CHAPTER 2

LITERATURE REVIEW

2.1 SURVEY ON OPINION MINING

The research work carried out by Goeuriot et al. (2012) has proposed the creation of lexical resources and their adaptation to the medical domain. The creation of a general lexicon, containing opinion words from the general domain and their polarity is described. Then the creation of a medical opinion lexicon based on a corpus of drug reviews is prescribed for classification. It shows that some words have a different polarity in the general domain and in the medical domain. Some words considered generally as neutral are opinionated in medical texts. Finally, the lexicons are evaluated and a simple algorithm that uses the general lexicon gives better results than the other well-known ones on the corpus is shown and that adding the domain lexicon improves them as well.

Similarly, Asghar et al. (2014) also have proposed a medical opinion lexicon for mining health reviews available on different health forums. This technique works based on the incremental modal and corpus of health reviews by creating medical polarity lexicon for medical terms. In each increment, the vocabulary of lexicon is enhanced systematically, polarity score with each word is attached, and finally, the resulting lexicon is filtered from unnecessary words by using word sense disambiguation techniques. The comparative results show the efficiency of the developed method with an
accuracy of 82% on training corpus and 78% on testing corpus of health reviews.

Buche et al. (2013) have advocated various techniques that have been developed for the key tasks of opinion mining. Then an overall picture of what is involved in developing a software system for opinion mining on the basis of the survey and analysis is presented with several existing tools and methods in opinion mining.

Shelke et al. (2012) have described techniques and approaches to directly enable opinion-oriented information seeking systems. An attempt has been made to deal with various approaches to be attempted on a computational treatment of sentiments and opinions. Various supervised or data-driven techniques for opinion mining like Naïve Bayes, Maximum Entropy (ME), and SVM are elaborated and their strengths and drawbacks are touched upon. From the survey, the final result obtained is unigram feature selection with SVM produces better results comparing with Naïve Bayes and maximum entropy.

Similarly, Yu et al. (2012) have proposed Sentiment Probabilistic Latent Semantic Analysis (S-PLSA), in which a review is considered as a document generated by a number of hidden sentiment factors in order to capture the complex nature of sentiments. Training an S-PLSA model enables to obtain a succinct summary of the sentiment information embedded in the reviews. Based on S-PLSFA, the study has proposed an Auto-Regressive Sentiment-Aware (ARSA) model for sales prediction. Further the accuracy of prediction is improved by considering the quality factor, with a focus on predicting the quality of a review in the absence of user-supplied indicators, and presented an Auto-Regressive Sentiment and Quality Aware model (ARSQA), to be utilized with sentiments and quality for predicting product sales performance.
Samsudin et al. (2012) have used an Artificial Immune System (AIS) technique to identify Malaysian online movie reviews. This opinion mining process uses three string similarity functions, namely cosine similarity, Jaccard coefficient and Sorensen coefficient. In addition, AIS performance is compared with the other traditional machine learning techniques like SVM, Naïve Bayes and k-Nearest Network. The results of the findings are elaborated which shows that AIS technique with k-NN produces improved accuracy upto 15% than others.

Cruz et al. (2013) have defined a set of domain specific resources which capture usable knowledge about how people express opinions on a given domain. These resources are automatically induced from a set of annotated documents. Some experiments are carried out on three different domains such as user-generated reviews of headphones, hotels and cars, compared to the approach to the other state-of-the-art and domain-independent techniques. The results confirm the importance of the domain in order to build accurate opinion extraction systems. Some experiments on the influence of the dataset size and act as an example of aggregation and visualization of the extracted opinions.

In the same way, Bagheri et al. (2013) have evaluated a novel unsupervised and domain independent model on a collection of English product review datasets. This model does not require any labeled training data and it can be easily applied to other languages or domains like movie reviews. Experimental results show considerable improvements of this model over conventional classification techniques including unsupervised and supervised approaches.

Agarwal et al. (2013c) have incorporated the information of POS based sentiment-rich phrases in a machine learning algorithm that determines the semantic orientation of a given text. In this sentiment, bi-tagged phrases
are utilized as features in combination with unigram features for sentiment classification. Joint feature vectors of unigrams and bi-tagged phrases have high dimensions consisting of noisy and unrelated features. Therefore a feature selection method is utilized to select only relevant features from the feature vector. Experimental results show that the combination of prominent unigrams and bi-tagged phrases outperforms the other features for sentiment classification implemented in a movie review dataset.

Liu et al. (2013) have studied the problem of developing adaptive sentiment analysis models for online reviews. Given the success of latent semantic modeling techniques, two adaptive methods are proposed to capture the evolving sentiments. As the part of a case study, the possibility of using the extracted adaptive patterns is investigated for sales prediction. The study is evaluated on an Internet Movie Data Base dataset consisting of reviews of particular movies and their box office revenues. Experimental results show that the adaptive methods can capture sentiment changes arising from newly available reviews, which help greatly to improve the feature prediction accuracy.

Habernal et al. (2014) have evaluated the state-of-the-art supervised machine learning methods for sentiment analysis. Different pre-processing techniques are explored and various features and classifiers are employed. Five different feature selection algorithms and the influence of named entity recognition and preprocessing on sentiment classification performance is investigated. In addition to newly created social media dataset, the results for other popular domains, such as movie and product reviews are reported. This would not only extend the current sentiment analysis research to another family of languages but also encourage competition, leading potentially to the production of high-end commercial solutions.
Similarly, Choi et al. (2012) have introduced Consento method, a consensus search engine developed to answer subjective queries. Consento performs segment indexing, as opposed to document indexing, to capture semantics from user opinions more precisely. In particular, the study has defined a new indexing unit named as Maximal Coherent Semantic Unit (MCSU). An MCSU represents a segment of a document and it captures a single coherent semantic. A new ranking method, called Consensus Rank that counts online comments referring to an entity as a weighted vote is also introduced. To validate the efficacy of the proposed framework, Consento with standard feature retrieval models and their recent extensions for opinion based entity ranking is compared. Experiments with movie and hotel data are carried out which show the effectiveness of the framework.

Liang & Dai (2013) have proposed a new system architecture that can be utilized to automatically analyze the sentiments of these messages. This system is combined with manually annotated data from Twitter, one of the most popular microblogging platforms, for sentiment analysis. In this system, machines can learn automatically extracting the set of messages which contain opinions, filter out non-opinion messages and determine their sentiment directions, i.e., positive or negative. Experimental results confirm the effectiveness of the system on sentiment analysis in real microblogging applications.

Wang et al. (2013) also have proposed a review rating prediction method by incorporating the character of reviewer's social relations as regularization constraints, into content based methods. In addition, a new classification method is advanced to classify the social relations of reviewers into strong social relation and ordinary social relation. For strong social relation of reviewers, higher weight is given than ordinary social relation when incorporating the two social relations into content based methods.
Experiments on two real movie review datasets demonstrate that the method of taking different social relations has better performance than the method of considering social relations as a whole and the content based methods.

In the same way, Saggion et al. (2012) have recommended an extrinsic evaluation framework where full reviews and different types of summaries (positional, generic and sentiment based) of several compression rates (from 10% to 50%) are evaluated. These are facing a difficult task; however, the results obtained are very promising and they demonstrate that the summaries are appropriate for the rating inference problem, performing at least equally to the full reviews when summaries are at least 30% of compression rate. Moreover, this study also finds out that the way the review is organized, as well as the style of writing, that strongly determines the performance of different types of summaries.

Yan et al. (2014) have put forth a bilingual approach for conducting sentiment analysis on both Chinese and English social media to obtain more objective and consistent opinions. This approach treats review comments as a stream of text containing both Chinese and English words. The stream of text is then segmented by the segment model and trimmed by the stop word lists which include both Chinese and English words. The stem words are processed and taken as feature vectors and then applied with two exchangeable natural language models like SVM and N-Gram. Finally, the approach is utilized to analyze movie reviews obtained from social media. This experiment shows that the bilingual approach has the high level of accuracy and is more effective than the existing learning based approaches.

Brindha & Santhi (2012) also have proposed the decision making tool to guide the consumers for purchasing two wheelers. The study aims to design decision making system based on algorithmic approach. Some methods have been proposed with some limitations. This study includes
different parameters such as cost, mileage, style, comfort and performance for getting accurate decision. The strength of the proposed method is the inclusion of weight factor and preference factor. Experimental analysis shows that this method provides guidelines for both consumers and manufacturers to decide which features are missing and what kind of features to be included in the existing system.

Kim et al. (2013) have advocated a scheme for mining public opinions from a collection of user comments, easily available on social networks, on the trailer of a new movie. It is necessary to predict whether the movie would be a box office hit based on public opinion and other properties such as the leading actors, director and their past works. Through various experiments, it is shown that the scheme can produce satisfactory results.

Xuan et al. (2012) have recommended syntax based patterns which are used for extracting rich linguistic features. These features are enhanced by using syntactic information of the text. From the observation made during investigating opinion evidences in the texts, it is noted that combining these new features with conventional features from previous studies, reveal a high accuracy about 92.1% for detecting subjective sentences on the movie review data.

Kumar et al., (2017) presented the step-by-step feature extraction approach to reach the goal of extracting maximum number of product features from the product reviews. Various types of nouns are extracted in the form of product features. These are namely frequent features, relevant features, implicit features and infrequent features. The results show that the comprehensive feature extraction approach performs better than the particular way for extracting the product features in the semantic environment. This approach is used in e-commerce websites to find out what product features are of interest to the customers. This model is useful in recommending products
to the customers as the search for a product in the e-commerce site takes place, the features from the product reviews are helpful with the corresponding opinion orientations. This forms the basis for suggesting similar products using the calculated sentiments in the recommendation process.

Nie & Zhou (2017) proposed a method to extract commodity feature based on Chinese online comments. In this method, the semantic rules of commodity feature are more perfectly defined, which significantly reduces the noise of candidate feature set, and simplifies the subsequent features' extraction. In this work, it also set the seed weight reasonably, and obtain the changed threshold and seed set by iterative method. Experimental results show that the proposed method can effectively and quickly perform unsupervised learning. Moreover, compared with other methods, it has better recognition performance.

Sweeney & Padmanabhan (2017) enhanced the word embedding’s approach with the deployment of a sentiment lexicon-based technique to appoint a total score that indicates the polarity of opinion in relation to a particular entity or entities. This type of sentiment classification is a way of associating a given entity with the adjectives, adverbs, and verbs describing it, and extracting the associated sentiment to try and infer if the text is positive or negative in relation to the entity or entities.

2.2 SURVEY ON FEATURE SELECTION FOR OPINION MINING

In feature selection, Alsaffar & Omar (2014) have demonstrated that all the feature reduction methods generally improve the classifier’s performance. SVM approach provides the highest accuracy performance of feature selection in order to classify Malay sentiment compared to the other
classification approaches such as Principal Component Analysis (PCA) and Chi Squared (CHI). SVM records 87% as the experimental accuracy result of feature selection.

Mukherjee & Bhattacharyya (2012) have presented a novel approach to identify feature specific expressions of opinion in product reviews with different features and mixed emotions. The objective is realized by identifying a set of potential features in the review and by extracting opinion expressions about those features by exploiting their associations. Capitalizing on the view that more closely connected words come together to express an opinion about a certain feature, dependency parsing is used to identify relations between the opinion expressions. The system learns the set of significant relations to be used by dependency parsing and a threshold parameter which allows to merge closely associated opinion expressions.

Huang et al. (2012) have proposed the product feature extraction as a sequence labeling task and employed a discriminative learning model using Conditional Random Fields (CRFs) to tackle it. The POS features and the sentence structure features into the CRFs learning process have been innovatively included. The empirical studies have proved the effectiveness in classifying the text into semantic basis approaches compared to the other counterpart methods.

Claypo & Jaiyen (2015) have proposed an opinion mining on Thai restaurant reviews using K-Means clustering and Markov Random Field (MRF) feature selection. The proposed method begins with text preprocessing for breaking reviews into words and removing stop words, followed by text transformation for creating keywords and generating input vectors. MRF feature selection is adopted subsequently for selecting relevant features from a large number of features extracted. Then K-Means is employed for clustering the opinions into positive and negative reviews. From
the experimental results, it is clear that MRF feature selection could efficiently reduce the number of features in the data set, so the computational time gets decreased significantly.

Similarly, Baccianella et al. (2014) have presented six novel feature selection methods that have been devised specifically for ordinal classification and tested them on two data sets of product review against three existing methods previously known from the literature, using two learning algorithms from the support vector regression tradition. The experimental results show that all the proposed metrics largely outperform all the baseline techniques (and are more stable than these others by an order of magnitude), on both the data sets and for both the learning algorithms.

Kamal et al. (2012) have presented an opinion mining system which implements a rule based system to identify candidate feature-opinion pairs from review documents. The system is able to identify product features and opinions that are related either directly or indirectly. The extracted feature-opinion pairs along with the source documents are modeled using a bipartite graph. The graph based ranking method HITS is used for selecting better features.

Similarly, Lukacs et al. (2013) have described a study of speech to music transitions looking for patterns between the acoustic features and the subjective perception of the transition quality. In the course of the work, a set of audio test data is created, a subjective opinion test for rating the quality of the transitions is conducted and acoustic features are extracted from both the pieces of speech and music. The data collected are analyzed using data mining methods. The most important patterns found in the data are music and speech tempo, intensity range and Mel spectral coefficients which have made it possible to predict the quality of the match with a performance rate of 70%.
Sharma & Dey (2012a) have explored the applicability of five commonly used feature selection methods in data mining research such as Document Frequency (DF), Information Gain (IG), Gain Ratio (GR), CHI and Relief-F and seven machine learning based classification techniques such as Naïve Bayes, SVM, Maximum Entropy, Decision Tree, K-Nearest Neighbor, Winnow and Ada boost for sentiment analysis on online movie review dataset. This work demonstrates that the feature selection improves the performance of sentiment based classification, but it depends on the method adopted and the number of features selected. The experimental results presented in this feature selection show that GR gives the best performance for sentimental feature selection, and SVM performs better than the other techniques for sentiment based classification.

In the same way, Hai et al. (2014) have extracted a list of candidate opinion features from the domain review corpus by defining a set of syntactic dependence rules. For each extracted candidate feature, it’s Intrinsic-Domain Relevance (IDR) and Extrinsic-Domain Relevance (EDR) scores on the domain-dependent and domain-independent corpora respectively are estimated. Candidate features that are less generic, EDR score less than a threshold and more domain-specific IDR score greater than another threshold are then confirmed as opinion features. This interval thresholding approach the Intrinsic and Extrinsic Domain Relevance (IEDR) criterion. Experimental results on two real-world review domains show that the proposed IEDR approach outperforms several other well-established methods in identifying opinion features.

Agarwal & Mittal (2013a) also have proposed the unigram and bi-grams features extracted from the text, and composite features created using them. POS based feature adjectives and adverbs are also extracted. IG and Minimum Redundancy Maximum Relevancy (MRMR) feature selection
methods are utilized to extract prominent features. Furthermore, the effects of various feature sets for sentiment classification are investigated using machine learning methods. The effects of different categories of features are investigated on four standard datasets, i.e., movie review and product (book and electronics) review dataset. Experimental results show that the composite features created from prominent features of unigram and bi-gram perform better than the other features for sentiment classification. MRMR is a better feature selection method compared to IG for sentiment classification. Boolean Multinomial Naïve Bayes (BMNB) algorithm performs better than SVM classifier for sentiment analysis in terms of accuracy and execution time.

Ahmad et al. (2015) have recommended the feature selection in sentiment analysis based on natural language processing and modern methods such as GA and RST. Feature selection in text classification is compared based on traditional and sentiment analysis methods. Feature selection is an important step in sentiment analysis since a suitable feature selection can identify the actual product features criticized or discussed by consumers. It can be concluded that metaheuristic based algorithms have the potential to be implemented in sentiment analysis research and they can produce an optimal subset of features by eliminating features that are irrelevant and redundant.

Agarwal & Mittal (2016) have also proposed the machine learning algorithms that have been used widely for sentiment analysis. Bag-of-Words (BoWs) representation is utilized commonly for sentiment analysis. BoW assumes the independence of words and omits the importance of semantic and subjective information in the text. All the words in the text are given equal importance. The BoW representation is used commonly for sentiment analysis, resulting in high dimensionality of the feature space. Machine learning algorithms reduce this high-dimensional feature space with the help of feature selection techniques that reduce the feature number by selecting
only the important features eliminating the noisy and irrelevant features. Recently, machine learning based sentiment analysis models are gaining prominence in this sentiment analysis.

Saraswathi & Tamilarasi (2012) have extracted the feature set from reviews using TF-IDF and the reviews are classified into positive or negative using bagging algorithms. This work is evaluated using a subset of IMDB. Bagging algorithm produces better classification accuracy and reduced Root Mean Squared Error (RMSE).

Similarly, Penalver-Martinez et al. (2014) have proposed an innovative opinion mining methodology that takes advantage of new semantic web-guided solutions to enhance the results obtained with traditional natural language processing techniques and sentiment analysis processes. The main targets of this methodology are: (1) feature based opinion mining by using ontologies at the feature selection stage gets improved and (2) a new vector analysis based method for the analysis of sentiments has been provided. This methodology has been implemented and tested in detail in a real-world movie review-themed scenario which yields very promising results when compared with the conventional approaches.

Banati & Bajaj (2012) have analyzed the current trend of market in terms of relevant product features. The users’ interest towards these features is extracted by mining their opinions. Subsequently, market segmentation is done by clustering similar users and the best segment(s) is selected for product promotion. This strategy finally exploits the social connectedness among online users to identify the best initial seeds. This approach is also capable of attracting the attention of a large span of web users by employing a small fraction of advertising budget and it has the potential in current e-marketing scenario.
Ganeshbhai & Shah (2015) have advocated an autonomous text analysis and summarization system for reviews available on Web. Opinion mining aims to distinguish the emotions expressed within the reviews, classifying them into positive or negative and summarizing them into the form that is quickly understood by users. Feature based opinion mining performs fine-grain analysis by recognizing individual features of an object upon which a user has expressed opinions. This approach gives an insight into various methods proposed in the area of feature based opinion mining and illustrates the limitations of the existing works and future direction in feature based opinion mining.

Sharma & Dey (2012) have explored the applicability of feature selection methods for sentiment analysis and the performance for classification in terms of recall, precision and accuracy. Five feature selection methods such as DF, IG, GR, CHI, and Relief-F and three popular sentiment feature lexicons like Head Match (HM), General Inquirer (GI) and Opinion Lexicon are taken for investigation on movie review corpus, with a size of 2,000 documents. The experimental results show that IG gives consistent results and GR performs the best overall for sentimental feature selection while sentiment lexicons give poor performance. Furthermore, the performance of the classifier depends on the appropriate number of representative features selected from the text.

Agarwal et al. (2015) have presented a concept extraction algorithm based on a novel concept parser scheme to extract semantic features that exploit semantic relationships between words in natural language text. Additional conceptual information of a concept is obtained using the Concept Net ontology. Concepts extracted from text are sent as queries to Concept Net to extract their semantics. Important concepts are selected while redundant concepts are eliminated using the MRMR feature selection technique. All the
selected concepts are then used to build a machine learning model to classify a given document as positive or negative. The study evaluates the concept extraction approach using a benchmark movie review dataset provided by Cornell University and product review datasets on books and electronics. Comparative experimental results show that the proposed approach to sentiment analysis performs better than the existing state-of-the-art methods.

Similarly, Singh et al. (2013a) have proposed the domain specific feature based heuristic for aspect level sentiment analysis of movie reviews. An aspect oriented scheme that analyzes the textual reviews of a movie and assigns them a sentiment label on each aspect is devised. The scores on each aspect from multiple reviews are then aggregated and a net sentiment profile of the movie is generated on all the parameters. The study uses a SentiWordNet based scheme with two different linguistic feature selections comprising adjectives, adverbs and verbs and n-gram feature extraction. The SentiWordNet scheme is used also to compute the document-level sentiment for each movie review and the results obtained are compared with results derived from Alchemy Application Programming Interface (API). This sentiment profile of a movie is also compared with the document-level sentiment results. The results attained show that the aspect level classification scheme produces a more accurate and focused sentiment profile than the simple document-level sentiment analysis.

Singh & Dubey (2014) have proposed the sentiment analysis that consists of different fields like natural language processing, text mining, decision making and linguistics. Several types of text analysis that classify the text and makes decision by extracting and analyzing the text are attempted. Opinions can be categorized into positive and negative and text analysis measures the degree of positivity or negativity associated with that event like people, organization and social issues. So, basically, emotions and appraisals
in the direction of any social issue, people or entity are investigated. Recently, most of the researches have been done on the sentiment analysis of products and services. This analysis of events, issues and other data are retrieved from social media like twitter.

2.3 SURVEY ON CLASSIFIERS USED IN OPINION MINING

Veeraselvi & Saranya (2014) have presented opinion detection and organization subsystem, that have been integrated into larger question-answering system. The subjectivity classification system employs Genetic-Based Machine Learning (GBML) technique and considers subjectivity as a semantic problem. The review classification is predicted through the average semantic orientation of the phrases in the review that contains adjectives or adverbs. Experimental results of the proposed techniques are more efficient and they generate eminent evaluation.

Khairnar & Kinikar (2013) have introduced and surveyed the field of sentiment analysis and opinion mining. Sentiment analysis and opinion mining have been a very active research area in recent years. In fact, it has extended from computer science to management science. Finally, this approach concludes that all the sentiment analysis tasks are very challenging. The concept of SVM is explained through a small set of data in a 2-dimensional feature space. With the kernel methods used, SVM can be used to classify data in high dimensional space. This SVM is an excellent method for data classification.

Onan & Korukoglu (2015) have presented comparatively the performance of opinion mining datasets on bagging, dagging, random subspace and AdaBoost ensemble methods with five different classifiers and six different data representation schemes. The experimental results show that
ensemble methods could be used for building efficient opinion mining classification methods.

Similarly, Moraes et al. (2013) have presented an empirical comparison between SVM and ANN regarding document level sentiment analysis. The resulting models and contexts reveal that the both approaches achieve better levels of classification accuracy. A standard evaluation context with the most popular supervised methods for feature selection and weighting in a traditional bag-of-words model has been adopted. Except for some unbalanced data contexts, the experiments indicate that ANN produces superior or at least comparable results to SVMs. The results have also confirmed some potential limitations of both the models, which have been rarely attempted in the sentiment classification literature.

Kalaivani & Shunmuganathan (2013) have evaluated the performance of sentiment classification in terms of accuracy, precision and recall. In this approach, three supervised machine learning algorithms like SVM, Navie Bayes and k Nearest Neighborhood (KNN) are compared for sentiment classification of the movie reviews that contain 1,000 positive and 1,000 negative processed reviews. The experimental results show that the SVM approach outperforms the Navie Bayes and KNN approaches and the training dataset has a large number of reviews and the SVM approach reaches the accuracy of more than 80%.

Medagoda et al. (2013) also have investigated opinion mining and sentiment classification studies in three non-English languages to identify the classification methods and to measure the efficiency of each algorithm used in these methods. It is found that most of the researches conducted for non-English have followed the methods used in the English language with only limited usage of language specific properties like morphological variations.
The application domains appear as if they are restricted to particular fields and significantly less research has been conducted in cross domains.

Chandrakala & Sindhu (2012) have presented various approaches to opinion mining and sentiment analysis. Some of the machine learning techniques like Naïve Bayes, Maximum Entropy and SVM have been illustrated. The recent developments in sentiment analysis and its related subtasks are also presented. The state-of-the-art of existing approaches has been described with main focus on the following tasks: subjectivity detection, word sense disambiguation, feature extraction and sentiment classification using various machine learning techniques.

Wang et al. (2014) also have conducted a comparative assessment of the performance of three popular ensemble methods like bagging, boosting and Random subspace based on five base learners such as Naïve Bayes, Maximum Entropy, Decision Tree, k-NN and SVM for sentiment classification. Moreover, ten public sentiment analysis datasets are investigated to verify the effectiveness of ensemble learning for sentiment analysis. Based on a total of 1,200 comparative group experiments, empirical results make known that ensemble methods substantially improve the performance of individual base learners for sentiment classification. Among the three ensemble methods, Random subspace has better comparative results although it is seldom touched upon in the existing researches. These results illustrate that ensemble learning methods can be used as viable methods for sentiment classification.

Hosseini & Zekri (2012) have reviewed the application of the Adaptive Neuro-Fuzzy Inference System (ANFIS) as a classifier in medical image classification during the past 16 years. ANFIS is a Fuzzy Inference System (FIS) implemented in the structure of an adaptive fuzzy neural network. It combines the explicit knowledge representation of an FIS working
with the learning power of ANNs. It concentrates mainly concentrate on the integration of the best features of fuzzy systems and neural networks. Further, a brief comparison with other classifiers, advantages and drawbacks of this classifier are investigated.

Dinu & Iuga (2012) have focused on Naïve Bayes classifiers in opinion mining applications. The first thing considered is the feature sets to be chosen when training such a classifier to obtain the best results in the classification of objects, in this case, texts. The second thing is whether combining the results of Naïve Bayes classifiers with the same classifier trained on different feature sets has a positive effect on the final results. Two databases, both consisting of negative and positive movie reviews, are used for training and testing the classifiers.

Kang et al. (2012) have proposed the Naïve Bayes algorithm. Experiment shows that when this algorithm and unigrams + bigrams are used as the feature, the gap between the positive accuracy and the negative accuracy is narrowed to 3.6% than when the original Naïve Bayes is used, and that the 28.5% gap is able to be narrowed compared to that of the use of SVM. Additionally, the use of this algorithm based on the senti-lexicon shows an accuracy that is improved with a maximum of 10.2% in recall and a maximum of 26.2% in precision than that by the use of SVM, and by a maximum of 5.6% in recall and a maximum of 1.9% in precision than when the Naïve Bayes is used.

Mouthami et al. (2013) have proposed Sentiment Fuzzy Classification (SFC) algorithm with POS tags for improving the classification accuracy on the benchmark dataset of movie review dataset.
Singh et al. (2013a) have proposed the document level sentiment classification. The study has been implemented with two machine learning based classifiers (Naïve Bayes and SVM), the unsupervised Semantic Orientation-Pointwise Mutual Information-Information Retrieval (SO-PMI-IR) approach and the SentiWordNet approaches for sentiment classification of movie reviews. This approach uses two pre-existing large datasets and one of the moderate sizes of datasets is collected. It makes primarily two useful contributions: (a) a comprehensive evaluation of the performance of all the available approaches for use with movie reviews and (b) a modified Adjective-Adverb combination scheme of SentiWordNet approach.

Agarwal et al. (2013b) have extracted opinion-rich phrases using POS based rules and dependency relation in the documents that are capable of extracting contextual and syntactic information from the given documents. Next, Point-wise Mutual Information (PMI) based method is used for calculating the semantic orientations of these phrases. At last, review document is classified after aggregating the semantic orientation of all the phrases into positive or negative polar document.

Dehkharghani et al. (2012) have defined sentiment analysis as to the automatic extraction of sentiments from a natural language text. The effect of subjectivity based features on sentiment classification on two lexicons is analyzed and a new subjectivity based features are utilized for sentiment classification. These subjectivity based features are experimented based on the average word polarity and the new features are proposed based on the occurrence of subjective words in review texts. Experimentation is done on hotel and movie reviews. The results show an overall accuracy of about 84% and 71% in hotel and movie review domains respectively, improving the baseline using the average word polarities by about 2% points.
Sayeedunnissa et al. (2013) have proposed the supervised learning solution for sentiment analysis on twitter messages which give profound accuracy using Naïve Bayes classification. The tweets are classified into either positive or negative. This dataset consists of movie reviews retrieved from twitter using certain keywords on a cloud platform. The experimental analysis has been done in three major stages. In the first stage, Naïve Bayes algorithm is utilized which performs Boolean classification on BoW, resulting in 71% of accuracy. In the second stage, Naïve Bayes algorithm is applied on BoW after removing stop words which give 72% of accuracy. In the third stage, using the feature selection concept of IG, high value features are selected using CHI, which give maximum accuracy. The evaluation metrics used are accuracy, precision, recall and F-Measure for both the sentiment classes. The results show that Naïve Bayes algorithm with the minimum Chi Square value of 3 for feature selection produces better Positive Recall. The preprocessing steps needed to achieve high accuracy are proposed.

Similarly, Cho et al. (2014) have proposed the systematic analysis framework using Korean Twitter data to be mined for classifying temporal and spatial trends of brand images. A publicly available Korean morpheme analyzer is utilized for analyzing Korean tweets grammatically, and Korean polarity dictionaries containing a noun, adjective, verb and root are constructed to automatically analyze the sentiment of each tweet message. Sentiment classification is performed by SVM and multinomial Naïve Bayes classifier. In particular, own feature selection improves the SVM sentiment classification accuracy to 80%. Based on this result, the temporal and spatial distribution of brand images are visualized, and the temporal changes of brand-related keyword networks are presented. This process of analysis enables trends in brand awareness to be systematically traced and evaluated. This allows various other analyses like advantages and disadvantages of the brand, and a comparison with its competitors.
Singh et al. (2013) have proposed the performance evaluation of the SentiWordNet approach for document level sentiment classification of movie reviews and blog posts. It can be implemented with variations in linguistic features, scoring schemes and aggregation thresholds. This approach uses two pre-existing large datasets of movie reviews and two blog post datasets on revolutionary changes in Libya and Tunisia. Next, computed sentiment polarity and its strength for both the movie reviews and blog posts have also been presented. There are used for giving an evaluative account of the performance of the SentiWordNet approach with two popular machine learning approaches: Naïve bayes and SVM for sentiment classification. The comparative performance of the approaches for both the movie reviews and blog posts is illustrated through standard performance evaluation metrics of accuracy, F-measure and entropy.

In the same way, Sharma & Dey (2012b) have proposed the sentiment classification model using Back Propagation Artificial Neural Network (BPANN). IG with other three popular sentiment lexicons is used for extracting sentiment, representing features that are then used to train and to test the BPANN. This new approach combines the strength of BPANN in classification accuracy with intrinsic subjectivity knowledge available in the sentiment lexicons. These results are obtained from experiments on the movie and hotel review corpora have shown that this approach has been able to reduce dimensionality while producing accurate results for sentiment based classification of text.

Waila et al. (2012) have proposed the evaluation of machine learning based classification approaches (Naïve Bayes and SVM) with the unsupervised semantic orientation based SO-PMI-IR algorithm for sentiment analysis of movie review texts. This approach uses both the pre-existing datasets and own dataset collection comprising a large number of user...
reviews for Hindi movies. The Naïve Bayes and SVM approaches are implemented in multiple folds. The results, in addition to presenting a detailed comparative view of these techniques, demonstrate that with suitable selection of features, the Naive Bayes algorithm performs sensibly well and at times matches the popularly believed superior performance level of SVM, at least for sentiment analysis task. The SO-PMI-IR algorithm produces substantially accurate sentiment classification with no prior training requirements. The accuracy of SO-PMI-IR depends on POS tags used as features and thresholding and aggregation schemes employed.

Manek et al. (2013) have recommended a model sentiment classification of movie reviews using Efficient Repetitive Pre-processing (SentReP) that is based on tested parameters and it is a highly focused pre-processing technique to classify opinions. This approach works on the Cornell movie review data set and significantly proves the accuracy and effectiveness of SentReP across different volumes of data when compared with the other different prevailing approaches. Therefore this approach is very efficient in analyzing sentiments of movie reviews.

Sharma & Dey (2013) have recommended a hybrid sentiment classification model based on boosted SVM. This model exploits the classification performance of the two techniques Boosting and SVM applied for sentiment based classification of online reviews. The results on movies and hotel review corpora of 2,000 reviews have shown that this approach has succeeded in improving the performance of SVM when it is used as a weak learner for sentiment based classification. Specifically, the results show that SVM ensemble with bagging or boosting significantly perform better than a single SVM in terms of accuracy of sentiment based classification.

Liu et al. (2012) also have designed and developed a movie-rating and review-summarization system for a mobile environment. The movie-
rating information is based on the sentiment classification result. The condensed descriptions of movie reviews are generated from the feature based summarization. A novel approach is proposed based on Latent Semantic Analysis (LSA) to identify product features. Furthermore, a way is found to reduce the size of summary based on the product features obtained from LSA. Both the sentiment classification accuracy and system response time are considered for designing the system. The rating and review-summarization system can be extended to the other product-review domains easily.

Mittal et al. (2013) have proposed a method to increase the coverage of Hindi SentiWordNet for better classification results. In addition, the impact of the negation and discourse rules are also investigated for Hindi sentiment analysis. The algorithm proposed produces the classification accuracy of 82.89% for positive reviews and 76.59% for negative reviews, and an overall accuracy of 80.21%.

Sharma et al. (2014) have proposed a document based opinion mining system that classifies the documents as positive, negative and neutral. Negation is also handled in the proposed system. Experimental results using movies reviews show the effectiveness of the system. Experimental results indicate that the document based sentiment orientation system produces good accuracy, precision and recall.

Kumar & Kathiravan (2015) also have classified the product features based on the user behavior and proposed an Ant Opinion Miner Classification Rule Learning (AOM-CRL) process. Initially, the process of Ant Opinion Miner (AOM) helps to fetch the combination of, i.e., hybrid product features based on the user behavior. AOM involves the pheromone initialization, updation and fitness function for efficient classification of hybrid features. Pheromone initialization starts the optimization process based on the user behavior with opinion patterns based classification on product
features. Then the pheromone updating process is carried out with the same behavior for a set of hybrid features of the products. Both the initialization and the updation uses the user behavior information to easily adopt the classification rule. The fitness function is employed in AOM-CRL process to produce quality result on the classification process. In addition, different sets of hybrid feature classification also produce high quality function value through ant-miner based classification rule. This ant-miner based classification rule integrates the Enhanced Rapid Repeated Attribute Reduction (ERRAR) algorithm to improve the classification accuracy on sentiment analysis with minimal processing time. Experiments are conducted with classification rate on user opinions, false positive rate and precision rate on product result.

Kalaivani & Shunmuganathan (2015) have introduced an optimized feature reduction that incorporates an ensemble method of machine learning approaches involving IG and genetic algorithm as feature reduction techniques. Experiments are conducted on multi-domain review dataset and movie review dataset in opinion mining. The effectiveness of single classifiers like Naïve Bayes, logistic regression, SVM and ensemble technique for opinion mining is compared on five datasets. This hybrid method is evaluated and using IG and genetic algorithm with ensemble technique perform better in terms of various measures for multi-main review and movie reviews. Classification algorithms both single and hybrid are evaluated using McNamara’s test to compare the level of significance of the classifiers.

Similarly, Itani et al. (2012) have presented the application of two different approaches for classifying Arabic Facebook posts. The first one depends on syntactic features employing common patterns used in different Arabic dialects to express opinions. These patterns achieve high accuracy and
determine the polarity of a sentiment even when tested against new corpus. This approach works on informal Arabic text which has not been addressed before. Different setups are tried and the highest coverage and accuracy achieved are 49.5% and 83.4% respectively. The second approach is an ordinary probabilistic model, Naive-Bayes classifier that assumes the independence of features which determines the class of highest coverage and accuracy achieved in this approach is 60.5% in the first setup and 91.2% when Naive search is used as a binary classifier to classify the posts as objective or subjective.

Hailong et al. (2014) also have provided the opinion mining with machine learning and lexicon based approaches, together with evaluation metrics. Cross-domain and cross-lingual approaches are also explored. Experimental results show that the supervised machine learning methods such as SVM and Naive Bayes, have better precision while lexicon based methods are also very competitive because they require a few efforts in human-labeled document, and are not sensitive to the quantity and quality of the training dataset.

Agarwal & Mittal (2012) have presented a new feature selection method, namely Probability Proportion Difference (PPD) based on the probability of belongingness of a term to a particular class. This approach is capable of removing irrelevant terms from the feature vector. Further, a Categorical Probability Proportion Difference (CPPD) feature selection method is proposed based on Probability Proportion Difference (PPD) and Categorical Proportion Difference (CPD). CPPD feature selection method is able to select the features which are relevant and capable of discriminating the class. The performance of the proposed feature selection methods is compared with the CPD method and IG method which have been identified as one of the best feature selection methods for sentiment classification. Experimentation
of the proposed feature selection methods is performed on two standard datasets viz. movie review dataset and product review, i.e., book dataset. Experimental results show that the proposed CPPD gives better feature selection method and outperforms the other feature selection method in sentiment classification.

Govindarajan (2013) has presented the effectiveness of ensemble technique for sentiment classification. The ensemble framework is applied to sentiment classification tasks with the aim of efficiently integrating different feature sets and classification algorithms to be synthesized for a more accurate classification procedure. The feasibility and the benefits of the proposed approaches are demonstrated by means of movie review that is widely used in the field of sentiment classification. A wide range of comparative experiments are conducted, and finally, some in-depth details are presented and conclusions are drawn about the effectiveness of ensemble technique for sentiment classification.

Samsudin et al. (2013) have proposed the opinion mining that uses machine learning approach with a good feature selection technique since the current filter typed feature selection techniques require interference from the user to select the appropriated features. A feature selection technique based on Artificial Immune System (AIS) is utilized for selecting the appropriate features for opinion mining. Experiments with 2,000 online movie reviews illustrate that the technique has reduced 90% of the features and improved opinion mining classification accuracy up to 15% with k-Nearest Neighbor classifier and up to 6% with Naïve Bayes classifier.

Martineau & Finin (2009) have proposed the Support Vector Machines with Delta TF-IDF to show how significantly it improves accuracy for sentiment classification problems and it produces sentence level subjectivity detection in movie reviews. Sentences are labeled as objective or
subjective. In which, the combination of SVM Difference of TFIDFs achieves 91.26% of classification accuracy.

With the rapid development of the World Wide Web, electronic word-of-mouth interaction has made consumers active participants. Nowadays, a large number of reviews posted by the consumers on the Web provide valuable information to other consumers. Such information is highly essential for decision making and hence popular among the internet users. This information is very valuable not only for prospective consumers to make decisions but also for businesses in predicting the success and sustainability. Manek et al., (2017) proposed a Gini Index based feature selection method with Support Vector Machine (SVM) classifier for sentiment classification for large movie review data set. The results show that the Gini Index method has better classification performance in terms of reduced error rate and accuracy.

Catal & Nangir (2017) investigated the potential benefit of Multiple Classifier Systems (MCS) concept on Turkish sentiment classification problem and propose a novel classification technique. Vote algorithm has been used in conjunction with three classifiers, namely naive bayes, SVM, and Bagging. Parameters of the SVM have been optimized when it was used as an individual classifier. Experimental results showed that multiple classifier systems increase the performance of individual classifiers on Turkish sentiment classification datasets and meta-classifiers contribute to the power of these multiple classifier systems. The proposed approach achieved better performance than naive bayes, which was reported the best individual classifier for these datasets, and SVMs. MCS is a good approach for sentiment classification, and parameter optimization of individual classifiers must be taken into account while developing MCS-based prediction systems.

Shubha & Suresh (2017) presented a novel method called Machine Learning Bayes Sentiment Classification (MLBSC) to improve the
classification accuracy by forming classes (i.e., positive, neutral and negative) based on the extracted words from user review comments. Initially, related opinion words are organized for its semantic equivalence of sentiments based on prior training list (i.e. using extracted words). Then probabilistic Bayes classifiers are applied on semantic opinion words to evaluate sentiment class label. The sentiment class labels are trained for positive, neutral and negative sentiments with the user review comments. The method MLBSC is evaluated for customer review data sets from research repositories. The MLBSC method produces attribute relevancy and economically significant gains for customers and performs better out of sample based on review comments. An intensive and comparative study shows the efficiency of these enhancements and shows better performance in terms of classification accuracy, size of classes, density of class label, execution time for class generation.

2.4 SURVEY ON OPTIMIZATION OF FEATURE SELECTION IN OPINION MINING

In optimization process for feature selection, Bekhuis & Demner-Fushman (2012) have proposed an open source data mining suite to process and to classify biomedical citations that point to mostly non-randomized from two systematic reviews. This study is conducted in two phases. The design of phase I with no optimization is: 4 classifiers × 3 feature sets × 3 citation portions. Classifiers used for experiment are k-nearest neighbor, Naïve Bayes, complement Naïve Bayes and evolutionary SVM (SVM). Phase II with optimization involves a subset of the classifiers as well as features extracted from full citations and full citations with over weighted titles. Optimized features and classifier parameters are evaluated by manually setting IG thresholds outside of a process for iterative grid optimization and 10-fold cross validation is used. In phase I, the evolutionary SVM produces the best recall for a bag of words extracted from full citations. In phase II, the
performance with optimization for evolutionary SVM is boosted and Naïve Bayes classifiers are complemented.

Sheeba & Vivekanandan (2014) have recommended some additional features for improving the accuracy of classification method. The quality of the sentiment classification is improved using fuzzy logic framework. This fuzzy logic includes the features like Fuzzy rules and Fuzzy C-means algorithm. The quality of the output is evaluated using the parameters such as precision, recall and f-measure. In this, Fuzzy C-means clustering technique is measured in terms of purity and entropy. The data set is validated using 10-fold cross validation method and 95% of confidence interval is observed between the accuracy values. Finally, the proposed fuzzy logic method produces more than 85% of accurate results and error rate is very less compared to the existing sentiment classification techniques.

In the same way, Winkler et al. (2015) have presented an ensemble modeling approach using machine learning algorithms for sentiment analysis. The main goal of sentiment analysis is to develop estimators that are able to identify the sentiment orientation of sentences found in any arbitrary source. This approach depends on the analysis of the words found in sentences and the formation of large sets of heterogeneous models, i.e., binary as well as multi class classification models that are calculated by various machine learning methods; these models shall represent the relationship between the presence of given words (or combination of words) and sentiments. A German corpus of Amazon recensions and a set of machine learning methods such as decision trees and adaptive boosting, Gaussian processes, random forests, k-nearest neighbor classification, SVM and ANNs with evolutionary feature and parameter optimization and genetic programming are achieved.

Sheikhan (2014) has presented a Recurrent Neural Network (RNN) for prosody generation. Word-level and syllable-level linguistic features are
taken as the inputs of this RNN. To provide data efficiently for the RNN based prosody generator in the training, validation and testing phases, automatic segmentation and labeling of phonemes are performed. The number of inputs to the RNN is reduced by reducing the number of features by employing a Binary Gravitational Search Algorithm (BGSA) for Feature Selection (FS). Experimental results demonstrate the achievement of the RNN based prosody generator in synthesizing the six prosodic elements with acceptable Root Mean Square Error (RMSE). By using a BGSA based FS unit, a lighter neural model is achieved with a 53% of reduction in the number of weight connections, producing RMSEs with acceptable degradation over the no-FS unit prosody generator. The performance of the BGSA based FS method is measured with a binary Particle Swarm Optimization (BPSO) algorithm and BGSA produces slightly better results. A modified mean opinion score scale is utilized to evaluate the intelligibility and naturalness of the synthesized speech using RNN with BGSA method.

Gupta et al. (2015) have proposed an automatic feature selection method for aspect term extraction and sentiment classification. This approach is based on the principle of Particle Swarm Optimization (PSO) and it performs feature selection within the learning framework of Conditional Random Field (CRF). Experiments on the benchmark setup of SemEval-2014 aspect based sentiment analysis shared task give the F-measure values of 81.91 % and 72.42 % for aspect term extraction in the laptop and restaurant domains respectively. This method yields the classification accuracies of 78.48% for the restaurant reviews and 71.25% for the laptop domain reviews. Comparison of the results with the baselines and the other existing systems shows that the proposed approach attains the promising accuracies with much reduced feature sets in all the settings.
Similarly, Basari et al. (2012) have recommended the binary classification which is divided into two classes. These classes are positive and negative. The positive class shows good message opinion while the negative class shows the bad message opinion of certain movies. This approach is based on the accuracy level of SVM with the validation process that uses 10-fold cross validation and confusion matrix. The hybrid PSO is utilized to improve the election of the best parameter to solve the dual optimization problem. This result shows the improvement of accuracy level from 71.87% to 77%.

Weichselbraun et al. (2013) have introduced a hybrid approach that combines the throughput of lexical analysis with the flexibility of machine learning to resolve ambiguity and considered the context of sentiment terms for feature selection. The context aware method identifies confusing terms that vary in polarity depending on the context and stores them in contextualized sentiment lexicons. The foundation surfaces the way for interlinking, extending or even replacing contextualized sentiment lexicons with semantic knowledge bases. An extensive evaluation done by applying the method to user reviews across three domains: movies, products and hotels.

Nirmala Devi & Jayanthi (2016) also have proposed the customer relation management, especially in the context of complaint management. For automating the task of classifying a single topic text based reviews, document level sentiment classification is utilized. The document level classification classifies approximately the sentiment using SVM algorithm and PSO is used for optimization. This proposed SVM-PSO method obtains improved result than the SVM on the benchmark dataset of movie review dataset.

Similarly, Li et al. (2015) have recommended a PSO Global Optimization based Sentiment analysis (PSOGO-Senti) to improve sentiment analysis with IG for feature selection and SVM as the learning engine. The
PSOGO-Senti approach utilizes PSO algorithm to obtain the global optimal combination of feature dimensions and parameters in SVM. The study evaluates the PSOGO-Senti model on two datasets: Ctrip data set and Guahao data set from different fields. The experimental results show that the PSOGO-Senti approach is effective and robust for sentiment analysis tasks in different domains. By comparing the improvements of two-polarity, three-polarity and five-polarity sentiment analysis results, it is found that the five-polarity sentiment analysis offers the largest improvement in feature selection and classification. The improvement of the two-polarity sentiment analysis is the smallest. Furthermore, the PSOGO-Senti achieves higher improvement for a more complicated sentiment analysis task.

Xiong et al. (2014) also have presented a new rule based method. This method recognizes effectively the polarity of Chinese sentences using Chinese appraisers, degree adverbs and negations, First, the method combines three types of Chinese words into the pre-defined rules employs the word distances of those rules as constraints and utilizes the strengths of appraisers and degree adverbs as items of the rules. Then it utilizes PSO for obtaining the optimal parameters of the rules such as the thresholds of constraints and the adjustments of the strengths. Furthermore, it employs Chinese lexicon How Net as the resource of Chinese sentiment. Experiments show that the method generates higher precision, recall and F1 than the baseline of C Support Vector Classification (C-SVC) on two real-world applications. It also obtains the second rank for the task two of Chinese Opinion Analysis and Evaluation (COAE) in 2011.

Kumar et al. (2016) have discussed that swarm optimization produces significant accuracy. This study provides a view into the different algorithms which can be used for improved sentiment analysis. Comparison of swarm inspired feature subset selection with the other feature selection methods in opinion mining, it is found that swarm inspired feature selection
algorithms converge quickly and generates better results. This algorithm can efficiently find optimum feature subset. Optimization technique Swarm Intelligence ABC with Naïve Bayes Classifier produces the classification accuracy as 88.5%.

Liu et al. (2016) have proposed a Multi-Swarm PSO (MSPSO) method which generates multi diverse particle swarms on different cross training subsets. These swarms are utilized to find the best features by using the F-Measure fitness function. The experimental results on the real-life dataset show that MSPSO can effectively reduce the text feature redundancy and capture discriminative features. Compared with conventional feature selection methods, MSPSO can offer better performance when selecting the same dimensions. Besides, the result of a user survey points to 72.19% of subjects is approved of the usability of the recognition results and the effectiveness of the feature selection.

In the same way, Ernawati (2016) has proposed a Naïve Bayes classifier with PSO as an optimization method for feature selection and applied it to classify the text on the review of online sales company to improve the accuracy of classification. The research results focus on the classification of the text into positive and negative. Comparison of result is done based on the accuracy of Naïve Bayes before and after the addition of feature selection methods. Validation is performed using 10-fold cross validation while the accuracy is measured by the confusion matrix and Receiver Operating Characteristic (ROC) curves. This result shows that an increase in the classification accuracy from 79.50% and AUC 0.500 to 86.88% and AUC 0.705 is achieved. Finally, it can be concluded that the application of PSO algorithm for feature selection process with Naïve Bayes classification algorithm is able to improve the accuracy of classification.
Kristiyanti (2015) has proposed SVM by comparing two-feature selection, namely PSO and GA. This approach improves the accuracy of the classification of SVM. Furthermore, the research has found the text classification in a positive or negative format from the cosmetic product review. Measurement in accuracy and feature reduction are done based on SVM accuracy before and after adding the feature selection method. This evaluation is done by using 10-fold cross validation while the accuracy measurement is done by using the confusion matrix and ROC Curve. The results of the integrated SVM Algorithm and Feature Selection Algorithm and PSO indicate an average accuracy of 97.00% and the average Area Under Curve (AUC) of 0.988 while GA shows the best results with average accuracy 94.00% and average of AUC 0.984. SVM algorithm with integrated feature selection PSO exhibits the best accuracy improvement from 89.00% to 97.00%.

Zheng et al. (2013) have proposed Differential Context Relaxation (DCR) and Differential Context Weighting (DCW) approaches. In these two approaches, the weight is assigned for contextual features. The study compares DCR and DCW on two real-world datasets, and DCW reveals the improved accuracy over DCR with comparable coverage. This approach also shows that PSO optimization can be used to efficiently determine the weights for DCW.

Table 2.1 summarizes the techniques available in the literature. Based on these reviews, investigations on feature selection and opinion classification are focused. Different hybridized techniques for optimizing feature set and classifiers are proposed.
Table 2.1 Comparison Table for the Literatures Used

<table>
<thead>
<tr>
<th>S.No</th>
<th>Author Name</th>
<th>Techniques/Algorithm Used</th>
<th>Merits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Catal &amp; Nangir (2017)</td>
<td>Three classifiers, namely Naive bayes, SVM, and Bagging.</td>
<td>Multiple Classifier System (MCS) is a good approach for sentiment classification, and parameter optimization</td>
</tr>
<tr>
<td>4.</td>
<td>Agarwal &amp; Mittal (2016)</td>
<td>Bag-of-Words (BoWs) representation</td>
<td>Eliminates noise and irrelevant features</td>
</tr>
<tr>
<td>5.</td>
<td>Penalver-Martinez et al. (2014)</td>
<td>Opinion mining</td>
<td>Enhanced results</td>
</tr>
<tr>
<td>S.No</td>
<td>Author Name</td>
<td>Techniques/Algorithm Used</td>
<td>Merits</td>
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</tr>
<tr>
<td>10</td>
<td>Ahmad et al. (2015)</td>
<td>GA and RST</td>
<td>Produced an optimal subset of features by eliminating features that are irrelevant and redundant.</td>
</tr>
<tr>
<td>11</td>
<td>Gupta et al. (2015)</td>
<td>Particle Swarm Optimization (PSO), Conditional Random Field (CRF)</td>
<td>Obtained the classification accuracies of 78.48% for the restaurant reviews and 71.25% for the laptop domain reviews</td>
</tr>
<tr>
<td>12</td>
<td>Li et al. (2015)</td>
<td>PSO Global Optimization based Sentiment analysis (PSOGO-Senti)</td>
<td>Achieves higher improvement for a more complicated sentiment analysis task</td>
</tr>
<tr>
<td>13</td>
<td>Liu et al. (2016)</td>
<td>Multi-Swarm PSO (MSPSO) method</td>
<td>Better performance when selecting the same dimensions</td>
</tr>
<tr>
<td>14</td>
<td>Ernawati (2016)</td>
<td>Naïve Bayes classifier with PSO</td>
<td>Classification accuracy from 79.50% and AUC 0.500 to 86.88% and AUC 0.705 is achieved</td>
</tr>
<tr>
<td>15</td>
<td>Kristiyanti (2015)</td>
<td>Support Vector Machine, PSO, GA</td>
<td>Best accuracy improvement as 97%</td>
</tr>
<tr>
<td>16</td>
<td>Singh &amp; Husain (2014)</td>
<td>SVM with N-gram feature selection</td>
<td>It produces the good accuracy as 81.15%</td>
</tr>
<tr>
<td>17</td>
<td>Tripathi and Naganna (2015)</td>
<td>SVM -TF-IDF with N-grams</td>
<td>Achieves higher improvement and produces the classification accuracy as 84.75%</td>
</tr>
<tr>
<td>18</td>
<td>Kumar et al. (2016)</td>
<td>Naïve Bayes with Swarm Intelligence optimization</td>
<td>Best accuracy improvement as 88.5%</td>
</tr>
</tbody>
</table>
2.5 SUMMARY

Opinion mining handles the evaluation of opinions on different kinds such as positive and negative. Reviews show that the classification protocols used effectively for overcoming pitfalls occurred in previous research works. Finally, the performance of opinion or sentiment classification is enhanced. The main research gap to be addressed here is the enhancement of the performance metrics like accuracy in classification of positive and negative reviews using optimization techniques. The main obstacles are handling different languages, emotions, implicit and explicit attributes, and negations, complexity of documents or sentences and so on. In this research work, the main facet of feature selection and opinion classification are focused. Different hybridized techniques for optimizing feature set and classifiers are proposed.