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Greetings Demba Kandé, Fodé Camara, Samba Ndiaye and Fodé M. L Guirassy,

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Acceptance and Invitation Letter

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Dear Demba Kandé, Fodé Camara, Samba Ndiaye and Fodé M. L Guirassy,

On behalf of the Conference Committee, I am pleased to inform you that, after peer review, your manuscript identified above is accepted for oral presentation by the 5th International Conference on Information Management (ICIM2019), which will take place at the Trinity Hall, University of Cambridge, UK from 24th to 27th of March, 2019.

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FWLSA-score: French and Wolof Lexicon-based for Sentiment Analysis

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***Abstract*—With the advent of Internet, people actively express their opinions about products, services, events, political parties and other one in social media, blogs, and website comments. The amount of research work on sentiment analysis is growing explosively. However, the majority of research efforts are devoted to English language data, while a great share of information is available in other languages. It is a challenging task to identify sentiment polarity of reviews written in both Wolof and French languages because theirs spelling are usually incorrect or non-uniform. In this paper, we propose a novel framework that contains (i) an extended French lexicon [1] with a new words and expressions currently used in both languages; and (ii) a sentiment scoring algorithm that uses string (word) similarity algorithm to address the spelling problem. Our algorithm classifies reviews as positive or negative based on the polarity of the words or expressions. Our experimental results on a real corpus demonstrated the effectiveness of our proposal.**

Keywords—component, Natural language Processing (NLP); Text Mining (TM); Opinion mining (OM); Sentiment Analysis (SA); Lexicons; Similarity

I. INTRODUCTION

In recent years, sentiment analysis (including subjective/objective analysis, polarity identification, opinion extraction, etc.) has drawn much attention in the NLP field [2]. Sentiment analysis aims to associate a given text with a polarity orientation (positive, negative or neutral). It is intensively used in many applications, such as reputation management, product reviews, political debates, and so on. From political reviews for example, people 'opinions can be used to predict the election results for political parties or candidates. In Senegalese context, two languages are mainly used or both combined to comment political posts or posts in other fields.

Unfortunately, the most of the research in sentiment analysis relate to English language for which various resources are available such as polarity lexicons, Naturel Language Processing (NLP) and so on. Only few reliable resources are available for French sentiment analysis but not in Wolof which is a nominal language with a complex verbal system [3]. The main challenge for cross-lingual sentiment analysis is the vocabulary gap between the source language and the target language. This problem is addressed with different approaches in the literature [2], such as using translation tools to translate the corpus source directly into target language. This is not possible with Wolof language because it does not exist a reliable resource "translator" to make the parallel between French and Wolof. For this reason, we propose a new framework which contains (i) a cross-lingual lexical which simultaneous contains words or expressions frequently used in both languages and (ii) a new polarity score algorithm based on string (word) similarity calculation to address the spelling problem.

We conducted experiments on real corpus that we generated from political posts on a very popular website. The experimental results show the effectiveness of our proposition which gives a very good predictive accuracy in opinions mining.

The rest of this paper is organized as follows: Section 2 introduces related work. The proposed approach is described in detail in Section 3. Section 4 shows the experimental results. Finally, we conclude this paper in Section 5.

II. RELATED WORKS

Polarity identification can be performed on word level, sentence level or document level. Related work for word-level polarity identification includes in [5], sentence-level polarity identification in [6], and document-level polarity identification with [7]. There are two main approaches, i.e., the supervised learning [11] approach and the lexicon-based approach [12]. The recent work in the area showed that supervised approaches tend to overcome unsupervised ones [13] and [14], the latter have the advantage of avoiding the hard-working step of labeling training data. Only the last is discussed in this section.

The lexicon-based approach can avoid some of the issues [8], and has been shown to perform quite well in a large number of domains. Such methods are typically unsupervised. They use

a sentiment lexicon (which contains a list of sentiment words, phrases, and idioms), composite expressions and rules of opinions [9], and (possibly) the sentence parse tree to determine the sentiment orientation on each aspect in a sentence.

By now, it should be quite clear that words and phrases that convey positive or negative sentiments are instrumental for sentiment analysis. In the research literature, sentiment words are also called opinion words, polar words, or opinion-bearing words. Positive sentiment words are used to express some desired states or qualities while negative sentiment words are used to express some undesired states or qualities. Collectively, they are called sentiment lexicon (or opinion lexicon). For easy presentation, from now on when we say sentiment words, we mean both individual words and phrases.

Researchers have proposed many approaches to compile sentiment words. Three main approaches are: manual approach, dictionary-based approach, and corpus-based approach.

A. *Manual* approach

The manual approach is labor intensive and time consuming, and is thus not usually used alone but combined with automated approaches as the final check, because automated methods make mistakes. Below, we discuss the two automated approaches.

B. *Dictionary-based approach*

Using a dictionary to compile sentiment words is an obvious approach because most dictionaries list synonyms and antonyms for each word (WordNet; Miller et al. 1990). Thus, a simple technique in this approach is to use a few seed sentiment words to bootstrap based on the synonym and antonym structure of a dictionary. To perform a sentiment analysis on synonyms-based several dictionary are available in WordNet:

SentiWordNet: SentiWordNet [15] is a lexical resource devised to support Sentiment Analysis applications. It provides an annotation based on three numerical sentiment scores (positivity, negativity, neutrality) for each WordNet synset [16]. Clearly, given that this lexical resource provides a synset-based sentiment representation, different senses of the same word may have different sentiment scores. In this case, SentiWordNet needs to be coupled with a Word Sense Disambiguation (WSD) to identify the most promising meaning [17].

WordNet-Affect: WordNet-Affect [18] is a linguistic resource for a lexical representation of affective knowledge. It is an extension of WordNet which labels affective-related synsets with affective concepts defined as A-Labels (e.g. the term euphoria is labeled with the concept positive-emotion, the noun illness is labeled with physical state, and so on). The mapping is performed on the ground of a domain-independent hierarchy of affective labels automatically built relying on WordNet relationships.

SenticNet: SenticNet [19] is a lexical resource for concept-level sentiment analysis. It relyies on the Sentic Computing [20], a novel multi-disciplinary paradigm for Sentiment Anaylsis. Differently from the previously mentioned resources, SenticNet is able to associate polarity and affective information also to complex concepts such as accomplishing goal, celebrate special occasion and so on. At present, SenticNet provides sentiment scores (in a range between -1 and +1) for 14,000 common sense concepts.

MPQA: MPQA Subjectivity Lexicon [22] provides a lexicon of 8,222 terms (labeled as subjective expressions), gathered from several sources. This lexicon contains a list of words, along with their POS-tagging, labeled with polarity (positive, negative, neutral) and intensity (strong, weak).

The most popular positive and negative words lexicon that can help to perform sentiment analysis were described: Liu and Hu opinion lexicon [36}, SentiWordNet[15], SentiWords [37], AFINN [38], WordStat Sentiment Dictionary [39], SenticNet [19], the Affective Norms for English Words [40], the Whissell Dictionary of Affect in Language [41], Pattern [42], Linguistic Inquiry and Word Count [43], the MPQA Subjectivity Lexicon [22].

In [21], a comparative study is performed of the above-described lexical resources in the task of sentiment classification of microblog posts. MPQA and SentiWordNet emerged as the best performing lexical resources on those data despite of results controversial. The methods such as antonym-based [23], WordNet distance-based method [24], Markov random method [25], pointwise mutual information (PMI) [26], and others are studies in the literature.

In summary, we note that the advantage of using a dictionary-based approach is that one can easily and quickly find a large number of sentiment words with their orientations. The main disadvantage is that the sentiment orientations of words collected this way are general or domain and context independent. In other words, it is hard to use the dictionary-based approach to find domain or context dependent orientations of sentiment words.

C. *Corpus-based approach*

The corpus-based approach has been applied to two main scenarios: (1) given a seed list of known (often general-purpose) sentiment words, discover other sentiment words and their orientations from a domain corpus; and (2) adapt a general-purpose sentiment lexicon to a new one using a domain corpus for sentiment analysis applications in the domain.

However, the issue is more complicated than just building a domain specific sentiment lexicon because in the same domain the same word can be positive in one context but negative in another. In this part, we discuss some of the existing works that tried to deal with these problems.

The first works [27] consider corpus and some seed adjective sentiment words to find additional sentiment adjectives in the corpus. Their technique exploited a set of linguistic rules or conventions on connectives to identify more adjective sentiment words and their orientations from the corpus. They use the conjunction rules, which says that conjoined adjectives usually have the same orientation. This idea is called sentiment consistency.

Introducing the concepts of intra-sentential and inter-sentential sentiment consistency [28], which they call coherency. The intra-sentential consistency is similar to the idea

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above. Inter-sentential consistency simply applies the idea to neighboring sentences. That is, the same sentiment orientation is usually expressed in consecutive sentences. Sentiment changes are indicated by adversative expressions such as but and however.

Although finding domain-specific sentiment words and their orientations are useful, it is insufficient in practice. Many words in the same domain can have different orientations in different contexts [8]. They then proposed to use the pair (aspect, sentiment_word) as an opinion context, e.g., ("battery life", "long"). Their method thus determines sentiment words and their orientations together with the aspects that they modify. In determining whether a pair is positive or negative, the above intra-sentential and inter-sentential sentiment consistency rules about connectives are still applied. Other works adopted the same context definition such as comparative sentences [30]; syntactic patterns-based pairs of adjectives quantifiers [29], and others.

A connotation lexicon problem is studied in [31]. It concerns words that are often associated with a specific polarity of sentiment. A graph-based method based on mutual reinforcement was proposed to solve the problem [32].

Research work focusing on French sentiment analysis includes [4], [33], [34], [35], and others. Such work represents the extension of the Lexicon-based methods for French sentiment analysis. The related work [4], explores cross-lingual projections to generate emotion and polarity analysis resources in French by leveraging on the tools and resources available in English. They have investigated a lexicon-based approach based on the semi-automatic translation and expansion to synonyms of the English NRC Word Emotion Association Lexicon (NRC-EmoLex). Another study [35] based on SentiAIL multilingual lexicon-based software tools for Indonesian and French sentiment analysis. In this study, we focus on unsupervised sentiment polarity identification and we only investigate the lexicon-based approach in the experiments.

III. Presentation of FWLSA-score

A. Overview

In this section, we present the technical means used to implement our French and Wolof cross-lingual processing chain. Generally, the comment is written in French and also in Wolof, under a spelling often incorrect (not in conformity with the French lexicon). Thus, deducing the polarity (negative opinion, positive opinion or neutral opinion) associated with each comment is a challenge.

In Fig 1. we describe our framework which is mainly based on:

- A lexicon that we manually created by associating at least 15,000 words or groups of words, either positive or negative. We derive it from the lexicon FEEL [4].
- A weighting algorithm whose basic idea consists of associating a +1 score with the positive word and -1 with the negative word. For an expression (group of words) with a positive polarity the score will be + length (expression), when length () represents the size of the expression (i.e. the number of words that compose it). Respectively, the score will be -length (expression) for an expression with a negative polarity.

We considered a set of words that we call DiscriminantWord. A word belongs to this category if it is discriminant, in other words its presence in a comment makes it possible to directly deduce the polarity of the comment. Table 1 gives an excerpt from the DiscriminantWord List.

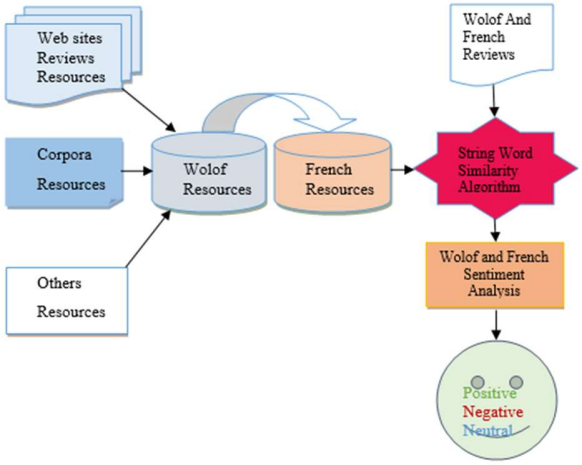

Fig. 1. Framwork of our approach

In this approach, the words similarity distance is used to minimize the spelling errors of words. It is desirable to have a single value to represents the similarity of a given word and this value must be range in [0,1]. Thus, the more similar the two words are, the more their similarity measure tends to 1, and the more they differ the more it tends to 0. This value is defined as follows:

$$Sim(s_1(i), s_2(j)) = 1 - \frac{d(i,j)}{max\ (m,n)} \quad (1)$$

The sentiment score of the word $S_1(i)$ is weighted by the degree of similarity $Sim(s_1(i), s_2(j))$ between the word $S_1(i)$ received as input (words of reviews) and that $S_2(j)$ compiled in the lexicon.

B. Description

Due to the complexity of natural languages and words used by internauts to express their opinions, we consider a review denoted ***rev***, as a set of sentences. These sentences obtaine by splitting the revview in several sub-reviews $rev_1, rev_2, \ldots, rev_n$ denoted *sub-rev* using punctuations and the syntaxic structure (French and Wolof) of the review as a delimiter. Whenever a punctuation character or syntax is found in *rev*, a new *sub-rev* is built. The polarity of rev denoted s^{rev} is the sum of the polarities $s_1^{sub\text{-}rev}, \ldots, s_i^{sub\text{-}rev}, \ldots s_n^{sub\text{-}rev}$ des sub-rev which compose it. With $s_i^{sub\text{-}rev}$ the polarity of *sub-rev* in *rev*. It depends ($s_i^{sub\text{-}rev}$) on the sentimental score $score(w_j)$ of each word or French-Wolof

expression it contains. Score(wj) can be considered as a score function that classifies a word or expression according to their polarity orientation. It is a dichotomy function which is equal to +1 if the word is positive and -1 if it is negative. In which case the score will be calculated as follows:

$$score(w_j) = + length\ (w_j) \quad if\ w_j\ is\ positive$$
$$score(w_j) = - length(w_j) \quad if\ w_j\ is\ negative \qquad (2)$$

when $length(w_j)$ represents the size of the expression (i.e. the number of words that compose it).

Thus, based on the Senegalese commenting habits, when a negation is found in a review, we only consider the polarity of the set of words after the negation word. When a sub-review contains an idioms or emoticons, its polarity is considered as the polarity of all the review.

Let $\boldsymbol{s^{rev}}$ be sentiment (polarity) of the review *rev*, we calculated it as follows:

$$S^{rev} = \sum_{i=1}^{n} S_i^{sub-rev} \qquad (3)$$

Where $s_i^{sub-rev}$, the polarity of the sub-rev *i*, is obtained with Equation (3):

$$S^{sub-rev} = \sum_{j=1}^{J} score(w_j) \qquad (4)$$

Where $score(w_j)$ is the polarity of the words or Wolof-French expression containing in the sub-rev.

The similarity between words lexicon and sub-rev words have introducing to manage the wrong writing in French and Wolof reviews. Thus, $score(w_j)$ is weighted through the similarity $Sim(s_1(i), s_2(j))$ between two words describe in section 3.1.

$$S^{sub-rev} = \sum_{j=1}^{J} score(w_j) \times Sim(s_1(i), s_2(j)) \qquad (5)$$

IV. Experimental Evaluation

In this section, we evaluated the effectiveness of our lexicon-based framework for polarity classification using local social media posts as the corpus. Our algorithm is implemented in Java, and we specifically evaluated its accuracy.

Lexicon resource: Here, we presented the lexicon used in our framework. It is mainly derived from FEEL lexicon [31] in which more than 85% of terms are words and almost 15% are expressions (compound terms). Among the expression terms, initially 9 % are composed of two words and 5 % are composed of three words. We added a list of common French idioms that are all negative polarity. We list them in Table I. We have also added nearly 1000 words, emoticons and expressions commonly used by Senegalese.

TABLE I. French idioms

Liste des Idiomes
non plus
pas du tout
pas plus que
pas encore
absolument pas
même pas
pas maintenant
non seulement
pas seulement
ni l'un ni l'autre
n'a jamais
n'a pas
ne pas
mais seulement
rien de nouveau
plus jamais
jamais dans ma vie
ni elle non plus
nulle part
à peine
meme pas
ne plus
ne jamais

Dataset and Experimental Design: in experiments, we used as a dataset the reviews on Seneweb. Seneweb is a web portal with content mainly geared to the Senegalese community in both Senegal and around the world. It can reach more than 7000 connected instant (or 54.2% of users users in Senegal, 14.1% in France, 8.4% in United States, 4.8% in Italy and 3.1% in Canada, etc.) according to Alexa (Amazon comparison tool). Our dataset contains 200 reviews.

Evaluation methodology: to evaluate the efficiency of our approach, we use precision as an indicator. Precision is the proportion of reviews correctly classified among those classified by our approach in the positive or negative class. It measures the ability of FWLSA-score to classify a review in a correct class.

$$P_i = \frac{VP_i}{VP_i + FP_i}$$

Where VP_i is the number of reviews ranked well in the category *i*, FP_i is the number of misclassified reviews in category *i* and *i* is either the class of positive sentiment or negative sentiment.

Results: in order to better evaluate FWLSA-score, a comparison between human judgment and polarity predicted by FWLSA-score. In Fig. 2, we have colored the positive words in green, the negative words in purple and the discriminant words in red.

Fig 2. Example of some sentiment prediction of FWLSA-score

The result of comparison between the sentiment predicted by FWLSA-score and human judgment is presented in Table II and Table III.

TABLE II. CONFUSION MATRIX.

[j, apprecie, beaucoup, sonko, mais, je, le, repete, il, doit, faire, une, communication, plus, rassurante] **negative**
[votre, phacochere, ~~tombera~~, que, vous, le, vouliez, ou, non] **negative**
[proteger, sonko, le, seul, qui, peut, nous, aider, par, la, grace, de, dieu] **positive**
[nous, seul, pouvons, nous, aider, , le, soutenir, pour, que, il, soit, elu, oui, mais, pas, pour, nous, aider] **negative**
[la, solution, est, sonko] **positive**
[tout, le, senegal, compte, sur, vous] **positive**
[sonko, seul, et, le, senegal, en, grand] **positive**
[~~votez~~, sonko, pour, mettre, fin, a, la, mafia] **positive**
[merci, beaucoup, mon, president, fier, de, toi, excellence, ousmane, sonko] **positive**
[vive, sonko, moi, j, etais, a, medina, baye, pour, la, priere, sonko, est, aimer, il, est, la, bonne, de, la, solution] **positive**
[du, courage, sonko, et, bonne, continuation] **positive**
[je, ne, voterai, jamais, sonko] **negative**
[ce, sont, les, bambins, de, facebook, qui, souteinnent, ce, guignol, de, sonko, qui, nous, fatigue] **negative**

Human / Approach	Positive	Negative
Positive	119	18
Negative	3	60

From confusion matrix, we calculated the precision.

TABLE III. PRECISION OF EACH CLASS AND THE AVERAGE.

Human / FWLSA-score	Positive	Negative	Average
Precision	0,8686	0,9523	0.9105

Discussion of the results: This results show the effectiveness of FWLSA-score. It predicts with a good precision the review' sentiment. We note that it better predicts the negative polarity.

V. CONCLUSIONS

In this paper, we presented a lexicon-based approach for Sentiment Analysis from French and Wolof reviews, we called FWLSA-score. The experimental results show the effectiveness of FWLSA-score which gives a very good predictive accuracy in opinions mining.

In future work, we plan to introduce word-sense disambiguation notion to make our framework semantics-aware.

REFERENCES

[1] Y. Chen, and S. Skiena, "Building Sentiment Lexicons for All Major Languages," In ACL (2) (pp. 383-389), 2014.

[2] W. Y. Chong, B. Selvaretnam and L. Soon, "Natural Language Processing for Sentiment Analysis: An Exploratory Analysis on Tweets," 4th International Conference on Artificial Intelligence with Applications in Engineering and Technolog, IEEE Xplore, 2014.

[3] M. Guérin, "Le syntagme nominal en wolof : une approche typologique," Institut de Linguistique et Phonétique Générales et Appliquées (ILPGA), Université de la Sorbonne Nouvelle Paris 3, 2011.

[4] A. Abdaoui, J. Azé, S. Bringay and P. Poncelet, "FEEL: a French Expanded Emotion Lexicon. Springer Science+Business Media Dordrecht," 2016.

[5] S. Huang, W. Han, and X. Que, "Polarity Identification of Sentiment Words Based on Emoticons," Ninth International Conference on Computational Intelligence and Security, IEEE Xplore, 2013.

[6] A. Khan, B. Baharudin and K. Khan, "Sentiment Classification Using Sentence-level Lexical Based Semantic Orientation of Online Reviews," Trends in Applied Sciences Research, 6: 1141-1157, 2011.

[7] X. Wan, "Using Bilingual Knowledge and Ensemble Techniques for Unsupervised Chinese Sentiment Analysis," Conference on Empirical Methods in Natural Language Processing, pages 553–561, Association for Computational Linguistics, 2008.

[8] Ding and al, "A Holistic Lexicon-Based Approach to Opinion Mining," 2008.

[9] Liu, "A Rule-Based Approach For Effective Sentiment Analysis," Pacific Asia Conference on Information Systems (PACIS), 2010.

[10] H. Jing, "A Rule-Based Approach For Effective Sentiment Analysis," Pacific Asia Conference on Information Systems (PACIS), 2010.

[11] X. Hu, L. Tang, J. Tang, and H. Liu, "Exploiting social relations for sentiment analysis in microblogging," In Proceedings of the sixth ACM international conference on Web search and data mining, pages 537–546, ACM, 2013.

[12] M. Taboada, J. Brooke, M. Tofiloski,K. Voll and M. Stede, "Lexicon-based methods for sentiment analysis," Computational linguistics, 37(2):267–307, 2011.

[13] S. Rosenthal, P. Nakov, A. Ritter, and V. Stoyanov, "Semeval-2014 task 9: Sentiment analysis in twitter," Proc. SemEval, 2014.

[14] S. Rosenthal, P. Nakov, A. Ritter, and V. Stoyanov, "Semeval-2013 task 9: Sentiment analysis in twitter," Proc. SemEval, 2013.

[15] A. E. Baccianella, Stefano and F. Sebastiani, "SentiWordNet 3.0: An enhanced lexical resource for sentiment analysis and opinion mining," In Proceedings of LREC, volume 10, pages 2200–2204, 2010.

[16] G. A. Miller, "WordNet: a lexical database for english," Communications of the ACM, 38(11):39–41, 1995.

[17] C. Hung, S. J. Chen, "Word Sense Disambiguation Based Sentiment Lexicons for Sentiment Classification," Knowledge-Based Systems, 2016.

[18] C. Strapparava and A. Valitutti, "Wordnet affect: an affective extension of wordnet," In LREC, volume 4, pages 1083–1086, 2004.

[19] E. Cambria, D. Olsher and D. Rajagopal, "Senticnet 3: a common and common-sense knowledge base for cognition-driven sentiment analysis," AAAI, Quebec City, pages 1515–1521, 2014.

[20] E. Cambria and A. Hussain, "Sentic computing," Springer,(2012.

[21] C. Musto, G. Semeraro and M. Polignano, "A comparison of Lexicon-based approaches for Sentiment Analysis of microblog posts," 2014.

[22] J. Wiebe, T. Wilso, and C. Cardie, “Annotating expressions of opinions and emotions in language,” Language resources and evaluation, 39(2-3):165–210, 2005.

[23] Mohammad and al, “antonym-generating affix patterns,” 2009.

[24] Kamps and al, “Using Wordnet to measure semantic orientation of adjectives,” Proceedings of LREC-04, 4th International Conference on Language Resources and Evaluation, vol. 4, pp. 1115–1118, 2004.

[25] Hassan and Radev, “Identifying Text Polarity Using Random Walks,” ACL 2010, 48th Annual Meeting of the Association for Computational Linguistics, 2010.

[26] P. Turney, Littman, M. M. Praise and Criticism, “Inference of Semantic Orientation from Association,” In ACM Transactions on Information Systems, 21(4), October. pp. 315–346, 2003.

[27] V. Hatzivassiloglou and K. R. McKeown, “Predicting the semantic orientation of adjectives,” 35th Annual Meeting of the Association for Computational Linguistics and Eighth Conference of the European Chapter of the Association for Computational Linguistics Pages 174-181, 1997.

[28] Kanayama and Nasukawa, “Fully automatic lexicon expansion for domain-oriented sentiment analysis,” EMNLP '06 Proceedings of the 2006 Conference on Empirical Methods in Natural Language Processing Pages 355-363, 2006.

[29] Y. Wu and M. Wen, “Disambiguating Dynamic Sentiment Ambiguous Adjectives" In Proceedings of COLING, 2010.

[30] M. Ganapathibhotla and B. Liu, “Mining opinions in comparative sentences,” 22nd International Conference on Computational Linguistics, Coling, 2008.

[31] S. Feng, J. S. Kang, P. Kuznetsova and Y. Choi, “Connotation lexicon: A dash of sentiment beneath the surface meaning,” 51th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers), Sofia, Bulgaria, Angust. Association for Computational Linguistics, 2013.

[32] S. Feng, R. Bose and Y. Choi, “Learning General Connotation of Words using Graph-based Algorithms, ”Empirical Methods in Natural Language Processing, pages 1092–1103, Edinburgh, Scotland, UK, July 27–31, Association for Computational Linguistics, 2011.

[33] A. Rhouati, J. Berrich, G. Belkasmi and T. Bouchentouf, “Sentiment Analysis of French Tweets based on Subjective Lexicon Approach: Evaluation of the use of OpenNLP and CoreNLP Tools,” Journal of Computer Science; Volume 14, Issue 6; Pages 829-836, 2018.

[34] H. Ghorbel and D. Jacot, “Sentiment Analysis of French Movie Reviews,” Advances in Distributed Agent-Based Retrieval Tools (pp.97-108). Part of the Studies in Computational Intelligence book series (SCI, volume 361), Springer-Verlag Berlin Heidelberg, 2011.

[35] G. Shalunts and G. Backfried, “Helmy Syakh Alam. Sentiment analysis in Indonesian and French by SentiSAIL,” Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC). IEEE Xplore, 2017.

[36] https://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html#lexicon

[37] https://hlt-nlp.fbk.eu/technologies/sentiwords

[38] http://www2.imm.dtu.dk/pubdb/views/publication_details.php?id=6010

[39] https://provalisresearch.com/products/content-analysis-

[40] http://csea.phhp.ufl.edu/media/anewmessage.html

[41] https://www.god-helmet.com/whissel-dictionary-of-affect/index.htm

[42] http://www.clips.ua.ac.be/pages/pattern-en#sentiment

[43] http://liwc.wpengine.com/