An Adaptive Reputation for Exploring Product Services

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Abstract*—With the explosion of e-commerce, it presents a great opportunity for people to share their consumption experience in review websites. However, at the same time we face the information overloading problem. How to mine valuable information from these reviews and make an accurate recommendation is crucial for us. Traditional recommender systems (RS) consider many factors, such as product category, geographic location, user's purchase records, and the other social network factors. In this paper, we firstly propose a social user's reviews sentiment measurement approach and calculate each user's sentiment score on items/services. Secondly, we consider service reputation, which reflects the customers' comprehensive evaluation. At last, we fuse service reputation factor into our recommender system to make an accurate rating prediction, which is based on Lexicon Based Approach. We conduct a series of experiments on Amazon dataset, and experimental results show the proposed approach outperforms the existing RS approaches.

I. INTRODUCTION

As we all know, service reputation is important for customer to make decisions, which reflects consumers' comprehensive evaluation based on the intrinsic value of a specific product. If we want to know service reputation, users' textual reviews are necessary. In our daily life, users are most likely to buy those items that are posted with highly praise reviews. Hence, how to mine reviews information to recommend user favourite and satisfying items has become an important issue in web mining, machine learning and natural language processing. Extracting users' interests with the content of reviews has received considerable attention in recent years. We observe that in many practical cases, it is more important to provide numerical ratings rather than binary decisions. Especially when a customer compares several candidate products, all of them reflect positive sentiment in a binary classification. To make a purchase decision, customers not only need to know whether the product is good or not, but also how good the product is [7]. In our daily life, when we search the net for purchasing, both positive reviews and negative reviews are valuable to be as reference. For positive reviews, we can know the advantages of the product. For negative reviews, we can obtain the shortcomings in case of being cheated.

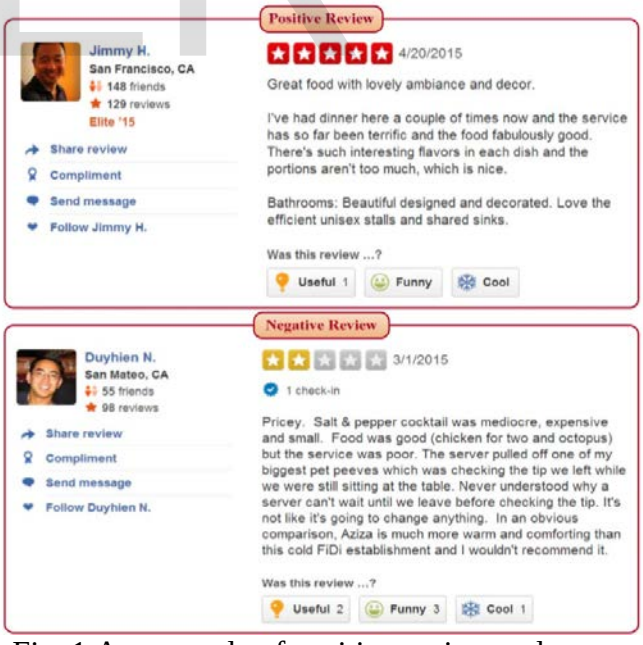

Fig. 1 An example of positive review and negative review on Amazon website.

In Fig.1, we intuitively show an example of positive reviews and negative reviews on Yelp website. From Fig.1, there

are many positive words in a 5-star review, such as “great”, and “lovely”. But in a 2-star review we find negative words, such as “expensive”, and “poor”. That means a good review reflects a high star-level and a bad review reflects a low-level. When we know the advantages and disadvantages from the two kinds of reviews, we can easily make a decision. Normally, if item’s reviews reflect positive sentiment, then the item may be with good reputation. Oppositely, if item’s reviews are full of negative sentiment, then the item is most likely with bad reputation. So based on users’ reviews sentiment, we can infer users’ comprehensive ratings on items. However, users’ sentiment is hard to predict and the unpredictability of service reputation makes a great difficulty in exploring social users. To address these problems, we propose a rating prediction model, which makes the best use of users’ sentiment extracted from the textual descriptions of users’ reviews/comments. When compared with previous works [1-3], [6], [7], [17]-[22] the main difference is that: previous works mainly focus on exploring social user’s salient feature and discussing how to classify sentiment, and do not go deeper in mining users’ sentiment for potential applications. But in our paper, we adequately mine user’s sentiment, and leverage the sentiment to infer service reputation which proved to make great contributions to the prediction accuracy of RS.

The main contributions of our approach are summarized as follows: 1) We propose a social user’s sentiment measurement approach based on the mined sentiment words and sentiment degree words from users’ reviews. 2) We build item’s “Virtual Friends” to solve the cold start problem. Then we leverage “Virtual Friends” to calculate service reputation similarity to help predict users’ ratings. 3) We take service reputation factor into a Lexicon Based Approach model to carry out an accurate recommendation. The experimental results and discussions show that the service reputation factor is effective to improve rating prediction performances.

II. RELATED WORK

We survey recent works related to our approach. We firstly review some classical approaches based on Lexicon based approach, which have been used for recommendation. Then the reviews based approaches in social networks are briefly reviewed. Finally, sentimental mining and applications are provided.

A. Existing System

The existing system mainly focus on exploring social user’s salient feature and discussing how to classify sentiment, and do not go deeper in mining user’s sentiment for potential applications[19]. This means that the various e-commerce sites provides various products.

These products are provided with various kinds of reviews. Thus, if user attempts to view the review of a product, the user doesn’t get a brief summary about the product. Thus, the user is not sure about the product. Extracting users’ interests with the content of reviews has received considerable attention in recent years [15]. Hence, how to mine reviews information to recommend user favorite and satisfying items has become an important issue in web mining, machine learning and natural language processing.

B. Challenges in Existing system

Existing approaches fails to ensure the accuracy of feedback ratings. There is a large variety of service users on the Internet. Service users can express their QoS preferences services. The user ratings are often subject to service user’s preferences. Some service users provide low ratings on various web services, whereas some others may be aggressive or neutral and provide high ratings. Hence, different service users often give different ratings to the same used

service [15]. To address the aforementioned weaknesses, a novel reputation computation approach is proposed for accurately measuring the reputation of web services.

C. Proposed System

In the proposed system adequately mine user's sentiment, and leverage the sentiment to infer service reputation which proved to make great contributions to the prediction accuracy of RS.

1) We develop a separate review analysis site for rating analysis.

2) We propose a social user's sentiment measurement approach based on the mined sentiment words and sentiment degree words from users' reviews.

3) We build item's "Virtual Friends" to solve the cold start problem. Then we leverage "Virtual Friends" to calculate service reputation similarity to help predict users' ratings.

Fig. 2 Architecture Diagram of the Proposed System

III. LITERATURE SURVEY

We propose a recommender model, which considers service reputation factor. Our idea is to make full use of users' subjective sentiment of the items, which can be explored from users' textual reviews. In order to better understand the approach, we firstly give the calculation method of sentiment, and then we describe how to use sentiment information to infer service reputation, at last we fuse service reputation factor into rating prediction model, which is based on Lexicon Based Approach.

A. Lexicon Based Approach

Application of a lexicon is one of the two main approaches to sentiment analysis and it involves calculating the sentiment from the semantic orientation of word or phrases that occur in a text. With this approach a dictionary of positive and negative words is required, with a positive or negative sentiment value assigned to each of the words. Different approaches to creating dictionaries have been proposed, including manual and automatic approaches. Generally speaking, in lexicon-based approaches a piece of text message is represented as a bag of words. Following this representation of the message, sentiment values from the dictionary are assigned to all positive and negative words or phrases within the message. A combining function, such as sum or average, is applied in order to make the final prediction regarding the overall sentiment for the message. Apart from a sentiment value, the aspect of the local context of a word is usually taken into consideration, such as negation or intensification.

B. Reviews Based Applications

There are also some textual reviews based works for the task of recommendation. Feng et al. [6] use social images and tagged text information and they propose a novel hierarchical user interest mining approach for personalized products recommendation. Ling et al. [9] propose a unified model that combines content-based filtering with collaborative filtering, and harnessing the information of both ratings and reviews. Moreover, they apply topic modeling techniques to improve prediction accuracy. Aiming at accurate user

classification for tag application systems, Zhao et al. [10] mine users' intention in reviews and extend the tag semantics by open knowledge platform. Their research can not only be used as the basis of the users' interests and preferences research, but also can be employed in non-Tag application. Xu et al. [11] propose a new personalized recommendation model, i.e. topic model based collaborative filtering (TMCF) utilizing users' reviews and ratings. They exploit extended Latent Dirichlet Allocation (LDA) model to generate topic allocations for each review and then obtain each user's preferences.

C. Sentiment Based Applications

There are many approaches around sentiment analysis and rating prediction. Zhang et al. [4] fuse the self-supervised emotion integrated sentiment classification results into collaborative filtering (CF) recommenders. This model greatly solved the rating prediction problems for those users who have no ratings but a list of reviews.

Based on reviews factor, Phan et al. [5] propose a content-based ranking method in which the user engagement and the comment polarity are all considered. In their paper, they analyse users' comment by using a lexicon based approach. Zhang et al. [14] propose the Explicit Factor Model (EFM). They extract explicit product features and user opinions by phrase-level sentiment analysis on user reviews, then generate both recommendations and disrecommendations according to the specific product features to the user's interests and the hidden features are also learned.

TABLE 1. RULE BASED DEGREE DETERMINATION FOR SENTIMENTAL DEGREE WORDS

Level	D_w	Sentiment Degree Words
1	5	Most, best, greatest, absolutely, highly…
2	4	Over, very, greatly, much, *really*, super…
3	2	Even, more, far, so, *such*, intensely…
4	0.5	A little, a bit, rather, more or less…
5	0.25	Less, not very, bit, little…

Fig. 3 An example of review analysis for identifying user's sentiment on Yelp website.

IV IMPLEMENTATION AND RESULT

We have implemented this application in php and mysql. The Application begins from the user registering in the site by providing the user name, password , and a contact number. Contact number is to send message to the user so that the user knows if user have provided any comments regarding the product and what that comment is. On registering the user is redirected to the login page, where user are supposed to log into the site to visit the products and the recommended site.

The users who have logged in is provided a session for further reference. The reviews are collected form the Amazon dataset. The dataset contains the review for various products in Amazon site , wherin review for the particular product is separated and few efficient reviews are posted on the site and all other reviews are analysed using Lexicon Based Approach. This Approach is carried out by maintaining a dictionary of positive and negative words which contains arrays of all positive and negative words respectively. The user can also post review about the product in this site which would be stored in this site's database and the opinion of the comments would also be analysed along with those in the dataset. The users

can also provide the rating on five star levels. The products along with full specification can be viewed by the user by clicking on to the title of the product.

On clicking the title, it will redirect to the recommended site after analyzing the reviews from the dataset and the review provided by the user in the site. The sentiment of the reviews posted by the users is identified in this module. The sentiment of the review is identified using sentiment analysis from the comments posted by the users. The user review sentiment of each product is analyzed in graphical representation.

Fig. 6 A link to traverse to the recommended site

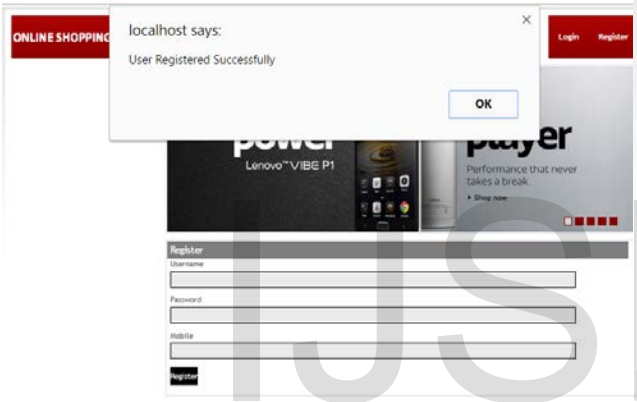

Fig. 4 User Register Page

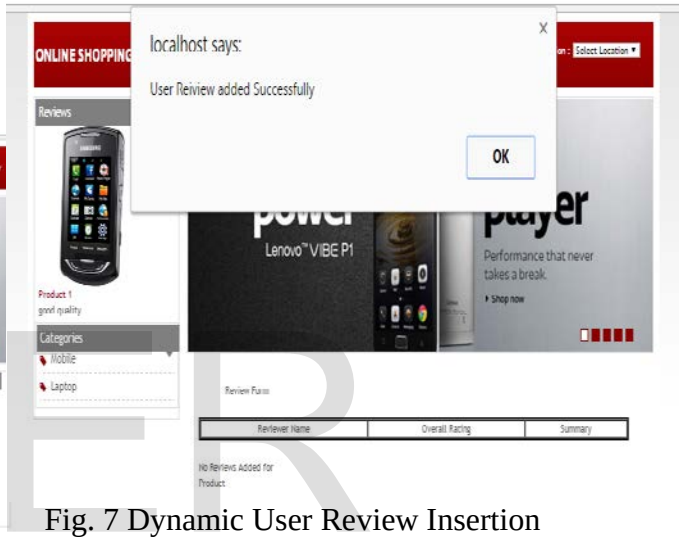

Fig. 7 Dynamic User Review Insertion

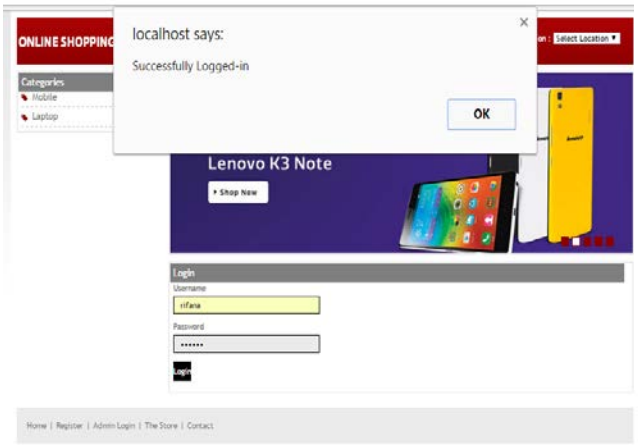

Fig. 5 User Login Page

Unboxed ACER One 10 S1002 Quad Core(2 GB DDR3/32GB EMMC HDD/WIN10) Netbook (NT.G53SI.001)

Reviewer Name	Reviewer text	Overall Rating	Review classification
Almonte	The acer one Plus has a 13 megapixel rear camera, which will produce high quality photos. Its 5 megapixel front camera makes it a good selfie phone. It can capture 1080p high definition video with its primary camera, which is second only to 4K in terms of recording quality.	5	Postive-2
Herbert John	The metal body is with a weight of 168 grams, it is somewhat heavier than average for a smartphone its size. The extra mass is due to this phone battery for its size.	5	Postive-0
Paul Walker	The unboxed acer one ten plus has an advertised talk time of 18 hours. In terms of battery capacity, it is really good in storage, a massive battery capacity for a smartphone released in 2016.	1	Postive-2
Vishnu	The acer is very small and cute phone to use its easily fitted in the pocket overall nice smart and casual phone	5	Postive-2

Fig. 8 Classification of User Reviews

Thus an Application is designed to compare all the reviews of the product and recommend a site for the user for the purchase of the product. This Application mines the user's opinion about the product and provides an additional help for the users for purchasing the product.

V CONCLUSION

In this paper, a recommendation model is proposed by mining sentiment information from social users' reviews. We propose social user's sentiment measurement approaches based on the mined sentiment words and sentiment degree words from users' reviews. Besides, we build items' "virtual friends" to solve the cold start problems, and then we fuse service reputation similarity into a Lexicon Based framework to predict users' ratings. In particular, as long as we extract user's reviews from his/her rating histories, we can quantitively measure user's sentiment. And also we demonstrate users' sentiment can really denote what users' interest preferences. The extensive experiments on real world datasets show significant improvements in rating accuracy over existing approaches. In our future work, we will explore social users' sentiment deeply.

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