our model takes into account these parameters of the user to recommend books. Most of the friend suggestions mechanism relies on pre-existing user relationships to pick friend candidates. For example, Facebook relies on asocial link analysis among those who already share common friends and recommends symmetrical users as potential friends. The rules to group people together include:

1) Habits or life style
2) Attitudes
3) Tastes
4) Moral Standards
5) Economic level; and
6) People they already know.

Apparently, rule #3 and rule #6 are the mainstream factors considered by existing recommendation systems. In our everyday lives, we may have hundreds of activities, which form meaningful sequences that shape our lives. In this paper, we use the word activity to specifically refer to the actions taken in the order of seconds, such as "sitting", "walking", or "typing", while we use the phrase life style to refer to higher-level abstractions of daily lives, such as "office work" or "shopping". For instance, the "shopping" life style mostly consists of the "walking" activity, but may also contain the "standing" or the "sitting" activities.

2. SYSTEM ARCHITECTURE



As seen in the above fig1 the system architecture have 7 modules:

1. Data Collection Module: In this module data which is required to construct a recommendation system is taken by the user. For this the data is extracted from the life document which is given by the user.

2. Life Style Analysis: In this module actual user's life style will be extracted from this life style analysis module by using the probabilistic module. Basically life style is a mixture of activities. For this analysis various calculations have to be performed in order to get the correct analysis. By taking the advantage of probabilistic topic model the topic that is activities are being calculated in terms of their likes-.dislikes and matched-unmatched. By this module users life will be reflected at will give the total calculations of their choices.

3. Life Style Indexing Module: Whenever the data is given to the system it have to be in the proper format so it will be easy to system to classify or performing operations over the data so for this purpose life style indexing module is proposed. This module actually done the job of database management it takes the life document of the user and puts the life style of the user in the database in the specific format as (life style, user). Because of this the data will be maintained in the proper format.

4. Friend Matching Graph Module: After indexing data is handled by friend matching module. This module is responsible for construction of friend matching graph. Friend matching graph is a representation of the relationship between users.

5. Impact Ranking Module: Here in this module ranking is done on the users likes and dislikes from these ranking overall impacts of the users will be calculated on the basis of friend matching graph.

6. Users Query Module: This module is for taking the query from the user as an input and then it sends the ranked list of friends to the user.

7. Feedback Mechanism Module: this is the last module of the system. System allows users to give a feedback of recommendation result which will be useful to improve the accuracy for the future recommendation.

3. Related Work

Recommendation systems that try to suggest items (e.g., music, movie, and books) to users have become more and more popular in recent years. For instance, Amazon [1] recommends items to a user based on items the user previously visited, and items that other users are looking at. Netflix [3] and Rotten Tomatoes [4] recommend movies to a user based on the user's previous ratings and watching habits. Recently, with the advance of social networking systems, friend recommendation has received a lot of attention. Generally speaking, existing friend recommendation in social networking systems, e.g., Facebook, LinkedIn and Twitter, recommend friends to users if, according to their social relations, they share common friends. Meanwhile, other recommendation mechanisms have also been proposed by researchers. For example, Bian and Holtzman [8] presented MatchMaker, a collaborative filtering friend recommendation system based on personality matching.Kwon and Kim [20] proposed a friend recommendation method using physical and social context. However, the authors did not explain what the physical and social context is and how to obtain the information. Yu et al. [32] recommended geographically related friends in social network by combining GPS information and social network structure. Hsu et al. [18] studied the problem of link recommendation in weblogs and similar social networks, and proposed an approach based on collaborative recommendation using the link structure of a social network and content-based recommendation using mutual declared interests. Gou et al. [17] proposed a visual system, SFViz, to support users to explore and find friends interactively under the context of interest, and reported a case study using the system to explore the recommendation of friends based on people's tagging behaviors in a music community. These existing friend recommendation systems, however, are significantly different from our work, as we exploit recent sociology findings to recommend friends based on their similar life styles instead of social relations. Meanwhile, other recommendation mechanisms have also been proposed by researchers. For example, Bian and Holtzman presented MatchMaker, a collaborative filtering friend recommendation system based on personality matching. Kwon and Kim proposed a friend recommendation method using physical and social context. However, the authors did not explain what the physical and social context is and how to obtain the information. Yu et al. recommended geographically related friends in social network by combining GPS information and social network structure. Hsu et al. Studied the problem of link recommendation in weblogs and similar social networks, and proposed an approach based on collaborative recommendation using the link structure of a social network and content based recommendation using mutual declared interests. Gou et al. proposed a visual system, SFViz, to support users to explore and find friends interactively under the context of interest, and reported a case study using the system to explore the recommendation of friends based on people's tagging behaviors in a music community. These existing friend recommendation systems, however, are significantly different from our work, as we exploit recent sociology findings to recommend friends based on their similar life styles instead of social relations. Activity recognition serves as the basis for extracting high-level daily routines (in close correlation with life styles) from low-level sensor data, which has been widely, studied using various types of wearable sensors. Zheng et al. used GPS data to understand the transportation mode of users. Lester et al. used data from wearable sensors to recognize activities based on the Hidden Markov Model (HMM). Li et al.

4. Overview

Before a user initiates a request, he/she should have accumulated enough activities in his/her life documents for efficient life styles analysis. The period for collecting data usually takes at least one day. Longer time would be expected if the user wants to get more satisfied friend recommendation results. After receiving a user's request (e.g., life documents), the server would extract the user's life style vector, and based on which recommend friends to the user. The recommendation results are highly dependent on users' preference. Some users may prefer the system to recommend users with high impact, while some users may want to know users with the most similar life styles. The recommendation results are highly dependent on users' preference. Some users may prefer the system to recommend users with high impact, while some users may want to know users with the most similar life styles. It is also possible that some users want the system to recommend users who have high impact and also similar life styles to them. To better characterize this requirement, we propose the following metric to facilitate the recommendation.

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Algorithm 1 Computing users' impact ranking

Input: The friend-matching graph G.
Output: Impact ranking vector r for all users.

for $i = 1$ to n **do**
  $\mathbf{r}_0(i) = \frac{1}{n}$
end for
$\delta = \infty$
$\epsilon = e^{-9}$
while $\delta > \epsilon$ **do**
  for $i = 1$ to n **do**
    $\mathbf{r}_{k+1}(i) = \sum_j \frac{1-\varphi}{n}\mathbf{r}_k(j) + \varphi\frac{\sum_j \omega(i,j)\cdot\mathbf{r}_k(j)}{\sum_j \omega(i,j)}$
  end for
  $\delta = \sum_{i=1}^{n} |\mathbf{r}_{k+1}(i) - \mathbf{r}_k(i)|$
end while
return r

It is also possible that some users want the system to recommend users who have high impact and also similar life styles to them. To better characterize this requirement, we propose the following metric to facilitate the recommendation, Ri(j) = _S(i; j) + (1 _)rj_ where Ri(j) is the recommendation score of user j for the query user i, S(i; j) is the similarity between user i and user j, and rj is the impact of user j. _ 2 [0; 1] is the recommendation coefficient characterizing users' preference. _ is introduced to make S(i; j) and rj in the same order of magnitude, which can be roughly set to n=10, where n is the number of users in the system. When _ = 1, the recommendation is solely based on the similarity; when _ = 0, the recommendation is solely based on the impact ranking.

Algorithm 2 Friend recommendation

Input: The query user i, the recommendation coefficient β and the required number of recommended friends from the system p.
Output: Friend list F_i.

$F_i \leftarrow \emptyset$, $Q \leftarrow \emptyset$
extracts i's life style vector $\mathbf{L}_i$ using the LDA algorithm.
for each life style z_k the probability of which in $\mathbf{L}_i$ is not zero **do**
  put users in the entry of z_k into Q
end for
for each user $j \notin Q$ **do**
  $S(i,j) \leftarrow 0$
end for
for each user j in the database **do**
  $R_i(j) = \beta S(i,j) + (1-\beta) r_j \kappa$
end for
sort all users in decreasing order according to $R_i(j)$
put the top p users in the sorted list to F_i

5. MODULES OVERVIEW

1. Life Style Modeling

Life styles and activities are reflections of daily lives at two different levels where daily lives can be treated as a mixture of life styles and life styles as a mixture of activities. This is analogous to the treatment of documents as ensemble of topics and topics as ensemble of words. By taking advantage of recent developments in the field of text mining, we model the daily lives of users as life documents, the life styles as topics, and the activities as words. Given "documents", the probabilistic topic model could discover the probabilities of underlying "topics". Therefore, we adopt the probabilistic topic model to discover the probabilities of hidden "life styles" from the "life documents". Our objective is to discover the life style vector for each user given the life documents of all users.

2. Activity Recognition

We need to first classify or recognize the activities of users. Life styles are usually reflected as a mixture of motion activities with different occurrence probability. Generally speaking, there are two mainstream approaches: supervised learning and unsupervised learning. For both approaches, mature techniques have been developed and tested. In practice, the number of activities involved in the analysis is unpredictable and it is difficult to collect a large set of ground truth data for each activity, which makes supervised learning algorithms unsuitable for our system. Therefore, we use unsupervised learning approaches to recognize activities.

3. Friend-matching Graph Construction

To characterize relations among users, in this section, we propose the friend-matching graph to represent the similarity between their life styles and how they influence other people in the graph. In particular, we use the link weight between two users to represent the similarity of their life styles. Based on the friend-matching graph, we can obtain a user's affinity reflecting how likely this user will be chosen as another user's friend in the network. We define a new similarity metric to measure the similarity between two life style vectors. Based on the similarity metric, we model the relations between users in real life as a friend-matching graph. The friend-matching graph has been constructed to reflect life style relations among users.

4. User Impact Ranking

The impact ranking means a user's capability to establish friendships in the network. In other words, the higher the ranking, the easier the user can be made friends with, because he/she shares broader life styles with others. Once the ranking of a user is obtained, it provides guidelines to those who receive the recommendation list on how to choose friends. The ranking itself, however, should be independent from the query user. In other words, the ranking depends only on the graph structure of the friend-matching graph, which contains two aspects: 1) how the edges are connected; 2) how much weight there is on every edge. Moreover, the ranking should be used together with the similarity scores between the query user and the potential friend candidates, so that the recommended friends are those who not only share sufficient similarity with the query user, and are also popular ones through whom the query user can increase their own impact rankings.

6. Future Work

In this paper, we have elaborated the concept of friend service recommendation service. We have also presented a comprehensive study of the common friend recommendation services of social networks. Recommender systems are efficient tools that overcome the information overload problem by providing users with the most relevant contents . The importance of contextual information has been recognized by researchers and practitioners in many disciplines including Ecommerce, personalized IR, ubiquitous and mobile In our existing system, we have implemented the page rank algorithm for viewing the web pages based on user's interest. The main drawback of the friend book is its inability to compute large volume of data. In our proposed method, we use incremental computation of Page Rank, can be implemented incrementally (or) distributive for large scale evolving graphs. Additionally, we propose a novel algorithm, Weighted Page Rank algorithm which distributes rank score based on popularity of the pages and we set threshold for each edge & it can represent the similarity relationship of friend-matching graph. InFuture Fisher-Yates chaotic shuffling can be used to prevent the friend book users' identity from public or malicious attacker and iteratively reweighted least squares (IRLSs)is a fast solver, which smooth's the objective function and minimizes it by alternately updating the variables and their weights. the future work can be concentrated on implementing it on other social networking, and same can be used to build stand alone app and access the user activity through mobile sensors. Friendtome can utilize more information for life discovery, which should improve the recommendation experience in the future.

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