Sentimental Analysis on Application Reviews on Educational Apps

Amandeep Kaur, Nidhi Gumber

***Abstract*- Today, very large amounts of information are available in online documents, and a growing portion of such information comes in the form of people's experiences and opinions. It would be helpful for companies, recommender systems, and review or editorial sites to automatically compile digests of such information. It has proven quite useful in such contexts to create summaries of people's experiences and opinions that consist of subjective expressions extracted from reviews. here we are developing an automated sentimental analysis program which will automatically analyze all the comments and give a concluded feedback. In this work an SVM based algorithm regression method for developing and normalizing evaluation rating of the educational application is used. A robust feature added is stop list. In the implementation we have used external comment files and each word in every comment is compared with the pre created word file according to naïve string search algorithm this process keeps on for every comment in the database and for every match score evaluated for both aspect-level and document-level is normalized with comparison to the normalized list and rating is generated from every comment. After this aggregated results are shown in pictorial form. This technique deals with the sentiments and textual comments given by the users.**

***Index Terms*— aspect level method, naive string search algorithm regression method, rating of keywords.**

I. INTRODUTION

Sentiment analysis aims to uncover the attitude of the user's on a particular application from the textual comments. Other terms used to denote this research area include "opinion mining" and "subjectivity detection". It uses natural language processing and machine learning techniques to find statistical and/or linguistic patterns in the text that reveal attitudes. It has gained popularity in recent years due to its immediate applicability in business environment, such as summarizing feedback from the product reviews, discovering collaborative recommendations, or assisting in election campaigns. Previous works focus on two important properties of text:

1.Subjectivity – whether the style of the sentence is subjective or objective.

2.Polarity – whether the author expresses positive or negative opinion.

Most prior work on the specific problem of categorizing expressly opinionated text has focused on the binary distinction of positive vs. negative (Turney, 2002; Pang, Lee, and Vaithyanathan, 2002; Dave, Lawrence, and Pennock, 2003; Yu and Hatzivassiloglou, 2003). But it is often helpful to have more information than this binary distinction provides, especially if one is ranking items by recommendation or comparing several reviewers' opinions: example applications include collaborative filtering and deciding which conference submissions to accept. Therefore, in this chapter we consider generalizing to finer-grained scales: rather than just determine whether a review is \thumbs up" or not.

We have used aspect-level method for sentimental analysis of textual comments. As this method gives the explored opinion about product .in this method firstly we decided four aspects related to educational apps and ratings for these aspect level keywords is obtained by normalizing evaluation ratings based on regression method and table for keywords and their corresponding values is created after that keywords based on linguistic features from input textual data is extracted and defined under these four aspects after that naïve string search algorithm is used for matching and for each matched keyword score is aggregated. After all these aggregation is shown in pictorial form.

Rest of paper is described as IIrd section contains all previous techniques of sentimental analysis, IIIth section describes the method which we have used for our work, IVth section shows results.

Manuscript received October 28, 2014.

II. RELATED WORK

As we have purposed a method for sentimental analysis is based on aspect level which also related to some other basic work which we are going to explained here.

A. NLP part –of-speech sentimental Analysis[4]

In this method SAS data miner 7.1 is used for data mining as input data is often short, contains non- grammer sentence and slags.for sentimental analysis SAS sentimental analysis studio used which have two modes one is rule based model and another is statistical model. In rule based model main keywords like product name and features are tagged as nouns. After that statistical model is built for rest part of speech tagging and learned features from first model is imported to start pos tagging and these keywords automatically matched with corpus directory. Then adverb (ADV), negative adjective (NEGADJ), positive adjective (POSADJ), verbs (VERB) are tagged different lists prepared for less or more positive negative sentences is prepared after all this CLASSIFIER rule is used to match term or phrase for features , CONCEPT rule to locate related terms and DIST_n is for no of matches from these matches weightage to rules is given after that positive and negative results are calculated.

B. Feature based heuiristic for aspect-level sentiment classification[1]

This method labels on aspect level is assigned to input text and scores on each aspect is aggregated and net profile of a product is generated on all parameters. In this method SentiWordNet based scheme with two different linguistic feature selection is used. This linguistic feature selection is combination of adjectives, adverbs verbs and n-grams. in this method algorithmic formulation is applied on both document-level analysis and aspect-level analysis as this algorithm firstly extract opinionated terms and lookup their scores in SentiWordNet. Use of SentiWordNet is difficult as a lot of decisions to taken regarding linguistic features to be used and weight to be given to these features so scores for each extracted word is obtained from SentiWordNet library. Then aggregation of scores gives the final results.

C. NLP techniques [6]

Two natural language processing techniques are used for sementic extraction from textual input one is linguistic patterns and second is extraction rules. Extraction rule is used to identify words in corpus we first extract noun phase then some difficult functionality i.e noun phrase and verb after that more extended functionality i.e noun phrase verb and preposition conjunctions etc but in linguistic patterns tagging is done on domain level are words related to domain is extracted so linguistic pattern gives more accurate results than extraction rules.

D. SVM machine learning technique [12]

*T*his technique gives subjective and objective opinion about text i.e. positive and negative opinion so this technique is not much useful in all scales.

As from all previous work aspect level or Domain level technique gives more accurate results so we have used this technique in our work

III. METHODOLOGY

Here we are matching certain predefined words with comments being mentioned by user of product. Every word or group of words has certain significance and grade accordingly in the formulation table of the data base .Every significant word make increase in the grade of product review in terms of following:

1. Quality
2. Usage
3. Graphics
4. Time to respond, etc.

Apart from previous work in our work for sentimental analysis of textual data we have used (regression) techniques to give scores and ratings to pre extracted keywords. As these scores are used to show graphical results at aspect level. For keyword matching NAVIE STRING SEARCH algorithm is used in our word.

In this we are searching for those particular words and grading it accordingly to the prescribed rating of that word .For that we need to follow certain steps which are described in Diagram below:

Steps of working are explained below as shown in figure1.

A. INPUT

Get the input from comment file.

In the first stage we get input from word from both predefined word list and comment file. So these are inputs now ready to be send to the stage of string matching.

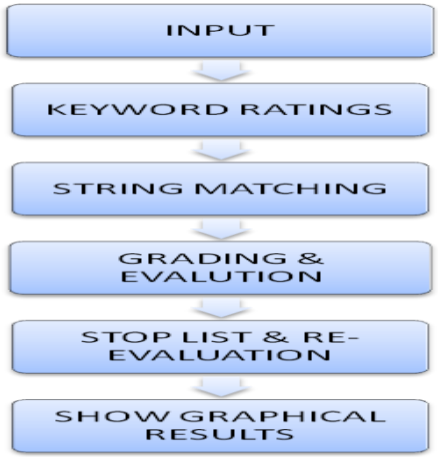

Figure1: Methodology

B. RATING

Here by ratings to keywords decided at aspect level is given. These ratings used to show sentimental analysis in graphical form. There are several methods to calculate ratings and provide them to keywords. But in our work we use **Regression Method of Normalization of Evaluating Rating.**

For the rating calculation of aspect words, we mainly make use of semantic orientation computation based on HowNet proposed by Zhu[13] and is typically reflected in formula (1).

$$SOsim(w)=Max(similarity(w, ti) \quad (1)$$

Where SOsim(W) denotes the rating value of w; ti standing for the ith word in string; similarity(w, ti) corresponds to the semantic similarity computation between words. We take the maximum similarity value among those calculated between target words and all baseline words as the target words' rating value.

We here are implementing the algorithm of regression to find the rating of an education based application. The rating of the any aspect is defined as; we can take a regression perspective by assuming that the labels come from a discretization of a continuous function g mapping from the feature space to a metric space. If we choose g from a family of sufficiently “gradual" functions, then similar items necessarily receive similar labels. In particular, we consider linear, "insensitive SVM regression”. Here applying linear regression to classify documents (in a different corpus than ours) with respect to a three-point rating scale. We compute aggregate up to nearest tens of number and take it as overall factor to calculate the value out of which rating is evaluated. Let us say if we have good keyword in document 49 times and keyword bad 40 times so we can take nearest tens of 50 .So, we have rating as 10 of word “good” and 8 rating in “bad” so overall rating is subtraction of two rating .This comes out to be 2 out of 10.

C. STRING MATCHING

In this stage string matching is being done on comment file word with all words of same length from the word list. For sting matching NAÏVE string search algorithm is used. The

word list here acts as predefined significant word list used to give rating to the product being used .The same procedure is being carried on all words of comment file. i.e. each and every word from comment file is being matched against word of word list. The basic principle of string matching to look out for words of same length in predefined wordlist. This makes our task easier to go for further stage of evaluation of rating for product.
Here pure half of task is being completed and move to the next stage.

D. GRADE EVALUATION

Grade Evaluation: In this stage, we are to process the evaluation of word being matched from our grade list. Each word in the list has its own significance in terms of grading .In fact group certain specific words in specific order also determine specific evaluation points for rating .so all grades of each word and group of predefined words is computed. The result grade evaluated is rating by user of products in different fields like Product usage, Interface, Knowledge, Quality, etc
For grade evaluation weighted formula is used.
Making use of the ratings generated, we can calculate fP_{ci} And fp_{ci} of each character emerging in string. fP_{ci} and foci respectively denote the frequencies of a character ci in the positive and negative words. Formulas (2) and (3) utilize the percentage of a character in positive/negative words to show its sentiment tendency.

$$P_{ci} = \frac{fp_{ci} / \sum_{j=1}^{n} fp_{cj}}{fp_{ci} / \sum_{j=1}^{n} fp_{cj} + fn_{ci} / \sum_{j=1}^{m} fn_{cj}} \quad (2)$$

$$N_{ci} = \frac{fn_{ci} / \sum_{j=1}^{m} fn_{cj}}{fp_{ci} / \sum_{j=1}^{n} fp_{cj} + fn_{ci} / \sum_{j=1}^{m} fn_{cj}} \quad (3)$$

Pc_i and Nci respectively denote the weights of ci as positive and negative characters; n and m respectively denote total number of unique characters in positive and negative words. The difference of Pci and Nci, i.e., Pci-Nci in Formula (4), determines the sentiment tendency of character ci. If it is a positive value, then this character appears more times in positive words and vice versa. A value close to 0 means that it is not a sentiment character or it is a neutral sentiment character.

$$S_{ci} = (P_{ci} - N_{ci}) \quad (4)$$

In this way, when expanding the polarity lexicon, average rating value of each character of new words is calculated which reflects as formula (5), where n stands for the character number of word w. If some characters without rating value appear, take the default value as zero.

$$SO_{character}(w) = \frac{\sum_{j=1}^{m} Scj}{n} \quad (5)$$

In this way grade evaluation is done. Store these values to show graphical results.

E. RE MATCHING WITH STOP LIST

Re matching with stop list: Whenever there is change in the comment file, it undergoes same procedure and stages of String matching and grade evaluation .This makes it dynamic and accurate enough to measure performance of product .In this way, High rating evaluation could easily be done.
Stop list is new feature added in our work. In stop list irrelevant words to aspect level words are extracted from sting before apply grade evaluation formula and with this feature processing become faster and it gives good results in less time. So this key feature is here added for fast processing.

F. SHOW GRAPHICAL RESULTS

After all this process results for sentimental analysis is shown in graphical form.
Here to find no of comments can be seen as:

$$Score_t = count_t(pos.word)+(neg.word) \quad (6)$$

Where SOsim(W) denotes the polarity value of w; ti standing for the ith word in polarity lexicon; similarity(w, ti) corresponds to the semantic similarity computation between words. This overall count is taken by adding both positive and negative comments together for an application. We take the maximum similarity value among those calculated between target words and all baseline words as the target word's rating value.

IV. RESULTS

Results generated from whole process are given below and these results are shown for variation in no of comments. The result grade evaluated is rating by user of products in different fields like Product usage, Interface, Knowledge, Quality, etc

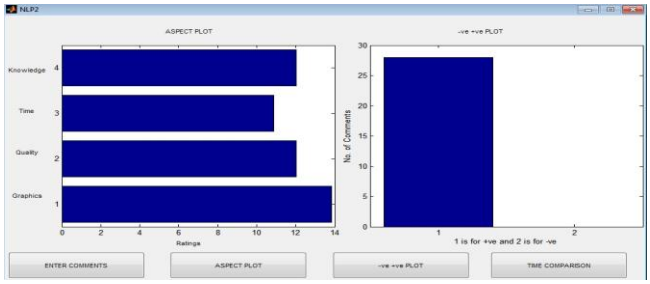

Figure 2: Results for all positive comments

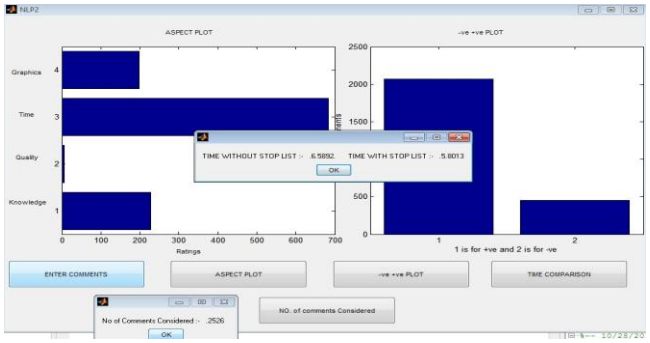

Figure 3: Results for approximately 2500 comments

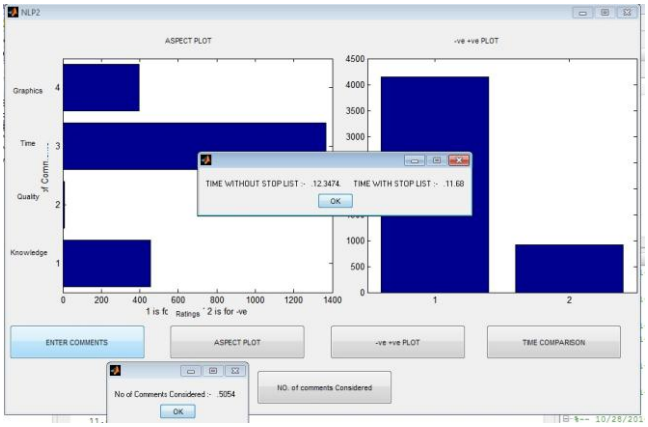

Figure 4: Results for 5000 comments

After evaluating these all results summary of time comparison is shown in table 1.

Table 1 Time Comparison table

No. of comments	Time taken without stop list (in secs)	Time taken with stop list (in secs)
1000	.5.567	.5.408
2500	.6.5892	.5.8013
5000	.12.3474	.11.08

This table shows the time comparison between two sentimental analysis systems this shows that sentimental analysis system with stop list is much better because it reduces time for processing. As results shows aggregate time for old system is 1.22 approx and for new system with stop list is 1.11 so difference between time taken by two systems is 0.11. This shows system with stop list is better than old system.

VI. CONCLUSION

Sentimental analysis is used in wide range of applications like classifying reviews, summarizing reviews and other real time applications. From our research work we conclude that aspect level scheme for sentimental analysis is very useful as this method gives detail results about application and product reviews based on different domains. Another researcher also satisfied the thing that Aspect level scheme and linguistic patterns approaches are very useful as these gives accuracy result 98.9% [3].

From the above work it is evident that neither classification model consistently outperforms the other, different types of features have distinct distributions. It is also found that different types of features and classification algorithms are combined in an efficient way in order to overcome their individual drawbacks and benefit from each other's merits, and finally enhance the sentiment classification performance. Stop list new added feature enhance the performance of sentimental analysis system very accurately as results shows aggregate time for old system is 1.22 approx and for new system with stop list is 1.11 so difference between time taken by two systems is 0.11. This shows system with stop list is **better than old system.**

In future work performance measures can be further enhanced. Sentiment analysis can be applied on different range of applications as our work is on educational apps.The main challenging aspects exist in use of other languages, dealing with negation expressions; produce a summary of opinions based on product features/attributes, complexity of sentence/ document, handling of implicit product features etc.

ACKNOWLEDGEMENT

It is with deep sense of gratitude and reverence that I express my sincere thanks to my supervisor Er. Nidhi Gumber for her guidance, encouragement, help and valuable suggestions throughout. Her untiring and painstaking efforts, methodical approach and individual help made it possible for me to complete this work in time. I consider myself very fortunate for having been associated with a scholar like her. Her kindness and scientific approach served a veritable incentive for completion of this work.

REFERENCES

[1] V.K Singh, R.Pirayani, A. Uddin & P. Walia "Sentiment Analysis of Movie Reviews"IEEE,978-1-4673-5090-7/13, 2013.

[2] Meena Rambocas , João Gam, "Marketing Research : The Role of Sentimental", FEP research papers, ISSN: 0870-8541, n. 489, April 2013.

[3] Rudy Prabowo1, Mike Thelwall Sentiment Aalysis: A CombinedApproach, 2012

[4]Jiawen Liu,Mantosh Kumar Sarkar & Goutam Chakraborty,"Feature-based Sentiment Analysis on Android App Reviews Using SAS® Text Miner and SAS® Sentiment Analysis Studio", SAS Globol Forum,2013.

[5] Ming Liu, Rafael A. Calvo & Luiz Augusto Pizzato"Using Wikipedia and Conceptual Graph Structures to generate Questions for academic writing support", IEEE tractions on learning technologies, VOL. 5, NO. 3, july-september 2012.

[6] Maricela bravo, alejandro Reyes, "Natural Language Processing Techniques for Extraction of Semantic Information in Web Services", IEEE,987-0-7695-3441-1/08, 2008.

[7] P. Waila, Marisha, V.K. Singh & M.K. Singh, "Evaluating Machine Learning and Unsupervised Semantic Orientation Approaches for Sentiment Analysis of Textual Reviews", Proceedings of International Conference on Computational Intelligence and Computing Research, Coimbatore, India, Dec. 2012.

[8] V. K. Singh, P. Waila, Marisha, R. Piryani & A. Uddin, "Sentiment Analysis of Textual Reviews: Evaluating Machine Learning, Unsupervised and SentiWordNet Approaches", In Proceedings of 5th International Conference of Knowledge and Smart Technologies, Burapha University, Thailand, Jan. 2013.

[9] Yi and Niblack, "Sentiment Mining in Web Fountain",Proceedings of 21st international Conference on Data Engineering, pp. 1073-1083, Washington DC,2005

[10] Yongyong Zhail, Yanxiang Chenl, Xuegang Hu, "Extracting Opinion Features in Sentiment Patterns" , International Conference on Information, Networking and Automation (ICINA),2010.

[11] Pang, B. & Lee, L. Seeing stars: exploiting class relationships for sentiment categorization with respect to rating scales. In Proceedings of the 43rd annual meeting of the Association for ComputationalLinguistics (ACL), June 25–30 (pp. 115–124). University ofMichigan, USA, 2005.

[12] Bin Wen, Ping Fan, Wenhua Dai, Ling Ding "Research on Analyzing Sentiment Of Texts Based on Sementic Comprehension" 978-1-4799-2860-6/13/IEEE,2013.

[l3] Y. L. Zhu, J. Min, Y. Q. Zhou, and X. J. Huang, "Semantic orientation computing based on HowNet," Journal of Chinese Information Processing, vol. 20, no. 1. pp. 14-20,2006.

[l4] L. W. Ku, Y. T. Liang, and H. H. Chen, "Opinion extraction, summarization and tracking in news and blog corpora," Boston, Massachusetts, AAAI'2006, pp. 100-107,2006.