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Classifying Product Quality Depending on Online Aspect Reviews

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Abstract:*According to any individual living in today's world what is the most important thing that one does before buying any product? Blindly we say that it's checking out the number of online reviews about the product and its aspects, comparing it with a similar product of other brand and then coming to a conclusion about its overall quality. Now while we are referring to the reviews posted online is it possible for us to go through all the reviews posted and then come to a conclusion? Practically it's not possible as we individuals do not have so much time to do the analysis. So we tend to read and analyze only those many reviews that we are comfortable with due to which the conclusion that we come up with about the quality of the product is not always up to the mark. In the paper, we are taking this problem into consideration and we have come up with a method as a solution by combining multiple algorithms.*

Keywords:*Sentiment Analysis, Aspect Review, e-commerce, rating systems*

I. Introduction

We all struggle very hard in our everyday life, earn money, that money is utilized to satisfy our needs and buy products that make our life easy and comfortable. So all we hope is that whatever we buy is of the best quality and may serve us for long duration or simply we can say that it values the money we pay to buy it. There was a time when before buying any new products we used to actually switch from shop to shop to find the best product of that kind. Then came a time where we started asking our friends and relatives for the review of a product if they have used one, so as to reduce our efforts and time in choosing the good product. But now in the 21st century, we need not waste our time by switching from one shop to other or ask any other person for the review of the product. The Internet has become one such boon that has come up as an answer to all our questions. Using this quality of internet, the sellers came up with an idea of online shopping for the new generation. Not only this, they are on a complete big mission of easing the everyday life of this generation individuals.

At the initial stage of online shopping, people were with a second thought of buying goods online. Then e-commerce website introduced the review system where consumers are actually allowed to express their comments and views about the product they have purchased. This helped the other buyers to first have a thorough idea about the desired product. We can also say that the review system itself as a whole started to play an important role in the world of shopping.Let us discuss some of the importance of the review system: the rating and the reviews help in giving a greater value for the product. This is not only for the product but also gives a good recognition and helps to build a reputation to the dealer or the manufacturer in the shopping world.

Not only the consumers who buy a product online refer the reviews it's also referred by the consumers who prefer offline shopping, the product manufacturers also started to refer the reviews to improve the quality of the product. As the importance of reviews started to increase the review system also started to change. Then there came a new type of review system – the star rating system. In the star rating system, the user just has to rate the overall product quality in the terms of stars i.e. he just has to select the number of stars which he would actually wish to rate the product with. In the later versions of the star rating system, consumers were also allowed to rate in the terms of full stars and half stars.

Even after having such a simple to understand the form of the rating system, there is a very big question what is the need for text reviews now. Why is it still important and does anybody in today's world use it? The answer for it is that the importance of the text reviews is never going to be reduced. Even in this electronic era how much importance the documentation work has the same amount of importance is given to text review. Text review is the simplest form of system that allows the product developer to understand what actually the customer feels about their product. The main reason is that in text form reviews the customer is given the freedom to write about the products review by specifying each and every aspect/feature about the product and specifying its quality individually. This allows the review reader to get a complete idea of the products. This also helps the product manufacturer to enhance or improve the product quality. So we can say it reduces the time of the development department in searching for the drawbacks in each aspect of the product. So up-gradation and quality improvement can be done within a short period of time.

Let's take an example to understand the part. If we consider the reviews given to a product in any e-commerce website - Sandisk pen drives are worst in a matter of transfer speed. So from the above review, we can come to a conclusion saying the user has given a negative review about the product and the aspect considered here is the transfer speed. We are able to get to a conclusion about this review quickly as there is only one review and it specifies only one aspect of the product. Now let's consider the real-time scenario where we have to go through a number of reviews and then come to the conclusion, this is going to be a very tedious job and the conclusion may not be correct too.

II. Literature Survey

In this section, we review one of the research paper - Importance of Online Product Reviews From a Consumer's Perspective says that textual review about a product from the customer point of view. The textual review is always considered in comparison with other review forms like star rating system, etc. as it describes the characteristics of the product. In textual review form, the consumer is allowed to express his experience or views about the different aspects of the product. It finally refers to the fact that online reviews play an important role in online shopping. Consumers embrace the textual reviews given by other buyers in the process of selecting a product or vendor online. Online reviews correspond to be important which is clearly reflected in the survey result. The analysis shows that 74.04% of the participant of the survey consider the online reviews to be important, whereas 4.80% think that reviews are rather unimportant.[4,9]

It is also necessary to know the importance of product reviews according to the manufacturers. The online reviews have helped in increasing the brand values and also the trust towards the online product seller. As stated earlier, our local area businesses also gain a lot from positive reviews and equally lose a lot from negative reviews. About **69%** of all consumers search for online reviews of a product, before making a decision to purchase. The survey clearly shows that the products that have received positive reviews are sold 200% times compared to other products. 42% e-commerce websites have reported that there is an increase in the average order of products being sold through their website. [5,6]

Survey also shows that irrespective of the category the reviews given by the user belong to, there is an increase in SEO (Search Engine Optimization) of e-commerce websites. The increase in SEO affects almost 10% of the business of e-commerce website. [11]

In recent times, many surveys were conducted by the online market vendors to find out how many people actually refer to the online reviews before or while they are purchasing any product online. Few of the survey are - A survey conducted by JAKPAT, to find how many people refer online reviews before purchasing any product. The conclusion of the survey turned out to be that, out of the total number of consumers, 82.41% consumers believe in referring online reviews before buying products, whether it be for online or offline shopping. 95.41% of people often compare the product reviews with the once on other e-commerce websites. Also, 51.56% people believe in uploading positive reviews once they purchase a product while the rest believe in uploading negative reviews about a product.[3]

A9: Amazon's Product Search Algorithm: Is one such algorithm used by the Amazon dealers to rank the products depending on the review given by the users. Here the analysis of the reviews starts as soon as the customers finish typing a word in the review box. The reviews of the customers are evaluated using human judgments, key business metrics programmatic analysis and performance metrics. Some of the pillars in which the amazon product ranking system depends on are:

1. Conversion Rate
2. Customer Satisfaction & Retention
3. Relevancy.

Also, Amazon uses both predicted and real conversion rates for product rankings.[10]

Another Ranking system is the recommendation system. In this system ranking of the product is done on the basis of the recommendation reviews given to a product by a number of users. The equation completely depends on the product, number of users, and its popularity given in the form of reviews.[12]

[2]Product Aspect Ranking and Its Applications: Addresses an issue of enhancing the review system for the benefit of companies, which use feedbacks of the customer to improve the quality of the product in a particular aspect. Consumer reviews are important for both firms and the developer as it has valuable knowledge. A huge number of reviews of the product is available based on the different aspect of the commodity. The customer always specifies the aspect while writing a review. But every person analyzing the reviews doesn't take in the account each and every review in the system as it is time-consuming and confusing to go through each and every comment and to decide which one to consider.

There are 3 basic components:

1) Every aspect of the product is identified and sorted,
2) Classified on the basis of user's expressions,
3) Lastly, the ranking is done.

Using these algorithms is beneficial as it minimizes the complexity. Probabilistic aspect ranking algorithm recognizes important aspects, deferring the main aspect quality is improvised.

[13]Flipkart.com is one of the leading E-Commerce websites. It is one such website that has gained the trust of people for online shopping. Also, the review posted in this website not only does not give the feedback about the website experience and quality of service, but reviews about the product purchased and their quality are also available. Flipkart.com and other e-commerce websites proved to be very helpful in the implementation of the project, as the reviews that we used to perform analysis on was obtained.

III. Implementation part and Results

In the proposed system, we concentrate on thetopic of product ranking, which aims to identify the key product aspects from online consumer reviews. The key aspects are identified by two observations, a) The important aspects of a product are usually commented by a large number of consumers; b) And consumers' opinions on the important aspects influence their overall opinions on the product.

In this proposed system, given consumer reviews of a product is the input, we first identify the product aspects by a dependency parser. Then determine consumers' opinions on these aspects using a sentiment classifier. We apply an aspect ranking algorithm to identify the key aspects by simultaneously considering the influence of consumers' opinions given to each aspect on their overall opinions.

The experimental results on 5 popular products, to test the effectiveness of our approach. We further apply the aspect ranking results to the document-level sentiment classification, so as to improve the performance significantly.

The proposed system uses product reviews given by the user and performs sentiment analysis i.e. to find a positive, negative or neutral sense of aspects of the product. Each product may contain number comments and also new comments are added every minute, in order to handle a number of reviews we are using apache Hadoop framework.

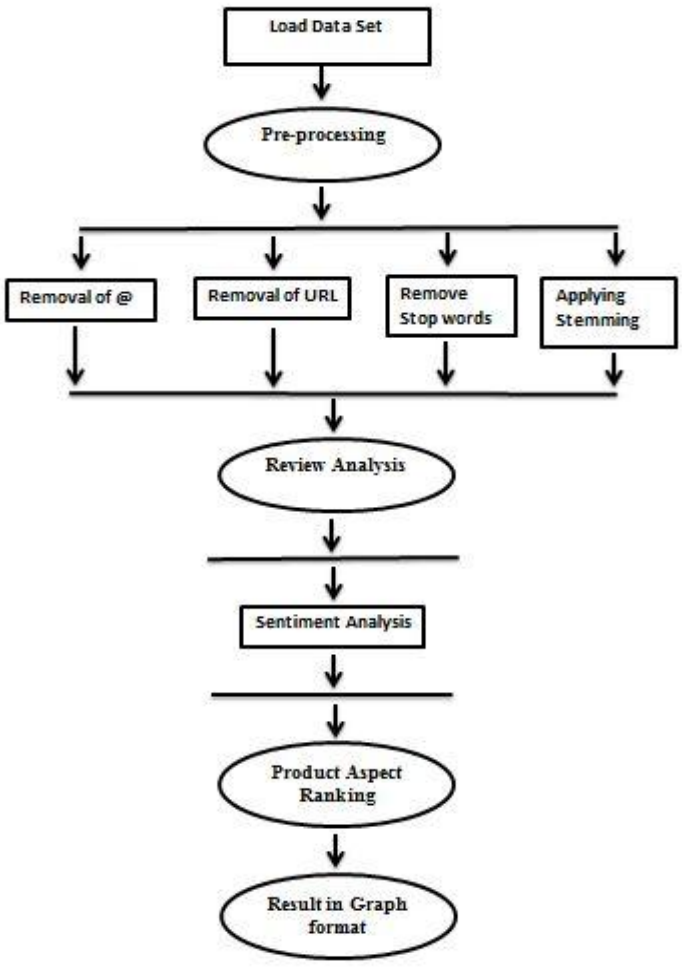


Fig: System Architecture

Algorithms used:

1. Probabilistic Aspect Ranking

1.1 Notations and Problem Formulation

Let R = {r1, · · ·, r|R|} denotes a set of online consumer reviews of a specific product. Each review r ∈ R is associated with an overall opinion rating 1497 or/and covers several aspects of the product with customer comments on such aspects. Suppose there are n aspects of a product then the product is rated depending upon it.We can see that the overall product quality is rated based on a weighted sum of the opinions/reviews on specific aspects.

1.2 Aspect Identification

There are usually two types of reviews, positive and negative review and free text reviews which are the combination of both. For positive and negative reviews, the aspects are identified as the frequent noun terms in the reviews. To identify the aspects in free text reviews, we first parse each review using the Stanford parser-1 and extract the noun phrases (NP) from the parsing tree as aspect candidates.

1.3 Aspect Sentiment Classification

To this end, we here utilize positive and negative reviews to train an SVM(support Vector Machine) sentiment classifier. Specifically, we collect sentiment terms in the positive and negative reviews as features and represent each review into feature vector using Boolean weighting.

1.4 Aspect Ranking

In the first case, the number of aspects that are mentioned in the review by the consumer is calculated. Then the mentioned aspects are considered with the key aspects if the match is found then, comments given to each aspect of the product is considered. The comment for each aspect is rated according to using the product aspect ranking algorithm. The overall weight of the review is calculated and the rating of the product is done.

2. Porter Stemmer Algorithm

Porter stemming algorithm (or 'Porter stemmer') is a process for removing the commoner morphological and making the word generic form. Following are the steps of this algorithm:-

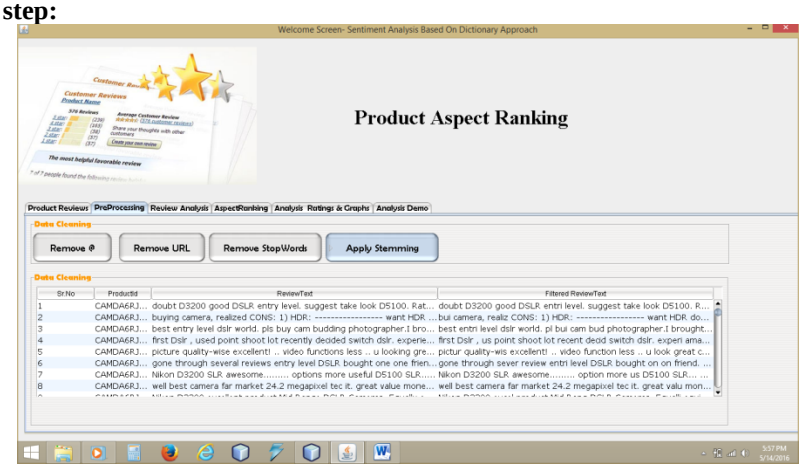
1.1 Gets rid of plurals and -ed or -ing suffixes
1.2 Maps double suffixes to single ones: -ization, -ational, etc.
1.3 Deals with suffixes, -full, -ness etc.
1.4 Takes off -ant, -ence, etc.
1.5 Removes a final -e

Basic Working Structure:

1. Preprocessing

a. Tokenization
 i. It splits sentences into words
b. Normalization
 i. Removes stop words from input text data
c. Part-of-speech (POS) tagging
 i. Detects if the word token is noun, verb, adjective

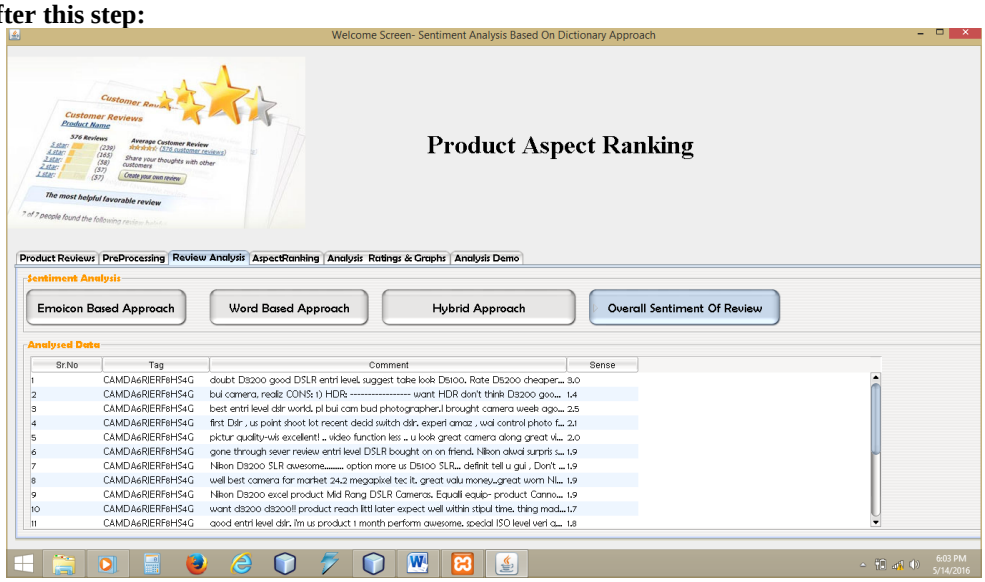
Results after this step:



2. Aspect Ranking Framework

Aspect ranking framework is consists of different fundamental processing modules such as aspect identification, aspect classification, sentiment classification and aspect ranking.

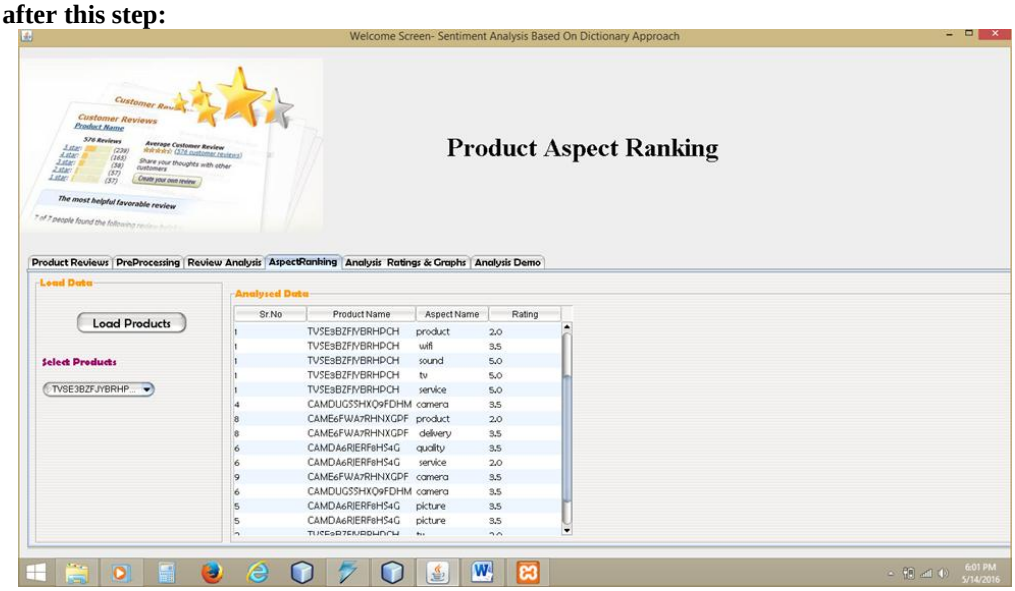
Results after this step:



3. Evaluations

In this section, we evaluate the effectiveness of our approach on aspect identification, sentiment classification, and aspect ranking.

Results after this step:



4. Feature Extraction

a. AFINN dictionary for finding word and their sense

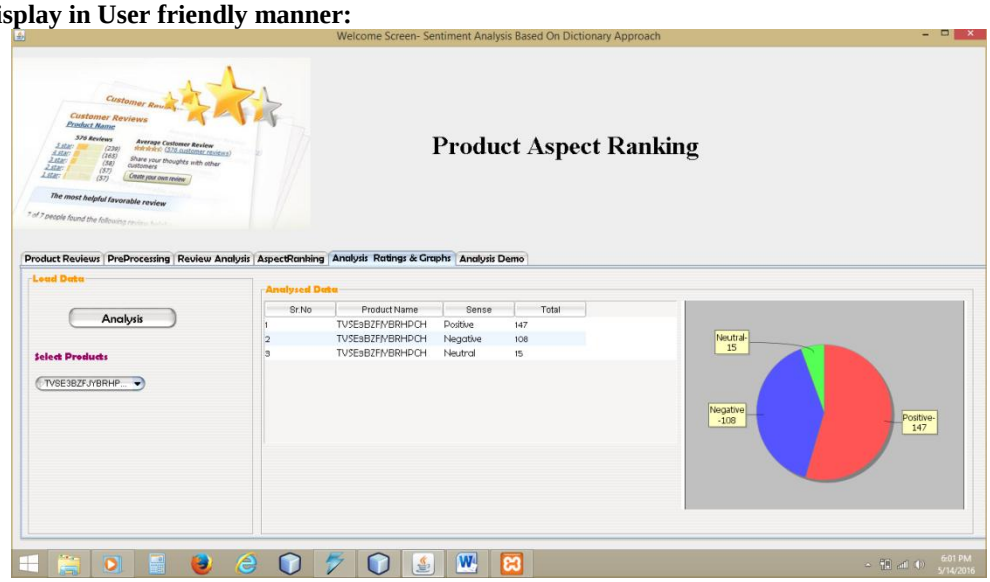
b. Finding negative annotations in the sentence and reverse the weight

c. Calculating overall weight using dictionary approach

d. Calculate overall weight using emoticons approach

e. Sum up both to draw final conclusion

Result Display in User friendly manner:



Advantages:

- Identifies key aspects based comments given in the review, which increases the efficiency of the reviews.
- It helps the product manufacturers to easily understand drawbacks of the product and the hence manufacturer can concentrate on the aspects the actually needs to improvement for the overall quality improvement of the product.
- The proposed framework and its components are domain-independent.

IV. Conclusion And Future Work

This paper provides an overview of the completed, ongoing and emerging methods of quality analysis of product based on customers review. The reviews from the customers are analyzed such as by making the reviews simplified then apply NLP to it so as to make the reviews compatible for ranking purpose. The efficiency and accuracy of the system is more compared to the previous system as the input data taking previously was manually copy-pasted. In addition to this, the results will display both the overall product quality as well as quality about each aspect mentioned in the review, that too only after considering the meaningful reviews so that wrong conclusion about the product is not made.

The future scope includes considering more than 1 adjectives in the review to analyze the quality, secondly adapting the current generation text formats i.e. abbreviations such as gr8 for great, f9 for fine, etc. Also, try to give importance to the reviews which do not describe the aspect quality.

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