IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 5, Issue 11, November 2016

Implementation of 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 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, Friend Recommendation system 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 Collaborative Filtering with threshold 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, Friend Recommendation system returns a list of people with highest recommendation scores to the query user. Finally, Friend Recommendation system integrates a feedback mechanism to further improve the recommendation accuracy. We have implemented Friend Recommendation system 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.

Keywords: Mobile Social Networks, Recommendation friend, Privacy, Collaborative Filtering

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 organization: Social networks can potentially be used my all members of an organization, 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

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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 workor 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. LITERATURE SURVEY

1) "Probabilistic mining of socio geographic routines from mobile phone data"
AUTHORS: K. Farrahi and D. Gatica-Perez

In this paper, They suggest that human interaction data, or human proximity, obtained by mobile phone Bluetooth sensor data, can be integrated with human location data, obtained by mobile cell tower connections, to mine meaningful details about human activities from large and noisy datasets. We propose a model, called bag of multimodal behavior that integrates the modeling of variations of location over multiple time-scales, and the modeling of interaction types from proximity. Our representation is simple yet robust to characterize real-life human behavior sensed from mobile phones, which are devices capable of capturing large-scale data known to be noisy and incomplete. We use an unsupervised approach, based on probabilistic topic models, to discover latent human activities in terms of the joint interaction and location behaviors. Our methodology also finds dominant work patterns occurring on other days of the week. We further demonstrate the feasibility of the topic modeling framework for human routine discovery by predicting missing multimodal phone data at specific times of the day.

2. Collaborative and structural recommendation of friends using weblog-based social network analysis
AUTHORS: W. H. Hsu, A. King, M. Paradesi, T. Pydimarri, and T. Weninger

In this paper, they address the problem of link recommendation in weblogs and similar social networks. First, they present an approach based on collaborative recommendation using the link structure of a social network and content-based recommendation using mutual declared interests. Next, they describe the application of this approach to a small the user/community network of the blog service Live Journal.

They then discuss the ground features available in Live Journal's public user information pages and describe some graph algorithms for analysis of the social network. These are used to identify candidates, provide ground truth for recommendations, and construct features for learning the concept of a recommended link. Finally, they compare the performance of this machine learning approach to that of the rudimentary recommender system provided by Live Journal.
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3. Reality Mining: Sensing Complex Cocial Systems.
AUTHORS: N. Eagle and A. S. Pentland

We introduce a system for sensing complex social systems with data collected from 100 mobile phones over the course of 9 months. We demonstrate the ability to use standard Bluetooth-enabled mobile telephones to measure information access and use in different contexts, recognize social patterns in daily user activity, infer relationships, identify socially significant locations, and model organizational rhythms.

4. Understanding Transportation Modes Based on GPS Data for Web Applications.
AUTHORS: Y. Zheng, Y. Chen, Q. Li, X. Xie, and W.-Y. Ma

In this paper, they had used supervised learning approach to automatically infer users' transportation modes, including driving, walking, taking a bus and riding a bike, from raw GPS logs. Our approach consists of three parts: a change point-based segmentation method, an inference model and a graph-based post-processing algorithm. First, we propose a change point-based segmentation method to partition each GPS trajectory into separate segments of different transportation modes. Second, from each segment, we identify a set of sophisticated features, which are not affected by differing traffic conditions (e.g., a

IJARCCE

ISSN (Online) 2278-1021
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International Journal of Advanced Research in Computer and Communication Engineering
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person's direction when in a car is constrained more by the road than any change in traffic conditions). Later, these features are fed to a generative inference model to classify the segments of different modes. Third, we conduct graph-based post-processing to further improve the inference performance. This post-processing algorithm considers both the commonsense constraints of the real world and typical user behaviors based on locations in a probabilistic manner.

5. Online friend recommendation through personality matching and collaborative filtering
AUTHORS: L. Bian and H. Holtzman

Most social network websites rely on people's proximity on the social graph for friend recommendation. In this paper, we present Matchmaker, a collaborative filtering friend recommendation system based on personality matching. The goal of Matchmaker is to leverage the social information and mutual understanding among people in existing social network connections, and produce friend recommendations based on rich contextual data from people's physical world interactions.

Matchmaker allows users' network to match them with similar TV characters, and uses relationships in the TV programs as parallel comparison matrix to suggest to the users friends that have been voted to suit their personality the best. The system's ranking schema allows progressive improvement on the personality matching consensus and more diverse branching of users' social network connections. Lastly, our user study shows that the application can also induce more TV content consumption by driving users' curiosity in the ranking process.

III.SYSTEM

1. 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

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:

1. Recommend potential friends to users if they share similar life styles.
2. 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.

SYSTEM ARCHITECTURE:

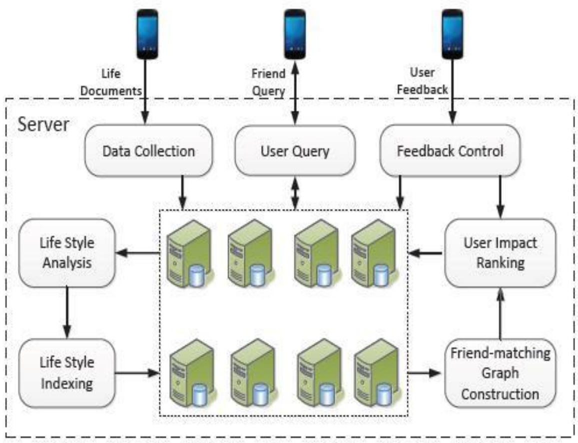

FIG: ARCHITECTURE

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

 DOI 10.17148/IJARCCE.2016.51151

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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.

Collaborative Filtering for Friend Recommendation
Analyze different life style-based recommendation generation algorithms.Techniques for computing life style-life style similarities. Neighbors of x = users who have historically had a similar taste to that of x. Items that the neighbors like compose the recommendation. Improve scalability of collaborative filtering algorithms. Improve the quality of recommendations for the users.

Bottleneck is the search for neighbors – avoiding the bottleneck by first exploring the relatively static, relationships between the items rather than the users. Trying to predict the opinion the user will have on the different life style and be able to recommend the "best" life style to each user based on the user's previous likings and the opinions of other like minded users.

The Collaborative Filtering process

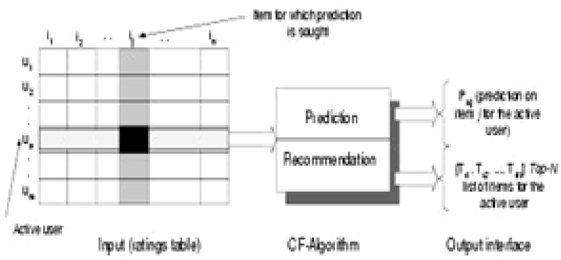

FIG: COLLABORATIVE FILTERING

IV.EXPERIMENTAL RESULT

In the Experimental result, we had collected information of 10 users and each user 6 life style. We are using collaborative filtering with threshold to recommend the friends. If threshold is above 3 means 50% then we recommend the friends.

user	Feature1	Feature2	Feature3	Feature4	Feature5
1	1	1	0	0	0
2	0	1	1	0	0
3	1	1	1	0	0
4	1	1	1	0	0
5	1	1	0	1	0
6	1	1	0	1	0

On the above table user 3 recommend user 4 and user 5 recommend user 6 and vice versa. User 1 and user 2 is not recommended by other user because threshold is not match. If threshold will decrease means 1 or 2 then each user can recommend to each other. But if it will increase then it will not recommend.

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DOI 10.17148/IJARCCE.2016.51151

V. CONCLUSION

In this paper, we presented the design of Friend recommendation system for social networks. Different from the friend recommendation mechanisms relying on social graphs in existing social networking services, Friend recommendation extracted life styles from user-centric data collected and recommended potential friends to users if they share similar life styles.

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