

# *A Meticulous Critique on Prevailing Techniques of Aspect-Level Sentiment Analysis*

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**Abstract**—Sentiment Analysis (SA) refers to mining emotional value from an array of words to determine the notion, perspective and behavior an individual may have towards an entity. Personnel conducting online business face the truth of their products and services which eventually helps them to improve their strategies of selling and maximizing profits. Consumers get a true feedback of any product or service they wish to avail which eventually yields sophisticated decision making. In this paper, a profound review of the most current mechanisms deployed using varied approaches has been stated. The main aim of this survey is to give a satisfied understanding of the latest updates in the field of sentiment analysis especially highlighting the recent trends under aspect based sentiment analysis.

**Index Terms**—Sentiment Analysis; emotional value; decision making; aspect; review.

## I. INTRODUCTION

Products and Services offered on the internet are accumulating at an exponential volume [21]. Digital world has made the process of acquiring products and services quite effortless. E-commerce is flourishing across the globe with millions of products unveiling day to day. An important fraction of this business is consumer reviews, it holds value not only to the consumer community but a stupendous advantage to individuals muddled in online business. On one hand where consumer reviews posted on the diverse media are utilized by people to make a purchasing decision according to some requirements set in mind, on the other hand online selling community regards reviews posted as a reality check of their selling item [5].

Consumers express their sentiment or feeling towards a product or service they purchase and operate [19]. E-commerce sites and consumer forums exhibit millions of opinions written by consumers and calculate overall sentiment value of these by offering consolidated analysis in the form of ratings. Sentiment Analysis (SA) in simple terms is a mechanism to measure of how good,

bad or worst something can be by computing mathematically on a numerical scale and producing an output for the public in simple terms. There are two different perception's to sentiment analysis. SA exists at peculiar layers specifically script or document level, sentence level, attitude or aspect level and concept level. This paper has its focus on aspect based sentiment analysis [1].

Every individual has a different point of view about any entity. Not all features can be attracting to every person. This can be understood with the example of purchasing a phone, someone may prefer the camera quality at the same time someone may fancy memory storage. This brings us to a settlement that a single product can be admired by the same people with different qualities. Thus, Aspect based sentiment analysis (ABSA) concerns extracting aspects or features from the text and assigning sentiment value to them. Reviews written can depict explicit as well as implicit aspects. ABSA is carried out at different task levels which means the entire working is computed in discrete stages [11].

### A. Motivation

Sentiment analysis is yielding benefits to global population in discrete domains to name a few like social media, E-commerce, Restaurant or Hotel business, Movie arena and lots more [19]. In everyday situations that are faced, judgments and actions of other individuals have consistently made individuals keen to know more and more about an entity of interest [13]. It is human perception to consider suggestions before under-taking any decision be it something very petty or something of immense concern [20]. People en-quire with family, friends, colleagues and relatives about some good eatery or beautician or the most common which doctor to consult. In the internet age every issue from political drama to the best hair shampoo is being discussed by masses. People usually consult personal as well as professional advice before buying any product. Folks seek for being informed about everything in order to make a correct buying decision and always decisions are under the influence of other individuals sentiments [18], [21].

Spontaneously, sentiment analysis is not restricted to the working on just customer reviews. As a matter of fact, sentiment analysis is studied and practiced in very contrasting situations and domains [15].

### B. Contribution and Outline

With the enormous amount of literature being drafted every year on sentiment analysis it becomes difficult to segregate the most current and traditional methods and techniques used to tackle the challenges under it. The study makes the following contributions:

- The article has evaluated the most current and valuable articles especially highlighting aspect based sentiment analysis.
- It presents discrete techniques utilized in the research articles to give a better understanding to the audience of the latest methods that are being employed
- It gives a comparison of the literature review depicting the gaps that could be addressed.

The remainder of the article is structured as follows :

Section 2 presents working of aspect based sentiment analysis and challenges involved which is followed by Section 3, which deals with the techniques and methods used in varied research articles. Subsequently, a comparison among the articles is given for a crisp understanding in Section 4 and Section 5 presents the conclusion of this paper.

## II. ASPECT BASED SENTIMENT ANALYSIS

Sentiment Analysis is all about discovering sentiments or feelings people have towards something. It can be with regards to a product purchased, a movie seen or a degree obtained as it covers a ample realm. Document level sentiment analysis is too broad in terms of finding out sentiment value, it just provides an overview of what the topic is directing towards rather than highlighting key facts. E-commerce websites provide star ratings (for example rating between 1 to 5), this type of setup displays general statistics of likes and dislikes for a product but it fails to bring out the precise reason behind satisfaction or dissatisfaction. People fail to understand what are the features of a product that the customer admires and which qualities are disfavoured [2].

Aspect based sentiment analysis clearly resolves this issue by inspecting reviews posted by customers and pointing out sentiment value for individual features of the product. For example, if there is a review posted like “The restaurant Lucky has an amazing ambience with super delicious food quality but the staff is always too arrogant and lazy to serve”. This review clearly shows that the person has discussed multiple features about the

restaurant, he has praised some parts and gave a thumbs down to some. The main goal of aspect based sentiment analysis is to find out the most important and spoken about aspects, highlight them and compute positive, negative or neutral sentiment associated with those aspects [6].

### A. Functions

Aspect based sentiment analysis takes place under following stages (refer Fig. 1) as mentioned below :

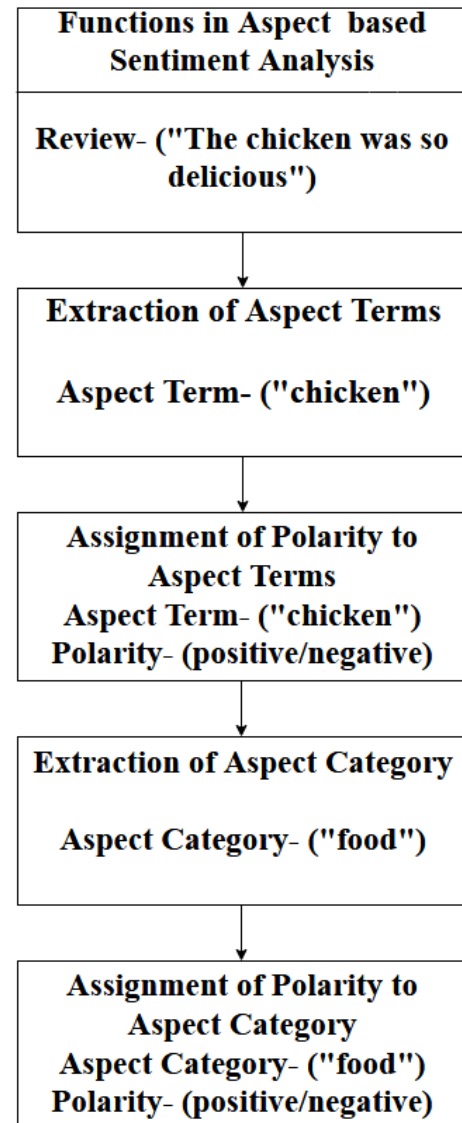


Fig. 1. Aspect based Sentiment Analysis

- **Extracting Aspect term:** Reviews written by customers always discuss some quality or topic of the product bought or service availed. The first and main agenda is to distillate the topic or aspect that is being spoken about. For example, “The battery lasts for long hours, here the aspect term to be extracted is battery as it is the topic that the customer has

spoken about [4], [10].

- Assignment of polarity to terms: After receiving aspect terms from the first stage we assign sentimental value to them. Consider for example "iPhone X has amazing camera quality but sound quality is poor", here the aspect terms are camera quality and sound quality and the polarity assigned to camera quality is positive and sound quality is negative [12].
- Extracting Aspect category: Before finding any topic being discussed in the reviews sometimes according to the given context like movies or restaurant predefined categories have been given by the hosting business, for example Zomato ( site that deals in restaurants/hotels reviews) provides predefined categories like food, service and atmosphere which makes it easier for the customers to write reviews on the mentioned areas [8]. They usually are less frequent in reviews [2].
- Assignment of polarity to category : After discovering the categories from the reviews the task now is to find out the sentiment value it holds. The result can be in the form of emotions or the usual positive, negative or neutral [8].

#### B. Challenges

Aspect based Sentiment Analysis has to tackle a lot of issues in order to achieve what it has determined. A few of the challenges are as follows:

- Slang Language Detection
- Sarcasm detection
- Word having multiple meanings
- Words having different intensities
- Determining relevant words from a stack of words
- Grammatical errors like spelling mistakes

### III. TECHNIQUES IN ASPECT BASED SENTIMENT ANALYSIS

Enormous amount of research and implementation has been undertaken in this domain. A lot of varied techniques have been adapted to accomplish the functions in aspect based sentiment analysis. A discussion of different techniques implemented in the research articles are taken under consideration.

#### A. Topic Modelling approach

Topic modelling equips with approaches to setup, analyze and compile enormous volume of information that is in the form of text. It benefits in :

- extracting out hidden topic based impressions that exist throughout the assemblage
- Interpreting documents conferring to the topics
- Utilizing these interpretations to setup, discover and assemble all the texts

Topic modelling can be explained as an approach to discover an array of words which points to the topic from an assemblage of documents that suits best the information present in the assemblage. It is also a method under text mining [6].

In article [11], the authors claim to implement a system that can tackle several domains and diverse languages by using unsupervised learning and topic modelling approach. It first takes input a corpus of reviews posted by customers and examples for every domain it works on (eg. environment for ambience, fish for food etc) along with this it also considers examples of positive and negative words used ( eg . excellent, tasty, poor, noisy etc ). Considering this input it produces an output which consists of three lists namely a weighted list containing aspect terms, positive words and negative words. For the purpose of segregation of aspect terms and opinion words as well assignment of sentiment polarity LDA topic modelling approach has been undertaken.

#### B. Ensemble Methods

Ensembling is usual done in order to overcome the shortcomings of one of the approaches and amalgamate a few of them to build a more robust system. In sentiment analysis individually many classifiers under machine learning have performed well but usually leave out certain gaps that need to be taken care of. Machine Learning classifiers have their own pros and cons. They are usually amalgamated to tackle sentiment analysis challenges [10]. Particle Swarm Optimization (PSO) approach lined with feature picking and constructing an ensemble has been discussed in [12]. Here specific training and test sets have been taken and the most suited feature sets are utilized for extracting the attitude and classifying the sentiment. The set of classifiers used are Condition Random fields, Support Vector machine and Maximum Entropy. The approach determines mechanically the finest group of classifiers based on PSO approach which enhances the performance of the classification that is to be done up to the mark.

The whole process is undertaken in the following steps as stated :

- Extracting the aspect terms and assigning the polarity by identifying the feature sets involved
- Performing feature selection using the classifiers listed above
- Building an ensemble from the output obtained from the different classifiers

The above steps are in general done and can be carried out irrespective of the domain you are working on. Evaluation for extraction of features and polarity assignment have been performed.

#### C. Machine Learning Approach- Supervised

Machine learning algorithms are used effortlessly to dis-

cover sentiments. Both categories supervised and unsupervised as well as their sub categories are used widely by experts to either perform sentiment classification or mine aspects from reviews written. Under supervised learning there is a pre-requirement of labeled data which can be a boon or it can take away extra time and effort. It has variety of classifiers under it that can be used individually or together. Naive Bayes and Support Vector Machine are one of the most commonly used.

A decision tree classifier is rigorously used by many researchers but in order to combat its problem of over-fitting in this research article [3] random forest algorithm has been made use of which is based on the emotions retrieved from the reviews. The algorithm can classify whether the review posted was helpful or not helpful. The selection of using random forest algorithm was done by studying a lot of performance parameters and drawing conclusions like the market side would benefit from this approach as they would easily be able to handle challenging data coming out from textual reviews. Random Forest algorithm aims to create a reduction in variance of noise occurrence that occurs in other models. It is considered to be a collection of decision trees as it works on the same lines but as a standard decision tree takes into consideration all the occurring variables to create the finest division whereas random forest does not inculcate all and chooses a few randomly to create a split. It surely provides an edge over the other classification algorithms as it creatively picks out the important variables required rather than moving all over. It makes use of bootstrapping to find out the most relevant and useful variables. This feature gives an impetus to figure out what is helpful and what is not.

#### *D. Machine Learning Approach- Unsupervised*

Unsupervised learning algorithms deal with unlabeled documents or topics and aim to cluster or categorize them. Topic modelling is a type of unsupervised learning method.

The research paper [9] involves in depth learning of aspect based sentiment analysis focusing mainly on aspect category detection. It works on the grounds of the spreading activation algorithm as well as association rule mining concepts. It firstly involves pre-processing steps like stop words removal and lemmatization then it chalks upon a five stage procedure to extract out direct and indirect relation among relevant words mentioned in review sentences.

The whole process involves identifying seed words revolving around the domain being worked upon to make the process completely unsupervised. Making use of Standard Core NLP to find out associated important keywords used in reviews, then construct a matrix comprising of the notational words and its synonyms. From the constructed

matrix a directed graph has been built up based on a weight formula from which rules have been drawn out between seed words and notational words used in reviews. A lot of parameter setting is required for the working of this method along with domain specific seed word generation which acts as one of the few drawbacks.

#### *E. Ontology Usage*

Ontology depicts a data illustration which represents acquaintance as a group of perceptions within a realm and the bond amongst these perceptions. To simplify this take an example like a person is an employee, here person is a class and employee states the relationship it holds

Here if another sentence is considered like Todd works at Reliance, this clearly gives us the notion that Todd is a person and he is an employee of Reliance [16].

In the article [1] by making use of ontology the focus was to enhance the process of extracting aspect terms from reviews as well as eradicate the issues arising from lexicon based approaches and improve the process of assigning sentiment value. The research proposes to prove that performing word level sentiment analysis gives a poor output in comparison to concept level.

A four step Ontology Based Sentiment Summarization Framework(OBPSS) has been developed where each stage has been undertaken dependent on the previous work that had been studied. Usually ontology is regarded as an exterior conceptual source but it has been used for the extraction of relevant aspect terms. Three modules namely extracting features, modelling the ontology required and finally assignment of sentiment. Firstly, NLP techniques are applied by making use of a standard review dataset of CanonSD500 camera. Secondly an ontology has been built that revolves around the field which is the digital camera domain and regarded it as the nucleus. Later on notions arising from the root are added on to grow the ontology with multiple relations two main concepts are embarked affirmative and unaffirmative to reveal the action. The last part that was computed was sentiment allocation which was done by making use of a lexicon approach.

#### *F. Hidden Markov Model*

Hidden Markov Models is an interesting area of unsupervised machine learning holding its tremendous contribution in speech recognition, pattern recognition, handwriting recognition, solving sequence pattern problems as well as in the learning methods of neural networks based on biology. It is a statistical model which is extremely robust and dictates to be used in situations where the quality of input is familiar but not the precise specifications.

In this specific research article [7] aim was to make use of the concept of Hidden Markov Model theory and

predict what a customer has to say about a particular product. It was implemented on MATLAB in a step by step format. Initially dataset from Amazon was taken which comprises customer reviews on different products. This dataset is split into training set and test set to be worked upon.

The dataset is already Part of Speech (POS) tagged so it has to be run on Hidden Markov Model for grasping and to perform the required analysis. Making use of the functions of MATLAB the framework takes every input of the dataset and identifies the tags as positive or negative. The tags are either nouns, adjectives or verbs. A vector is constructed and all positive or negative tags are stored in them. Again a function named 'hmmestimate' is utilized to find out the states and sequences which will eventually be used to calculate Emission and Transition probabilities. Lastly an evaluation of the performance of Hidden Markov Model is done using performance measures.

#### G. Parallel k-means and Map Reduce

K-means is utilized in data mining and considered to be one of the most simplest algorithms. It is a clustering algorithm and is based on heuristics which clearly means it may not focalize to give optimum results and even the picking of clusters may produce varied results. Since several years many innovations have been developed of K-means algorithm. Many issues have arisen in these innovations namely handling outliers, high dimensional data and huge datasets.

Most of the time taken in K-means algorithm is for distance computation to ease this process and make it faster, parallel K-means was proposed to bring down the run time complexity. It is especially used in clustering problems involving huge datasets. Parallel K-means is usually implemented in the Hadoop environment with Map Reduce framework. Map Reduce is a programming classic used for producing and handling huge datasets involving a parallel and distributed environment.

In this research piece [2] an advanced approach to the regular K-means called parallel K-means clustering is implemented which is undertaken on a Map-Reduce structure involving creation of summaries of aspect level attitude analysis and also made use of ensembling approaches. For summarization the dependence is not restricted to Natural Language pProcessing (NLP) techniques but techniques using basic K-means is incorporated to improve the precision of summarization process. A five stage process is carried out which includes preprocessing the data available, extracting the correct features required, determining the precise sentiment associated and on the Hadoop environment side again pre processing is performed for the HDFS, followed by Map Reduce processing and final product is Aspect Summary generation.

For extraction of features latent semantic analysis (LSA) and Singular Value Decomposition (SVD) is used to carry out the reduction in data as well as preserving the relevant data. The classifier employed to sequence or train with positive and negative words and classify the sentiment of the words extracted was Naive Bayes. The reviews posted as well as the sentiment score obtained and aspect terms extracted are precisely listed on the HDFS file. The number of clusters required to carry out K-means is fixed depending on the most relevant aspect terms obtained. Map function is performed on the key-value pairs followed by reduce function.

#### H. Lexicon Approaches

Reviews comprise of words which express feeling either good or bad about the entity being spoken about. Humans usually tend to build an understanding and be cognitive about what makes them feel positive and what brings negativity. In this case words play an important role as they stand out the feelings that a human being experiences. Lexicon is a list of words or vocabulary that is known. It can be constructed manually by building a list of words and discovering their synonyms and antonyms like in a dictionary. Here all the words have a certain positivity or negativity attached to them for example joy denotes positivity and anger denotes negativity. This approach is used since sentiment analysis has been spoken about and many researchers have built their own lexicons to outperform others and improve accuracy [4], [14].

In the research [3] emotions have been taken into consideration and analysis have been made about what importance it holds in reviews posted by customer and work includes two lexicons by giving a detailed comparison of which outperforms the other. Firstly a discovery of two distinct types of dictionaries one that is crowd funded and the other one that is developed by an expert is used. Reviews from Amazon review dataset are taken and extraction of features is performed by checking if it appears in dictionary, in this case NRC emotion lexicon was used. The researchers have stated that their lexicon can be implemented on any text not just reviews. Bag of words method is used where each review is denoted as a bag of word which comprises the presence of each part or word of the review. Only those words are stored which appear in the reviews posted by customers as well as the NRC lexicon. If atleast one word from the review is reflected in the NRC lexicon a feature vector is constructed corresponding to it. For comparison purposes another lexicon developed by an expert named Galc has been used and the same method was applied to this lexicon as well and later comparisons were drawn which concluded that results coming from crowd funded lexicon were more precise than expert developed lexicon.

#### I. Alternative Methods

Neural Networks of its existing distinct types namely

recurrent neural network and convolutional neural network are also used extensively to solve challenges under sentiment analysis [17]. It does not match upto to the accuracy provided by other state of art methods but surely gives an alternative to the regular approaches and dives folks to pursue the current trend along with discovering and improvising it further.

Fuzzy logic is an interesting concept dealing with complete truth and false existence concerning boolean values only. Application of it to sentiment analysis can reap different challenges.

#### IV.COMPARISON

In Table I. a distinction is presented which arises from the research pieces in terms of the idea or algorithm used as well as the shortcomings arising from it.

#### V.CONCLUSION

This research article introduces sentiment analysis by highlighting the motivation that arised to work towards it. It also enlists the challenges and later listing the various types of sentiment analysis prevalent. The topic of interest is Aspect level Sentiment Analysis so efforts have been made to pen down the tasks and sub tasks comprising it by giving relevant examples in a meaningful manner that can be easily understood by the audience. It also presents the most current approaches utilized in sentiment analysis by providing an overview of the methodology adopted by the researches along with the fine points of it. It also provide a comparative table which presents the gaps that were witnessed during the review and examination of the articles. The future work that can be performed is a more extensive and exhaustive survey involving greater number of articles can be written along with a detailed comparative analysis.

Table I Comparison and Tracing Gaps

Ref.	Algorithm Used	Gaps
1	Ontology specific	Basic understanding of Ontology in the field of sentiment Analysis is required beforehand as there is
3	Lexicon approach	Extraction and Scoring could be compared with other prevalent approaches rather than
2	Parallel K-means and Map-Reduce	Limited content written on Map-reduce which requires prior understanding of its working. Comparison of performance measures from standard K-means as opposed to parallel K-means would prove to cater more clarity on precision, re- call and other measures.

Ref.	Algorithm Used	Gaps
7	Hidden Markov Model(HMM) approach	HMM is a bag of core concepts which requires mastering it from the base. An illustration of a very few reviews run through the model could provide a better picture of its working.
9	Unsupervised Learning and Association Rule Mining	Parameter arrangement which involves a lot of thresholds is a constraint as it requires fine tuning to reach a conclusion. Setting up seed words for different categories can also cause delay.
3	Supervised Learning approach and Lexicon Usage	Difficult to decipher random forests in a visual manner. It has aimed to overcome the disadvantages of Decision Tree classifier but evaluation does not show the performance measures of the two being compared to conclude which outperforms the other.
11	LDA topic modelling approach	It works on diverse domains but holds a constraint on the length of the reviews

#### REFERENCES

- [1]. A. Marstawi, N.M. Sharef, Aris, T. N.M. Aris and A. Mustapha, "Ontology-based Aspect Extraction for an Improved Sentiment Analysis in Summarization of Product Reviews," in Proceedings of the 8th International Conference on Computer Modeling and Simulation ICCMS '17, ACM, New York, NY, USA, pp 100-104, 2017.
- [2]. V. Priya and K. Umamaheswari, "Ensemble based Parallel k means using Map Reduce for Aspect Based Summarization," in Proceedings of the International Conference on Informatics and Analytics, ICIA 2016, Pondicherry, India, ACM, New York, NY, USA, pp. 1-9, 2016.
- [3]. A. Felbermayr and A. Nanopoulos, "The Role of Emotions for the Perceived Usefulness in Online Customer Reviews", Journal of Interactive Marketing, vol. 36, pp. 60-76, 2016.
- [4]. Y.-H. Hu and K. Chen, "Predicting hotel review helpfulness: The impact of review visibility, and interaction between hotel stars and review ratings," International Journal of Information Management, vol. 36, no. 6, pp. 929-944, 2016.
- [5]. M. Malik and A. Hussain, "Helpfulness of product reviews as a function of discrete positive and negative emotions," Computers in Human Behavior, vol. 73, pp. 290-302, 2017.
- [6]. M. M. Rahman and H. Wang, "Hidden Topic Sentiment Model," in Proceedings of the 25th International Conference on World Wide Web-(WWW '16),

- International World Wide Web Conferences Steering Committee, Republic and Canton of Geneva, Switzerland, pp. 155-165, 2016.
- [7]. S. Soni and A. Sharaff, "Sentiment Analysis of Customer Reviews based on Hidden Markov Model," in Proceedings of the 2015 International Conference on Advanced Research in Computer Science Engineering and Technology (ICARCSET '15), ACM, New York, NY, USA, pp. 1-5, 2015.
- [8]. V. Suresh, S. Roohi, and M. Eirinaki, "Aspect-based opinion mining and recommendation system for restaurant reviews," in Proceedings of the 8th ACM Conference on Recommender systems (RecSys '14), ACM, New York, NY, USA, pp. 361-362, 2014.
- [9]. K. Schouten, O. V. D. Weijde, F. Frasincar, and R. Dekker, "Supervised and Unsupervised Aspect Category Detection for Sentiment Analysis with Co-occurrence Data," IEEE Transactions on Cybernetics, pp. 1-13, 2017.
- [10]. T. A. Rana and Y.-N. Cheah, "A two-fold rule-based model for aspect extraction," Expert Systems with Applications, vol. 89, pp. 273-285, 2017.
- [11]. A. Garcia-Pablos, M. Cuadros, and G. Rigau, "W2VLDA: Almost unsupervised system for Aspect Based Sentiment Analysis," Expert Systems with Applications, vol. 91, pp. 127-137, 2018.
- [12]. M. S. Akhtar, D. Gupta, A. Ekbal, and P. Bhattacharyya, "Feature selection and ensemble construction: A two-step method for aspect based sentiment analysis," Knowledge-Based Systems, vol. 125, pp. 116-135, 2017.
- [13]. D. Anand and D. Naorem, "Semi-supervised Aspect Based Sentiment Analysis for Movies Using Review Filtering," Procedia Computer Science, vol. 84, pp. 8693, 2016.
- [14]. S. C. A. Canuto, M. A. Goncalves, and F. Benevenuto, "Exploiting New Sentiment-Based Meta-level Features for Effective Senti- ment Analysis," in Proceedings of the Ninth ACM International Conference on Web Search and Data Mining - WSDM 16, ACM, New York, NY, USA, pp. 53-62, 2016.
- [15]. A. N. Farhan and M. L. Khodra, "Sentiment-specific word em- bedding for Indonesian sentiment analysis," 2017 International Conference on Advanced Informatics, Concepts, Theory, and Applications (ICAICTA), Denpasar, pp. 1-5, 2017.
- [16]. M. Fernandez-Gavilanes, T. Alvarez-Lopez, J. Juncal-Martinez, E. Costa-Montenegro, and F. J. Gonzalez-Castano, "Unsupervised method for sentiment analysis in online texts," Expert Systems with Applications, vol. 58, pp. 57-75, 2016.
- [17]. S. Jebbara and P. Cimiano, "Aspect-Based Sentiment Analysis Using a Two-Step Neural Network Architecture," Semantic Web Challenges Communications in Computer and Information Science, pp. 153-167, 2016.
- [18]. B. Gao, N. Hu, and I. Bose, "Follow the herd or be myself? An analysis of consistency in behavior of reviewers and helpfulness of their reviews," Decision Support Systems, vol. 95, pp. 1-11, 2017.
- [19]. W. Medhat, A. Hassan and H. Korashy, "Sentiment analysis algorithms and applications: A survey," Ain Shams Engineering Journal, vol. 5, no. 4, pp. 1093-1113, 2014.
- [20]. M.S. Akhtar, P. Bhattacharyya, and A. Ekbal, "Aspect based Senti- ment Analysis in Hindi: Resource Creation and Evaluation" LREC, 2016 .
- [21]. Z. Liu and S. Park, "What makes a useful online review? Implica- tion for travel product websites," Journal of Tourism Management, vol. 47, pp. 140-151, 2015.