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Evaluating Opinion Strength Using Rule-Based and Fuzzy Measure Approach

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Abstract - Recently opinion Analysis gives extensive contribution of Natural Language Processing (NLP) which promises with the computational measures of opinion, subjectivity and objectivity in the given sentimental text. Opinion analysis is the mechanism of extracting meaningful knowledge from the people's review opinions, appraisals and emotions toward specific entities, events and their respective attributes. Many times these opinions drastically make impact on consumers to choose their products and entities. Some users watch movies according to rating given by bunch of peoples. Thus, it is desired to develop an efficient and effective sentiment analysis system for product buyer and for movie reviewers based on bunch of people comments regarding that particular product or movie. Here we consider the positive, negative, neutral sentences along with some special sentences in which negations words occur or a sentence containing not only but also like structural composition in the sentences which change the meaning of total sentence. We found SentiWordNet dictionary to assigns sentiment scores to each sentiment word found in comments. Sentiment words are assigned three sentiment scores: Positivity, Negativity and Objectivity with a word which lies in between the range 0 to 1. The final opinion review prediction uses Rule-Based and Fuzzy measures approach and gives the final output.

Keywords - *SentiWordNet dictionary, Sentiment Analysis System, Natural Language Processing, Fuzzy measures, Web Opinion Minining*

1. Introduction

Today the Internet holds an enormous amount of textual data, which is also growing every day. The text is in ubiquitous format on the web, since it is easy to generate and publish. People communicate through online resources, discussion forums, groups and blogs. What is hard now-a-days is not accessibility of valuable information but rather extracting it in the appropriate context from the vast ocean of text content. It is now beyond human supremacy and time to see through it manually and therefore, the research problem of automatic categorization and organizing text is perceptible. Textual information on web can be separated into two main fields: facts and opinions. While facts focus on objective data transmission, the opinions express the sentiment of their person behind. Currently Google searches for facts and facts can be expressed with keywords; but Google search does not discover opinions, because opinions are hard to articulate with keywords.

SA is a "Web Opinion Mining", where the primary objective is to classify the opinions according to a variety and range. The boundaries on the range usually correspond to +ve or -ve feelings about a product or brand which in fact determines sentiment orientation of an individual or a group of people. Current ranking strategies are not appropriate for opinion mining. Primarily the research has mostly persistent on the classification of the text data. Sentiments are naturally subjective from individual to individual, and can be absolute illogical. It's critical to analyze relevant sample of data when attempting to measure sentiment. No particular data point is necessarily relevant. An individual's sentiment toward a brand or a product may be inclined by one or more mind and someone might have a terrible day and tweet a -ve remark about something they otherwise had a pretty neutral opinion.

With large enough samples, outliers are diluted in the aggregate. Also since sentiment are very likely to changes over the time according to a person's mood, world events, and so forth, it's usually important to look at data from the perspective of time. Like any other type of Natural

Language Processing (NLP) analysis, context matters, it's an incredibly difficult issue, sarcasm and other types of ironic language are inherently problematic for machines to detect when looked at in isolation. It's imperative to have a sufficiently sophisticated and rigorous enough approach that relevant context can be taken into account. That would require knowing a particular person is ironic, exaggerated or sarcastic which offers evidence to conclude whether or not a phrase is ironic.

The focus of the system is to analyze the sentiments for the movie reviews. The input is to be taken from the movie review sites and the social networking sites on which the comments are posted for the particular product or movie.

The SA is done by three methods i.e. Rule-Based approach, Machine-Learning and the Hybrid Approach of the two. Rule-Based is the manually created Rules approach. Machine-Learning give the more efficient approach as compared to the Rule-Based approach. The Hybrid Approach of both above specified approaches will give the more superior and filtered outcome of the analysis for the product or movie reviews.

2. Review

C. Hauff [5] provides the way to handle the negation words like no, neither, not, couldn't, etc words in the sentence. It might be possible that even if the negative words are present in the sentence still its meaning is positive or vice-versa. These types of situations are discussed in this paper appreciably.

A. Neviarouskaya categorizes a sentences using emotions like 'Anger', 'Disgust', 'Guilt', ', Fear', 'Interest',' Joy', 'Sadness' ('distress'), 'Shame' and 'Surprise' and last one is the neutral one. [7].

B. Tierney shows the outcome of SentiWordNet lexical resource for the problem like automatic sentiment classification of film reviews. It comprises counting +ve and -ve term scores to find exact sentiment orientation, and an improvement is presented by building a data set of relevant features using SentiWordNet as source, and applied to a machine learning classifier[8].

M. Thelwall provides much better hybrid knowledge for involving the Rule-Based and Support Vector Machines method for SA. This hybrid approach gives the maximum efficiency for analysis of sentiment based reviews [9].

P. Bhattacharyya also gives a technique for the effective SA of film reviews. It also provides a novel algorithmic approach to process the predictions for individual documents of the specific test dataset to improve the accuracy over the entire document set. It presented a WorldNet based method for the effective inclusion of linguistic information in the system without any kind of experts' intervention. It also presents a genuine generic method that can be used to improve the accuracy of classification over a specified test dataset in any kind of classification work. [11]

B. Pang gives idea about the Support Vector Machines technique related to opinion analysis. It also includes the other informative technique like Naive Bayes, Maximum entropy etc [12]

3. Implementation Framework

The development of a complete review or opinion mining application might involve attacking each of the following problems. If the application is integrated into a general-purpose search engine, then one would need to determine whether the user is in fact looking for subjective material. This may or may not be a difficult problem in and of it: perhaps queries of this type will tend to contain indicator terms like "review", "reviews", or "opinions", or perhaps the application would provide a "checkbox" to the user so that he or she could indicate directly that reviews are what are desired. Besides the still-open problem of determining which documents are topically relevant to an opinion-oriented query, an additional challenge we face in our new setting is simultaneously or subsequently determining which documents or portions of documents contain review-like or opinionated material. Sometimes this is relatively easy, as in texts fetched from review-aggregation sites in which review-oriented information is presented in relatively stereotyped format: examples include Epinions.com and Amazon.com. However, blogs also notoriously contain quite a bit of subjective content and thus are another obvious place to look and are more relevant than shopping sites for queries that concern politics, people, or other non-products, but the desired material within blogs can vary quite widely in content, style, presentation, and even level of grammaticality.

Once one has target documents in hand, one is still faced with the problem of identifying the overall sentiment expressed by these documents and/or the accurate opinions regarding particular features or aspects of the items or topics in question. Again, while some sites make this kind of extraction easier for e.g., user reviews posted to Yahoo! Movies must specify grades for predefined sets of distinctiveness of films more free-form text can be much harder for computers to analyze, and indeed can pose additional challenges; for e.g., if quotations are included in a newspaper article, care must be taken to attribute the views expressed in each quotation to the correct entity.

3.1 Rule Based Algorithm

Algorithm 1 Find the total count of sentences of the document.
Input: Annotated or sentiment review based document
Output: Total Count of Annotation present in the Document

1. **for** each annotated document **do**

$$\text{Count} = \sum_{I=0}^{N} \text{Annotation}$$

2. **End for.**
3. Output Total Count.

Algorithm 2 Find the average score of each annotation found in specific document
Input: List of sentiment words extracted from annotation document
Output: Sentiment score and Sentiment Review

1. **for** each sentiment word from List **do**
   Get an adjective, adverb polarity as well as sentiment scores using *SentiWordNet*.
2. Calculate the intensity of each word using fuzzy measure algorithm.
3. Final Sentiment Analysis Score (SAS)

$$\text{SAS} = \sum_{I=0}^{N} \frac{\text{Max(Polarity)}}{\text{Count}}$$

4. Output Sentiment Analysis Score.
5. Output Overall Sentiment Review.

3.2 Algorithm Fuzzy Intensity Finder

We calculate the weight of the extracted opinionated phrases as the weights of individual words in the phrases.

Case 1: There are few adverbs like very, really, extremely, simply, always, never, not, absolutely, highly, overall, truly, too, etc. (we imply 15 such adverbs) which may be used positively or negatively like {very good, very bad}, {extremely acceptable, extremely unacceptable}, {too good, too bad}, {simply outstanding, simply disgusting} etc.

Case 2: Again never, not etc. will change the orientation of the opinion like {not good will be bad} {never accepted will be always rejected} etc.

Case 3: Case 1 and Case 2 may also come together in opinion phrases like {not very good}, {not absolutely recommended}, {not truly reliable one} etc. We consider them accordingly in the calculation of fuzzy weights of opinion phrases.

Case 4: It is also possible that in some cases like {It is not only good but also it's an awesome} etc. appears in sentiments.

In Case 1, we consider the weight (W) of the opinion like (very /extremely/highly etc) (Adj)
$= \sqrt{\text{Value Of (Adj)}}$ if ValueOf(Adj) ≥ 0.5
$= (\text{Value Of (Adj)})^2$ if ValueOf(Adj) < 0.5

Table 1: Fuzzy Measure of (Adverb, Adjective) Phrases

Good	0.625	Very good	0.7906
Bad	0.25	Very bad	0.0625
Awesome	0.875	Simply Awesome	0.9354
Pathetic	0.375	Highly Pathetic	0.1406

In Case 2, we consider the weight (W) of the opinion like (not/never)(Adj /Verb)
= 1 - ValueOf(Adj/Verb)

Table 2: Fuzzy Measure of (Not/Never, Adjective) Phrases

Good	0.625	Not good	0.375
Bad	0.25	Not bad	0.75
Conclusive	1.0	Never Conclusive	0.0
Stunning	0.75	Never Stunning	0.25

In case 3, we consider the weight (W) of the opinion like (not/never) (very /extremely/highly etc)(Adj)
$= \sqrt{(A * B)}$
Where A = (very/extremely/highly etc) (Adj)
$= \sqrt{\text{Value Of (Adj)}}$ if ValueOf(Adj) ≥ 0.5
$= (\text{Value Of (Adj)})^2$ if ValueOf(Adj) < 0.5
And B = (not/never) (Adj)

Table 3: Fuzzy Measure of (Not, Adverb, Adjective) Phrases

Good	0.625	Not Good	0.375	Not Very Good	0.5445
Bad	0.25	Not Bad	0.75	Not Very Bad	0.2165

In case 4, we consider the weight (W) of the opinion like (but/also/nor) words. Firstly we divide the sentiment into two opinions group. Then these two opinions separately calculated as follows. Finally the average of both cases will be taken as a Fuzzy measure for the given sentence.

F= $\sqrt{(\sqrt{A} + \sqrt{B})/2}$ if ValueOf(Any Adj) ≥ 0.5

$F = ((A^2 + B^2)^2)/2$ if ValueOf(Both Adj) < 0.5

3.3 Results

Table 4: Fuzzy Measure of (But, Also) Phrases

Good	0.625	Awesome	0.875
$\sqrt{\text{Good}}$	0.7906	$\sqrt{\text{Awesome}}$	0.9354
This is a not only good but also awesome			0.9289
Bad	0.25	Pathetic	0.375
Bad^2	0.0625	Pathetic^2	0.1406
This is not only bad but it's pathetic			0.0206

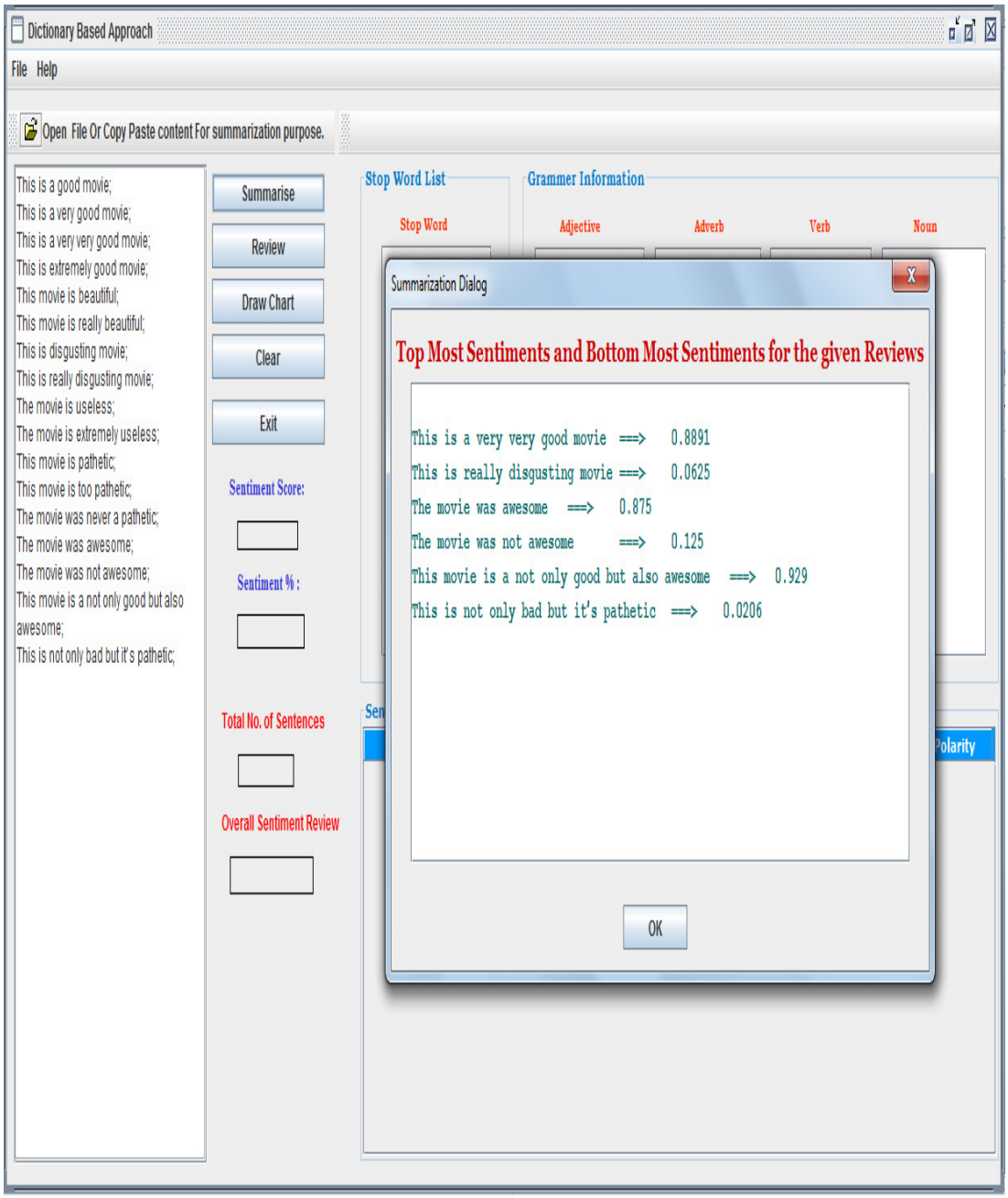

Figure 3: Summary for Topmost and Bottom Most Sentiments

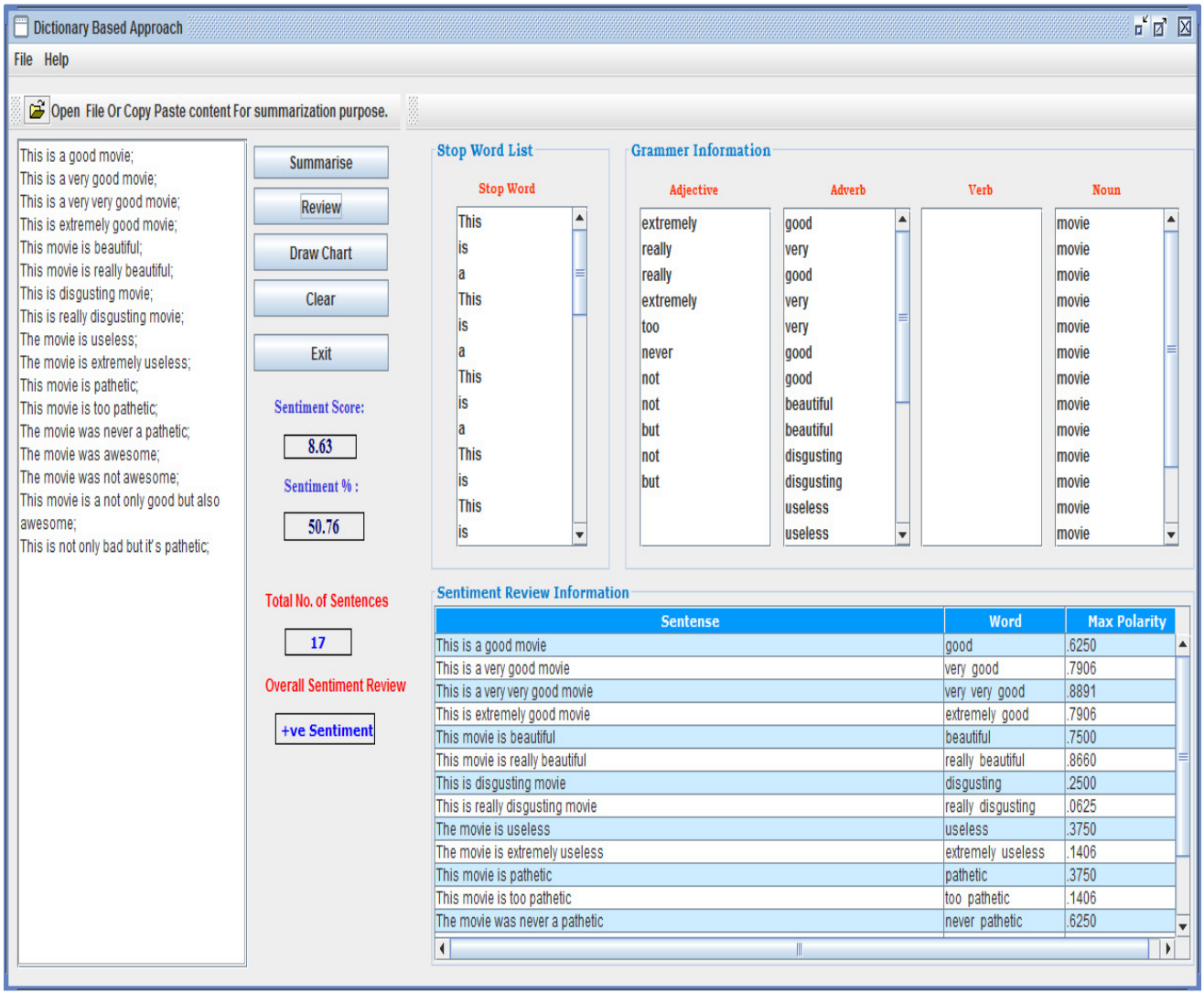

Figure 4: Preprocessing, Classification and POS tagging

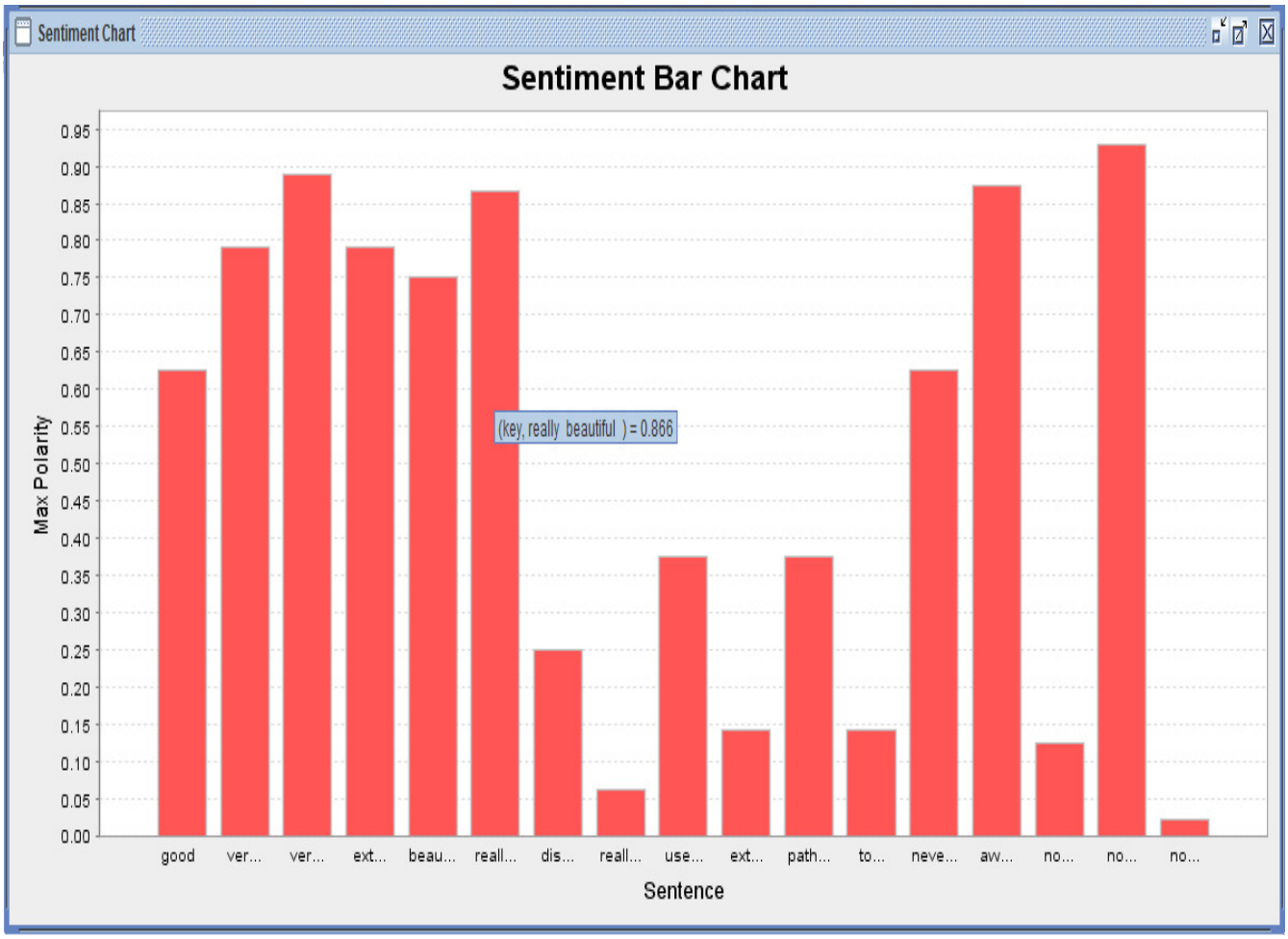

Figure 5**:** Fuzzy measure graph for SA

So, if the above value is positive (i.e. >= 50%) then, sentiment of document is positive, otherwise negative.
Here, sentiment of collective annotator over document is positive.

4. Advantages

- Here we take direct, unlimited, unbiased as well as real-time opinions of legitimate users.
- It provides cost effective approach of capturing user feedback.
- Uninterrupted with wide geographic reach, real time feedback.
- This approach provides much better reaction time for service and quality improvement for market.

5. Conclusions

Implementation of SA based system provides major benefits to improve current market strategies so that maximum benefits can be achieved by applying proper and market suitable strategies. The major opinions sources regarding film or any product are Web, Social Networking web-sites for instance Orkut, Facebook and Twitter and other many web services from where subject related information can be gathered.

There are various challenge, more companies and researchers are working in this area until one day it would be easy for users and companies to minimally obtain complete and wealthy summarized fact about the opinions from the web in order to uphold them in the decision making process in their daily life.

Our work gives idea regarding how document based sentiment analysis implementation can be done by applying rule based and fuzzy system to create decision making system .

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