Sentiment Classification Using Product Reviews

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Abstract: *Sentiment Analysis is an evolving field of research in text mining field. Nowadays, the opinions expressed through reviews are increasing day by day on the web. It is practically unfeasible to analyze and extract opinions from such huge number of reviews manually. To solve this problem an automated opinion mining approach is needed. Extraction of mood from texts is a demanding task as it involves understanding the underlying semantic. One aspect of research which is considered in this paper is to classify a given tweet/paragraph whether it is of Positive[True positive, False positive] or Negative[True negative, False negative] sentiment. In this paper a new approach is been proposed that uses lexicon database to assign each word in a text a value called valence. The valence is nothing but how a single word is affecting the whole sentence in which it is used. Every word in a sentence has its own strength and it tries to influence the overall semantic of the sentence. Higher the value of valance of a word in the sentence, the more influential it is. The approach proposed in this paper makes use of lexicon based approach as well as machine based learning. It uses AFINN lexicon database to assign valance to words and Support Vector Machine (SVM), Naïve Bayes classifier (NB) machine learning algorithms for training and testing the model.*

Keywords: *AFINN, Machine learning, Product reviews, Sentiment analysis, Valence.*

I. Introduction

Sentiment analysis has been carried out on a variety of topics. For example, there are sentiment analysis studies for movie reviews product reviews, and news and blogs. In sentiment analysis, the classes to which a piece of text is assigned are usually negative or positive. They can also be other binary classes or multi-valued classes like classification into positive, negative and neutral, but still they are less than the number of classes in topic-based classification. Sentiment analysis is tougher compared to topic-based classification as the latter relies on keywords for classification, whereas in the case of sentiment analysis keywords a variety of features have to be taken into account. The main reason that sentiment analysis is more difficult than topic-based text classification is that topic-based classification can be done with the use of keywords while this does not work well in sentiment analysis .Other reasons for difficulty are: sentiment can be expressed in subtle ways without any perceived use of negative words; it is difficult to determine whether a given text is objective or subjective; it is difficult to determine the opinion holder ;there are other factors such as dependency on domain and on order of words . Other challenges of sentiment analysis are to deal with sarcasm, irony, negation and so on.

This paper is organized as follows. Section II describes the literature survey related to sentiment analysis. Section III presents the proposed work, in Section IV we show the partial results and section V concludes the work.

1.1 Problem statement

Given a review tweet/paragraph of a particular product the paper aims to classify it as Positive sentiment [True positive, False positive] or Negative sentiment [True negative, False negative].

II. Literature Survey

Sentiment analysis is the field of study that analyzes people's opinions, sentiments, evaluations, appraisals, attitudes, and emotions towards entities such as products, services, organizations, individuals, issues, events, topics, and their attributes. It represents a large problem space. There are also many names and slightly different tasks, e.g. sentiment analysis, opinion mining, opinion extraction, sentiment mining, subjectivity analysis, affect analysis, emotion analysis, review mining, etc. However, they are now all under the umbrella of sentiment analysis or opinion mining. While in industry, the term sentiment analysis is more commonly used, but in academia both sentiment analysis and opinion mining are frequently employed. They basically represent the same field of study. Sentiment analysis and opinion mining mainly focuses on opinions which express or imply positive or negative sentiments.

In [1] author used data mining techniques for the purpose of classification to perform sentiment analysis on the views people have shared in Twitter. The data was collected from twitter that is in natural

language and apply text mining techniques –tokenization, stemming etc to convert them into useful form and then use it for building sentiment classifier that is able to predict happy, sad and neutral sentiments for a particular tweet. Rapid Miner tool is being used, that helps in building the classifier as well as able to apply it to the testing dataset.

In [2] paper focused on aspect level opinion mining and proposed a new syntactic based approach for it, which uses syntactic dependency, aggregate score of opinion words, SentiWordNet and aspect table together for opinion mining. The experimental work was done on restaurant reviews. The dataset of restaurant reviews was collected from web and tagged manually.

In [3] a method which performs 3-class classification of tweet sentiment in Twitter has been proposed. An end to end system which can determine the sentiment of a tweet at two levels- phrase level and message level [4] Deals with fundamental problem of sentiment analysis, sentiment polarity categorization. Online product reviews from Amazon.com are selected as data used for study. A sentiment polarity categorization process has been proposed. Experiments for both sentence-level categorization and review-level categorization have been performed.

In [5] author have examined how well ANEW and other word lists performs for the detection of sentiment strength in microblog posts in comparison with a new word list specifically constructed for microblogs. Author has used manually labeled postings from Twitter scored for sentiment. Using a simple word matching and this showed that the new word list may perform better than ANEW, though not as good as the more elaborate approach found in SentiStrength. In [6] author has proposed a methodology for text feature classification applying information extraction.

III. Proposed Approach

This section contains the detailed process flow of sentiment analysis. Fig. 1 describes a brief outline of the algorithm that was followed in sentiment analysis.
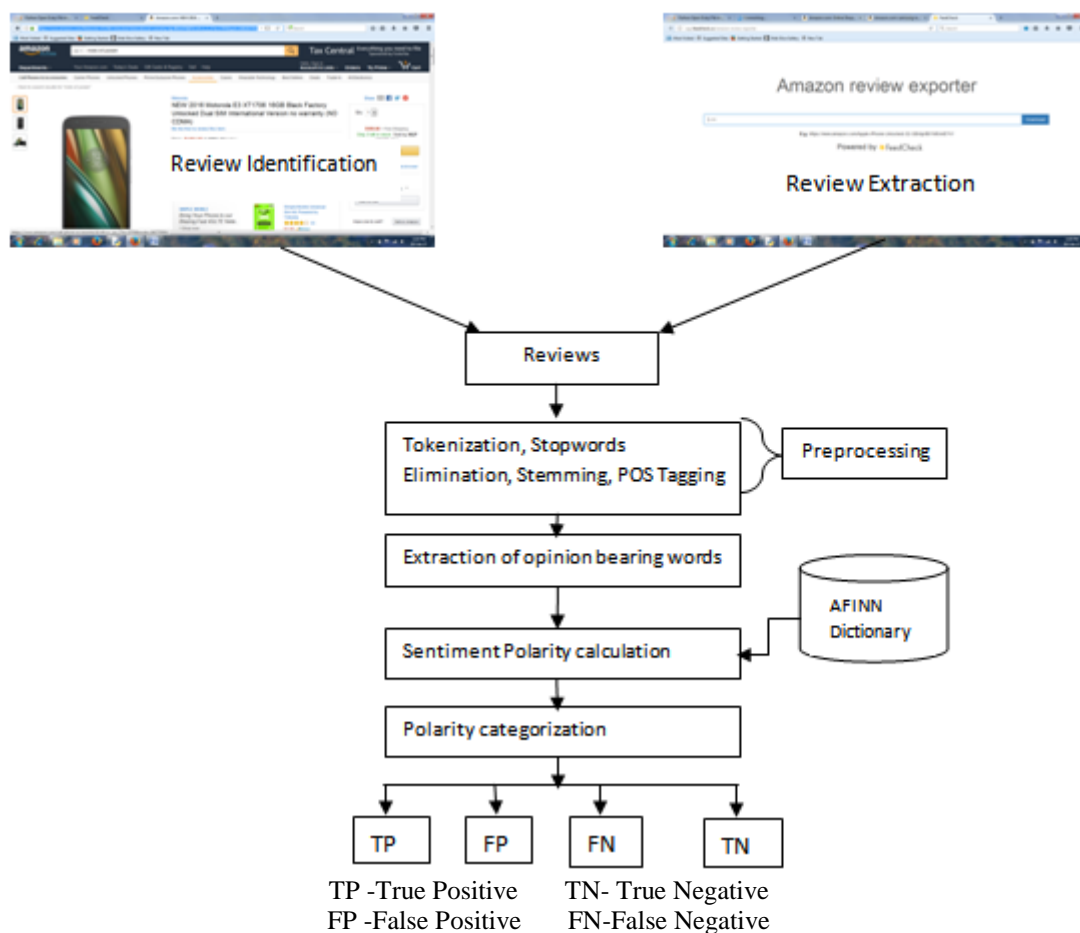
TP -True Positive   TN- True Negative
FP -False Positive   FN-False Negative
Fig. 1: System Architecture

3.1 Data collection

Data used is a set of product reviews collected from amazon.com on mobile phones.

3.2 Data Preprocessing

As the dataset is from Amazon.com, the data is in the form of text. The text data is highly prone to inconsistencies. This step is very important as it extract out unwanted words from tweets. To make the data more relevant for analysis, text preprocessing is performed.

3.2.1 Tokenization

The process of breaking a stream of text up into phrases, words, symbols, or other meaningful elements called tokens. The goal of the tokenization is the exploration of the words in a sentence.

3.2.2 Stopword Elimination

The most common words that unlikely to help text mining such as prepositions, articles, and pro-nouns can be considered as stopwords. Since every text document deals with these words which are not necessary for application of text mining. All these words are eliminated. A new list of stop words was created that eliminated only those words that did not contribute to opinion mining.

3.2.3 Stemming

Stemming also known as lemmatization is a technique for the reduction of words into their stems, base or root. Many words in the English language can be reduced to their base form or stem e.g. like, liking, likely, unlike belong to like. Porter stemmer algorithm is used to form root word for given input reviews and store it in text file.

3.2.4 POS Tagging:

The Part-Of-Speech of a word is a linguistic category that is defined by its syntactic or morphological behavior. Common POS categories in English grammar are: noun, verb, adjective, adverb, pronoun, preposition, conjunction, and interjection.POS tagging is the task of labeling each word in a sentence with its appropriate part of speech. POS tagging is an important phase of opinion mining, it is essential to determine the features and opinion words from the reviews.

3.3 Extraction of opinion bearing words in an around feature

First, a Set of opinion words (adjectives, as they are normally used to express opinions) is identified. If an adjective appears near a product feature in a sentence, then it is regarded as an opinion word.

3.4 Sentiment polarity calculation

Sentiment oriented words will have prior polarity which is obtained from AFINN dictionary. This dictionary is of about 2490 English language words assigns every word a score between -5 (Negative) and +5 (Positive).In this processing the extracted opinion bearing words will be compared with the words in AFINN dictionary. For classifying each review the corresponding weights of each opinion bearing words are counted. Sentiment polarities are divided into four categories like True positive & False positive And True negative & False negative.

3.5 Classifiers

Naive Bayes Classifier(NB):

Naive Bayes is a simple technique for constructing classifiers models that assign class labels to problem instances, represented as vectors of feature values, where the class labels are drawn from some finite set. Naive Bayes classifiers assume that the value of a particular feature is independent of the value of any other feature, given the class variable.

Support Vector Machine(SVM):

Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyper plane. In other words, given labeled training data, the algorithm outputs an optimal hyper plane which categorizes new examples.

Algorithm1:
Input: Document text X
Output: Sentiment being conveyed by each review in X

Algorithm Sentidetect (R , A)
Tokenize the Document text.
Divide X into its constituent paragraphs or sentences.
for each review R_i extract   opinion bearing words
for each paragraph/tweet R_i in X **do**
     pol[R_i]**<-0**
     for each Opinion Bearing word w in R_i **do**
       Tpos[w]<-positive value for word w in A
       Fpos[w]<-positive value for word w in A
       Tneg[w]<-positive value for word w in A
       Fneg[w]<-negative value for word w in A
       OBWSc<-pol[R_i]+pol[w]
If (OBWSc > = 2)Then
    Print " R conveys True Positive sentiment"
Else if (OBWSc = 2 or OBWSc = 1) Then
    Print"R conveys False Positive sentiment"
Else if (OBWSc= -2 or OBWSc = -1) Then
    Print"R conveys False Negative sentiment"
Else if (OBWSc >= -2) Then
    Print"R conveys True Negative sentiment"
 	
 * OBWSc –Opinion Bearing word Score

IV. Experimental Results

Experiments were performed on a dataset obtained by extracting product reviews from Amazon.com. We focused on the mobile phone domain. Considering reviews of one product at a time sentiment of the reviews were classified into four categories namely True positive, False positive, True negative, False negative. Using the proposed algorithm the results obtained for 500 product reviews were as follows:

1. 42% of reviews were classified as Truepositive.
2. 43% of reviews were classified as Falsepositive.
3. 2% of reviews were classified as Truenegative.
4. 10% of reviews were classified as Falsenegative.

V. Conclusion

Categorization of reviews assist the customers to make an informed choice on whether to buy a product or not based on its Truepositive,Falsepositive,Truenegative and Falsenegative points by reducing the time that they would have spent reading through a loads of reviews.The proposed approach in this paper tries to predict sentiments from reviews posted by users on the Amazon.com. The approach used a of lexicon based approach. It tries to evaluate each opinion bearing word on the basis of its intensity. It assigns a valence to words found in the tweets/paragraph using AFINN lexicon dataset. The SVM and Naïve Bayes classifiers are used for training and testing the various product reviews dataset.

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