

A Review on Sentiment Analysis Research in Myanmar Language

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Abstract—*Sentiment analysis is an emerging research area and is very important because human beings are largely dependent on the web in these days. A little research on sentiment analysis has been done for Myanmar language in Myanmar. So, this paper aims to review past, present and future of Myanmar sentiment analysis and presents the study of the Myanmar language research on the opinion lexicon creation and sentiment classification. The lexicons are created for four domains and the sentiment classification is done for three domains by using the equations of polarity scores, Support Vector Machine (SVM), Long Short-Term Memory (LSTM) and Naïve Bayes. The objective of this paper is to provide a review of Myanmar language sentiment analysis research papers from well-known journals and conferences between 2017 and 2019.*

Keywords— *Myanmar language, opinion lexicon, sentiment classification*

I. INTRODUCTION

Sentiment analysis is a type of natural language processing (NLP), where NLP or computational linguistics, is the scientific study of human languages from a computational perspective. It can be classified into three different levels such as document level, sentence level, and aspect level.

- Document Level- The whole document is classified as a single sentiment positive, negative or neutral.
- Sentence Level - The sentences in the documents are analyzed individually and classified as positive, negative or neutral.
- Aspect Level- It deals with identifying the features in a sentence for a given document and analyze the features and classify them as positive, negative or neutral [1].

There are voluminous data on web for Myanmar language in these days. It is important to do analysis on this huge data to retrieve very useful information so sentiment analysis (SA) in Myanmar language is required. This paper surveys the efforts to build sentiment analysis systems for Myanmar. The rest of the paper is organized as follows:

Section 2 explains the survey papers of sentiment analysis on other languages. Section 3 discusses the background theory of sentiment analysis. Research on creation of sentiment lexicons is presented in section 4.

Research on sentiment classification is explained in section 5. The challenges of sentiment analysis in Myanmar are presented in section 6. The conclusion and future work are described in Section 7.

II. RELATED WORK

Many research works have described about sentiment analysis for other languages with several different methods. There are comparatively few studies for Myanmar language concerned with sentiment analysis. Firstly we explain some important sentiment analysis research in Chinese, Arabic, Hindi and India. And then survey of the Myanmar sentiment analysis studies are presented in this section.

Authors in paper [2] gave us a study of Chinese language sentiment analysis. Firstly, sentiment corpora and lexica buildings are described. They presented three different approaches used to build an opinion lexicon in Chinese (the manual construction of a sentiment lexicon, dictionary-based approach and corpus-based approach). And then, they conducted a review of monolingual Chinese sentiment classification through three main classification frameworks (machine learning-based approach, knowledge-based approach and mix models). At last they explained multilingual approach of sentiment classification. The authors discussed also three testing dataset (ChnSentiCor[3], IT168TEST[4] and SIGHAN8[5]).

The authors explained a survey of Arabic sentiment analysis which contains Arabic language challenges, sentiment analysis process and advantages and disadvantages summary of the papers in [6]. They categorized the surveyed Arabic SA by approaches (supervised, semi- supervised, unsupervised and hybrid). They stated a power of supervised technique over other techniques. They presented Arabic SA by methods (SVM, decision tree, maximum entropy, binary classifier and so on). They described the most widely used approaches such as Support Vector Machines (SVM), Naive Bayes (NB), and K-Nearest Neighbors (KNN). The size and diversity of the datasets was investigated for the various studies of Arabic sentiment analysis. They explained several different text sources (Tweets, reviews/opinions, Wiki Pages, Web Forums and so on).

The authors described also a survey of sentiment analysis in Hindi language which discusses data source, sentiment classification, existing research works and challenges in [7]. They reviewed the papers of creation of SentiWordNet for Bengali language, sentiment Classification, four strategies to predict the sentiment of a word (corpus Based approach, automatic antonym

generation technique, error reduction technique), an unsupervised dictionary approach to determine the polarity of user Review in Hindi language, a backup plan for Hindi language, a graph based method to create lexicon, an effective technique based on negation and discourse relation to observe the sentiments from Hindi content, a novel approach to detect errors in the treebanks and shallow parsing on Marathi language.

A review on sentimental analysis in different Indian dialects is given in paper [8]. They reviewed Kannada sentiment analysis for reviews of mobile product, an analysis of sentence level text classification for Kannada language, HOMS: Hindi opinion mining system, a useful approach to sentiment analysis of Hindi tweets and domain specific sentence level mood extraction from Malayalam text. They explained three levels (document level, sentence level and phrase level) of sentiment analysis. They presented the applications and challenges and spam in sentimental analysis. Besides, they described the tools in sentiment analysis (WEKA[9], STANFORD CORENLP[10], NLTK[11], LingPipe[12], GATE[13] and APACHE OPENNLP[14]).

The author explained detail in three sentiment lexicons as a survey paper [15]. The first lexicon is the Sentiment Orientation CALculator (SO-CAL) [16]. The lexicon was created manually and it consists of about 5,000 words. The features of SO-CAL are adjectives, nouns, verbs and adverbs, intensifiers and downtoners, negation, irrealis blocking and text-level features. The second one is SentiWordNet and it was created automatically [17]. There are over 38,000 polar words and other strictly objective words. The steps such as selection of seed set, creation of training set, selection of learning algorithms, creation of classifiers and synset scoring are included in creation of an algorithm for SentiWordNet. The third one is Sentiment Treebank and it was created using crowdsourcing [18]. Partial parse trees are included and they are annotated with sentiment.

III. BACKGROUND THEORY

The techniques of sentiment classification are divided into: machine learning approaches and lexicon based approaches [1] and these are as shown in Fig 1.

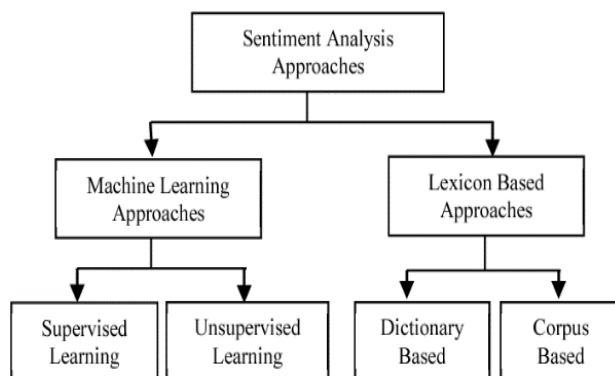


Fig. 1. CLASSIFICATION OF SENTIMENT ANALYSIS TECHNIQUES

3.1. Machine Learning Approaches

Machine learning totally based on ML algorithms and used to solve the sentence classification problem and that further makes the rule of syntactic features. Machine learning techniques can be divided as supervised and unsupervised learning.

3.1.1 Supervised Learning

This basically make use of known datasets to do the prediction for output result classified and divided into training set and test set. Training set is applied to learn the different properties of documents and test set is applied to evaluate the performance of classifier. Various supervised learning techniques are used as follows.

- Decision tree classifier
- Rule based classifier
- Probabilistic classifier
 - Maximum Entropy classifier
 - Naive Bayes classifier
- Linear classifier
 - Support Vector Machine(SVM)
 - Neural Network

3.1.2 Unsupervised Learning

In unsupervised approach, it compares each word of the text with valued of positive and negative word for ranking. This has no explicit target output associated with input, and it is learning through observation.

3.2. Lexicon Based Approaches

Lexicon based approaches address by finding the sentiment words in the text and then compare with the list of seed words. This method is based on that performs sum of the sentiment orientation of each word makes contextual sentiment orientation. Two branches of this approach are dictionary and corpus based approach.

3.2.1 Dictionary Based

In dictionary based approach, it first finds the sentiment word from the review text and then finds their antonyms and synonyms from dictionary. The dictionary used may be SentiWordNet or WordNet or other. There is a disadvantage with dictionary-based approach that it is not capable to extract opinions with domain specific orientation.

3.2.2 Corpus Based

The method comes into consideration to address the issues of dictionary based approach. It helps to find opinion word in a context specific orientation start with a list of sentiment word and then find other sentiment word in a large corpus whereas it is not as efficient as dictionary based approach because it is needed to create a huge corpus for covering words and which is a complex task.

The advantages, disadvantages and limitations of machine learning approach and lexicon based approach are shown in TABLE I.

TABLE I. ADVANTAGES, DISADVANTAGES AND LIMITATIONS OF SENTIMENT ANALYSIS APPROACHES

Approaches	Advantages	Disadvantages	Limitations
Machine Learning	<ul style="list-style-type: none"> The ability to modify and create trained models for specific purpose and contexts Yields high accuracy of classification 	<ul style="list-style-type: none"> A classifier trained on the texts in one domain does not work with other domains. A large amount of training corpus is required. 	<ul style="list-style-type: none"> The low applicability to new data because it is necessary the availability of labeled data that could be costly or even prohibitive
Lexicon Based	<ul style="list-style-type: none"> Wider term coverage Labeled corpus and learning process is not required. Lexicon created for one domain can be used for other domains with small changes. 	<ul style="list-style-type: none"> Requires powerful linguistic resources which are not always available. 	<ul style="list-style-type: none"> Finite numbers of words in the lexicons and the assignation of a fixed sentiment orientation and score to words

IV. MYANMAR LANGUAGE RESEARCH ON CREATION OF SENTIMENT LEXICONS

Myanmar is a national language of Myanmar, small amount of Myanmar content is available on the Web. From the last few years researchers has performed sentiment analysis in Myanmar language. There are 4 Myanmar sentiment lexicon creation papers for news article domain, movie domain, beauty product domain, and food and restaurant domain.

T. T. Zin et al proposed the domain-specific sentiment lexicon for news article in Myanmar Language [19]. They used word correlation and chisquare statistic to construct lexicon. In the paper, the focus was on feature selection by construction lexicon using n-gram, word correlation and chi-square statistic methods. The feature selection methods were applied to Facebook user’ comments on news media page written in Myanmar language. Comments of special news article, the Union Peace Conference-21st century Panglong Conference were extracted. And they also extracted people’s comments related to peace conferences on news pages. There were 27337 extracted comments from 11 news pages. The format of the lexicon was “word #polarity”. According to lexicon coverage analysis, the sentiment lexicon for news domain was stable (no new opinion words appeared) over 8000 training sentences.

W. W. Thant and K. Shirai constructed an opinion lexicon for Myanmar movies using a bootstrapping approach based on syllable n-gram frequencies [20]. The 12123 Facebook Myanmar movie comment dataset was a corpus of movie comments used for the automatic acquisition of new opinion words. From the corpus, all relevant Myanmar syllable n-grams (1-, 2-, 3-, 4- and 5-grams) were created. They stated 9 preprocessing rules for converting from unstructured to structured data. They also built the algorithm for initial positive seed selection, the algorithm for initial negative seed selection and the algorithm for polarity classification of comments. Their experiments showed that six and seven bootstrapping

iterations were sufficient to extract 44 positive words and 35 negative words. They found that most opinion words were syllable bi-grams and tri-grams.

Y. M. Aye and S. S. Aung manually collected 800 opinionative and non-opinionative reviews of food and restaurants from the Facebook and proposed them as a resource [21]. They used the lexicon-based approach for opinion word extraction from the reviews. They presented the Myanmar senti-lexicon creation of food and restaurant domain which includes the opinion words concerned with a restaurant review. They manually collected the sentiment words of the reviews based on their knowledge and expanded by finding more antonyms and synonyms for Myanmar language. There were 817 sentiment words and 55 emoticons (total 872) which contained 425 positive words, 428 negative words, 19 neutral in the Myanmar senti-lexicon. Sentiment words were extracted from reviews based on their created lexicon and these words are noun, verb, adverb, adjective and emoticons. And the polarity of the word was assigned to each word match with opinion dictionary.

A. A. Maw used term frequency-inverse document frequency (TF-IDF) approach to build a domain specific senti word net for Myanmar language by computing the sentiment orientation of verbs, adjectives, adverbs words [22]. They created the algorithm for building senti word net. It contained sentiment words together with their respective POS tag, positive score and negative score. The beauty product review of bella cosmetic product review datasets were used as product domain. Their datasets contained balance reviews to maintain the class distribution. Their system can classify positive or negative opinions of beauty product review from social media comments by applying domain-specific senti word net.

TABLE II summarizes various methods on sentiment lexicon creation for different domains in Myanmar Language along with the evaluation and future work.

TABLE II. COMPARISON OF SENTIMENT LEXICON CREATION RESEARCH IN MYANMAR LANGUAGE

Ref no	Used method (s)	Domain	Evaluation	Future Work
19	word correlation and chisquare statistic	new articles comments	Precision (60.36 %) Recall (70.96%) F-measure (65%)	<ul style="list-style-type: none"> to combine unsupervised feature selection method for lexicon expansion to enhance the accuracy of the sentiment classification on huge amount of information dataset
20	n-gram and bootstrapping approach	movie comments	Precision positive (86%) negative (89%)	<ul style="list-style-type: none"> to develop a larger corpus of movie documents and more data cleaning rules to handle spelling variations and to incorporate our method with a word segmentation tool to experiment further using a wider variety of Facebook comments to perform statistical substrings reduction (SSR) on the acquired n-gram statistics to handle slang words and implicit emotional comments,
21	dictionary based approach	food and restaurants' reviews	Accuracy (85%) Error of Opinion words extraction (6%) Incorrectly extracted opinion word (9%)	<ul style="list-style-type: none"> to enhance the performance in extraction of sentiment words to solve the formal and informal reviews to classify the subjectivity classification
22	TF-IDF and algorithm	bella cosmetic reviews	Precision Recall F-measure Failure-ratio	-

V. MYANMAR LANGUAGE RESEARCH ON SENTIMENT CLASSIFICATION

The authors [23] proposed a system for assigning polarity scores to Facebook Myanmar movie comments. There were 12,600 Myanmar movie comments in the plain text corpus. They manually designed a hand-tagging movie domain specific lexicon which contained 276 polarity words (152 positives and 124 negatives) after analyzing the plain text corpus. They calculated scores (positive, negative and neutral) of the opinion words using equations. And then they explained how to assign the scores to comments in detail. They evaluated for the polarity score lexicon. As an error analysis, they pointed the problem of whole comment polarity, spelling errors and about ambiguous words. Besides, evaluations on 3-class and 5-class are performed according to the scores.

The researchers [24] implemented a sentiment analysis system for Myanmar news in Facebook social media using Support Vector Machine. They applied n gram for feature selection and TF-IDF method for feature extraction. They created a sense annotated corpus. The data were collected from Myanmar news websites by using Facebook 4G crawler. There were 700 news in the dataset and each news contained average 5 sentences and totally 3500 sentences. They showed the example unigrams and bigrams of Myanmar positive and negative words.

They [25] proposed aspect based sentiment analysis of hotels' and restaurants' reviews and comments written in

Myanmar language using Long Short-Term Memory (LSTM). They collected about one thousand customer reviews for hotel and restaurant domain from the Facebook page. They used word2vec for text preprocessing. They applied three LSTM networks to take care of each of the three classification sub-tasks, namely predicting how many aspects a sentence contains, extraction of those aspects and prediction of the sentiment based on each of the sentence's aspects. They stated that there was still problematic that Bi-LSTM doesn't clearly classify the aspect term with context words on aspect based sentiment analysis.

The authors [26] extended the previously created dataset of movie domain, extracted of Myanmar movie features by preprocessing steps, and classified the comments into positive and negative by using Naïve Classifier and estimating the polarity of the comments. The main sources of data were from the user-created movie comments written by Myanmar language on Facebook. They defined an extensive set of 30 opinion words for positive and 25 words for negative. They explained in detail the classification of comments using the Naïve Bayes with a small dataset. The overall polarity was calculated by counting difference of the sentiment words. They stated the issue of data collection, preprocessing and re-training of new features.

TABLE III summarizes various techniques on sentiment classification for different domains in Myanmar Language along with the evaluation and future work.

TABLE III. COMPARISON OF SENTIMENT CLASSIFICATION RESEARCH IN MYANMAR LANGUAGE

Ref no	Used Technique(s)	Domain	Evaluation	Future Work
23	polarity score equations	movie comments	Accuracy positive (89%),negative(85%) 3-class evaluation (85%) 5-class evaluation (77%)	<ul style="list-style-type: none"> to create a larger dataset with more lexicon words to apply the role of intensifier and diminishers to enlarge the set of opinion words by further automatic process to construct the lexicon and corpus for other different domains
24	n gram , TF-IDF and SVM	Myanmar news	-	<ul style="list-style-type: none"> to train and test more dataset and other classifier such as decision tree, decision list, maximum entropy, ensemble
25	Long Short-Term Memory (LSTM)	hotels' and restaurants' reviews	-	<ul style="list-style-type: none"> to use deep learning techniques, a hybrid system combining both lexicon based approach and deep learning approach to efficiently cover business insight from unstructured data.
26	Naïve Bayes	movie comments	Cross Validation (83.6%) Precision positive(77.6%), negative(79.9%) Recall positive(80.7%), negative(76.7%) F-measure positive(79.1%), negative(78.3%)	<ul style="list-style-type: none"> to develop more data of movie comments, more opinion words, and more data cleaning rules to experiment with different classifiers on their dataset to consider worse sense disambiguation to get high accuracy

VI. CHALLENGES

The truth, however, is that there is relatively small available support for Myanmar-language sentiment analysis, majorly for the following reasons:

- **Lack of resources:** The sentiment lexicons can be constructed using several techniques such as manual, boot-strapping, and corpus-oriented. Lack of sufficient tools, annotated corpora, and resources lead to great struggle while doing sentiment lexicon creation for Myanmar language.
- **Lexicons in Myanmar language** are small compared to those built for English language because creation of lexicon is a complex and huge task. The nature of Myanmar language varies a great deal.
- As discussed earlier, there are several approaches in sentiment analysis, including lexicon-based approach and machine learning approach. Each approach has its own pros and cons. There is still difficult in comparison of both approaches in Myanmar language SA.
- **Lack of standard datasets** makes collection/creation of dataset a time consuming task. Comparison of techniques applied and results obtained, is a difficult task in the absence of standard data set.
- **Morphological complexities:** Myanmar language requires advanced data pre-processing and lexicon-building steps beyond what is applicable for the English language domain. This limits the potential applications of custom tools and current tools for Myanmar SA may not be easy to come by, may be limited in current functionality, or may not be freely available.

- **Research funding:** Relatively limited scholarly work and research funding in this area, when compared to other-language studies.
- **Unstructured Data:** Online text contains a large amount of unstructured data. The diversity in the sources of data and different formats increases the complexity. The writer does not follow any constraints and uses a different writing style in online text.
- Other big challenges of Myanmar SA are also needed to be addressed such as sarcasm detection, negation handling, spam and fake opinion detection and so on.

VII. CONCLUSION

The research on sentiment analysis is rapidly growing in the world. It has been found that only a few works have been developed in Myanmar for Myanmar language. This timely survey covers only past and recent Myanmar language research in two phases of sentiment analysis, namely the lexicon creation and sentiment classification. Firstly, sentiment lexicon building for four domains was introduced and reviewed. And then a survey of sentiment classification in Myanmar for three domains with several approaches is described. We report observations about domains, used techniques and evaluation methods studied in the published papers. Machine learning techniques are widely used in the sentiment classification. It is expected that this paper would be helpful for students and researchers to give information which can be utilized to anticipate the future.

Research work on Myanmar SA has mostly emphasized on the use of supervised methods and lexicon-based methods. The sentiment analysis in Myanmar language have been done by several approaches

as discussed till now but still there is a great space of improvement in this area. We intend to propose unsupervised learning techniques, principally through hybrid method. We also need to solve the future works of discussed papers.

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