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Predicting User Geographical Service Rating in Social Network Using Point of Interest Recommendation

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Abstract
Online social networks (OSNs) have experienced tremendous growth in recent years and become a de facto portal for hundreds of millions of Internet users. These OSNs offer attractive means for digital social interactions and information sharing, but also raise a number of security and privacy issues. While OSNs allow users to restrict access to shared data, they currently do not provide any mechanism to enforce privacy concerns over data associated with multiple users. Online Social Networks (OSNs), which attract thousands of million people to use everyday, also greatly extend OSN users' social circles by friend recommendations. OSN users' existing social relationship can be characterized as 1-hop trust relationship, and further establish a multi-hop trust chain during the recommendation process. As the same as what people usually experience in the daily life, the social relationship in cyberspaces are potentially formed by OSN users' shared attributes, e.g., colleagues, family members, or classmates, which indicates the attribute-based recommendation process would lead to more fine grained social relationships between strangers. The import social networking sites are Facebook, Twitter, LinkedIn, WhatsApp, Google plus. 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 The proposed Friend Recommendation framework shows good accuracy for social graphs used as model dataset.

Keywords: Data mining, Recommender Systems, Social network

1. Introduction

Now days, the prevalence of mobile devices with location based social network is increased like face book places. For better services, LBSNs allows to share check-ins and opinion about the places they have visited. This data collected by LBSNs allows recommending the user point of interest like hotels and malls. Also the mobile users identify the favorite POI via recommendation and the problem of POI can be solved. In latent factor model only characteristics of LBSNs are consider but there are many characteristics of LBSNs which distinguish POI recommendation from traditional recommendation. The main four challenges are Geographical influence, User mobility, implicit user feedback and user check-in counts. In this paper, they introduced Geo-PFM model and further develop a poisons Geo-PFM model which is also capable to capture the geographical influences on user check-ins behavior and effectively model the user mobility patterns. The nature of

Poisson distribution is more suitable and effective for implicit feedback for POI recommendation.

Nowadays, Social media is becoming more and more popular since mobile devices can access social network easily from anywhere. Therefore, Social media is becoming an important topic for research in many fields. As number of people using social network are growing day by day, to communicate with their peers so that they can share their personal feeling everyday and views are created on large scale. Social Media Monitoring or tracking is most important topic in today's current scenario. In today many companies have been using Social Media Marketing to advertise their products or brands, so it becomes essential for them that they can be able to calculate the success and usefulness of each product [2]. For Constructing a Social Media Monitoring, various tool has been required which involves two components: one to evaluate how many user of their brand are attracted due to their promotion and second to find out what people thinks about the particular brand. To evaluate the opinion of the users is not as easy as it seems to all users. For evaluating their attitude may requires to perform Sentiment Analysis, which is defined as to identify the polarity of customer behavior, the subjective and the emotions of particular document or sentence. To process this we need Machine Learning and Natural Language Processing methods and this is place where most of the developers facing difficulty when they are trying to form their own tools. Over the recent years, an emerging interest has been occurred in supporting social media analysis for advertising, opinion analysis and understanding community cohesion. Social media data adapts to many of the classifications attributed for "big-data" – i.e. volume, velocity and variety. Analysis of Social media needs to be undertaken over large volumes of data in an efficient and timely manner. Analysing the media content has been centralized in social sciences, due to the key role that the social media plays in modelling public opinion. This type of analysis typically on the preliminary coding of the text being examined, a step that involves reading and annotating the text and that limits the sizes of the data that can be analysed. With the development of Web, more and more people are connecting to the Internet and becoming information producers instead of only information consumers in the past, resulting to the serious problem, information overloading. There is much personal information in online textual reviews, which plays a very important role on decision processes. For example, the customer will decide what to buy if he or she sees valuable reviews posted by others, especially user"s trusted friend. People believe reviews and reviewers will do help to the rating prediction based on the idea that high-star ratings may greatly be attached with good reviews. Hence, how to mine reviews and the relation between reviewers in social networks has become an important issue in web mining, machine learning and natural language processing. It focus on the rating prediction task.

II Literature Survey

In (1) the system of Link prediction has adopted to recommend new friends in online social networks.it uses data about social Interaction. There was some advantages included an additional source of information, such as the place people visited, and it becomes possible with the help of soaring adoption of location based social services. Here we studied how to design a link prediction system for online LBSN. We gathered extensive data that is Gowalla, which capture the temporal evolution in its periodic snapshot. Here we studied link prediction space finds about 30% of new link are added in "place-friends" that is the users who already visited the same place and we showed this prediction space made 15 times smaller, rather they are having still 66% of future connection can be discovered. Here we define new prediction features based on the properties and characteristics of the visited place by users which are able to make This paper chose primarily three methods for text classification because of their relative popularity and success in prediction of sentiments:

- Naive Bayes: This works on the assumption of conditional independence and despite this oversimplified assumption, Naive Bayes performs well in many complex real-world problems. Naive Bayes classifier is superior in terms of CPU and memory consumption.
- Support Vector Machines: SVM also provides a robust approach to build text classifiers and was picked because of its ability to handle High dimensional input space. When learning text classifiers, many (morethan10000) features can been countered. Since SVMs use over fitting protection, which does not necessarily depend on the number of features, they have the potential to handle these large feature spaces.
- Maximum Entropy: MaxEnt Naïve Bayes is based on conditional independence assumption, hence to

ensure that this paper covers an alternative, it uses Maximum Entropy that does not assume conditional independence. It is based on the Principle of Maximum Entropy and from all the models that fit the training data, selects the one which has the largest entropy. Although it takes more time than Naïve Bayes to train the model, this method has proven to be useful in cases where we do not know anything about the prior distribution

(Hening-Thurau etal., 2003) state that customer comments articulated via the Internet are available to a large number of other customer's, and therefore can be expected to have a significant impact on the success of goods and services. This on consumer buying and communication behavior are tested in a large-scale empirical study. The results illustrate that consumers read online articulations mainly to save decision-making time and make better buying decisions. Structural equation modeling shows that their motives for retrieving online articulations strongly influence their behavior (Duan et al., 2008) showed that both a movie's box office revenue and WOM valence significantly influence WOM volume. WOM volume in turn leads to higher retrieve other customer's online articulations from webbased consumer opinion platforms. The relevance of these motives and their impact box office performance. This positive feedback mechanism highlights the importance of WOM in generating and sustaining retail revenue. (Chevalier & Mayzlin, 2006) hypothesized that buyers suspect that many reviewers are authors or other biased parties. They found marginal (negative) impact of 1-star reviews is greater than the (positive) impact of 5-star reviews. The results suggest that new forms of customer communication on the Internet have an important impact on customer behavior. Work on sentiment analysis found using a formal approach is the work by (Simancík and Lee, 2009). The paper presents a method to detect sentiment of newspaper headlines, in fact partially using the same grammar formalism that later will be presented and used in this work, however without the combinatorial logic approach. The paper focus on some specific problems arising with analysing newspaper headlines, e.g. such as headline texts often do not constitute a complete sentence, etc. However the paper also present more general methods, including a method for building a highly covering map from words to polarities based on a small set of positive and negative seed words. This method has been adopted by this thesis, as it solves the assignment of polarity values on the lexical level quite elegantly, and is very loosely coupled to the domain. However, their actual semantic analysis, which unfortunately is described somewhat shallow in the paper, seems to suffer from severe problems with respect to certain phrase structures, e.g. dependent clauses. eWOM is a form of communication, defined as a: "statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" (Hennig-Thurau, Gwinner, Walsh , & Gremle, 2004,p. 39). eWOM may be less personal in that it is not face-to-face (or maybe just personal in a different way than in the past), but it is more powerful because it is immediate, has a significant reach, is credible by being in print, and is accessible by others (Hennig-Thurau et al., 2004.

Collaborative Filtering

Collaborative filtering (CF) is an important and popular technology for recommender systems. The task of CF is to predict user preferences for the unrated items, after which a list of most preferred items can be recommended to users. The methods are classified into user-based CF and item-based CF. The basic idea of user-based CF approach is to find out a set of users who have similar favour patterns to a given user (i.e., „neighbours" of the user) and recommend to the user those items that other users in the same set like, while the item-based CF approach aims to provide a user with the recommendation on an item based on the other items with high correlations (i.e., „neighbours" of the item). In all collaborative filtering methods, it is a significant step to find users" (or items") neighbours, that is, a set of similar users (or items). Currently, almost all CF methods measure users" similarity (or items" similarity) based on co-rated items of users (or common users of items). Collaborative filtering and content based filtering have been widely used to help users find out the most valuable information.

Matrix Factorization based Approaches

1) Basic Matrix Factorization

Matrix factorization is one of the most popular approaches for low-dimensional matrix decomposition. Matrix factorization based techniques have proven to be efficient in recommender systems when predicting user preferences from known user-item ratings. Matrix can be inferred by decomposing item reviews that users gave to the items. Matrix factorization methods have been proposed for social

recommendation due to their efficiency to dealing with large datasets. several matrix factorization methods have been proposed for collaborative filtering. The matrix approximations all focus on representing the user-item rating matrix with low-dimensional latent vectors.

2) Social Recommendation

In real life, people‟s decision is often affected by friends‟ action or recommendation. How to utilize social information has been extensively studied. Yang et al. [6] propose the concept of "Trust Circles" in social network based on probabilistic matrix factorization. Jiang et al. [7] propose another important factor, the individual preference. some websites do not always offer structured information, and all of these methods do not leverage users‟ unstructured information, i.e. reviews, explicit social networks information is not always available and it is difficult to provide a good prediction for each user. For this problem the sentiment factor term is used to improve social recommendation. disconnect the potential future link. Here they described a supervised learning framework and this framework exploits prediction features , which is to be predict new links between friends-of-friends and place-friends. In (2) the effect of location sharing services is rapidly celebrating the convergence of our online and offline activities. Real-world provides connections among on- line users because of Foursquare, Google Latitude, Face- book Places, and related services. In this we studied to mine traffic patterns revealed through location sharing services to augment traditional location-based search. Also, we study location- based traffic patterns revealed through location sharing services and find that these can identify the related locations. Based on this observation, they propose and evaluate a traffic-driven location clustering algorithm that can group related locations with high confidence. To accurately predict the semantic category of uncategorized locations traffic pattern can be used. How traffic-driven semantic organization
of locations may be naturally incorporated into location-based web search are shown by them, according to results found. In (3) the millions of user driven footprints (checkins) are supported by the various location sharing services like Foursquare, Gowalla and facebook places. To conduct study on social and to model pattern of human mobility which are significant factor for the design of future mobile location services, traffic forecasting, urban planning as well as epidemiological models of disease spread, the global scale footprints are helpful.22 millions checkins over 220,000 users are investigated and by analyzing texual, temporal, social and spatial aspects associated with these footprints quantitative assessment of human mobility patterns are reported. Advantages: 1. Analysis and modelling of checkins of location sharing service users. 2. The study on various human mobility pattern helps to explore the social structure inherent in location sharing services.3.The concept can be helpful in personalized location recommendation based on users' checkins history. Disadvantages: It dose not cover all the aspects required for better recommendation process.

In (4) the personalized recommendation of places in which we are interested such as restaurants,malls ,hospitals etc. is provided for mobile users is the problem to choose the point of interest.user preferences,geographical influences & user mobility behaviours are the factors that can influence the decison process of user to choose pint of interest,due to its complexity & its connection to location based social networks. Point of interest recommendation lacks of integrated analysis of joint effect of multiple factors. So, a "Novel Geographical Probabilistic Factor Analysis Framework" is studied,which takes various factors into consideration. Above framework allows to capture geographical influences on users check-in behavious.recommendation model can be effectively expanded with user mobility behaviour. In this model, user check-in-count data is considered as implicitly user feedback for modeling user preferences. Results on real-world LBSN's data conclude the proposed recommendation model performs state-of-the-art latent factor models with significant margin. In(5) With the help of mobile networks user can post on social media services from anywhere .the three major things that influence the activities of mobile user are user,post and the location.The key to answer questions like who will post a message, where and on what topic is interaction of these entities.Here we sudied how to address the problem of profiling mobile users by modeling their activities which is nothing but to explore topic modlingconcedering the spstial and textual aspects of user posts, and predict future user location.

III. Proposed Work

Numerous models based on social networks have been proposed to improve recommender system performance. They
are:

1. The method of 'inferred trust circle' based on friends circle was designed by Yang [8] for the purpose of suggesting popular and number one items to users. Their approach, called the Circle Con Model, not only lessens the load of big data and estimation complexity, but also determines the relational faith in the complicated social networks.
2. Personalized travel recommendation was proposed by Chen [9] by considering user attributes and social information.
3. Jiang [10] proved that an user's individual choice is also an important aspect in social networks. 4. Herlocker et al [11] proposed a model which shows the similarity between users or items according to the number of common ratings.
5. Deshpande and Karypis [12] proposed an item-based CF combined with a condition-based probability similarity and Cosine Similarity when they are new in the system and haven't been rated before. The above two problems can also be solved with hybrid methods [4]. Scalability: With the growth of numbers of users and items, the system requires more resources for processing information and forming recommendations. Most of resources is consumed with the purpose of determining users with similar tastes, and goods with similar descriptions. This problem is also solved by combining various types of filtering technique and physical advancement of systems. Parts of many estimations may also be implemented offline in order to stimulate issuance of recommendations online. [5] Sparsity: In online shopping those have a huge amount of users and items there are almost always users that have rated just a few items. Using collaborative filtering and other approaches recommender systems generally create neighborhoods of users using their profiles. If a user has he/she could be related to the wrong neighborhood. Sparsity is the issue of scarcity of information. [6] Privacy: Privacy has been the most significant problem [7]. In order to receive the most accurate and correct recommendation, the system must collect the most amount of information mainly about the user, including analytical data, and data about the area of a individual user. Naturally, the query of reliability, security and confidentiality of the given information arises. Specially designed algorithms and programs can be conducted to deal with this privacy protection problem.

V Methodology

The user-service rating prediction model is proposed based on probabilistic matrix factorization by analyzing rating behaviors. Commonly, users like to be a participant in services in which they are interested and love sharing exposures with their friends by giving reviews and rating. A user-service rating foretelling approach is proposed by examining social users' rating habits in a combined matrix factorization framework.
The essential proposals of the paper are:
1. The aspect of interpersonal rating ways diffusion is proposed to well understand users' rating habits.
2. The user's social circle is analyzed and split the social network into three parts, direct friends, mutual friends,
and the indirect friends, to well understand social users' rating habit diffusions.
3. Four factors, intimate interest, social interest similarity, social rating habit similarity, and social rating behavior diffusion are fused into matrix factorization with fully exploring user rating habits to foretell user-service
ratings.
4. These four social factors are combined together to constrain user's latent features, which can decrease the time
complexity of our model.

The proposed methodology has the following advantages
1. We proposed a suggestion approach (probabilistic matrix factorization) that incorporates both (explicit and
implicit) influence of rating and trust information.
2. Using probabilistic matrix factorization, transmission cost and estimation cost is reduced.
3. Comparing to current method, forecasting and faith efficiency becomes high
4. The probabilistic matrix factorization approach overcomes the problems such as cold start, scalability sparsity and privacy.

A personalized suggestion approach was proposed by combining social network factors: intimate interest, social interest similarity, and interpersonal impact. In particular, the personal interest denotes user's individuality of rating items, especially for the professional users, and these factors were combined together to improve the faultlessness and appropriateness of recommender system. We conducted extensive experiments on two large realworld social rating datasets, and showed significant development over current approaches

that use mixed social network information. At current, the personalized suggestion model only takes user historical rating records and mutual relationship of social network into consideration. In our future works, we will consider user location information to suggest more personalized and real-time items.

VI. Conclusion

In this paper, we presented an integrated analysis of the joint effect of multiple factors which influence the decision process of a user choosing a POI and proposed a general framework to learn geographical preferences for POI recommendation in LBSNs. The proposed geographical probabi-listic factor analysis framework strategically takes all these factors, which influence the user check-in decision process, into consideration. This recommendation method has several advantages. First, the model captures the geographical influence on a user's check-in behavior by taking into consideration the geographical factors in LBSNs, such as the Tobler's first law of geography. Second,methods effectively modeled the user mobility patterns, which are important for location-based services. Third, the proposed approach extended the latent factors from explicit rating recommendation to implicit feedback recommendation settings in which the skewed count data characteristic of LBSN check-in behaviors are considered. Last but not least, the proposed model is flexible and could be extended to incorporate different latent factor models, which are suit- able for both explicit and implicit feedback recommenda- tion settings. Finally, extensive experimental results on realworld

LBSNs data validated the performance of the proposed method.

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