

TWITTER OPINION MINING ABOUT LEADERS

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This dissertation is dedicated to the two most important men in my life; Late Alhaji  
Abdullahi Osanga my father, and Hassan Ibrahim Ogiri my husband

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## ABSTRACT

Mutual respect between leaders and followers is a key prerequisite to success. The opinion of followers in challenging this leadership is just as great as it has been portrayed by the uprisings in North Africa and the Middle East tagged as the “Twitter or Social media revolution”. The sudden eruption of activities in the area of opinion mining, which deals with the computational analysis of opinion, sentiment, and subjectivity in text, has thus occurred as a means of responding directly to the surge of interest that deals with opinions and use of information technologies to seek out and understand the opinions of others. This study focused on identifying a set of suitable features and an appropriate classifier that can be used for detecting and classification of opinions about leaders in tweets. Words, unigram, bigram and negation features were used alongside Naïve Bayes (NB) and Support Vector Machine (SVM) learning algorithms. The results show that using NB with unigrams can indicate opinions about leaders of up to 91.41% accuracy and can therefore be used to suggest ways to improve a leader’s reputation as well as predicting potential candidates in political election.

## ABSTRAK

Sifat saling menghormati di antara para pemimpin dan pengikut adalah satu prasyarat penting untuk kejayaan. Pendapat pengikut-pengikut dalam mencabar kepimpinan ini adalah hebat seperti yang sudah digambarkan melalui kebangkitan-kebangkitan di Afrika Utara dan Timur Tengah yang dikenali sebagai “revolusi media Sosial atau Twitter”. Ledakan aktiviti-aktiviti secara tiba-tiba dalam perkara mengenai pengeluaran pendapat yang berhubung dengan analisa komputer ke atas pendapat, sentimen dan subjektiviti dalam teks selanjutnya berlaku sebagai cara memberi respons secara langsung kepada peningkatan mendadak minat berkaitan pendapat-pendapat dan penggunaan teknologi informasi bagi mendapatkan dan memahami pandangan-pandangan orang lain. Fokus kajian ini adalah mengenai mengenal pasti satu set ciri-ciri yang sesuai dan satu pengelasan yang baik yang boleh digunakan untuk mengesan dan pengelasan pendapat-pendapat berhubung para pemimpin dalam tweets. Ciri-ciri Words, unigram, bigram dan penafian telah digunakan bersama-sama dengan Naïve Bayes (NB) dan algoritma-algoritma pembelajaran Mesin Vektor Sokongan (SVM). Hasil kajian menunjukkan bahawa penggunaan NB dengan unigram boleh membayangkan ketepatan pendapat-pendapat berkenaan para pemimpin sehingga 91.41% dan seterusnya boleh digunakan bagi mencadangkan cara-cara untuk memperbaiki reputasi seseorang pemimpin dan juga meramal calon-calon berpotensi dalam pengundian politik.

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**LIST OF ABBREVIATIONS**

A	Accuracy
API	Application programming interface
E	Evidence
FN	False negative
FP	False positive
LMX	Leader member exchange
ML	Machine learning
NB	Naïve bayes
NEG	Negative
NLP	Natural language processing
NLTK	Natural language toolkit
OM	Opinion Mining
SVM	Support vector Machines
P	Precision
POS	Positive
R	Recall
TN	True positive
TP	True positive

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background**

Leadership has been and will always be a global issue as no nation can survive without it. From time in-memorial effective leadership has helped seen nations through times of war, turmoil and peril as it has made nations successful and prosperous. The absence of leadership equally has its sets back. Without leadership nations would lose focus, unity, vision, objectivity etc. The importance of leadership cannot be under-estimated as can be seen in families, schools, villages, states, countries, places of work and worship. All these entities mentioned cannot survive in harmony without good leadership. As leaders are known to inspire, encourage, visualise, set goals, action plan, allocate task and build teams that can work in harmony. The goal to produce competent leadership in societies has been a long one since leadership is bounded by numerous important skills such as shared vision, ownership, and creativity necessary for co-creation of a community's future thereby resulting in breakthrough performance (Marques 2007). Furthermore, leadership is needed in making the mind-set of an economy shift to sustainability and to reinvent a suitable environment capable of producing bottom line results in today's volatile climate.

Leadership also viewed as supremacy or supervision is highly needed for a number of reasons. Firstly on a managerial level, leadership is needed in order to enhance organizational structures. (Katz & Kahn, 1978) as well as promote submissive motivation, capability, performance and satisfaction (Bass, 1990). Secondly, at an adept level, leadership aids in organizing functions as it reaches out to constantly changing environment (Katz & Kahn, 1978). Also, leadership in organizations is viewed as the major driving force behind the success or failure of any organization (Bass, 1990). All these reasons and much more make leadership an interesting issue of research in the 21st century.

However leaders need their follower's views, ideas and opinions in order to achieve all their said qualities as no leader can lead in isolation (Bass, 1990). Expression of these views and opinions could range from making reviews of products and services to expressing opinions on topics like health, education, tourism and even sensitive topics like politics. As a societal norm, the idea of leadership must evolve and keep pace with all societal changes as they occur. As our society changes at a rapid pace our understanding of leadership must change along with societal needs, else it becomes irrelevant and obsolete.

The web is an ideal place for these leaders and their followers to convey their different ideas and opinions through review sites, forums, discussion groups, blogs etc. Finding and extracting such opinions is of great importance for various reasons such as; improving existing services or implementing new feasible ideas by using Opinion Mining Systems (Esuli & Sebastiani, 2006; Pang & Lee, 2008).

Web 2.0 tools and platforms such as wikis, blogs, and social networking sites also provide a forum where a lot of reviews and opinions are expressed leading to a very large amount of structured data that can be exploited for many applications. Marketers of products, brand and organisations on the hand who want to outsmart each other make use of these reviews and create a reputation in the mind of their customers (Trout and Rivkin, 1996; Zabin and Jefferies 2008). Furthermore, The web has made information dissemination in the 21<sup>st</sup> century easy and convenient, A

good example is the Arab Uprisings which started mainly by calling for spreading of the news of a young man who sets himself ablaze due to official mistreatment by the government. Social networking sites such as Facebook, twitter, blogs and YouTube were used to organize the massive protest which began in Egypt and later spreading to other countries.

The use of these social networking sites gives rise to a lot of comments and opinions there-by giving room to a huge amount of documents to be discussed. Usually in review blogs people do not write directly about their point of view, rather they try to give examples or write about the pros and cons of the subject and reflect their way of thinking in natural language. Written or spoken words in Natural Language are best understood by humans, this is based on previously acquired linguistic resources. However if the same information is inputted into the system, it will be a very difficult task for the system to manipulate because it cannot interpret the attitude, sentiment or emotion expressed due to the reason being that the system does not have enough linguistic knowledge and is not as intelligent as humans. For instance one of the reviews about security reform is:

*“This puts the government in the role of arbiter of what practice is safe and unsafe. But I believe that Peoples security should be the first priority of a nation”*

According to this review, it can be concluded that the author is not satisfied with the current security practices therefore he/she is a supporter of the reform.

Thus, the opposition turns to the question: what is the best possible way of recognizing the sentiment behind document. That is to say how the opposition can find out if individuals are for or against the reforms, but this will undoubtedly consume too much time because the number of documents to be discussed are high. Therefore this process should be done automatically.

Primarily, these kinds of processes are best dealt with using natural language processing (NLP) and more precisely in opinion mining and sentiment analysis area. Pang and Lee (2008), Liu (2010) and Tsytsarau and Palpanas (2012) stated in their work that Opinion mining is still an emerging field of research that requires improvements on areas such as:

- Which documents are really relevant in response to an opinion-oriented query?
- Which subjective words are often used to express opinions on people?
- How to parse and analyze documents, phrases and sentences in Order to extract the right opinions from a text?
- How to identify the overall expressed sentiment of these documents and/or of specific opinions in response to a particular fixed set of features or aspects in a given text or document

Thus, this has led to the emerging fields of opinion mining and sentiment analysis, which handles retrieval of information and knowledge discovery from text with the aid of data mining and natural language processing (NLP) techniques in order to distil knowledge and opinions from a huge amount of information on the Web (Shelke et al., 2012). Mining opinions and sentiments from natural language, on the contrary, is an extremely ambitious and difficult task as it involves a deeper understanding and proper use of languages and classifiers.

The web has millions of documents that are exponentially growing. These documents hold different types of information. Information on the web can be categorized into two different categories: objective and subjective information. Objective information has factual details that are presented in textual and visual ways. While, subjective information is opinion and thoughts of people about a specific subject. Opinion Extraction is known to be difficult and requires more effort in analysing for better understanding of a particular subject. Objective information (or facts) is retrieved by various known business and general purpose search engines using different Information Retrieval (IR) techniques. Retrieving subjective



information needs in depth analysis and parsing of sentences and paragraphs in order to extract opinions and produce proper summaries on opinionated text. “This is due to the fact that opinions are hard to express with a few keywords” Haji et al. (2007). For instance to extract opinion from a given text, the following general steps are required (Pang and Lee, 2008):

- Finding the required documents that better gives opinions on a target
- Extracting Attributes/features of the target
- Identifying opinion orientation on the target
- Identifying sentences and apply text tagging to know opinion polarity; Text SO (Subjective / Objective); Text PN (Positive / Negative) and a Text strength (Weak, Mild, Strong
- Review, analyze and present summaries in textual of visual methods

Opinion polarity refers to the direction of the opinion and can be one of the following (Pang and Lee, 2008); Factual opinion which can be Positive, Negative or Neutral denoted as (+, -, 0) respectively. Non-factual opinion which refers to the feeling associated with a given text rather than just an opinion – this refers to anger, sadness, happiness, etc. of an individual or a group about a particular subject.

Given the above importance of leadership and Opinion mining, this dissertation is based on the aspect or feature-based opinion mining methods (Indurkiya and Dameru, 2010) as seen in the works of Popescu and Etzioni (2006); Hu and Liu (2004). The theme of this research is based on the extraction of Opinions about world known leaders from Twitter. The choice of these leaders fell on Barack Obama, the United States president and Nelson Mandela a former South African president and an anti-apertied hero. In selecting thses mentioned leaders, the following factors were highly considered:

- a. These leaders had acquired fame worldwide, either in a positive or negative way

- b. These leaders are timeless and unforgettable celebrities, as they always remembered and made reference to in societies even in death (Mandela)
- c. The ease of data availability expressed on the selected leaders.
- d. The year they each led. As they belong to the older and younger generation

The Abstraction of the problem addresses the issue of identifying opinion words related to leaders, opinion feature extraction and classification. Finally, evaluating the technique and approaches used in term of its accuracy and measured performance.

## **1.2 Problem Background**

The concept of processing and analyzing expressed comments and reviews about different topics has attracted many researchers to work on creating some kind of an automated tool that can identify the sentiment or opinion of a given text, document, sentence, or phrase (Liu, 2010). This task has been given various names like sentiment analysis, sentiment orientation, subjectivity analysis, or opinion mining (OM), and it is considered to be an emerging new research field in machine learning (ML), computational linguistics, and natural language processing (NLP).

The use of Twitter as a platform of data collection for making predictions is not limited to the commercial world only, but it has also been applied to predict political outcomes. Some of the earlier works published in these aspects include the works of O'Connor et al. (2010). Their work connected numerous amount of public opinion verdict collected from polls along with its corresponding sentiment Twitter was used to analyze several surveys on consumer confidence and political opinion within the year 2008 to 2009. The researchers made use of an unsupervised learning technique to determine the polarity of tweets using the OpinionFinder linguistic

resource. For the analysis of the evolution of the opinions, they developed the concept of the daily opinion score, which is simply the ratio between positive and negative tweets. With this score, they constructed a time series and compared it with the traditional metrics of opinion polls. The results pinpoint a viable potential of text streams as a replacement for normal traditional polling in years to come. They also pointed out that the work they have carried out is relatively simple and that to further increase the correspondence with opinion polls, it would be necessary to apply more advanced NLP techniques, as well as techniques for solving the specific problems generated by the texts published on Twitter. In the same vein, Tumasjan et al. (2010) also analysed the possibility of using Twitter to measure political opinion. In the process of carrying out the study, the authors posed these three questions:

1. Is Twitter a social network platform in which political issues are discussed?
2. Can political opinions be extracted and classified from Twitter?
3. Can Twitter be used as a tool for predicting political results?

In order to answer the first question, the authors examined the German elections of 2008 and came to a conclusion that there exist a high percentage of political tweets even though most tweets consisted of a high number of retweets. However in response to the second question, the tweets had a down side because the political content is dominated by a small group of users making subjectivity analysis difficult because each candidate and political party analyzed had a lot of emotional states. In order to overcome the difficulty; a software called LIWC200720 was used to calculate the relative frequency of words in relation to the query of the text being analysed. With the collected tweets, the researchers were able to create new profiles, showing different levels of opinion and differences between the campaigns involving political parties and its respective candidates, and finally came to a conclusion that the political tweets do contain subjective information after all. In respect to the third question, a simple experiment of assigning a voting percentage of a relative frequency of references to each political party in the corpus of tweets generated was created. Based on the assumption, that a reference represents a vote, the results

obtained differed by only 1.65 per cent from the outcome of the actual elections. With these data, the study arrived at a conclusion that Twitter can clearly be considered a valid indicator of the state of a political opinion, and that it can complement traditional methods of conducting opinion polls. The above article gave rise to a lot of questions due to the ease and apparent success of the experiments, and some doubts also on the strong conclusions that Twitter will be able to replace political polls in the future. One of the papers that opposed the works of Tumasjan et al. (2010) is Jungherr, Jürgens and Schoen (2012), these researchers repeated the same experiment but with more political parties. Jungherr et al. declared that with such little information, it is difficult for the research community to repeat the experiments. Moreover, Jungherr et al. dispersed the idea that the use of direct or indirect mentions in Twitters is not enough as an indicator of a political party's results in an election.

The last UK general elections were also used a source of data for a Sentiment analysis study. Maynard and Funk (2012) show a methodology for measuring political opinion. The technique consists of representing each opinionated tweet as a triplet <Person, Opinion, Political Party>, for instance, <peter pan, strong activist, republican>, meaning Peter Pan is strong republican activist. To build these representations, the system must first identify the opinion holder, the object of the opinion and the polarity of the opinion. The authors used the entity recognition system ANNIE (A Nearly-New IE system) (Maynard et al. 2002) to detect possible proper names that could represent the opinion holder, and also identify the political party. For the subjective and polarity classification, they follow an unsupervised methodology based on a lexicon approach, taking into account the negative words that could modify the orientation of the triggered opinion words. With the above schema described, the authors were able to study the progress of the political opinion of an author, which is a step ahead of the static Sentiment Analysis of techniques that were used by previous researchers in this area. As the authors highlighted in the concluding remarks that; political opinion is more changeable than an opinion about a commercial product, hence it is useful to study the evolution of an opinion in order to determine the possible vote of the author.

The fore-going discussion shows that in the NLP community there exist, some differences on the conviction that the application of Sentiment Analysis techniques to Twitter messages, or simply processing those messages, can be used as a prediction tool or in the political domain as a replacement of the traditional polls. Some of these differences are described by Garcia-Avello (2012), who describes some papers related to the prediction of economic or political events. The author highlighted all the flaws of those papers and some recommendations for following research on political opinion in Twitter. From the recommendations given, I will give more emphasis on two: firstly is the definition of ‘who a leader is?’, because to the best of my knowledge none of the published papers in this field has defined ‘who a political leader is ’, this is necessary when defining ‘what a vote is’ followed by the definition of a methodology or a system whose main focus should be on the prediction of political results. Secondly the choice of Opinion Mining technique should meet the proposed system requirement considering the fact that a negative mention of a political leader on Twitter maybe considered as a positive feature elsewhere in the political arena.

As artificial intelligence systems has recorded a huge amount of success used during information retrieval, data mining and natural language processing (NLP) systems, there is however an unsatisfied need for Opinion mining systems that can automatically process the vast amount of sentimental opinions available via social media. The increasing social necessity is the driving force for the massive research effort on Sentiment Analysis/Opinion Mining. Hence the theme of this Research, Thus, it is clearly necessary to develop Opinion Mining systems that can extract the intrinsic knowledge of words about leaders disseminated via Twitter.

### 1.3 Problem Statement

Based on previous approaches applied to the task of political sentiment analysis it can be concluded that the main problems encountered that needs improvement are:

- Identifying and extracting opinions consisting of information about particular aspects of interest and the corresponding subjectivity analysis in a structured form from unstructured text
- The lack of a suggested set of features and a classification algorithm to be used for polarity classification of opinions

As the number of Internet user's increases, so does the number of opinions available on the web. This recent happenings has lead to an avenue for massive opinion collection ranging from daily news editorials, blogs, governmental websites, products reviews websites to group boards messages. Moreover in the 21<sup>st</sup> century global village, text is considered the primary medium of conveying, representing and communicating information. This has also been seen with the consistency of using, instant messages, e-mails, Facebook, twitter, blogs, news articles, homepages as well as printed materials. All these daily activities and occurrences with textual information has led to an increasing need for the development of technologies that will help cater for issues arising from the resulting information overload.

In this study, we are interested in Opinion Mining at the sentence-level of tweets about leaders which aims at classifying a sentence/tweet, as having an overall positive, negative or neutral sentiment with regards to the given target. The main motive of this approach is to study existing approaches and techniques in opinion mining and to enhance extraction and classification of opinions on sentences and phrases expressed by users of micro-blogging sites such as twitter. Although there are quite a number of researches on opinion mining /sentiment analysis using twitter as the Platform of information dissemination on political issues by researchers such

as; Jiang et al. (2011), Maynard and Funk (2012), Jungherr et al. (2012) etc. No studies have been found that examine the application of Opinion mining tools and techniques to opinions on political leaders.

#### **1.4 Dissertation Objectives**

The objectives of this study are:

- a. To Identify words and related features for Opinion mining about leaders in tweets
- b. To develop a supervised sentiment classification model for tweets about leaders using NB and SVM
- c. To evaluate the performance of the developed supervised learning model

The approach followed in order to achieve the above objectives includes; data collection from twitter, Pre-processing the tweets (normalization, stemming and stop-words removal), identifying, extracting and representation of the features from the collected tweets. Building an annotated corpus that will be used to train and test the classifier at different corpus sizes; comparing the features and machine learning classification models i.e support vector machines (SVM) and naïve bayes (NB) to determine performance.

#### **1.5 Research Questions**

Some notable questions this research would answer are;

- How can words about leaders and features based on these words be constructed for opinion mining purposes?
- How can NB and SVM model be developed for opinion classification of leadership words into polarity classes of positive and negative?
- What is the efficiency of the developed opinion classification models based on performance?

It is however worthy of note that this dissertation does not serve as an assessment board of these leaders but just a review and the application of educational tools to a leader's skill, style and characteristics.

## **1.6 Scope of the Study**

- Leaders: President Barack Obama and late President Nelson Mandela
- Features: Unigram, Bigram and Negation
- Classifiers: Support Vector Machines (SVM), Naïve Bayes (NB)
- Programming Language: Python 2.7.3
- Lexical Resource: WordNet
- Datasets: political and leadership twitter based opinions consisting of 7,500 tweets collected in march 2013
- The performance of the classifiers are evaluated based on classification accuracy, precision and recall

## **1.7 Dissertation Organisation**

This dissertation is organized as follows:



- Chapter 1, gives insight to what the dissertation is all about, it covers the introduction, problem background, problem statement, aim, objectives, scope and significance of the study.
- Chapter 2 presents the discussion of the related work in this area of research ranging from opinion identification and extraction, opinion classification, to opinion summarization. A detailed discuss on the different machine learning techniques and features adopted by researchers in recent works, as well as the semantic orientation of opinionated text, words generation datasets and available lexical resources was also looked into. Furthermore, the leadership aspect and proposed approaches were also covered in detail.
- In Chapter 3, a detail review of the research Methodology, tools, and techniques to be used for analysis are also discussed in detail.
- Chapter 4, the experimentation, analysis and results of the NB and SVM based on the evaluated performance is reported in detail.

Chapter 5 highlights the conclusions, summary of research contributions, and the progress of activities that were carried out in order to execute the objectives of the research. Finally recommendations for future works were also stated.

## REFERENCES

- Agarwal, A., Biadys, F., and Mckeown, K.R. 2009. Contextual phrase-level polarity analysis using lexical affect scoring and syntactic n-grams. *Proceedings of the 12th Conference of the European Chapter of the Association for Computational Linguistics*, EACL '09, pages 24–32. Association for Computational Linguistics.
- Agrawal, R. and Srikant, R. 1994. Fast Algorithm for Mining Association rules. *Proceedings of 20th International Conference on Very Large Data Bases*, Santiago de Chile, Chile
- Andreevskaia, A., Bergler, S. 2006. Mining WordNet for a fuzzy sentiment: Sentiment tag extraction from WordNet glosses, *Proceedings of the European Chapter of the Association for Computational Linguistics (EACL)*.
- Arora, R. and Ravindran, B. 2008. Latent dirichlet allocation based multi-document summarization. *Proceedings of the second workshop on Analytics for noisy unstructured text data*.
- Barbosa, L. and Feng, J. 2010. “Robust sentiment detection on twitter from biased and noisy data,” *Proceedings of the 23rd International Conference on Computational Linguistics*, pp. 36–34.
- Bass, B. M., & Avolio, B. J. 1993. Transformational leadership: A response to critique. In M. M. Chemers, & R. Ayman (Eds.), *Leadership theory and research: Perspective and directions* (pp. 49–88). New York: Free Press.
- Bermingham, A. and Smeaton, A.F. 2010. Classifying sentiment in microblogs: is brevity an advantage? *Proceedings of the 19th ACM international conference on Information and knowledge management*, CIKM '10, pages 1833–1836. ACM,
- Bing Liu. 2010. "Sentiment Analysis and Subjectivity." *Invited Chapter for the Handbook of Natural Language Processing*, Second Edition.
- Bing Liu. 2012. *Sentiment Analysis and Opinion Mining*. Morgan & Claypool Publishers May.
- Bloom, K., Garg, N. and Argamon, S. 2007. Extracting appraisal expressions. *HLT-NAACL 2007*, pages 308–315.
- Bollen, J. and Huina, M. 2011. “Twitter mood as a stock market predictor,” *IEEE Computer*, vol. 44, no. 10, pp. 91–94.

- Bruch, H and Ghoshal, S. 2004. *A Bias for Action*. Harvard Business School Press Boston, MA.
- C M Whissell. 1989. The dictionary of affect in language, R. Plutchnik and H. Kellerman (Eds) *Emotion: Theory, research and experience*: vol 4, The measurement of emotions. Academic Press, New York.
- Cambria, E., Song, Y., Wang, H. and Howard, N. 2013. "Semantic multidimensional scaling for open-domain sentiment analysis," *IEEE Intelligent Systems*, doi: 10.1109/MIS.2012.118.
- Chatterjee, A., & Hambrick, D. C. 2007. It's all about me: *Narcissistic chief executive officers and their effects on company strategy and performance*. *Administrative Science Quarterly*, 52, 351–386. 2007
- Dave, K., Lawrence, S. and Pennock, D.M 2003. Mining the peanut gallery: opinion extraction and semantic classification of product reviews. *Proceedings of the 12<sup>th</sup> international conference on World Wide Web, WWW '03*, pages 519–528. ACM.
- Davidov, D. Tsur, O. and Rappoport, A. 2010. Enhanced sentiment learning using twitter hashtags and smileys. *Proceedings of the 23rd International Conference on Computational Linguistics: Posters, COLING '10*, pages 241–249. Association for Computational Linguistics.
- Day, D. V., Shleicher, D. J., Unckless, A. L., & Hiller, N. J. 2002. Self-monitoring personality at work: A meta-analytic investigation of construct validity. *Journal of Applied Psychology*, 87, 390–401.
- Do-Hyung, P., Lee, J. and Han, I.2007. *The effect of on-line consumer reviews on consumer purchasing intention: The moderating roleof involvement*. *International Journal of Electronic Commerce*, vol. 11(4): p. 125-148.
- Eagly, A. H., & Johnson, B. T. 1990. Gender and leadership style: A meta-analysis. *Psychological Bulletin*, 108, 233–256.
- Esuli, A. , Sebastiani, F. 2006a. Determining term subjectivity and term orientation for opinion mining, *Proceedings of the European Chapter of the Association for Computational Linguistics (EACL)*.
- Esuli, A., Sebastiani, F. 2006b. SentiWordNet: A publicly available lexical resource for opinion mining, *Proceedings of Language Resources and Evaluation (LREC)*.
- Fayyad, U., Piatetsky, G., Smyth, P. 1996: From data mining to knowledge discovery: An overview In: *Advances in Knowledge Discovery and Data Mining*, pp. 1–36. MIT Press, Cambridge.
- Fellbaum, C. 1998. *Wordnet: An Electronic Lexical Dastabase*.MIT Press.

- Fleishman, E. A., Mumford, M. D., Zaccaro, S. J., Levin, K. Y., Korotkin, A. L., & Hein, M. B. 1991. Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation. *The Leadership Quarterly*, 2, 245–287.
- Gamon, M., Aue, A., Corston-Oliver, S., & Ringger, E. 2005. Pulse: Mining customer opinions from free text. *Lecture Notes in Computer Science*, vol. 3646, pp. 121-132.
- Gerstner, D.R., & D.V., 1997. Day Meta-analytic review of leader-member exchange theory: Correlates and construct issues. *Journal of Applied Psychology*, 82, 827–844.
- Go A. Huang G. and Bhayani R.. 2009. Twitter sentiment analysis. Final Projects from CS224N for Spring 2008/2009 at *The Stanford Natural Language Processing Group*.
- Graen, G. B., & Uhl-Bien, M 1995. Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The Leadership Quarterly*, 6, 219–247.
- Greene, S. 2007. Spin: Lexical Semantics, Transitivity, and the Identification of Implicit Sentiment. *University of Maryland*
- Griffin, Ricky W. *Fundamentals of Management: Core Concepts and Applications*. Houghton Mifflin Company; Boston. 2000.
- Grishman, R. 1997. Information Extraction: Techniques and Challenges. In *Information Extraction: a Multidisciplinary Approach to an Emerging Information Technology, Frascati, Italy*. Springer.
- Hacker, S. K.; Wilson, M. C. 1999. *Work Miracles*. Insight Press; *Richmond, Virginia*.
- Hambrick, D. C. 2006. Upper echelons theory: An update. *Academy of Management Review*, 32, 334–343.
- Hambrick, D. C., & Mason, P. A. 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, 9, 193–206.
- Haslett, J.W. *Business Systems Handbook: Strategies for Administrative Control*. McGraw Hill, 1979.
- Hatzivassiloglou, V. and McKeown K.R. 1997. Predicting the semantic orientation of adjectives. *Proceedings of the eighth conference on European chapter of the Association for Computational Linguistics, EACL '97*. Association for Computational Linguistics.
- Hearst, M. 1997. Text data mining: Issues, techniques, and the relationship to information access. *UW/MS Workshop on Data Mining*. Berkeley
- House, R. J., & Aditya, R. N. 1997. *The social scientific study of leadership: Quo vadis?* *Journal of Management*, 23, 409–473.

- Hu, M and Liu, B. 2004a. Mining opinion features in customer reviews. *Proceedings of the 19th national conference on Artificial intelligence, AAAI'04*, pages 755–760. AAAI Press.
- Hu, M. and Liu, B. 2004b. Mining and summarizing customer reviews. *Proceedings of the tenth ACM SIGKDD international conference on Knowledge discovery and data mining, KDD '04*, pages 168–177.
- Indurkha, N. and Damerau, F.J. 2010. *Handbook of Natural Language Processing, 2010: Second Edition*, Chapman & Hall.
- Jensen, M., & Zajac, E. J. 2004. Corporate elites and corporate strategy: How demographic preferences and structural position shape the scope of the firm. *Strategic Management Journal*, 25, 507–524.
- Jiang, L., Yu, M., Zhou, M., Liu, X., and Zhao, T. 2011. Target-dependent twitter sentiment classification. *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics: Human Language Technologies, Vol. 1*, pp. 151–60. Stroudsburg, PA: Association for Computational Linguistics
- Jindal, N. and Liu, B. 2006. Identifying comparative sentences in text documents. *Proceedings of the ACM Special Interest Group on Information Retrieval (SIGIR)*.
- Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. 2002. Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology*, 87, 765–780.
- Judge, T. A., Piccolo, R. F., & Ilies, R. 2004. The forgotten ones? A re-examination of consideration, initiating structure, and leadership effectiveness. *Journal of Applied Psychology*, 89, 36–51.
- Jungherr, A., Jürgens, P., and Schoen, H. 2012. Why the Pirate Party won the German Election of 2009 or the trouble with predictions: a response to Tumasjan, A., Sprenger, T. O., Sander, P. G., and Welpe, I. M. 'Predicting elections with Twitter: what 140 characters reveal about political sentiment'. *Social Science Computer Review* 30(2): 229–34.
- Jurafsky, D and Manning, C. "Stanford NLP course. Lecture:" <https://www.coursera.org/course/nlp>. [Online; accessed 12-May-2012].
- Kim S. and Hovy E. 2006. Extracting opinions, opinion holders, and topics expressed in online news media text. *Proceedings of ACL/Coling Workshop on Sentiment and Subjectivity in Text*, pp1-8
- Kim, S. and Hovy, E 2004. Determining the sentiment of opinions. *Proceedings of the 20th international conference on Computational Linguistics, COLING '04*. Association for Computational Linguistics,
- Lin, D. (1998) Dependency-based evaluation of MINIPAR. *Workshop on Evaluation of Parsing Systems* at ICLRE

- Liu, Bing. (2010) Sentiment Analysis and Subjectivity, in *Handbook of Natural Language Processing, Second Edition*, N. Indurkha and F.J. Damerau, Editors.
- Manning, C.D, Raghavan, P. and. Schtze, H. (2009) An Introduction to Information Retrieval. *Cambridge University Press*.
- Marques, F. J. 2007. International Journal of Leadership Studies, ©2007 School of *Global Leadership & Entrepreneurship, Regent University* ISSN 1554-3145, Vol. 3 Iss. 1, 2007, pp. 98-125
- Maynard, D., and Funk, A. 2012. Automatic detection of political opinions in tweets. In Response to. Garc'ia-Castro, D. Fensel, and Antoniou, G. (eds.), *The Semantic Web: ESWC 2011 Workshops, Lecture Notes in Computer Science*, Vol. 7117, pp. 88–99. Berlin/Heidelberg:Springer
- Miller, G.A, Beckwith A, Fellbaum ,C. Gross ,C. and Miller K.J.1990. *Introduction to WordNet: an on-line lexical database*. International Journal of Lexicography, pages 235–244.
- Morsy, S. 2011. "Recognizing Contextual Valence Shifters in Document-Level Sentiment Classification", *Department of Computer Science and Engineering, The American University in Cairo (AUC)*.
- Nguyen, L. Wu, P., Chan, W. Peng, W. and Zhang, Y. 2012. "Predicting collective sentiment dynamics from time-series social media," in *KDD WISDOM*, Beijing.
- Northouse, P. G. 2007. *Leadership: Theory and Practice*. 4th ed. Thousand Oaks, CA: Sage Publications, 2007, p. 322-3.
- Nutt, P. C. 1987. *Identifying and appraising how managers install strategy*. Strategic Management Journal, 8, 1–14.
- O'Connor, B., Balasubramanyan, R., Routledge, B.R and Smith, N.A (2010). "From tweets to polls: Linking text sentiment to public opinion time series," *Proceedings. Of the International AAAI Conference on Weblogs and Social Media*, pp. 122–129.
- Offermann, L.R., Kennedy, J.K., & Wirtz, P.W. 1994. Implicit leadership theories: Content, structure, and generalizability. *Leadership Quarterly*, 5, 43-58.
- Pang, B. Lee, L. and Vaithyanathan, S. 2002. Thumbs up? sentiment classification using machine learning techniques. *Proceedings of the ACL-02 conference on Empirical methods in natural language processing - Volume 10*, EMNLP '02, pages 79–86. Association for Computational Linguistics.
- Peter, R. S. 1990. *The Fifth Discipline: The Art and Practice of the Learning Organization*. *Double Day*; New York.
- Peterson, R. S., Smith, D. B., Martorana, P. V., & Owens, P. D. 2003. *The impact of chief executive officer personality on top management team dynamics: One mechanism by*

- which leadership affects organizational performance. *Journal of Applied Psychology*, 88, 795–808.
- Philip J. S., Dexter C. D., Marshall S. S, and Daniel M. O. 1996. *The General Inquirer: A Computer Approach to Content Analysis*. MIT Press,
- Popescu, A.M., and Etzioni, O. 2005. Extracting product features and opinions from reviews. *Proceedings of the conference on Human Language Technology and Empirical Methods in Natural Language Processing (HLT-EMNLP'05)*.
- Qiu, G. ,Liu, B. , Bu, J., Chen, C. 2009. Expanding Domain Sentiment Lexicon Through Double Propagation, *Proceedings of the 21st international joint conference on Artificial intelligence*, San Francisco, CA, USA
- Radev, D., Allison, T., Blair-Goldensohn, S. and Blitzer, P. 2004. Mead- a platform for multidocument multilingual text summarization. *Conference on Language Resources and Evaluation (LREC)*.
- Ray, M. and Myers, M 1986. *Creativity in Business*. New York.
- Resick, C. J., Whitman, D. S., Weingarden, S. M., & Hiller, N. J. 2009. The bright-side and the dark-side of CEO personality: Examining core self-evaluations, narcissism, transformational leadership, and strategic influence. *Journal of Applied Psychology*, 94, 1365–1381.
- Robinson, A. and Stern, S 1997. *Corporate Creativity: How Innovation and Improvement Actually Happen*. San Francisco, California, Berrett-Koehler Publishers.
- Shelke, M.N, Deshpande,S. and Thakre ,V. 2012. Survey of techniques for opinion mining, *International Journal of Computer Applications*, 57,13,pp 0975-8887. 2012
- Simoudis, E. 1996. Reality check for data mining. *IEEE Expert* 11(5) .
- Trout, J., and Rivkin, S. 1996. *The New Positioning: The Latest on the World's #1 Business Strategy*. McGraw Hill, New York . (Zabin J. & Jefferies A., 2008)
- Tumasjan, A.; Sprenger, T. O.; Sandner, P. G.; and Welpe, I. M. 2010. Predicting elections with twitter: What 140 characters reveal about political sentiment. In *Fourth International AAAI Conference on Weblogs and Social Media*.
- Turney, P.D. 2002. Thumbs up or thumbs down? Semantic orientation applied to unsupervised classification of reviews. *Proceedings of the 40th Annual Meeting on Association for Computational Linguistics, ACL '02*, pages 417–424. Association for Computational Linguistics.
- Tushman, M. L., & Rosenkopf, L. 1996. Executive succession, strategic reorientation and performance growth: A longitudinal study in the US cement industry. *Management Science*, 42, 939–953.

- Wang B. and Wang H. 2007. Bootstrapping both Product Properties and Opinion Words from Chinese Reviews with Cross-Training. *IEEE/WIC/ ACM International Conference on Web Intelligence (WI'07)*, pp.259-262
- Wang, G. and Araki,K. 2008. "An Unsupervised Opinion Mining Approach for Japanese Weblog Reputation Information Using an Improved SO-PMI *Algorithm*," *IEICE TRANS. INF. & SYST*, vol. VOL.E91-D, pp. 1032- 1041.
- Wiebe, J., Wilson, T., Bruce, R., Matthew, B., and Melanie, M. 2004. *Learning Subjective Language. Computational Linguistics*, 30(3):277-308.
- Wilson, T., Wiebe, J., Hwa, R. 2004. *Just How Mad are You? Finding strong and Weak Opinion clauses*.In Proceedings of AAAI
- Wilson, T., Wiebe, J. and Hoffmann, P. 2005. Recognizing contextual polarity in phraselevel sentiment analysis. *Proceedings of the conference on Human Language Technology and Empirical Methods in Natural Language Processing, HLT '05*, pages 347-354. Association for Computational Linguistics.
- Yi, J., Nasukawa, T., Bunescu R., Niblack, W. 2003. "Sentiment Analyzer: Extracting Sentiments about a Given Topic using Natural Language Processing Techniques", *Proceedings of IEEE International Conference on Data Mining (ICDM)*
- Yu, H. and Hatzivassiloglou, V. 2003. Towards answering opinion questions: separating facts from opinions and identifying the polarity of opinion sentences. *Proceedings of the 2003 conference on Empirical methods in natural language processing, EMNLP '03*. Association for Computational Linguistics.
- Zhou, L. and Hovy, E 2005. *Fine-grained clustering for summarizing chat logs*. Proceedings of the Workshop on Beyond Threaded Conversation, *held at the Computer-Human Interaction conference (CHI2005)*.