

Detecting Fraud Reviews of Apps Using Sentiment Analysis

S. Sabeena

Dept. of Computer Applications, Pioneer College of Arts and Science, Bharathiar University, Coimbatore, India

*Corresponding Author: sabeena.mphil@gmail.com

Available online at: www.ijcseonline.org

Accepted: 19/Jan/2019, Published: 31/Jan/2019

Abstract—Sentiment analysis is one of the main tasks of Natural Language Processing (NLP). This analysis had gained more attention in recent years. In this paper, we tackled the problem of sentiment polarity categorization as one of the fundamental problems of sentiment analysis. A general process is proposed with detailed descriptions. Data used are online product reviews collected from Amazon.com. Experiment for sentence-level categorization and review-level categorization are performed with best outcomes. Finally, we give insight into our future work on sentiment analysis.

Keywords—*Natural Language Processing(NLP), Sentiment Analysis, Sentence Level Categorization, Review Level Categorization.*

I. INTRODUCTION

Sentiment is an approach, thought, or decision stimulated by feeling. Sentiment analysis [1], also called as opinion mining, which analyze the people’s sentiments towards certain entities. A resourceful place considered to be an internet with respect to the sentiment data. According to the user’s point of view, where people can post their own information through various social media, such as forums, micro-blogs, or online social networking sites. Other side from the researcher’s outlook many social media sites publish their application programming interfaces (APIs), provoking data collection and explored by developers and researchers.

For example, Twitter currently has three different versions of APIs are in available in, REST API, Search API, and Streaming API [2].

The REST API, developers are able to gather status data and user information; the Search API permits developers to query detailed Twitter content, however the Streaming API is able to collect Twitter content in real-time. The developers can blend all the above three APIs to develop their own applications. Therefore, sentiment analysis has a well-built fundamental with the support of immense online data.

Some spam are meaningless, others are different opinions called fake opinions. The second flaw is ground truth of such online data is not available. A ground truth is more as a tag of a some opinion, which indicates whether the opinion is positive, negative, neutral. The Stanford Sentiment 140 Tweet Corpus of Fang and Zhan, permits unrestricted use and reproduction in all medium, in which original work is cited [3].

Table 1 Customer reviews and messages.

Star Rating	Meaning
☆	Very Poor
☆ ☆	Poor
☆ ☆ ☆	Good
☆ ☆ ☆ ☆	Very Good
☆ ☆ ☆ ☆ ☆	Excellent

As a last paragraph of the introduction should provide organization of the paper/article (Rest of the paper is organized as follows, Section I contains the introduction of application programming interfaces API, Section II contain the related work of sentiment analysis, Section III explain the methodology with flow chart of sentiment mining, Section IV describes results and discussion, Section VI concludes research work of sentiment analysis.

II. RELATED WORK

Data in this paper is a set of product reviews collected from Amazon, between February and April, 2014. Each product review receives inspections. Then each review will have a rating on it which is the ground truth. This rating is based on star-scaled system. The highest rating has 5 stars and the lowest rating have 1 star (Table 1). This paper analyses the vital problem of sentiment polarity categorization [4].

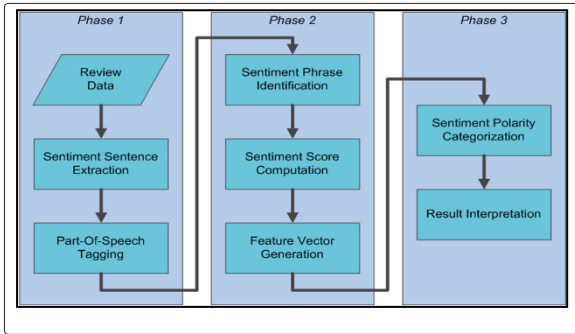


Fig 1 Categorization flow chart

An algorithm is proposed for negation phrases. Sentiment score computation is done by proposed mathematical approach. Sentiment polarity categorization is presented by a feature vector generation method. These experiments are based on sentence level and review level Performance.

The three classification models are evaluated and compared based on their results. In this section ‘Methods’, software platform and grouping models are used in this study. Experimental results are presented in ‘Results and discussion’. Discussion and future work is in section ‘Review-level categorization’. The paper is concluded in Section ‘Conclusion’.

III. METHODOLOGY

6,799 tokens are from Twitter data. Each token is for sentiment score TSI (Total Sentiment Index). It features itself as a positive token and as a negative token. A TSI for a token is computed as

$$TSI = \frac{p - tp/tn \times n}{p + tp/tn \times n}$$

Where *p* is number of times a token appears in positive tweets and *n* is the number of times a token performs in negative tweets. *tp/tn* is the ratio of total number of positive tweets over total number of negative tweets. Data collection in total is 5.1 million of reviews belong to 4 major types that are beauty, book, electronic, and home (Figure 2). These online reviews were posted by over 3.2 millions of customers towards 20,062 products. Each review includes reviewer ID, product ID, and rating, time of the review, helpfulness, and review text [5].

Every rating is based on a 5-star scale. It results all the ratings ranging from 1-star to 5-star with no of a half-star or a quarter-star. Each and every word of a line in the sentence has its own syntax rules that define how every word is used.

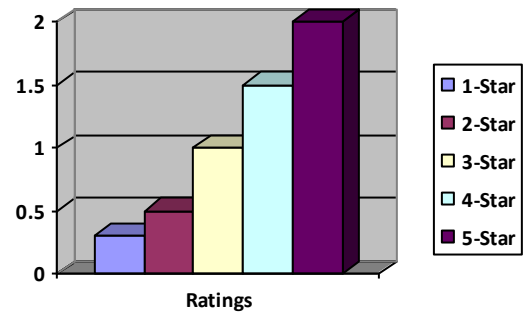
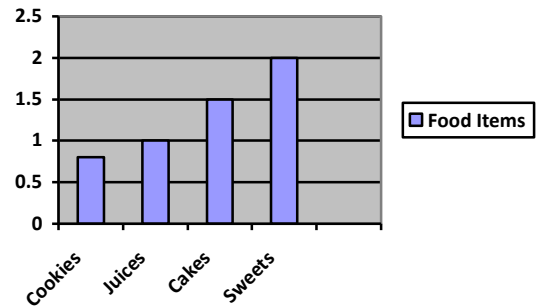


Fig 2 Rating bar chart

IV. RESULTS AND DISCUSSION

A. SENTIMENT MINING AND POS TAGGING

From the tagged sentences, objective content must be omitted. In our study as an alternative all the subjective content was taken for future analysis [6]. Now, the subjective at least contain one positive or negative word. Every word in the sentences represents the role of the word (i.e.) the action of the word is used. Those roles are known as parts of speech (POS). Here POS taggers have been developed to categorize the words based on parts of speech. POS tagger plays a vital role for the two reasons: (A) since words like noun and pronoun do not have sentiment so we can filter out such words with POS tagger. (B) It can be used to differentiate a word which is used in different parts of speech.

Table 2 Parts-Of-Speech tags for verbs

Tag	Definition
VB	Base form
VBP	present tense, not 3rd person singular
VBZ	present tense, 3rd person singular
VBD	past tense
VBG	present participle
VBN	past participle

For example, consider the following sentences:

I like running

He runs like the wind

The part-of-speech annotation in the above sentences is as follows:

PRP I **VBP** like running

PRP He **VBZ** runs like the wind

B. NEGATION PHRASES

When the negative prefixes are added to the words such as verbs and adjectives it gives different meaning. Let us take an adjective word “**worth**”, generally it has a positive sentiment [7]. For example: The cell phone which I have bought is not worth for its price. Here the phrase “**not worth**” denotes a negative sentiment. It is difficult to identify such phrases. There are two types of phrases used namely Negation-Of-Adjective (NOA) and Negation-Of-Verb (NOV).

Table 3 Negation Phrase Identification

Phrase	Type
not worth	NOA
not go wrong	NOA
not bad	NOA
didn't work	NOV
didn't like	NOV
don't recommend	NOV

For this type of phrase identification, we propose the below algorithm.

```

Algorithm: Negation Phrases Identification
Require: Tagged Sentences, Negative Prefixes
Ensure: NOA Phrases, NOV Phrases
for every Tagged Sentences do
  for (i/i + 1) as every word pair do
    if i + 1 is a Negative Prefix then
      if there is an adjective tag in next pair then
        NOA Phrases ← (i, i + 2)
        NOV Phrases ← (i, i + 2)
      else
        if there is an adjective tag in the pair after next then
          NOA Phrases ← (i, i + 2, i + 4)
          NOV Phrases ← (i, i + 2, i + 4)
        end if
      end if
    end if
  end if
end if

```

end for

end for

return NOA Phrases, NOV Phrases

C. SENTIMENT SCORE CALCULATION

This method counts the appearance of positive or negative tokens from the given sentences. When total number of positive tokens is more than the number of negative tokens then it is taken as positive score else negative score (vice-versa). The sentence will be tagged as the neutral when the positive and negative tokens are equal [8]. From the sentiment sentences it'll find the positive word and negative word count. If it has more number of positive word counts then it is represented as positive sentiment or when more number of negative word counts then it is stated as negative sentiment.

SENTIMENT SCORE = P-N

Where,

P - Count of positive words in sentiment sentence

N - Count of negative words in sentiment sentence

V. CONCLUSION

Nowadays, there are so many applications available on internet because of that user cannot always get correct or true reviews about the product on internet. In this paper, we proposed by developing web application which help to detect fraud apps using sentiment comments and data mining. We can check for user's sentimental comments on multiple applications. The reviews may be fake or genuine. But after comparing reviews of admin as well as user's, we can get more clear idea. Hence, we can get higher probability of getting real reviews. So we are proposing a system to develop a web application that will take reviews from registered users for single product, and analyze them for positive negative rating. For every user reviews and comments will be fetched separately and analyzed for positive negative rating. Then their rating/comments will be judged by the admin and it would be easy for admin to predict the application as Genuine or Fraud. In the Review Related Proofs, besides the ratings many App stores allow the customers to write their comments as the App reviews. Such reviews can replicate the personal views and usage experiences of present users for specific mobile apps. Indeed, review manipulation is one of the most important perspectives of App ranking fraud.

REFERENCES

- [1] Kim S-M, Hovy E, Determining the sentiment of opinions In: Proceedings of the 20th international conference on Computational Linguistics, page 1367. Association for Computational Linguistics, Stroudsburg, PA, USA.

- [2] Liu B, Sentiment analysis and subjectivity In: Handbook of Natural Language Processing, Second Edition. Taylor and Francis Group, Boca.
- [3] Pak A, Paroubek P, Twitter as a corpus for sentiment analysis and opinion mining In: Proceedings of the Seventh conference on International Language Resources and Evaluation.. European Languages Resources Association, Valletta, Malta.
- [4] Pang B, Lee L, Opinion mining and sentiment analysis. Found Trends Inf Retr2(1-2).
- [5] Twitter, Twitter apis. <https://dev.twitter.com/start>.
- [6] Liu B, The science of detecting fake reviews. <http://content26.com/blog/bing-liu-the-science-of-detecting-fake-reviews/>.
- [7] www.amazon.com.
- [8] Go A, Bhayani R, Huang L, Twitter sentiment classification using distant supervision, 1–12. CS224N Project Report, Stanford.
- [9] Sarvabhotla K, Pingali P, Varma V Sentiment classification: a lexical similarity based approach for extracting subjectivity in documents. InfRetrieval14 (3): 337–353.
- [10] Wilson T, Wiebe J, Hoffmann P, Recognizing contextual polarity in phrase-level sentiment analysis In: Proceedings of the conference on human language technology and empirical methods in natural language processing, 347–354.. Association for Computational Linguistics, Stroudsburg, PA, USA.
- [11] Zhang Y, Xiang X, Yin C, Shang L, Parallel sentiment polarity classification method with substring feature reduction In: Trends and Applications in Knowledge Discovery and Data Mining, volume 7867 of Lecture Notes in Computer Science, 121–132.. Springer Berlin Heidelberg, Heidelberg, Germany.
- [12] Choi Y, Cardie C, Adapting a polarity lexicon using integer linear programming for domain-specific sentiment classification In: Proceedings of the 2009 Conference on Empirical Methods in Natural Language Processing: Volume 2 - Volume 2, EMNLP '09, 590–598.. Association for Computational Linguistics, Stroudsburg, PA, USA.
- [13] Tan LK-W, Na J-C, Theng Y-L, Chang K, Sentence-level sentiment polarity classification using a linguistic approach In: Digital Libraries: For Cultural Heritage, Knowledge Dissemination, and Future Creation, 77–87. Springer, Heidelberg, Germany.

Authors Profile

Ms. S. Sabeena Bachelor of Science from Sri Krishna College, Coimbatore in 2012 and Master of Science from Avinashilingam University in year 2014. Master of Philosophy from Avinashilingam University in year 2016 and currently working as Assistant Professor in Department of Computer Applications, Pioneer College of Arts and Science, Coimbatore since 2017. She has published more than 5 research papers in reputed International Journals including Scopus. Her main research work focuses on Feature Selection in Data Mining.

