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## Sentiment Analysis

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### Abstract

Sentiment analysis is an important current research area. This paper describe the different basic elements of sentiment analysis i.e. what is sentiment analysis, what is the use of it, what are the different types of sentiment analysis. Sentiment analysis is the computational treatment of opinions, sentiments, and subjectivity of text. The correlated area to sentiment analysis (transfer learning, emotion detection, and building resources) that attracted researchers recently are discussed.

**Keywords :** Sentiment Analysis, Methods to analyse Sentiment Data, Classification of Sentiment Analysis, Uses of Sentiment Analysis, Types of Sentiment Analysis.

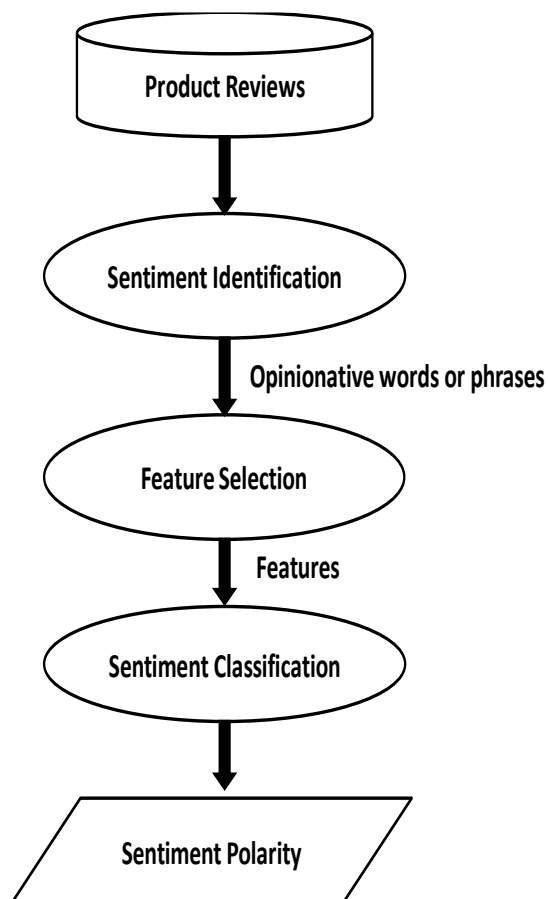
### 1. Introduction

Sentiment Analysis (SA) or Opinion Mining (OM) is the computational research of people's opinions, perspectives, and emotions toward an entity. The entity can represent individuals, events or topics. These topics are most likely to be enclosed by reviews. The two expressions SA or OM are interchangeable. They basically express a mutual meaning. Opinion mining extracts and examines people's opinion about entity while Sentiment analysis identifies the sentiments expressed in a text then analyses it. Sentiment analysis refers to the use of natural language processing, text analysis and computational linguistics to recognize and extract subjective information in source materials. Sentiment analysis is normally applied to reviews and social media for a variation of applications, ranging from marketing to customer service. In essence, it is the procedure of determining the emotional tone behind a series of words, used to gain an understanding of the attitudes, opinions and emotions expressed within an online mention.

Generally speaking, with respect to some matter or the overall contextual polarity of a file, sentiment analysis aims to verify the perspective of a speaker or a writer. The approach may be his/her judgment or evaluation, affective state (that is to say, the emotional state of the author when writing), or the intended emotional communication (that is to say, the emotional effect the author wishes to have on the reader).

The sentiment found within comments, feedback or critiques give useful indicators for many different purposes. These sentiments can be categorized in two categories: positive and negative; or into an n-point scale, e.g. very good, good, satisfactory, bad and very bad. In this respect sentiment analysis task can be interpreted as a classification task where each category represents a sentiment.

The target of SA is to find opinions, identify the sentiments they express, and then classify their polarity as shown below in a fig. 1.



**Fig.1:** Sentiment analysis process on product reviews.

Sentiment Analysis can be considered a classification process as illustrated in fig. 1.

## 2. Methods to analyse ‘Sentiment Data’

There are different methods to analyse the ‘Sentiment Data’: document-level, sentence-level, and aspect-level SA.

1. Document-level SA aims to categorize an opinion document as expressing a positive or negative opinion or sentiment. It considers the whole document a basic information unit (talking about one topic).
2. Sentence-level SA aims to classify sentiment expressed in each sentence. The first step is to identify whether the sentence is subjective or objective. If the subject is subjective, Sentence-level SA will determine whether the sentence expresses positive or negative opinions.
3. Aspect-level SA aims to classify the sentiment with respect to the specific aspects of entities. The first step is to identify the entities and their aspects.
4. Comparative sentiment analysis in which users express their opinions by comparing it with a similar product or brand. Therefore, the objective here is to identify sentences that contain comparative opinions
5. Dictionary based approach uses ‘Word Net’ to find suitable words of the sentiment word to carry out the analysis.
6. Corpus-based approach used to create a domain-specific sentiment lexicon to carry out the analysis.

The data sets used in Sentiment Analysis are an important issue in this field. The main sources of data are from the product reviews. These reviews are important to business

holders as they can take business decisions according to the analysis results of users’ opinions about their products. The reviews sources are mainly review sites. Sentiment Analysis is not only applied on product reviews but can also be applied on stock markets, news articles, or political debates.

## 3. Sentiment Classification

A large amount research exists on sentiment analysis of user opinion data, which mainly judges the polarities of user reviews. Sentiment analysis is often conducted at one of the three levels: the document level, sentence level, or attribute level. The literature survey done indicates two kinds of approaches including machine learning and semantic orientation, in relation to sentiment analysis. In addition to that, the natural language processing techniques (NLP) is used in this area, especially in the document sentiment detection.

### 3.1 Machine Learning

The machine learning approach appropriate to sentiment analysis mainly belongs to supervised classification techniques in particular. Thus, it is called “supervised learning”. A number of machine learning techniques have been adopted to classify the reviews. Machine learning techniques like Naive Bayes (NB), Maximum Entropy (ME), and Support Vector Machines (SVM) have achieved great success in text categorization. The other generally famous machine learning methods in the natural language processing areas are:

K-Nearest neighbourhood, ID3, C5, centroid classifier, winnow classifier, and the N-gram model.

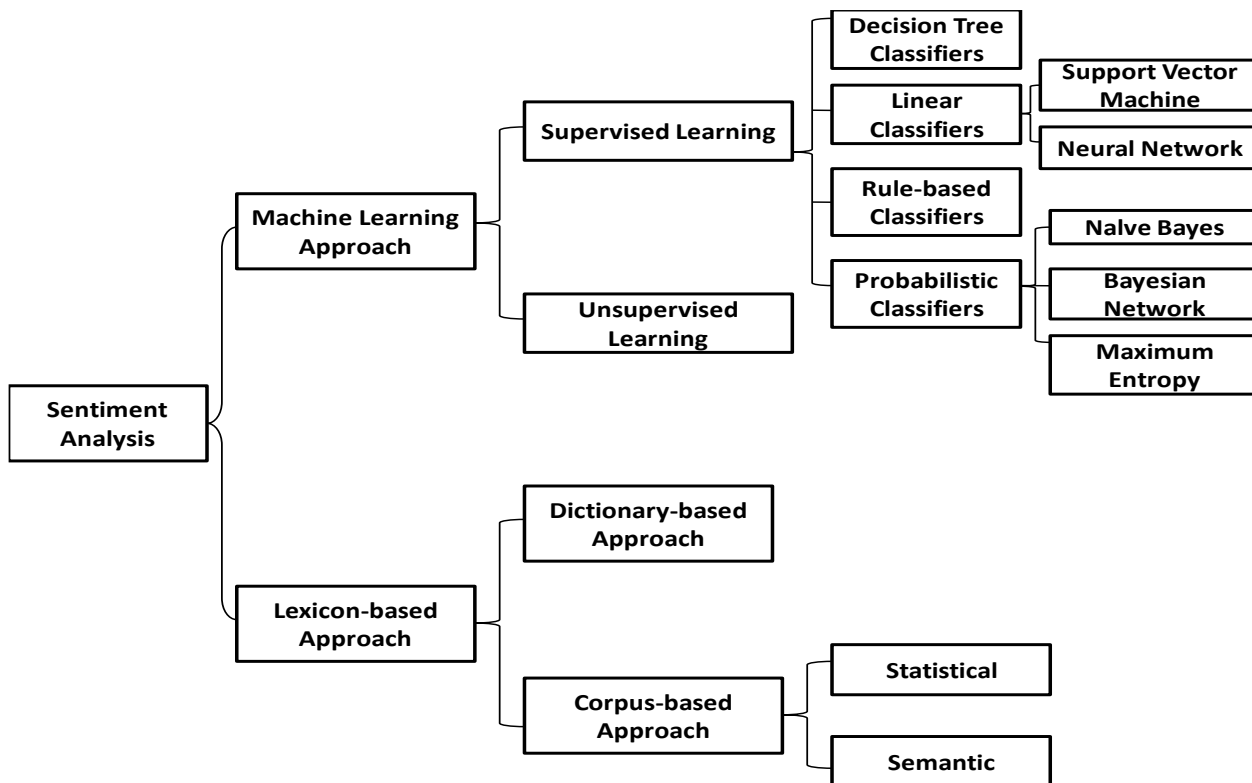


Fig. 2: Sentiment classification techniques

**3.2 Semantic Orientation**

Because it does not require any prior training in order to mine the data, so the Semantic orientation approach to Sentiment analysis is “unsupervised learning”. Instead, it measures how far a word is inclined towards positive and negative. Much of the research in unsupervised sentiment classification makes use of lexical resources available.

**3.3 Role of Negation**

Negation is a very general linguistic construction that affects polarity and therefore, need to be taken into consideration in sentiment analysis. Negation is not only conveyed by common negation words (not, neither, nor) but also by other lexical units.

**4. Uses of Sentiment Analysis**



Sentiment analysis is very helpful in social media monitoring as it allows us to gain an overview of the wider public opinion behind some topics. Social media monitoring tools like Brand watch Analytics make that process quicker and easier than ever before, thanks to real-time monitoring capabilities. The areas where we use

sentiment analysis are broad and influential. The ability to

extract insights from social data is a practice that is being widely adopted by organisations across the world. Shifts in sentiment on social media have been shown to associate with shifts in the stock market. The Obama administration used sentiment analysis to gauge public opinion to policy announcements and campaign messages ahead of 2012 presidential election. The skill to rapidly understand customer attitudes and respond accordingly is something that Expedia Canada took advantage of when they noticed that there was a steady increase in negative feedback to the music used in one of their television adverts.

**5. Types of Sentiment Analysis**

A fundamental job in sentiment analysis is classifying the polarity of a known text at the document, sentence, or feature/aspect level — whether the expressed opinion in a document, a sentence or an entity feature/aspect/characteristic is positive, negative, or neutral. Advanced, "beyond polarity" sentiment classification looks, for instance, at emotional states such as "angry," "sad," and "happy." In generally statistical classification methods, the neutral class is ignored under the supposition that neutral texts lie near the boundary of the binary classifier, several researchers suggest that, as in every polarity problem, three types must be identified. Moreover it can be proven that specific classifiers such as the Max Entropy and the SVMs can benefit from the introduction of neutral class and improve the overall accuracy of the classification. A method which is different for determining sentiment is the use of a scaling system whereby words commonly associated with having a negative, neutral or positive sentiment with them are given an associated number on a -10 to +10 scale (most negative up to most positive) and when a piece of unstructured text is analysed using natural language processing, the subsequent concepts

are analysed for an understanding of these words and how they relate to the concept.[citation needed] Each concept is then given a score based on the way sentiment words relate to the concept or idea, and their associated score.

This allows movement to a more sophisticated understanding of sentiment based on an 11 point scale. On the other hand, texts can be given a positive and negative sentiment strength score if the goal is to determine the sentiment in a text rather than the overall polarity and strength of the text.

➤ **Subjectivity/objectivity identification**

This task is commonly defined as classifying a known text (usually a sentence) into one of two categories: objective or subjective. This problem can sometimes be more difficult than polarity classification. The subjectivity of words and phrases may depend on their context and an objective document may contain subjective sentences (e.g., a news article quoting people's opinions). Furthermore, as mentioned by Su, results are largely dependent on the definition of subjectivity used when annotating texts. However, Pang showed that removing objective sentences from a document before classifying its polarity helped improve performance.

➤ **Feature/aspect-based sentiment analysis**

It refers to determining the opinions or sentiments expressed on different features or aspects of entities, consider examples of a cell phone, a digital camera, or a bank. A feature or aspect is an attribute or component of an entity, e.g., the screen of a cell phone, the service for a restaurant, or the picture quality of a camera. The advantage of feature-based sentiment analysis is the possibility to capture nuances about objects of interest. Different features can produce different sentiment responses, consider an example of a hotel which have a convenient location, but mediocre food. This problem involves several sub-problems, e.g., identifying relevant entities, extracting their features/aspects, and determining whether an opinion expressed on each feature/aspect is positive, negative or neutral. The automatic identification of features can be performed with syntactic methods or with topic modelling.

An important part of our information-gathering behaviour has always been to find out what other people think. New opportunities and challenges occur as people can, and do, actively use information technologies to seek out and understand the opinions of others, with the growing availability and popularity of opinion-rich resources such as online review sites and personal blogs. The unexpected eruption of activity in the field of opinion mining and sentiment analysis, which deals with the computational treatment of opinion, sentiment, and subjectivity in text, has thus occurred at least in part as a direct response to the surge of interest in new systems that deal directly with opinions as a first-class object.

## Conclusion

Opinion Mining and Sentiment Analysis covers techniques that assure to directly enable opinion-oriented information-seeking systems. The focus is on methods that seek to address the new challenges raised by sentiment-aware

applications, as compared to those that are already present in more traditional fact-based analysis. Ultimately, it moves beyond just the technical issues, devoting significant attention to the broader implications that the development of opinion-oriented information-access services has questions of privacy, vulnerability to manipulation, and whether or not reviews can have measurable economic impact. Opinion Mining and Sentiment Analysis is the first such comprehensive survey of this vibrant and main research area and will be of interest to anyone with an interest in opinion-oriented information-seeking systems. In future, more work is needed on further improving the performance of measures. Sentiment analysis can be applied for new applications. Although the techniques and algorithms used for sentiment analysis are advancing fast, however, a lot of problems in this field of study remain unsolved. The main challenging aspects exist in use of other languages, dealing with negation expressions; produce a summary of opinions based on product features/attributes, complexity of sentence/ document, handling of implicit product features, etc. More future research could be dedicated to these challenges.

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