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Experimental Representations of Opinion Mining from Online Reviews Based on Sentiment Analysis Model

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ABSTRACT: The main objective of this system is to analyze the mining techniques with user opinions regarding their shopping reviews and recommendations to provide great support to both manufacturers and customers. Opinion Mining targets and opinion words from online reviews for products, which are important tasks for fine grained opinion mining, the key component of which involves detecting opinion relations among words. To this end, this approach proposes a novel approach based on the partially supervised alignment model, which regards identifying opinion relations as an alignment process. The distribution of polarity ratings over reviews written by different users or evaluated based on different products for mining are often skewed in the mining industries. User reviews are highly essential for user and product information, which would be helpful for the task of sentiment classification of reviews. The temporal nature of reviews posted by the same user or evaluated on the same product are ignored by the researchers in past. Finally, we feed the user, product and review representations into a machine learning classifier for sentiment classification. Our approach has been evaluated on three large-scale review datasets from the IMDB and Yelp. In particular, compared to the traditional unsupervised alignment model, the proposed model obtains better precision because of the usage of partial supervision. In addition, when estimating candidate confidence, we penalize higher-degree vertices in our graph-based ranking algorithm to decrease the probability of error generation. Our experimental results on three corpora with different sizes and languages show that our approach effectively outperforms state-of-the-art methods.

KEYWORDS: Opinion Mining, Sentiment Analysis, Review Analysis.

I. INTRODUCTION

Sentiment analysis aims to detect opinions (or polarities) expressed regarding a given subject or topic from text. With the rapid growth of social media platforms such as micro-blogging services, social networking sites and short messaging services, people increasingly share their views and opinions online. As such, sentiment analysis has attracted much attention since opinions or sentiments detected from text are potentially useful for downstream applications including recommender systems, social network analysis, market forecasting and the prediction of political topics. Traditionally, researchers focused on identifying the polarity of text based on language clues extracted from the textual content of reviews.

Many recommendation and review sites offer a wealth of information beyond mere ratings, such as opinion holders (hereafter, users) who expressed their views and target entities (hereafter, products) that received the reviews. It is often observed that a lenient user might give higher rating than a critical user even if they post an (almost) identical review, while popular products are likely to receive more praises than less popular ones. The distributions of polarity ratings over reviews written by different users or written for different products are often skewed in the real world. Tang et al. reported that sentiment ratings from the same user (or towards the same product) are more consistent than those from different users (or towards different products). As such, it motivated researchers to exploit user or product

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information in sentiment analysis. Some approaches extracted user, product and review features based on the Bag-of-Words assumption, which were then subsequently incorporated into different machine learning classifiers.

Others took advantage of topic models in order to capture the interest distribution of users and the content distribution for products. Recently, deep neural networks have been used for distributed representation learning and have shown promising results in sentiment analysis. It is possible to learn the distributed representation of a user or a product, which essentially captures semantic information contained in the reviews posted by the user or via product evaluation. In such a representation, a user or product is represented as a dense and real-valued vector.

In previous studies, user, product and review information is incorporated into a purposely-built neural network model in order to learn distributed representations of users and products for the purposes of document-level sentiment classification. However, existing studies have ignored the temporal order of reviews that a user posted or a product received. We argue that the temporal relations of reviews are potentially helpful for learning user and product embeddings. For example, a product that receives positive reviews initially might be more likely to get positive reviews later on. Sequence models, such as recurrent neural network (RNN), are effective in learning temporal information, and have achieved excellent performance on tasks with a focus on temporal sequences.

In this system, therefore, we propose a sequence modeling based neural network approach to embed temporal relations of reviews into the categories of distributed user and product representations (hereafter, user embeddings and product embeddings for short) learning for the sentiment classification of reviews, in which reviews written by one user or evaluated on one product are considered as a temporal-ordered sequence.

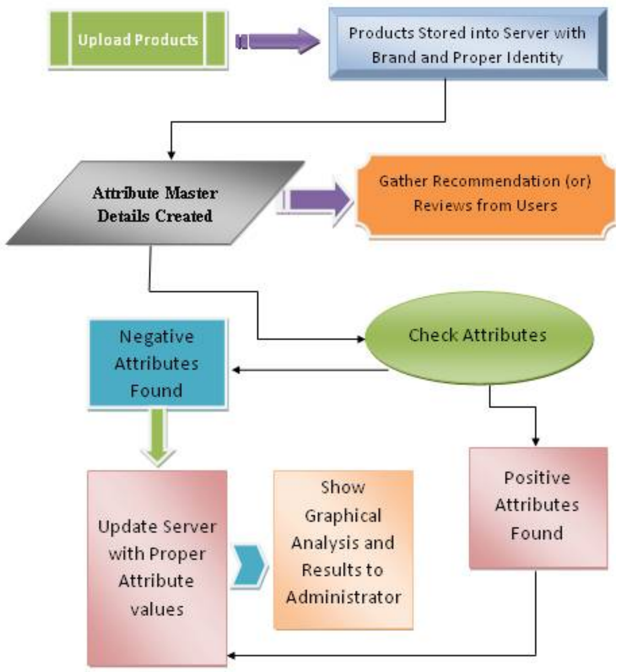

Fig.1. System Architecture

II. SENTIMENT CLASSIFICATION BASED ON USER AND PRODUCT MODELING

In recent years, there has been growing interests in incorporating the user and product information for sentiment analysis of product reviews. Seroussi et al. presented a nearest-neighbor collaborative approach for training user-specific classifiers whose outputs were subsequently combined with user similarity measurement for sentiment inference from text. Li et al. used the user, product and review features as a three-dimension tensor, and employed tensor factorization techniques to alleviate the data sparsity problem. Gao et al. referred to user- or product-specific sentiment polarity biases as user leniency and product popularity, respectively.

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They built a model that automatically computed user leniency and product popularity for sentiment classification. Diao et al. proposed a probabilistic model based on collaborative filtering and topic modeling to capture user and product features for sentiment classification. Li et al. incorporated textual topic and user-word factors with supervised topic modeling. Zhang et al. formalized the phrase level sentiment polarity labeling problem in a convex optimization framework, and designed iterative updating algorithms for leveraging review-level sentiment classification techniques to boost the performance of phase-level sentiment polarity labeling. Tang et al. incorporated user, product and review information into a purposely-built neural network model to learn distributed representations of users and products for document-level sentiment classification.

Temporal Information Modeling

In this module, we clearly describe how the temporal information about a user or a product, i.e. temporal order of the reviews written by one user or evaluated on one product, is captured in our approach. As shown in Fig. 1, the obtained review embeddings are grouped by the identical user or the identical product, respectively. In each group, review embeddings with corresponding ratings (labels) are treated as a temporal-ordered sequence ordered by their posted time to create a user review embedding sequence and a product review embedding sequence, respectively. Then, these two sequences are fed to a sequence model to learn user embeddings and product embeddings, respectively. We present here a Recursive Neural Network with gated recurrent unit (RNN-GRU) neural network for sequence modeling.

Sequence approach (Rnn-gRu) vs. unordered Set approach (Cnn)

In this module, we propose a CNN version of our approach which ignores the temporal order of the reviews when learning user or product embeddings. For user embedding learning, we aggregate all the reviews written by the same user and concatenate them into a long review with temporal order ignored before feeding it to the CNN. We do it similarly for product embedding learning by aggregating all the reviews about the same product without considering their temporal relation. Other components of our proposed approach, such as learning review embeddings and concatenating review content, user and product embeddings for SVM training, remain the same. We call this variant unordered set approach since all the reviews of the same user or the same product are considered as an unordered set.

Our original approach using RNN-GRU for user and product embedding learning is termed as review sequence approach.

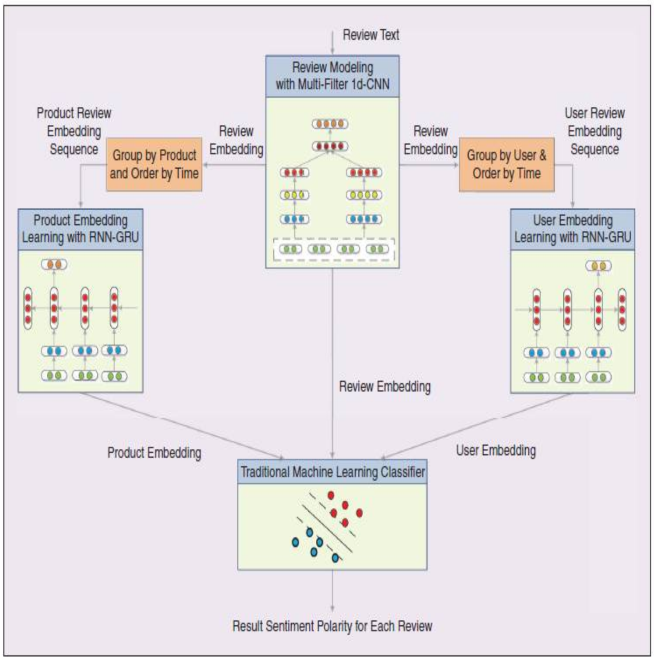

Fig.2. Framework of our Proposed Approach

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III. EXISTING SYSTEM

- In previous methods, mining the opinion relations between opinion targets and opinion words was the key to collective extraction.
- To this end, the most adopted techniques have been nearest-neighbor rules and syntactic patterns.
- Nearest neighbor rules regard the nearest adjective/verb to a noun/noun phrase in a limited window as its modifier.
- Syntactic information, in which the opinion relations among words are decided according to their dependency relations in the parsing tree.

Disadvantages

- Nearest neighbor rules strategy cannot obtain precise results because there exist long-span modified relations and diverse opinion expressions.
- Syntactic patterns are prone to errors. Online reviews usually have informal writing styles, including grammatical errors, typographical errors, and punctuation errors.
- This makes the existing parsing tools, which are usually trained on formal texts such as news reports, prone to generating errors.
- The collective extraction adopted by most previous methods was usually based on a bootstrapping framework, which has the problem of error propagation

IV. PROPOSED SYSTEM

- To precisely mine the opinion relations among words, we propose a method based on a monolingual word alignment model.
- An opinion target can find its corresponding modifier through word alignment.
- We further notice that standard word alignment models are often trained in a completely unsupervised manner, which results in alignment quality that may be unsatisfactory.
- We certainly can improve alignment quality by using supervision. However, it is both time consuming and impractical to manually label full alignments in sentences.
- Thus, we further employ a partially-supervised word alignment model (PSWAM).

Advantages

- Compared to previous nearest-neighbor rules, the WAM does not constrain identifying modified relations to a limited window; therefore, it can capture more complex relations, such as long-span modified relations.
- Compared to syntactic patterns, the WAM is more robust because it does not need to parse informal texts.
- In addition, the WAM can integrate several intuitive factors, such as word co-occurrence frequencies and word positions, into a unified model for indicating the opinion relations among words.
- Thus, we expect to obtain more precise results on opinion relation identification.
- The alignment model used has proved to be effective for opinion target extraction.

V. LITERATURE SURVEY

In the year of 2012, the authors "B. Pang, L. Lee, and S. Vaithyanathan" described into their paper titled "Thumbs Up? Sentiment Classification Using Machine Learning Techniques" such as: We consider the problem of classifying documents not by topic, but by overall sentiment, e.g., determining whether a review is positive or negative. Using movie reviews as data, we find that standard machine learning techniques definitively outperform human-produced baselines. However, the three machine learning methods we employed (Naive Bayes, maximum entropy classification, and support vector machines) do not perform as well on sentiment classification as on traditional topic-based categorization. We conclude by examining factors that make the sentiment classification problem more challenging.

In the year of 2015, the authors "R. L. Rosa, D. Z. Rodríguez, And G. Bressan" described into their paper titled "Music Recommendation System Based On User’s Sentiments Extracted From Social Networks" such as: In recent years, the sentiment analysis has been explored by several Internet services to recommend contents in

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accordance with human emotions, which are expressed through informal texts posted on social networks. However, the metrics used in the sentiment analysis only classify a sentence with positive, neutral or negative intensity, and do not detect sentiment variations in accordance with the user's profile. In this arena, this paper presents a music recommendation system based on a sentiment intensity metric, named enhanced Sentiment Metric (eSM) that is the association of a lexicon-based sentiment metric with a correction factor based on the user's profile. This correction factor is discovered by means of subjective tests, conducted in a laboratory environment. Based on the experimental results, the correction factor is formulated and used to adjust the final sentiment intensity. The users' sentiments are extracted from sentences posted on social networks and the music recommendation system is performed through a framework of low complexity for mobile devices, which suggests songs based on the current user's sentiment intensity. Also, the framework was built considering ergonomic criteria of usability. The performance of the proposed framework is evaluated with remote users using the crowdsourcing method, reaching a rating of 91% of user satisfaction, outperforming a randomly assigned song suggestion that reached 65% of user satisfaction. Furthermore, the paper presents low perceived impacts on the analysis of energy consumption, network and latency in accordance with the processing and memory perception of the recommendation system, showing advantages for the consumer electronic world.

In the year of 2014, the authors "R. Y. K. Lau, Y. Xia, And Y. Ye" described into their paper titled "A Probabilistic Generative Model For Mining Cybercriminal Networks From Online Social Media" such as: There has been a rapid growth in the number of cybercrimes that cause tremendous financial loss to organizations. Recent studies reveal that cybercriminals tend to collaborate or even transact cyber-attack tools via the "dark markets" established in online social media. Accordingly, it presents unprecedented opportunities for researchers to tap into these underground cybercriminal communities to develop better insights about collaborative cybercrime activities so as to combat the ever increasing number of cybercrimes. The main contribution of this paper is the development of a novel weakly supervised cybercriminal network mining method to facilitate cybercrime forensics. In particular, the proposed method is underpinned by a probabilistic generative model enhanced by a novel context-sensitive Gibbs sampling algorithm. Evaluated based on two social media corpora, our experimental results reveal that the proposed method significantly outperforms the Latent Dirichlet Allocation (LDA) based method and the Support Vector Machine (SVM) based method by 5.23% and 16.62% in terms of Area Under the ROC Curve (AUC), respectively. It also achieves comparable performance as the state-of-the-art Partially Labeled Dirichlet Allocation (PLDA) method. To the best of our knowledge, this is the first successful research of applying a probabilistic generative model to mine cybercriminal networks from online social media.

VI. EXPERIMENTAL RESULTS

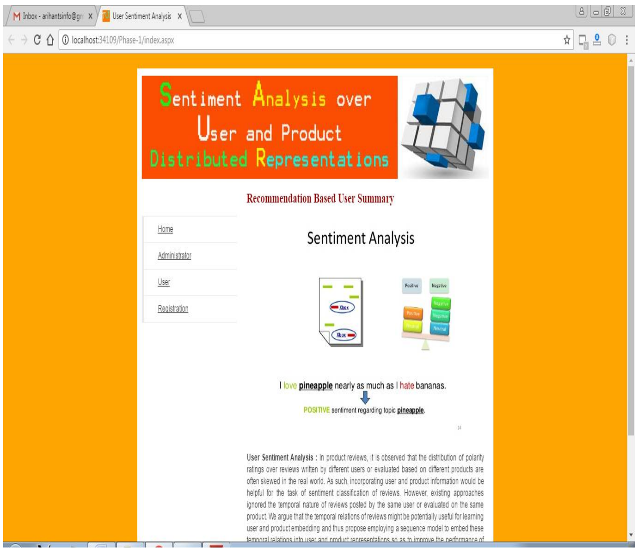

Fig.3. Home Page

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Fig.4. User Registration

Fig.5. Domain Master

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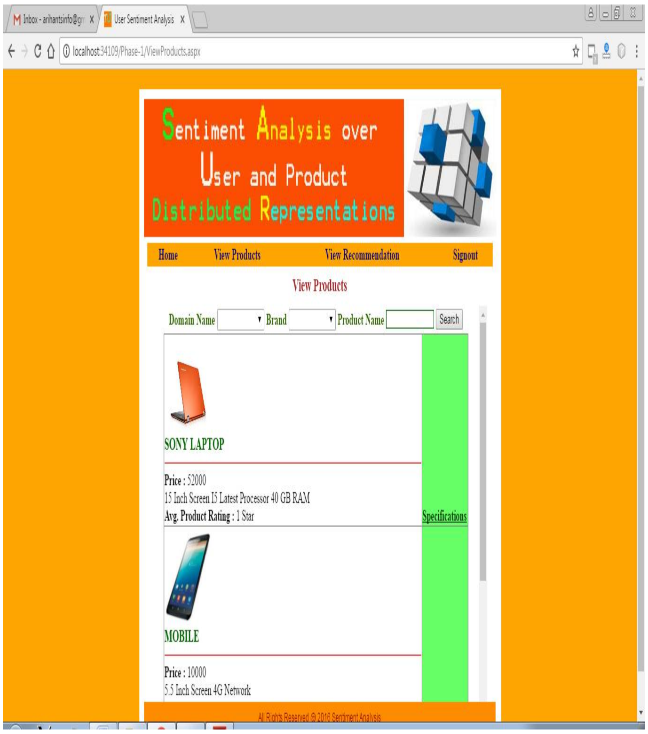

Fig.6.View Products

Fig.7. User Home

VII. CONCLUSION AND FUTURE SCOPE

This system has presented a sequence modeling based neural network approach for document-level sentiment analysis. The approach employs RNN-GRU to learn user and product embeddings from the temporal ordered review

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documents. These embeddings, together with review embeddings learned by a CNN, are used to train SVMs for sentiment classification. We have conducted extensive experiments on three review datasets using three evaluation metrics. Empirical results show that our approach achieves the state-of-the-art performance on all these datasets. We have found that (a) modeling reviews as sequences rather than unordered sets boost the performance of user and product representation composition; (b) concatenating review, user and product embeddings for training SVMs for sentiment classification gives superior results compared to a pure neural framework and beats the best results reported so far. Evaluations on three large-scale datasets show that the proposed method performs better than several strong baseline methods which regard reviews as unordered set.

In future work, we plan to explore other sequence learning model, such as bidirectional RNN, bidirectional LSTM and gated feedback RNN for sentiment analysis. We will also explore other methods in learning user and product embeddings and investigate the feasibility of using these embeddings for a wide range of tasks such as product recommendation and product sales prediction.

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