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Review Classification by using word Embedding, Neural Network& TF-IDF

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Abstract: Review plays an important role for consumer as well as for manufacturer, seller so this reviews are needed to be analyzed in such a manner so that it can give better results for effective usage the reviews data is huge so to analyzethis data there are various types of techniques to be analyzed this review data. This paper studies various approaches & techniques to analyze the data & word embedding is also studied . A system is proposed to use Neural network, word embedding for review classification.

Index Terms–Word Embedding, Classification, Neural Network, Machine Learning, TF-IDF.

I. INTRODUCTION

As in modern world data is most essential thing for people as well as to the tech jints. The more the data the more the information this information can be in various form images, videos, text, documents, archives etc. As the internet speed & connectivity increases the data will be flowing with the greater speed as compared to the previous times. This data can be used to analyse the patterns in it so by recognizing that this can be used to solve the problem or for drawing conclusions from data. Suppose consider to the reviews: that comes in our day to day life it a thoughtful way of expressing feelings or someone view on anything. If we consider it in the forms of consumer & product provider then this reviews play an important part for both the product provider will get to know how my product is doing & what are drawbacks of my product that needs to be overcome in the upcoming time & consumer can express his opinion on the product with the help of reviews. That same reviews provided by consumers will help other consumer whether to go for this product. It is same as getting opinion on product from bunch of people. So this huge amount of reviews data needs to be classified in such a way so that form which conclusions can be drawn which will help the product provider with their next releases. In that releases they would try to rectify the mistakes that happened previously.

As we know in our day to day life when we need to buy new product or use new services that time we try to get knowledge about that from the existing user like friend, family, relative, etc. so in this process we are trying to understand whether users are satisfied what are pitfalls of using what are usefulness of this. we try to analyze or exciting user try to analyze & explain it to us that same can be done for fewer reviews but for huge amount of reviews it's not possible to categorized & analyze the reviews, so for that the companies use various types of different techniques. That techniques can be various methodologies. Which are as follows

1. Artificial Neural Network
2. Machine learning
3. Various classifications algorithms

App stores square measure digital distribution platforms that enable users to transfer and rate mobile apps. Notable distribution platforms for mobile devices embody Apple and Android app stores, during which users will comment and write reviews of the mobile apps they're victimization. These reviews function a communication between developers and users wherever users will offer relevant data to guide app developers in accomplishing many package maintenance and evolution tasks, like the implementation of latest options, bug fixing, or the development of existing options or functionalities. App developers pay appreciable effort in aggregation and exploiting user feedback to boost user satisfaction. Previous work [10] has shown that more or less one third of the knowledge contained in user reviews is useful for developers. However, processing, analysing and choosing helpful user feedback presents many challenges. 1st of all, app stores embody a considerable body of reviews, which needs an oversized quantity of effort to manually analyse and method. which well-liked apps, like Facebook, received on the average four, thousands of reviews per day. to boot, users typically offer their feedback in sort of unstructured text that's tough to break down and analyze. Thus, developers and analysts got to browse a large amount of textual data to become aware of the comments and needs of their users [10]. In addition, the quality of reviews varies greatly, from useful reviews providing ideas for improvement or describing specific issues to generic praises and complaints (e.g. “You have to be stupid to program this app”, “I love it!”, “this app is useless”).

Binary classifier type as well as Multiclass classifier types.

II. Literature survey :

The text classification domain, victimization completely different approaches and introducing some new techniques during this field. The study [9] works on app review classification victimization ensemble algorithms and techniques. The dataset employed in the study was antecedently examined in [3], the dataset contains reviews from Apple’s app store and also the Google Play app store. within the study [9], the authors used NB, SVM, LR, and neural network (NN) in varied mixtures for classification. They designed 3 ensemble algorithms A, B, and C. In ensemble A, four classifiers, NB, SVM, LR, and NN, were classified for final prediction; in ensemble B, 3 classifiers, SVM, LR, and NN, were classified, and in ensemble C, the 2 classifiers NB and SVM were classified. the simplest performers from these individual and ensembles algorithms were LR and NN. This study additionally used ensemble models, like RF and AC, that work with numbers of base learners (decision trees) to create final predictions. In another analysis [4], text analysis was performed for mobile app feature requests. They designed MARA (mobile app review analyzer), a example for automatic retrieval of mobile app feature requests from on-line reviews. MARA takes review content as input for feature request mining. The feature request mining rule uses a collection of linguistic rules, that are outlined for supporting the identification of sentences that indicate such requests. The linear discriminant analyser model was accustomed determine topics which will be related to these requests in user reviews.

They used true positive (TP), false positive (FP), true negative (TN), false negative (FN), precision, recall, and Matthews correlation coefficient as evaluation metrics to check the accuracy of the algorithm. Researchers perform analysis on app reviews to facilitate app developers in finding out whether their customers are happy are not, which is also a goal of this study. In study [10], researchers tried to help mobile app developers by performing analysis on user reviews to categorize information that is important for app maintenance and evolution. For classification purposes, they deduced a taxonomy of user review categories that are relevant to app maintenance. The authors merged three techniques, natural language processing, text analysis, and sentiment analysis. By merging these techniques, they achieved desirable results in terms of precision and recall (Precision Score 74% and Recall Score 73%). They also applied these techniques individually to classify user reviews. In another study [11], the authors tried to extract the values of comparison scores of sentiment reviews using different feature extraction techniques, such as word2vec, word2doc, and TF-IDF, with SVM, NB, and decision tree algorithms. In study [11], the authors used grid search algorithms for parameter optimization of machine learning algorithms and feature extraction methods.

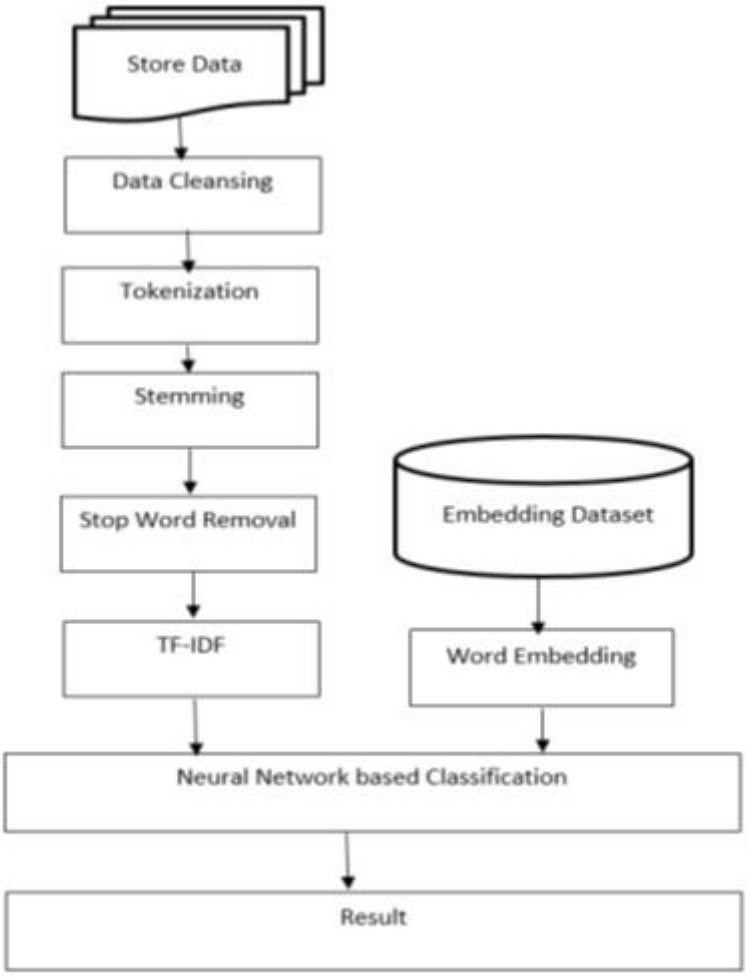
In the paper of Ensemble Methods for App Review Classification: An Approach for Software Evolution the researchers are Emitza Guzman, Muhammad El-Halaby, Bernd Bruegge [1] have categorized in below given manner The definition of taxonomy relies on the classes found in a very previous study [4] that manually analyzed the content of app store user reviews. For the event of their taxonomy, 2 of the authors manually annotated the relevancy to software system evolution of every antecedently outlined class. Overall, nine of the first classes were thought-about relevant for software system evolution. classes were deemed as

necessary for software system evolution once they gave info concerning aspects of the app that required to be improved or enforced. in addition, classes that highlighted the app options or practicality that satisfy users were conjointly contemplated as relevant to software system evolution as a result of they thought-about that this info notifies developers concerning aspects of the app that area unit necessary for users and concerning options that area unit being actively used [14].Ttend to thought-about general praise and criticism as classes relevant to software system evolution as a result of they provide info concerning the user acceptance and this information would possibly have an effect on software system evolution. They renamed a number of the first classes into terms they thought-about additional descriptive and changed a number of the previous definitions for higher clarity throughout the annotation of truth set The taxonomy they have arrived at consists of the 7 categories

III. Methodology :

For to get reviews classified the methodology for that will be by using the TF-IDF, word embedding , Neural Network

1. Data Cleaning
2. TF-IDF
3. Neural Network Classifier
4. Word Embedding



1. **User section**

   The user can register and login to system by using the registered credentials. So after logged in the user can view the different apps he can open that apps. & can view reviews for each apps. The reviews that can be seen by user are classified with the help of neural network classifier.

2. **Admin Section**

Here Admin also need to do login by using the credentials. And admin can see all the apps reviews and have other privileges. Here admin have all the control over app which app needs be discontinued like that. Admin can trigger the classification process by using the reviews classification function.

2.1 Data Pre-processing

Here the data pre-processing of the reviews will get completed. In data pre-processing their are different parameters or techniques that needs to be implemented in this as given bellow.

1. **Data cleaning** : Here in the data cleaning process the reviews special symbols or emojies will be cleaned out from sentences and the new sentence without emojies will be generated.

Data Cleansing

	Review	Review Cleansing
1	I used this App to help me get right size charts until i changed my Theme&needed things fixed .There has been no response in the last 4 Weeks despite me writing several E-mails. What a pitty :(I hope you reply to this Review. I will give you one last chance to respond.	I used this App to help me get right size charts until i changed my Theme&needed things fixed .There has been no response in the last 4 Weeks despite me writing several E-mails. What a pitty I hope you reply to this Review. I will give you one last chance to respond.
2	Testing out the free plan and we have had a really satisfying experience. Will surely recommend to all.	Testing out the free plan and we have had a really satisfying experience. Will surely recommend to all.
3	I wish I could leave a good review because it looks like a nice app but unfortunately after I have installed it a few days ago I am still having an issue on mobile and iPad version... i tried to get in touch with support and as of today I still did not get any answer... now my 3 days trial is over and I guessed I will be charge for an app that simply did not work as expected... waste of money and waste of time...	I wish I could leave a good review because it looks like a nice app but unfortunately after I have installed it a few days ago I am still having an issue on mobile and iPad version. i tried to get in touch with support and as of today I still did not get any answer. now my 3 days trial is over and I guessed I will be charge for an app that simply did not work as expected. waste of money and waste of time.

Fig. Data cleaning of reviews

2. **Removal of stop word** : Here in this technique the words that are repeatedly used for sentence creation that are going to be deleted in this type. Words like is, the, am, are, was , were, this , that, a, an, this types of words will be removed from the sentences. And stop word free sentence is created

	Processed Review	Stop Words Removal
1	I used this App to help me get right size charts until i changed my Theme&needed things fixed .There has been no response in the last 4 Weeks despite me writing several E-mails. What a pitty I hope you reply to this Review. I will give you one last chance to respond.	used app help get right size charts changed theme&needed things fixed no response last 4 weeks despite writing several emails pitty hope reply review will give one last chance respond
2	Testing out the free plan and we have had a really satisfying experience. Will surely recommend to all.	testing free plan really satisfying experience will surely recommend
3	I wish I could leave a good review because it looks like a nice app but unfortunately after I have installed it a few days ago I am still having an issue on mobile and iPad version. i tried to get in touch with support and as of today I still did not get any answer. now my 3 days trial is over and I guessed I will be charge for an app that simply did not work as expected. waste of money and waste of time.	wish leave good review looks like nice app unfortunately installed days ago still issue mobile ipad version tried get touch support today still not get answer now 3 days trial guessed will charge app simply not work expected waste money waste time
4	This app is unique and fully meets our needs. Excellent support team. Strongly recommend it.	app unique fully meets needs excellent support team strongly recommend
5	This app is absolutely perfectly design and super easy to use. Feels like made in Germany or Switzerland. Everything is customizable and yet its so easy to use. The free version is limited to 5 Questions which is totally fine to test it. Theres nothing I didnt like about it.	app absolutely perfectly design super easy use feels like made germany switzerland everything customizable yet easy use free version limited 5 questions totally fine test theres nothing didnt like

3. **Stemming** : It is one of the types of technique to get to the stem word of any particular word so here suppose I have a word like motivation , motivating, motivated so the stem word of this all word will be motivate like that the all words are going to be analysed and get assigned to their particular stem words
4. **Part of speech tagging** : In this techniques we are going to find words and their part of speech like adverb , noun, pronoun, adjective etc. That we are going to find in between the words.

	Processed Review	POS Tagging
1	I used this App to help me get right size charts until i changed my Theme&needed things fixed .There has been no response in the last 4 Weeks despite me writing several E-mails. What a pitty I hope you reply to this Review. I will give you one last chance to respond.	nsubj(used-2, I-1) nsubj(get-8, me-7) amod(charts-11, right-9) nsubj(changed-14, i-13) nsubj(fixed-20, Theme-16) amod(things-19, needed-18)amod(Weeks-10, last-8) amod(E-mails-15, several-14)nsubj(give-12, pitty-3) nsubj(hope-5, I-4) nsubj(reply-7, you-6) amod(chance-16, last-15)
2	Testing out the free plan and we have had a really satisfying experience. Will surely recommend to all.	amod(plan-5, free-4) nsubj(had-9, we-7) advmod(satisfying-12, really-11) amod(experience-13, satisfying-12)advmod(recommend-3, surely-2)
3	I wish I could leave a good review because it looks like a nice app but unfortunately after I have installed it a few days ago I am still having an issue on mobile and iPad version. i tried to get in touch with support and as of today I still did not get any answer. now my 3 days trial is over and I guessed I will be charge for an app that simply did not work as expected. waste of money and waste of time.	nsubj(wish-2, I-1) nsubj(leave-5, I-3) amod(review-8, good-7) nsubj(looks-11, it-10) amod(app-15, nice-14) advmod(installed-21, unfortunately-17) nsubj(installed-21, I-19) amod(days-25, few-24) advmod(having-30, ago-26) nsubj(having-30, I-27) advmod(having-30, still-29) amod(version-37, mobile-34)nsubj(tried-2, i-1) nsubj(get-17, I-13) advmod(get-17, still-14)advmod(is-6, now-1) amod(trial-5, days-4) nsubj(is-6, trial-5) advmod(is-6, over-7) nsubj(guessed-10, I-9) nsubj(charge-14, I-11) nsubj(work-22, that-18) advmod(work-22, simply-19)
4	This app is unique and fully meets our needs. Excellent support team. Strongly recommend it.	nsubj(unique-4, app-2) advmod(meets-7, fully-6)amod(team-3, Excellent-1)advmod(recommend-2, Strongly-1)

2.2 TF-IDF calculations

In this the TF-IDF score for words are going to be calculated over here with the help of the TF-IDF formula. The formula for calculating the TF-IDF will be as given bellow

$$TF = \frac{\text{No. of repetitions of words in sentence}}{\text{No. of words in sentence}}$$

$$IDF = \log\left(\frac{\text{No. of sentences}}{\text{No. of sentences containing words}}\right)$$

Finally, TF*IDF

Here in Tf-Idf the term frequency is calculated separate & inverse document frequency is calculated separately and then both values are get multiplied. So in this way we checking that how many times the terms are repeating and is that term is valuable or not that we are going to check in this.

2.3 Word Embedding

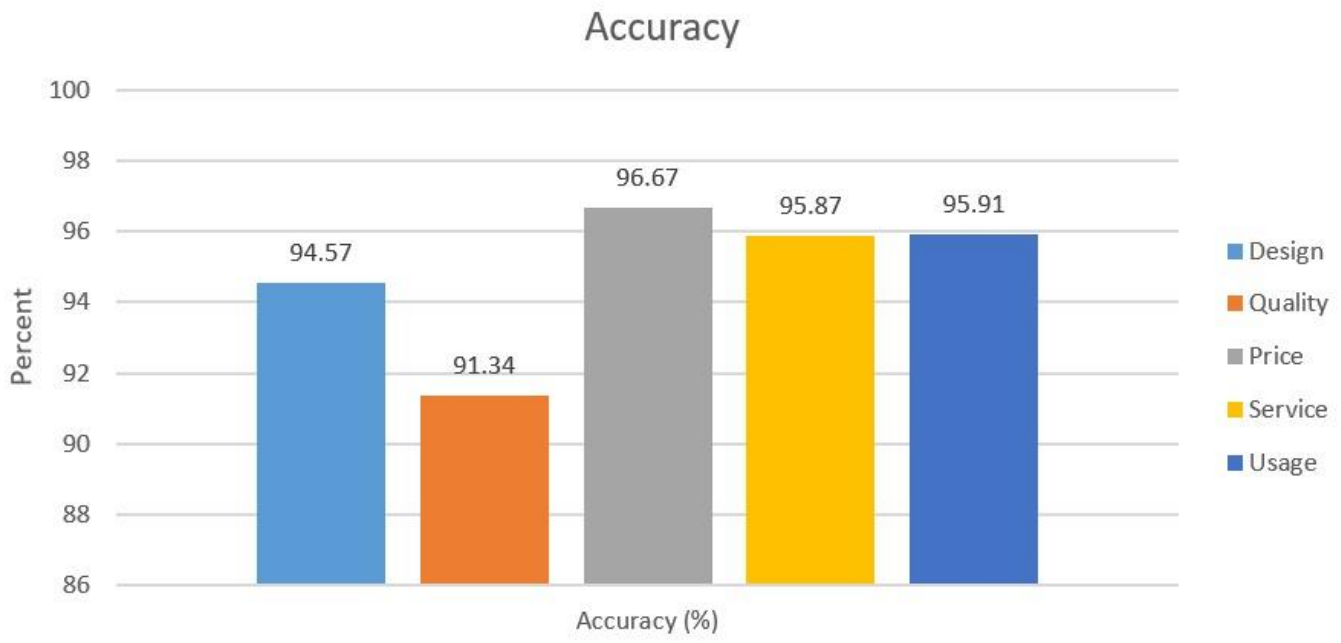
Word embedding is one of techniques by using the embedded dataset the word embedding data can be used. The words are converted to numbers by using the word embedding. Here embedded dataset is their which is use to give the values to the words.

2.4 Neural Network Classifier

Neural network classifier means all the features that are selected for the categorisation and with the help of some features the neural network model is going to predict for all other respective reviews. So the neural network consist of three main types of layer first is the input layer, second is hidden layer, third is output layer & all working of the neural network model is done with the help of the numeric format. So here weights are assigned with each nodes and on the basis of that interconnections and calculations are done & actual output result is get matched with the expected output & this whole process we can say that it is the neural network classification.

IV. Results

The result of the system is measured by the parameters Recall, Precision, F-Measure & Accuracy. As shown in the bellow given fig. The accuracy of the system is better above ninety percent in almost all categories



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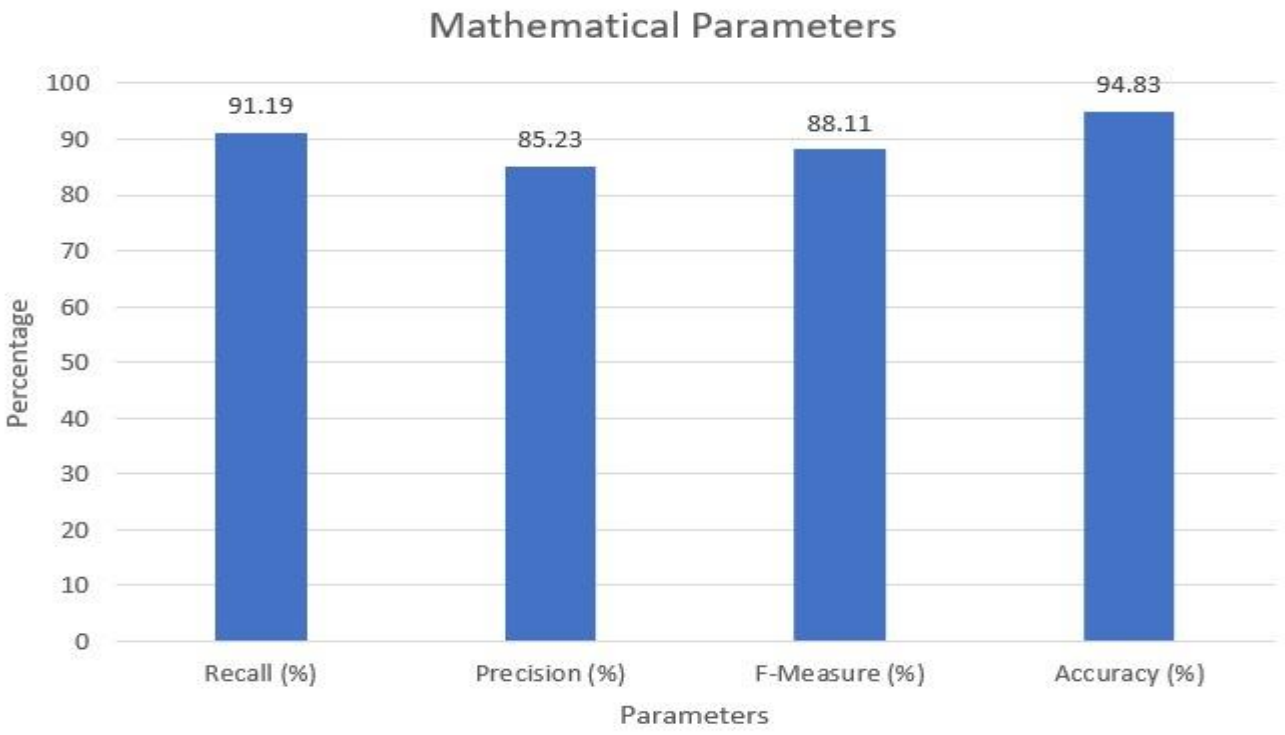

V. Conclusion :

Classification of review can be done by using neural network in the methodology. Used various factors in studying all this methodology. The methodology is resulting better. There are various feature scope to this studies. As deep learning is the new possibilities for problem to solve in a better ways. This system gives better accuracy above ninety percent. The feature scope to this system are excellent as compiles to gives a better results.

References

[1] E. Guzman, M. El-Haliby, and B. Bruegge, ‘‘Ensemble methods for app review classification: An approach for software evolution (N),’’ in Proc. 30th IEEE/ACM Int. Conf. Automat. Softw. Eng. (ASE), Nov. 2015, pp. 771–776.
[2] S. Panichella, A. Di Sorbo, E. Guzman, C. A. Visaggio, G. Canfora, and H. C. Gall, ‘‘How can I improve my app? Classifying user reviews for software maintenance and evolution,’’ in Proc. IEEE Int. Conf. Softw. Maintenance Evol. (ICSME), Sep. 2015, pp. 281–290.
[3] S. M. Isa, R. Suwandi, and Y. P. Andrean, Optimizing the Hyperparameter of Feature Extraction and Machine Learning Classification Algorithms. London, U.K.: The Science and Information Organization, 2019.
[4] F. Rustam, I. Ashraf, A. Mehmood, S. Ullah, and G. Choi, ‘‘Tweets classification on the base of sentiments for US airline companies,’’ Entropy, vol. 21, no. 11, p. 1078, Nov. 2019.
[5] V. Svetnik, A. Liaw, C. Tong, J. C. Culberson, R. P. Sheridan, and B. P. Feuston, ‘‘Random forest: A classification and regression tool for compound classification and QSAR modeling,’’ J. Chem. Inf. Comput. Sci., vol. 43, no. 6, pp. 1947–1958, Nov. 2003.
[6] F. F. Bocca and L. H. A. Rodrigues, ‘‘The effect of tuning, feature engineering, and feature selection in data mining applied to rainfed sugarcane yield modelling,’’ Comput. Electron. Agricult., vol. 128, pp. 67–76, Oct. 2016.Reinald Kim Amplayo and Seung-won Hwang, “Aspect Sentiment Model for Micro Reviews”, 2017 IEEE International Conference on Data Mining.
[7] Kim Schouten and Flavius Frasincar, “Survey on Aspect-Level Sentiment Analysis”, IEEE Transactions on Knowledge and Data Engineering, VOL. 28, NO. 3, MARCH 2016.
[8] M. Hu and B. Liu, “Mining opinion features in customer reviews,” in Proc. 19th Nat. Conf. Artif. Intell., 2004, pp. 755–760.
[9] M. Hu and B. Liu, “Mining and summarizing customer reviews,” in Proc. 10th ACM SIGKDD Int. Conf. Knowl. Discovery Data Mining, 2004, pp. 168–177.

[10] C. Long, J. Zhang, and X. Zhut, "A review selection approach for accurate feature rating estimation," in Proc. 23rd Int. Conf. Comput. Linguistics, 2010, pp. 766–774.
[11] Z. Hai, K. Chang, and J.-J. Kim, "Implicit feature identification via co-occurrence association rule mining," in Proc. 12th Int. Conf. Comput. Linguistics Intell. Text Process. 2011, vol. 6608, pp. 393–404.
[12] B. Liu, M. Hu, and J. Cheng, "Opinion observer: Analyzing and comparing opinions on the web," in Proc. 14th Int. Conf. World Wide Web, 2005, pp. 342–351.
[13] Z. Li, M. Zhang, S. Ma, B. Zhou, and Y. Sun, "Automatic extraction for product feature words from comments on the web," in Proc. 5th Asia Inf. Retrieval Symp. Inf. Retrieval Technol., 2009, pp. 112–123.
[14] Y. Zhao, B. Qin, S. Hu, and T. Liu, "Generalizing syntactic structures for product attribute candidate extraction," in Proc. Conf. North Am. Chapter Assoc. Comput. Linguistics: Human Lang. Technol., 2010, pp. 377–380.
[15] G. Qiu, B. Liu, J. Bu, and C. Chen, "Expanding domain sentiment lexicon through double propagation," in Proc. 21st Int. Joint Conf. Artif. Intell., 2009, pp. 1199–1204