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Amazon Review Classification and Sentiment Analysis

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***Abstract*— Reviews on Amazon are not only related to the product but also the service given to the customers. If users get clear bifurcation about product reviews and service reviews it will be easier for them to take the decision, in this paper we propose a system that performs the classification of customer reviews followed by finding sentiment of the reviews. A rule based extraction of product feature sentiment is also done. Also we provide a visualization for our result summarization.**

Keywords— Sentiment analysis, Amazon customer reviews, classification.

INTRODUCTION

Amazon is one of the largest online vendor in the World. People often gaze over the products and reviews of the product before buying the product on amazon itself. But the reviews on amazon are not necessarily of products but a mixture of product of product review and service review (amazon related or Product Company related). The buyer is misled as the overall sentiment (rating classification) that amazon gives is a collective one and there is no bifurcation between a service review and product review. The proposed model satisfactorily segregates service and product review, in addition to this it also classifies the review as Feature review if the user talks about some particular product feature. A featured review is nothing but a product review, our model also gives sentiment of the text about the product feature. For example, if the user writes in his review, "the camera for this phone is very good.", then we also classify camera feature as positive. We aim to build a system that visualizes the review's sentiment in the form of charts.

LITERATURE SURVEY

All Information in the world can be broadly classified into mainly two categories, facts and opinions. Facts are objective statements about entities and worldly events. On the other hand opinions are subjective statements that reflect people's sentiments or perceptions about the entities and events [5]. Maximum amount of existing research on text and information processing is focused on mining and getting the factual information from the text or information. Before we had WWW we were lacking a collection of opinion data, in an individual needs to make a decision, he/she typically asks for opinions from friends and families. When an organization needs to find opinions of the general public about its products and services, it conducted surveys and focused groups. But after the growth of Web, especially with the drastic growth of the user generated content on the Web, the world has changed and so has the methods of gaining ones opinion. One can post reviews of products at merchant sites and express views on almost anything in Internet forums, discussion groups, and blogs, which are collectively called the user generated content [6]. As the technology of connectivity grew so as the ways of interpreting and processing of users opinion information has changed. Some of the machine learning techniques like Naïve Bayes, Maximum Entropy and Support Vector Machines has been discussed in the paper [1]. Extracting features from user opinion information is an emerging task.

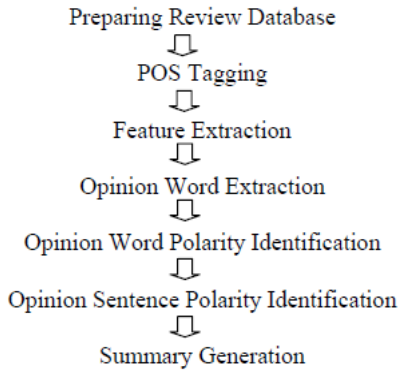

Fig 1. Basic Step of Feature Extraction [4].

In Fig 1, a generic model of feature extraction from opinion information is shown, firstly the information database is created, next POS tagging is done on the review, next the features are extracted using grammar rules such as adjective + noun or so on, as nouns are features and adjectives are sentiment words. Next Opinion words are extracted followed by its polarity identification [4]. Some models also calculate sentence polarity for accuracy. Lastly the results are combined to obtain a summary. Many algorithms can be used in opinion mining such as Naive Bayes Classification, Probabilistic Machine Learning approach to classify the reviews as positive or negative, have been used to get the sentiment of opinions of different domains such as movie [2], Amazon reviews of products [3].

In our work we have used reviews of iPhone 5 extracted from Amazon website. We studied all the reviews and got to know that there are many reviews in which the user talks about the service provided by amazon and its sellers. So we decided to classify reviews into service, product and feature based reviews. We also found that the sentiment of

each review is very obvious, the review rating provided by the user mirrors what the user writes as his/her review, i.e. if the user writes something bad definitely the overall rating the user gives is either 1 or 2 out of 5. This is from our study of a set of amazon reviews on iPhone 5. Our work mainly concentrates on feature extraction and finding out the sentiment of the particular feature. We have used POS tagging technique on sentence level. In our approach we have made certain rules using the tags of particular word and using list of words with respective sentiment value to find the feature and then getting the appropriate sentiment from it. The Sentiment model that we have proposed is designed based on the uncertainty of the amazon reviews. Our work also include summarization in the form of charts for overall view of the sentiments of the users on the product or a particular feature.

SYSTEM DESIGN

System Flow

In this system, we are finding ratings for feature reviews only and not for service and product review. Since on Amazon reviews there are ratings available for each review, the sentiment for the product review and service review will be equivalent to the review given by the customer so the computational task of finding the sentiments is reduced in case of service and product reviews.

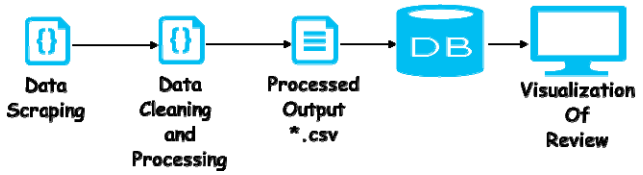

Fig 2. Basic Computations

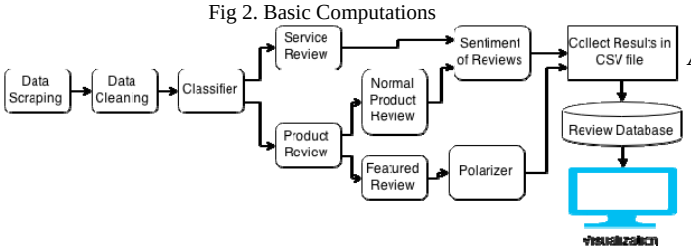

Fig 3. Detailed Block Diagram of System

In Fig 2, we have our basic workflow that we have followed to get the opinion mining of our test case of iPhone 5 reviews on amazon.com.

The Steps are as follows:

1. **Data Scraping :**

   Crawl the amazon review url to extract all required details from it. We need to take care of the text so as to satisfy the required format, for e.g.
 tags have a special meaning to the browser i.e. break read or next line, we need to explicitly convert each
 tag to spaces or else the crawling result will be improper. When working with online reviews there is always a question in our mind, how can I trust the review. This is not a problem with amazon reviews, amazon reviewers can up vote or down vote a review, this collectively is available as helpful count. We have taken a special care in extracting the data from web pages smallest necessary data is extracted for processing. The following is the list of items that we have extracted: Review of Title, Helpful Count, User Review and Date of Review. Caution: Websites uses utf-8 character set for encoding characters, but sometimes this encoding can give errors during web scraping as scraping involves matching strings and patterns. Solution to this is simply enforce the string to be coded in utf-8 format.

2. **Data Cleaning and Processing :**

   The data extracted need to be cleaned so that we get proper text review on which analysis can be performed. Cleaning of crawled data is done by removal of all special characters (such as: ":/.,'#$*^&-) in order to retrieve best results. After cleaning the crawled content copy it into a csv file.

   The next step is processing the cleaned data, firstly review is classified as service, feature or product review. If the review is a feature review then feature extraction is done using POS Tagging and grammar rule all stated below. After feature extraction the feature opinion polarization is obtained.

3. All **processed output** is stored in one csv file for further use.
4. The file is then loaded into the **database** for use in visualization and summarization.
5. Finally the **summarization** of sentiments is generated as charts and displayed to the user as an attractive dashboard.

Algorithm

1. Crawl the amazon review url to extract all required details from it. Special care for required format of information must be taken, example
 tags have a special meaning to the browser i.e. break read or next line, we need to explicitly convert each
 tag to spaces or else the crawling result will be improper.
2. Cleaning the crawled data. Removal of all special characters (such as : ":/.,'#$*^&-) must be done in order to retrieve best results. This also saves our review processing time. Put the crawled content into a csv file.
3. Read the csv file for processing, for each review do the following:
   a. Perform a service review test where the review is tested for occurrence of service words, i.e. if the review length is shorter than 15 words and service words are found in the review the the review is classified as service review else if the length of review is greater than 15 then

more than 2 service must occur in the review for it to be a service review.

b. If the review fails for the service test then it is tested for features of a product (such as camera, microphone and battery) if these exist then we classify the review as a feature review.
   i. For each feature we extract its sentiment from the review using POS tagging and ruled based extraction (using regular expressions).
   ii. Each phrase of sentiment extracted above is then sent to polarizer that return 1 if the sentiment is positive else -1 which means the sentiment is negative.

c. If the review fails the feature test also, then the review is classified as a product review.

4. A new final csv is generated with the classification and sentiment of the feature phrases.
5. This csv is then loaded into the database for creating the visualizations by querying data from the database.

Sentiment Polarity Methodology

The service and the product review's polarity is the rating the user provides for that review. The Good Reviews are those with rating 5 stars and 4 stars, Average Reviews are those with rating 3 stars and Bad Reviews are those with rating 2 stars and 1 star.

Finally, when a feature sentiment is extracted the sentiment phrase is sent to a polarizer method, this method basically returns +1 if the phrase is a positive sentiment else -1 if the phrase is a negative sentiment.

Firstly, the phrases are tested for indirect opinions such as "Battery no better than iPhone 4s", the test phrase is tested for certain pre-defined phrases that were found during manual analysis of reviews. Next if the phrase test fails, the review is tested for the word "not" if the word not exists then everything after not is polarized meaning every word after not is tested for whether it is a positive word or a negative word and consecutive words polarity are added and finally negated, for example "Camera is not good" this phrase is classified as negative as the word "good" is negated by the word "not".

Lastly if "phrase" and "not" test fail the test phrase is broken down into words and polarity of each word is found from a dictionary of sentiment words bifurcated as good and bad words and collective polarity is considered i.e. if the sum is below 0 the outcome is negative (-1) else outcome is positive (+1).

Rules for feature extraction

The following are some rules that our model uses to extract feature and its sentiment:

1. Adjective + Noun
2. Noun +Adjective
3. Adverb + Noun
4. Adverb +Adjective + Noun
5. Noun + Adverb + Verb
6. Noun + Verb
7. Noun + Verb
8. Noun +Verb + Noun
9. Noun +Determiner + Adjective
10. Noun + Verb + Adverb
11. Noun + (verb or Adjective or Adverb)

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RESULT

The main aim of our system is to ensure fair results of sentiments, also we don't want users to spend a lot of time reading through long textual descriptions in the reviews, and hence we summarize our result in the form of charts (Statistical Graphs). Data visualization is an important technology in the coming future, as data is increasing in size and complexity. Hence our system summarizes the results as bar charts and pie charts that help users to view and directly understand the sentiment extracted. Our model is classifying the reviews and doing a sentiment analysis on it. We prove this from the image below:

Fig 4. Product Rating Amazon

Fig 5. Product Rating

We see in Fig 4 the total count of good reviews is 468 i.e. (356(5 star) + 82 (4 Star)) but in Fig 5 its 372, that indicates that original sentiments were not only of the products but also of service (disadvantage of original

amazon sentiment model). A similar outcome can be observed for other star ratings.

Next we aid our classification and sentiment analysis by charts. Fig 6 shows it clearly, there is a chart on the left indicating overall sentiment of camera feature of iPhone and on the right are a few useful user comments.

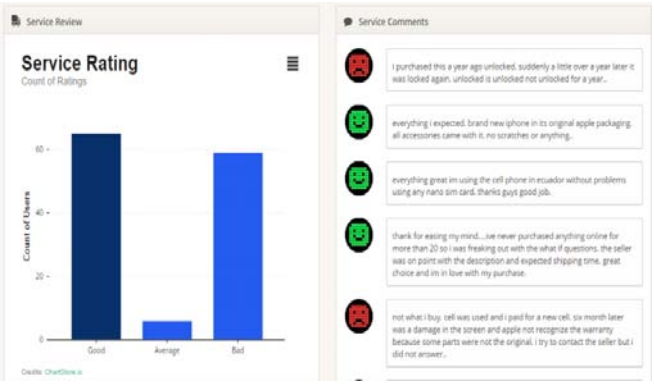

Fig 6. Sample Output

We also aid our charts with most helpful reviews. The profile picture on the review is the actual sentiment of that review. As shown in the Figure (Fig 6.) the reviews with green smiley is a review with good rating (5 Stars or 4 Star reviews), the review with yellow smiley are reviews with average rating (3 Stars) and red smiley are reviews with bad rating(1 Star or 2 Stars).

CONCLUSION

The system is accurate enough for the test case of iPhone 5 reviews on amazon. For sentiment analysis we have designed our own methodology that integrates existing sentiment analysis approaches. Classification of reviews along with sentimental analysis increased the accuracy of the system which in turn provides accurate reviews to the user.

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