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Sentiment Analysis Methods and Approaches: A Survey

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Abstract: *Opinion of individuals and their involvement is key facts in decision making process. It's a computational study of people's attitude, emotions, opinion etc. The development of social media and the large volume of data created by them, has led many researchers to learn the likelihood of their utilization in order to find unknown facts. Mining the valuable content from these opinion sources becomes a challenging job. These decisions can range from buying a product such as laptop to reviewing the movie, all the decisions will have a massive influence on the daily life. In sentiment Analysis has various issues such as accuracy related issues, Binary Classification problem, Data sparsity problem and Polarity Shift. Though many techniques were introduced for performing sentiment analysis, still that are not able in extracting the sentiment features from the specified content of text. This paper gives an insight of various sentiment Analysis methodologies and approaches in detailed and also discuss the limitations of existing work and future direction about sentiment analysis methodologies.*

Keyword: *Data Analytics; Decision making; Feature extraction; Opinion mining; Sentiment Analysis; Sentiment classification;*

1. INTRODUCTION

Data Mining is the process of discovering valuable patterns or knowledge from data sources, e.g., databases, texts, images, the web, etc. The valuable patterns should be valid, potentially useful, and understandable. Data Mining techniques support automatic investigation of data and attempts to source out patterns and trends in the data and also infers rules from these patterns which will help the user to support review and examine results in some related business or scientific area. It is a something that combines several field involving artificial intelligence, databases, information retrieval, machine learning, statistics, and visualization. Three main steps can be carried out in data mining which includes pre-processing, data mining and post-processing. Some of the common data mining task are supervised learning or classification, unsupervised learning or clustering, association rule mining, and sequential pattern mining.

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Web mining and text mining are becoming increasingly important and popular since old-style data mining uses structured data stored in relational tables, spreadsheet, or flat files in tabular form. The prompt development of the web in the last decade makes it the leading publicly accessible data source in the world. The web has several distinctive features, which makes mining useful data and knowledge an interesting and challenging task. Web mining wishes to find out useful information and knowledge from the structure of hyperlink, content of page and usage data. Web mining job can be classified into three types.

Web structure mining: It finds out useful facts from hyperlinks, which denote the structure of the web. From the links, it can discover important web pages, which is the key technology used in search engine, it can also discover communities of users who share common interests.

Web content mining: It extracts or mines useful information or knowledge from web page contents. Using web content mining it can automatically classify and cluster webpage according to their topics. It can also discover pattern in web pages to extract useful data such as description of products, posting of

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forum, etc., for many purpose. Also it can mine customer reviews and forum postings to discover customer opinions.

Web usage mining: It refers to the discovery of user access patterns from web usage logs, which records every click made by each user. One of the crucial concerns in web usage mining is the pre-processing of click-stream data in usage logs in order to produce right data for mining.

Sentiment analysis or opinion mining find out user's approaches, reviews, view, and reactions toward objects, events, issues, people, topics and their characteristics. Opinions are important because they are the key influencers of behaviors. With the explosive growth of social media on the web, individuals and organizations are increasingly using the content in these media for their decision making. On the other hand, finding and monitoring opinion sites on the web and distilling the information contained in these remains a formidable task because of the proliferation of diverse site. Therefore, the opinion mining or sentiment analysis has become the important research topic in the study area of data mining and internet application.

In this paper we firstly introduce the opinion mining framework. Then we focus on the comparison and analysis of key techniques. Finally, we make a summary and outlook

2. THE FRAMEWORK OF OPINION MINING

Today's internet world allows people to know other people's opinion to take decision. Now a day's organization also look their customer's review about their product and service. Before purchasing a product, a customer is willing to know other customer's opinion about a certain product. The opinion of one's can be either positive or negative also referred as sentiment, polarity or semantic orientation.

Opinion mining make use of three terms in order to fetch opinion. The opinion source, opinion and opinion polarity. These elements are important for opinion identification.

The Fig 1 shows the framework of opinion mining. It starts with preprocessing the dataset and opinion mining or sentiment classification by dictionary based technique or with different machine learning algorithm.

2.1 Opinion Classification

In general, researchers reconnoitered opinion mining into three stages such as Document level, Sentence level, Feature level. At document level the opinion mining makes use of the whole review and extracts opinion from the single opinion holder as positive or negative. In sentence level, opinion mining is to classify opinion at sentence level. It categorized every sentence into positive, negative, or no opinion. Subjectivity classification is done at pre-processing step in sentence level opinion mining system. Objective and subjective sentence was classified by subjectivity classification. Factual information's are represented as objective sentence whereas subjective opinions are classified as subjective sentences. Feature level opinion analysis openly looks at the opinion itself. It is also referred as aspect based or feature based opinion mining. It is based on the information that user may express his opinion on specific aspect or feature of an entity rather than entity itself.

2.2 Opinion Mining Approaches

Opinion Mining systems are commonly categorized on the basis of following Techniques such as dictionary Based, Machine Learning, and Ontology Based.

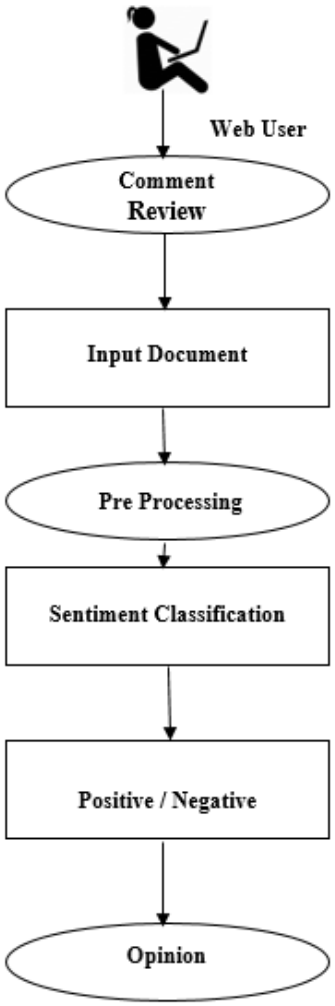

Figure 1 Opinion Mining Framework

Dictionary-based sentiment classification method uses word matching based on the vocabulary or lexi-

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con. It is the easiest way to perform sentiment analysis. WordNet and SentiwordNet are the pre-built dictionaries publically available to perform sentiment analysis which defines semantic orientation of words.

Machine learning algorithms can be defined as a combination of methods to automatically discover the available pattern in the given set of data. It makes use of undiscovered patterns to predict the future data (or) to implement the decision making under uncertainty. Machine learning can be classified in two ways such as supervised and unsupervised. Supervised learning is performed by considering the outcome variable and unsupervised learning is conducted by not considering the outcome variable. There are various types of algorithms for supervised learning such as classification (Decision tree, KNN, Logistic Regression, Naive Bayes, Random Forest, Regression etc.) and unsupervised learning algorithm such as clustering (Apriori algorithm, K-means, SOM, Neural network, etc.).

Ontology is a word generally used in philosophy and it is cast-offed in many diverse areas which means that "theory of Existence/ Nature of Being". Ontology explains the concepts in the domain and also the link between those concepts. Researchers mostly prefer ontology in feature extraction phase of sentiment analysis. Ontology will be constructed in the hierarchical form. OWL and RDF are the ontology language used to develop ontology. Ontology includes numerous modules such as Individuals, classes and properties.

3. LITERATURE REVIEW

The reviews, opinions given by the consumer for a product form a good source of information about the preference of the customer. That information can be used for making a recommendation. Silvana Aciar Et al [1] proposed an automatic mapping process using text mining technique. A controlled vocabulary and their relationship was included in the ontology. With the help of supervised learning the attribute of ontology was learnt from the sematic feature in the review comment. Using decision rules the reviews from the unstructured data were mapped into predefined ontology. This method allows valuable textual information for recommendation. The limitation of the above model is, the long and complicated sentence cannot be classified into any category and also it works on sentence level. J. Yi Et al [2] stated that Sentiment Analyzer (SA) that mines opinion topic from available web pages and uses natural language processing to identify topic in each of the reference for the given topic. It exploration contains extracting a topic specific feature, extraction of sentiments, and relationship analysis of association. SA uses two semantic means for the analysis. One was sentiment lexicon and the other was sentiment pattern database. The feature extraction algorithm produces good results of 87% for review articles, 86 ~ 91% (precision) and 91 ~ 93% (accuracy) for the general web pages and news articles. The algorithm has limitations in full parsing to produce better sentence structure study, and also need manual validation. Level of automation need to be improved.

In various disciplines mining sentiments from unstructured text has begun as a vital problem. Xue Bai Et al [3] proposed a Bayesian two-stage algorithm that work with unstructured text with little resources. The dependencies among the words be captured and also discovers a vocabulary for sentiment extraction. The main goal of their work is to learn principal sentiments of online text which is available in unstructured format. In the first stage for the sentiment variable Markov Blanket Classifier (MBC) learns qualified dependencies among the words and encodes them into a Markov Blanket Directed Acyclic Graph (MBDAG). In the second stage to produce a higher cross authenticated accuracy a Tabu Search (TS) meta-heuristic strategy to fine tune the MB DAG. Semantic relations and dependency patterns among the word be captured by learning the dependencies to obtain the meaning of the sentences. using this algorithm 87.5% cross-validated accuracy and 96.85% cross-validated AUC was achieved. The algorithm has to be tested with richer feature sets and of independence assumption.

Automatic opinion mining techniques analyze, extract and summarize the opinions from a large number of reviews. Aspect- level opinion mining make users efficiently traverse into complete information of their interesting aspects by organizing the opinion summarization in an organized form. XU Xueke Et al [4] recommended Joint Aspect/Sentiment model a generative topic model that purposes to extract aspects and aspect-dependent sentiment lexicons from online reviews in a given domain. JAS acclimate the standard topic model to mine topics relate to the reviewable topic to a single topic by forcing a sentence. Then the aspects categorized as subjectivity label and sentiment label. The JAS outperforms the general-purpose sentiment lexicon based baselines and produce a precision of 80.87. The "and" rules in linguistics heuristics and synonym/antonym rules should be implemented to test the performance.

The existing techniques to opinion article extraction depend merely on mining patterns from a lone review corpus, thus pay no consideration to the nontrivial inconsistencies in word distributional features of opinion through different corpora. A technique to classify opinion features from online reviews was proposed by Zhen Hai Et al [5] by using the difference in opinion feature statistics through domain-specific and domain-independent corpus. A list of candidate features from the given domain review was created by a number of syntactic dependence rule. The domain relevance score for individual recognized feature candidate with respect to domain specific and

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domain dependent was calculated and called as intrinsic-domain relevance (IDR) score, and the extrinsic-domain relevance (EDR). The low IDR scores and high EDR score were pruned and then confirmed as opinion feature. The results of IEDR is greater compared to IDR, EDR, LDA, ARM, MRC, and DP in terms of feature extraction performance. Neutral opinion is not considered in the system and the performance is not as expected for complicated word. This is for the reason that reviews with lengthier and more difficult words makes feature extraction much more challenging, and have large number of noisy domain-irrelevant user narratives or tales, which join with documents in the domain-independent corpus.

Finding the aspects/topics relating to class labels from online reviews, blogs, and discussion forums is a challenging task. Victor C. Cheng Et al [6] proposed a probabilistic aspect mining model (PAMM) to identify the aspects/topics related to class labels. In each execution PAMM dedicated on discovering topics relating to one class only rather than finding topic for all classes. This decreases the chance of having topics formed from mixing perceptions of different classes and the identified topic are easily inferred by the people. An EM-algorithm was developed for parameter estimation. Using WordNet, the review text was preprocessed. Negatives were labelled as 0 with a score of 1 and 2 also positives were labelled as 1 with score 4 and 5. Neutral with score 3 were disregarded as their sentiments were imprecise. To calculate mean PMI, a derived topic was allotted with class label. The information was readily available for supervised algorithms and half of the aspects were labelled 1 and the rest were labelled 0 for unsupervised algorithms. Experimental results have shown that the topics attained with PAMM give higher classification accuracy with mean PMI. Parameter estimation of PAMM needs only one matrix to be estimated from the training data. The amount of features needs to be finalized physically similar to other clustering algorithms. Important features may be unused if the value is too small. On the other hand, unrelated features to be included if the value may be too large. This model should be improved to find aspects relating to different segmentation of data.

To find semantic aspects and aspect-level sentiments from review data in addition to predict whole sentiments of reviews. Zhen Hai Et al [7] projected an efficient probabilistic supervised joint aspect and sentiment model (SJASM) to deal with the difficulties in one go under a unified framework. The benefits of SJASM includes it can simultaneously model aspect terms and corresponding opinion words of each text review for semantic aspect and sentiment detection. It also exploits sentimental overall ratings as supervision data, and can infer the semantic aspects and fine-grained aspect-level sentiments that are not only meaningful but also predictive of overall sentiments of reviews and it leverages sentiment previous data, and might expressly build the correspondence between detected sentiments (latent variables) and globe sentiment orientations. SJASM achieves the best overall sentiment prediction accuracy of 87.88%. Probabilistic topic modelling approaches to sentiment analysis often requires the number of latent topics to be specified in advance of analyzing review data.

In sentiment analysis a common technique to model text in statistical machine learning is Bag-of-words (BOW). Polarity shift problem degrades the performance of BOW. To overcome this problem for sentiment classification Rui Xia Et al [8] proposed dual sentiment analysis (DSA) model. This model first creates a sentiment-reversed review for each training and test review. This model also suggested a double training procedure to use original and reversed training reviews in couple for learning a sentiment classifier, and a dual prediction algorithm which considers two sides of one review to classify test review. The DSA framework also extend from polarity classification to trinity classification. At last it creates a corpus-based method to construct a pseudo-antonym dictionary which removes DSA's dependency on an external antonym dictionary for review reversion. The results prove the effectiveness of DSA. In future complex polarity shift pattern such as transitional, subjunctive and sentiment-inconsistent sentences be considered.

Data mining, information retrieval and machine learning research communities been attracted by social recommendation systems. Numerous serious restrictions are available in traditional social recommendation algorithm due to batch machine learning methods. Zhou Zhao Et al [9] suggested a solution for online applications that work on real time. A new online graph regularized over performance learning (OGRPL) framework with collaborative user item relationship and item context feature was developed as a unified preference language process. The framework extends with frank-wolfe algorithm as an iterative technique. Wide range of experiments on several large dataset was conducted and obtain significant lower errors in terms of root mean square error and mean absolute error. The only limitation is the framework should be implemented with nonlinear user preference as the user model.

In order to increase the precision of opinion mining FarmanAli Et al [10] proposed a framework by merging support vector machine along with fuzzy domain ontology. Traditional machine learning algorithm have Limitation in classification of sentiment. That means review feature will be classified as Positive / Negative. The proposed system brings a perfect understanding that the fuzzy based ontology is more domain specific as compared with traditional crisp ontology. The FDO and smart model are developed using Protege OWL-2 (Ontology Web Language) tool

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TABLE 3 COMPARISON OF METHODOLOGY AND APPROACH

Sl. No	Title	Year	Issues Addressed	Proposed Technique	Dataset used	Limitations
1	Recommender System Based on Consumer Product Reviews	2006	review comments into ontology instance conversion	Automatic ontology mapping	www.dpreview.com	long and complicated sentence cannot be classified into any category
2	Sentiment analyzer: extracting sentiments about a given topic using natural language processing techniques	2003	classifying the sentiment of an entire document	Sentiment Analyzer (SA) using natural language processing (NLP) techniques	cnet.com dpreview.com epinions.com	Limitations in full parsing to produce better sentence structure and also need manual validation.
3	On Learning Parsimonious Models for Extracting Consumer Opinions	2005	Extracting sentiments from unstructured text	Bayesian two-stage algorithm	rec.arts.movies.reviews newsgroup archived at the IMDB	To be tested with richer feature sets and of independence assumption
4	Aspect-Level Opinion Mining of Online Customer Reviews	2013	To improve aspect-level opinion mining	Joint Aspect/Sentiment model	Hotel review	“and” rules in linguistics heuristics and synonym/antonym rules not implemented
5	Identifying Features in Opinion Mining via Intrinsic and Extrinsic Domain Relevance	2014	opinion feature extraction by ignoring the non-trivial disparities in word distributional characteristics	IEDR approach	cellphone and hotel reviews	non-noun features, infrequent features, as well as implicit features be implemented
6	Probabilistic Aspect Mining Model for Drug Reviews	2014	opinion mining problems	probabilistic aspect mining model (PAMM)	User reviews of four different drugs from the WebMD website	To find aspects relating to different segmentation of data
7	Analyzing Sentiments in One Go: A Supervised Joint Topic Modeling Approach	2017	To predict overall sentiments of reviews	probabilistic supervised joint aspect and sentiment model	Game and CD reviews from Amazon3, hotel reviews from TripAdvisor	Number of latent topics to be specified in advance
8	Dual Sentiment Analysis: Considering Two Sides of One Review	2015	Polarity shift problem	Dual sentiment analysis	Multi-domain sentiment datasets	complex polarity shift patterns such as transitional, subjunctive and sentiment-inconsistent sentences
9	User Preference Learning for Online Social Recommendation	2016	unable to capture the change of user preferences over time	Online graph regularized over preference eLearning	douban.com ciao.com	Non-linear user preference learning function be implemented as the user model
10	Opinion mining based on fuzzy domain ontology and Support Vector Machine: A proposal to automate online review classification	2016	Binary Classification Problem and Accuracy	Fuzzy Ontology with Machine learning Technique	Hotel Review	Increased Complexity
11	A Pattern-Based Approach for Multi-Class Sentiment Analysis in Twitter	2017	Limitation in classification	SENTA	Twitter	Accuracy level
12	Sentence Compression for Aspect-Based Sentiment Analysis	2015	Challenge to syntactic parsers	Sentiment compression technique before the aspect based sentiment analysis	Chinese Blog Review Dataset	Extractive compression technique fails to achieve accuracy
13	Word-of-Mouth Understanding: Entity-Centric Multimodal Aspect-Opinion Mining in Social Media	2015	problem of multimodal aspect-opinion mining for entities in social media	Multimodal aspect-opinion model	Flickr photos, TripAdvisor reviews, and news articles	more types of social media data like network activities can be used to validate the effectiveness of mmAOM

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14	Co-Extracting Opinion Targets and Opinion Words from Online Reviews Based on the Word Alignment Model	2007	fine grain opinion mining	partially-supervised alignment model	Customer Review Datasets COAE 2008 dataset Large	Topical relation should be considered
15	Distantly Supervised Lifelong Learning for Large-Scale Social Media Sentiment Analysis	2017	continuously increasing data	distantly supervised lifelong learning framework	Twitter dataset and a Chinese Weibo dataset	More Classification should be evaluated

and JAVA. The proposed framework also overcomes the binary classification problem by increasing the category to 5 such as positive, strong positive, negative, strong negative. The proposed framework was evaluated in the movie review domain and it is compared with the traditional SVM algorithm. The accuracy of opinion mining increases from 71.87 to 82.70. In future the proposed system will be expanded to make use of ype-2 fuzzy ontology and SVM-based opinion mining for recommendation system.

Texts collected from social sites are oriented towards binary or ternary classification. Mondher Bouazizi Et al [11] proposed an approach that classifies the texts collected from social sites into multiple sentiment classes. In this approach it classifies tweets into seven different classes. A user friendly tool SENTA was developed for the extraction of wide set of features from text. An accuracy of 60.2% was obtained for multi-class sentiment analysis. Still obtaining a high accuracy level is a challenging task.

Wanxiang Che Et al [12] proposed a framework for aspect/feature based sentiment analysis along with the sentence compression technique. Feature based sentiment analysis is applied based on syntactic features which stances a chance for over natural problem. This kind of issue creates the sentiment analysis too challenging to handle the syntactic parsers used in the opinion mining technique. The proposed framework creates a modernized sentence compression technique before the sentiment analysis. For compressing a text for sentiment analysis two schemes are used. That is extractive compression and syntactic compression technique. Syntactic compression technique is considered to be more efficient than extractive compression technique because it compresses the text by removing the unimportant words. The proposed system makes use of feature - polarity collection based sentiment analysis. Most of the feature based sentiment analysis focus on the relationship between the features and the polarity words which extremely affects the efficiency. To solve this problem, the proposed framework makes use of syntactic patterns.

In social media aspects are basically multimodal and the sentiments be subject to definite aspects. To address the problem Quan Fank Et al [13] offered a multimodal aspect-opinion model (mmAOM). The model captures relationship between textual and visual modalities by seeing both user-generated photos and textual documents, along with relations between aspects and opinions. The multimodal aspect-opinion model was applied to entity association visualization and multimodal aspect-opinion retrieval. Flickr photos, TripAdvisor reviews, and news articles were the dataset used for evaluation of the model. Qualitative and quantitative assessment outcomes have confirmed the efficiency of the multimodal aspect-opinion mining model. In future social media data network activities can be used to validate the effectiveness of multimodal aspect-opinion model.

To fine grain opinion mining it is important to consider opinion targets and opinion words. Kang Liu [14] proposed a unique method based on the partially-supervised alignment model, which concerns finding opinion relations as an alignment process. Then, a graph-based co-ranking process is used to assess the confidence of individual candidate. Finally, opinion targets or opinion words are extracted from candidates with higher confidence. This method captures opinion relations more precisely than others. Topical relation should be considered as a future development.

In the social networking website, it contains enormous amount of texts and range of topics. To manually collect the labelled data and to train the sentiment classifier would be difficult for different domains. Rui Xia Et al [15] proposed a continuous sentiment learning algorithm for huge social networking websites. The framework stores all the training task information sequentially in knowledge base. It consists of three learning task namely past, current and future. In the current learning task, the current knowledge is compared with the past knowledge, if both are same the knowledge of both task be merged into one otherwise it considers as a new past task and store the knowledge learned in it additionally. Cumulative knowledge of all past task can be used to predict the future task. Lifelong Bagging model and a Lifelong Stacking model are the two means for adding the knowledge learned in different conditions from different tasks. The feasibility and efficiency of this algorithm is better than traditional ones.

The Table 3 provides the flawless summary of many approaches used in sentiment Analysis. Among this ontology along with machine learning technique will be very suitable for opinion mining with better accuracy.

The many feature selection and classification algo-

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rithms have been developed for performing effective feature selection and classification over the different datasets such as network intrusion [16], medical dataset [17] and the social network datasets in this direction by various researchers in the past [17-24]. Among them, Sannasi et al [16] [18] proposed new intelligent agent based feature extraction methods and classification algorithms for analyzing the data. Indira priya et al [20] proposed a new behavior analysis model for identifying the user interests and sentiments over the product purchase. The same authors [21] provides new model for analyzing the user's behaviors and sentiments. Online review also conducted by the authors [22] for finalizing the product reviews and expectation based on their sentiments. In [23], the authors provided a new recommendation system for selecting the suitable contents according to their sentiments.

Nazan Öztürk and SerkanAyvaz[25] proposed a new approach for performing sentiment analysis on Twitter data using text mining approach. Zou Xiaomei et al [26] conducted a new microblog sentiment analysis with weak dependency connections. Iti Chaturvedi et al [27] made a survey about the differences between the facts and the opinions for performing sentiment analysis. They also discussed the various challenges in this direction. Charalampos et al [28] introduced a new fuzzy computational model of emotion for the cloud based sentiment analysis. Zufan Zhang et al [29] perform a textual sentiment analysis through the three different attention using the standard convolutional neural networks and the cross-modality consistent regression.

4. SUGGESTION PROPOSED

Soft computing techniques can be used in the new feature selection techniques for performing sentiment analysis. First, new fuzzy rules will be introduced by the administrator of the application and for conducting the pre-processing activities over the dataset. Second, propose a new convolutional neural network for effective classification.

5. CONCLUSION

Sentiment analysis (or) opinion mining shows an important part in business decision making. This paper discusses the level of opinion mining and provides the strong understanding about various approaches. This survey also provides the knowledge about the sentiment analysis issues such as binary classification, data sparsity, polarity shift problem briefly and how they are handled in different domains. Many of the societies have placing their hard work in finding the top system for sentiment analysis. Some of the works give good results but still many more limitations in these algorithms. Advanced and effective methods required to be created which would overcome the present challenges faced by Opinion Mining and Sentiment Analysis.

REFERENCES

[1] Silvana Aciar; Debbie Zhang; Simeon Simoff; John Debenham. (2006), " Recommender System Based on Consumer Product Reviews," IEEE/WIC/ACM International Conference on Web Intelligence, pp. 719-723..

[2] J. Yi; T. Nasukawa, R. Bunescu, W. Niblack. (2003), "Sentiment analyzer: extracting sentiments about a given topic using natural language processing techniques," Third IEEE International Conference on Data Mining,, pp. 427-434..

[3] Xue Bai, Rema Padman ,Edoardo Airoldi. (2005), "On Learning Parsimonious Models for Extracting Consumer Opinions," Proceedings of the 38th Annual Hawaii International Conference on System Sciences, pp. 75b - 75b.

[4] Xueke Xu, Xueqi Cheng, Songbo Tan, Yue Liu, Huawei Shen. (2013), "Aspect-level opinion mining of online customer reviews," China Communications, Vol.10, No..3, pp. 25 – 41.

[5] Zhen Hai, Kuiyu Chang, Jung-Jae Kim, Christopher C. Yang. (2014), "Identifying Features in Opinion Mining via Intrinsic and Extrinsic Domain Relevance," IEEE Transactions on Knowledge and Data Engineering, vol.26, No.3, pp. 623 – 634.

[6] Victor C. Cheng, C. H. C. Leung, Jiming Liu, Alfredo Milani. (2014), "Probabilistic Aspect Mining Model for Drug Reviews," IEEE Transactions on Knowledge and Data Engineering, Vol.26, No. 8, pp. 2002 – 2013.

[7] Zhen Hai, Gao Cong, Kuiyu Chang, Peng Cheng, Chunyan Miao. (2017), "Analyzing Sentiments in One Go: A Supervised Joint Topic Modeling Approach," IEEE Transactions on Knowledge and Data Engineering, Vol.29, No..6, pp. 1172 – 1185.

[8] Rui Xia, Feng Xu, Chengqing Zong, Qianmu Li, Yong Qi, Tao Li. (2015), "Dual Sentiment Analysis: Considering Two Sides of One Review," IEEE Transactions on Knowledge and Data Engineering, Vol..27, No. 8, pp. 2120 – 2133.

[9] Zhou Zhao, Hanqing Lu, Deng Cai, Xiaofei He, Yueting Zhuang. (2016), "User Preference Learning for Online Social Recommendation," IEEE Transactions on Knowledge and Data Engineering, Vol.28, No..9, pp. 2522 – 2534.

[10] Farman Alia, Kyung-Sup Kwaa,Yong-Gi Kimb. (2016), "Opinion mining based on fuzzy domain ontology and Support Vector Machine: A proposal to automate online review classification," Applied Soft Computing, Vol. 47, pp. 235 – 250.

[11] Mondher Bouazizi, Tomoaki Ohtsuki. (2017), "A Pattern-Based Approach for Multi-Class Sentiment Analysis in Twitter," IEEE Access, Vol.5, pp. 20617 – 20639.

[12] Wanxiang Che, Yanyan Zhao, Honglei Guo, Zhong Su, Ting Liu. (2015), "Sentence Compression for Aspect-Based Sentiment Analysis," IEEE/ACM Transactions on Audio, Speech, and Language Processing, Vol.23, No.12, pp. 2111 – 2124.

[13] Quan Fang, Changsheng Xu, Jitao Sang, M. Shamim Hossain, Ghulam Muhammad. (2015), "Word-of-Mouth Understanding: Entity-Centric Multimodal Aspect-Opinion Mining in Social Media," IEEE Transactions on Multimedia, Vol.17, No.12, pp. 2281 – 2296.

[14] Kang Liu, Liheng Xu, Jun Zhao. (2015), "Co-Extracting Opinion Targets and Opinion Words from Online Reviews Based on the Word Alignment Model," IEEE Transactions on

ISSN: 2456 - 3935
International Journal of Advances in Computer and Electronics Engineering
Volume 3, Issue 2, February 2018, pp. 1–8

Knowledge and Data Engineering, Vol.27, No.3, 2015, pp. 636 – 650.

[15] Rui Xia, Jie Jiang, Huihui He. (2017), "Distantly Supervised Lifelong Learning for Large-Scale Social Media Sentiment Analysis," IEEE Transactions on Affective Computing, Vol.8, No.4, pp. 480 – 491.

Sannasi Ganapathy, Kanagasabai Kulothungan, Sannasy Muthurajkumar,Muthuswamy Vijayalakshmi, Palanichamy Yogesh, Arputharaj Kannan. (2013), "Intelligent feature selection and classification techniques for intrusion detection in networks: a survey", EURASIP Journal on Wireless Communications and Networking, Vol. 271, No. 1, pp. 1-16.

[16] Sethukkarasi R, Ganapathy S, Yogesh P, Kannan A. (2014), "An intelligent neuro fuzzy temporal knowledge representation model for mining temporal patterns", Journal of Intelligent & Fuzzy Systems,Vol. 26, No.3, pp. 1167-1178.

[17] S Ganapathy, P Yogesh, A Kannan. (2012), "Intelligent agent-based intrusion detection system using enhanced multiclass SVM", Computational intelligence and neuroscience, Vol. 2012, pp. 1-9.

[18] Nazan Öztürk, SerkanAyvaz. (2018), "Sentiment analysis on Twitter: A text mining approach to the Syrian refugee crisis",Telematics and Informatics, Vol. 35, No.1, pp. 136-147.

[19] SA Sadhana, L SaiRamesh, S Sabena, S Ganapathy, A Kannan. (2017), "Mining Target Opinions from Online Reviews Using Semi-supervised Word Alignment Model", 2017 Second International Conference on Recent Trends and Challenges in Computational Models (ICRTCCM), pp. 196-200.

[20] Indira Priya Ponnuvel, Ghosh Dalim Kumar, Kannan Arputharaj and Ganapathy Sannasi. (2014), "Neuro Fuzzy Link based Classifier for the Analysis of Behavior Models in Social Networks", Journal of Computer Science,Vol. 10, No.4, pp. 578-584.

[21] Sannasi Ganapathy, Pandi Vijayakumar, Palanichamy Yogesh, Arputharaj Kannan. (2016), "An Intelligent CRF Based Feature Selection for Effective Intrusion Detection",International Arab Journal of Information Technology (IAJIT), Vol.13, No.1, pp. 44-50.

[22] SP Perumal, Kannan Arputharaj, Ganapathy Sannasi. (2017), "Fuzzy family tree similarity based effective e-learning recommender system", 2016 Eighth International Conference on Advanced Computing (ICoAC), pp. 146-150.

[23] P Indira Priya, DK Ghosh, A Kannan, S Ganapathy. (2014), "Behaviour Analysis Model for Social Networks using Genetic Weighted Fuzzy C-Means Clustering and Neuro-Fuzzy Classifier", International Journal of Soft Computing, Vol. 9, No.3, pp. 138-142.

[24] L Sai Ramesh, Sannasi Ganapathy, R Bhuvaneshwari, Kanagasabai Kulothungan, V Pandiyaraju, Arputharaj Kannan. (2015), "Prediction of user interests for providing relevant information using relevance feedback and re-ranking", International Journal of Intelligent Information Technologies (IJIIT), Vol.11, No.4, pp. 55-71.

[25] Zou Xiaomei, Yang Jing, Zhang Jianpei, Han Hongyu. (2018), "Microblog sentiment analysis with weak dependency connections", Knowledge-Based Systems, Vol. 142, pp. 170-180.

[26] Iti Chaturvedi, Erik Cambria, Roy E.Welsch, Francisco Herrer. (2018), "Distinguishing between facts and opinions for sentiment analysis: Survey and challenges", Information Fusion, Vol. 44, pp. 65-77.

[27] Charalampos, Karyotis, Faiyaz Doctord, Rahat Iqbal, Anne James, Victor Chang. (2018), "A fuzzy computational model of emotion for cloud based sentiment analysis", Information Sciences, Vol. 433–434, pp. 448-463.

[28] Zufan Zhang, Yang Zou, Chenquan Gan. (2018), "Textual sentiment analysis via three different attention convolutional neural networks and cross-modality consistent regression", Neurocomputing, Vol. 275, pp. 1407-1415.

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