

Friendbook: A Semantic-Based Friend Recommendation System For Social Networks

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ABSTRACT

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 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. 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 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.

I.INTRODUCTION

What Is A Social Network? Wikipedia defines a social network service as a service which “focuses on the building and verifying of online social networks for communities of people who share interests and activities, or who are interested in exploring the interests and activities of others, and which necessitates the use of software.”

A report published by OCLC provides the following definition of social networking sites: “Web sites primarily designed to facilitate interaction between users who share interests, attitudes and activities, such as Facebook, Mixi and MySpace.”

What Can Social Networks Be Used For?

Social networks can provide a range of benefits to members of an organisation:

Support for learning: Social networks can enhance informal learning and support social connections within groups of learners and with those involved in the support of learning.

Support for members of an organisation: Social networks can potentially be used by all members of an organisation, and not just those involved in working with students. Social networks can help the development of communities of practice.

Engaging with others: Passive use of social networks can provide valuable business intelligence and feedback on institutional

services (although this may give rise to ethical concerns).

Ease of access to information and applications: The ease of use of many social networking services can provide benefits to users by simplifying access to other tools and applications. The Facebook Platform provides an example of how a social networking service can be used as an environment for other tools.

Common interface: A possible benefit of social networks may be the common interface which spans work / social boundaries. Since such services are often used in a personal capacity the interface and the way the service works may be familiar, thus minimising training and support needed to exploit the services in a professional context. This can, however, also be a barrier to those who wish to have strict boundaries between work and social activities.

Examples of Social Networking Services

Examples of popular social networking services include:

Facebook: Facebook is a social networking Web site that allows people to communicate with their friends and exchange information. In May 2007 Facebook launched the Facebook Platform which provides a framework for developers to create applications that interact with core Facebook features

MySpace: MySpace is a social networking Web site offering an interactive, user-submitted network of friends, personal profiles, blogs and groups, commonly used for sharing photos, music and videos..

Ning: An online platform for creating social Web sites and social networks aimed at users who want to create networks around specific interests or have limited technical skills.

Twitter: Twitter is an example of a micro-blogging service. Twitter can be used in a variety of ways including sharing brief

information with users and providing support for one's peers.

Note that this brief list of popular social networking services omits popular social sharing services such as Flickr and YouTube.

Opportunities and Challenges

The popularity and ease of use of social networking services have excited institutions with their potential in a variety of areas. However effective use of social networking services poses a number of challenges for institutions including long-term sustainability of the services; user concerns over use of social tools in a work or study context; a variety of technical issues and legal issues such as copyright, privacy, accessibility; etc.

Institutions would be advised to consider carefully the implications before promoting significant use of such services.

II.EXISTING SYSTEM

Most of the friend suggestions mechanism relies 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. 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.

DISADVANTAGES OF EXISTING SYSTEM

- 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

III.PROPOSED SYSTEM

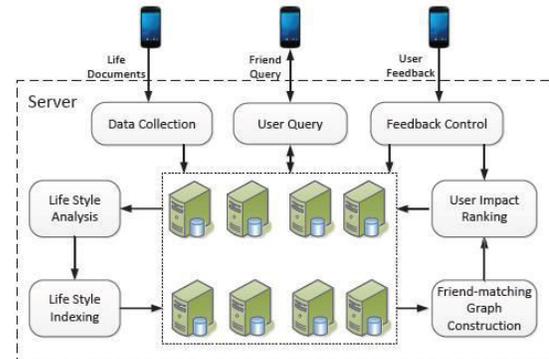
- A novel semantic-based friend recommendation system for social networks, which recommends friends to users based on their life styles instead of social graphs.
- By taking advantage of sensor-rich smartphones, Friendbook discovers life styles of users from user-centric sensor data, measures the similarity of life styles between users, and recommends friends to users if their life styles have high similarity.
- 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.
- 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.
- We integrate a linear feedback mechanism that exploits the user's feedback to improve recommendation accuracy.

ADVANTAGES OF PROPOSED SYSTEM

- Recommend potential friends to users if they share similar life styles.

- The feedback mechanism allows us to measure the satisfaction of users, by providing a user interface that allows the user to rate the friend list

IV.SYSTEM ARCHITECTURE



V.IMPLEMENTATION

MODULES:

- ⊗ Life Style Modeling
- ⊗ Activity Recognition
- ⊗ Friend-matching Graph Construction
- ⊗ User Impact Ranking

MODULES DESCRIPTION:

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.

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.

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.

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.

VI.CONCLUSION

In this paper, we presented the design and implementation of Friendbook, a semantic-based friend recommendation system for social networks. Different from the friend recommendation mechanisms relying on social graphs in existing social networking services, Friendbook extracted life styles from user-centric data collected from sensors on the smartphone and recommended potential friends to users if they share similar life styles. We implemented Friendbook on the Android-based smartphones, and evaluated its performance on both smallscale experiments and large-scale simulations. The results showed that the recommendations accurately reflect the preferences of users in choosing friends. Beyond the current prototype, the future work can be four-fold. First, we would like to evaluate our system on large-scale field experiments. Second, we intend to implement the life style extraction using LDA and the iterative matrix-vector multiplication method in user impact ranking incrementally, so that Friendbook would be scalable to large-scale systems. Third, the

similarity threshold used for the friend-matching graph is fixed in our current prototype of Friendbook. It would be interesting to explore the adaptation of the threshold for each edge and see whether it can better represent the similarity relationship on the friend-matching graph. At last, we plan to incorporate more sensors on the mobile phones into the system and also utilize the information from wearable equipments (e.g., Fitbit, iwatch, Google glass, Nike+, and Galaxy Gear) to discover more interesting and meaningful life styles. For example, we can incorporate the sensor data source from Fitbit, which extracts the user's daily fitness infograph, and the user's place of interests from GPS traces to generate an infograph of the user as a "document". From the infograph, one can easily visualize a user's life style which will make more sense on the recommendation. Actually, we expect to incorporate Friendbook into existing social services (e.g., Facebook, Twitter, LinkedIn) so that Friendbook can utilize more information for life discovery, which should improve the recommendation experience in the future.

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