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A Survey of Sentiment Analysis on Social Media

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Abstract: Opinions and sentiments are only attributes that leaps out at the mention of sentiment analysis. This paper attempts to offer a broader definition of sentiment analysis that describes its features in various areas of big data. The enormous growth of internet users and social media led to the generation of sentiments, evaluation, attitude, emotions towards entities such as products, services, organizations, events, topics and their attributes. This survey paper documents the basic concept relating to sentiment analysis. The primary focus of this paper is on various sentiment algorithms, sentiment applications, sentiment techniques and its related fields
Keywords: Sentiment Analysis, Opinion Mining, Sentiment tools, Sentiment Tools, Sentiment Applications

I.   INTRODUCTION

As we know that every human has a tendency to make his own thoughts. Our thoughts make belief system. Sentiment analysis is a field of study to analyze people sentiments, emotions, feelings, beliefs from various web sources and social networks. Sentiment analysis has another name called opinion mining. Opinion mining has an impact on various social networks like twitter, facebook etc. [14] As recorded from various resources huge data has been found from internet and web sources. So as per the basic requirement we need sentiment analysis in business and socials networks to analyze others opinions. Opinionated texts on web help to create new ideas for business needs, social networks and the most important our political systems. Politicians also take interest to know the public opinions about their social involvements and related works. Public opinions are the key source for every social networks, media, forums and blogs.[5,11] The levels of Opinion words are changed according to the different scenario. It can be Positive in one scenario also can be negative in other scenario. Thus People's express their opinions in different manner. Combination of opinions can be difficult to analyze sometimes they can be checked sentence by sentence. The idea behind analyze sentences to know the real aspect behind each and every opinion of People of different categories whether they concerned to various forums , blogs , twitter, face book and other social networks. Sentiment analysis has different levels to analyze various opinions like a document, a sentence, and sometimes a comparison.

II.   DIFFERENT LEVELS OF SENTIMENT ANALYSIS

A. Document level

This type of sentiment analysis used when a whole document is to be analyzed in various forms like if an organization need a review about their product. A review can be positive or negative depends upon the consumer opinion. It is based on a single review that's why this type of sentiment analysis can only be used for single entity not for multiple entities or reviews. So we can say that only a single product can be analyzed at a single time. Thus multiple products are not applicable in document level. [4,14]

B. Sentence level

At this level the main focus is on sentence rather than the whole document and a sentence can be analyzed in three different ways positive, negative or neutral. Spellings, Sentence fragments, mistakes in writing etc. are some of the examples need to be analyzed in sentence level. Missing of a subject and verb or both generate a sentence fragment.

C. Aspect level

As conclude from the above discussion both the above levels haven't care about People opinions. But if we talk about aspect level is totally depends upon People liking and disliking. Aspect level directly focuses on opinions instead of Language constructs. Aspect level always takes a target as an opinion. An Opinion always take two aspects one is positive and other is negative. For example, the sentence "The Honda scooter engine is good but its battery life is short" it analyze two main aspects one is engine quality other is battery life. The sentiment about scooter engine is positive but about battery life it is negative. This example shows how aspect levels focus on different opinions. [6]

D. Sentiment Lexicon

It is another important level of sentiment analysis mainly focuses on sentiment words or opinion words. These words are known as sentiment lexicon. Each opinion word has a different aspect in different domains. Also a sentence may not always express sentiments. Sometimes neutral reviews are there in a sentence. [3]

"can you please tell me which bike is good".

"if i can find a good bike in the showroom, i will buy it."

"can you please tell me which bike is good".

"if i can find a good bike in the showroom, i will buy it."

Here in the above example "good" is a sentiment word but shows any sentiment neither positive nor negative. Sarcastic sentence are also sometimes not showing any emotion or sentiment. [3,33]

As discussed earlier sentiment analysis focuses on various sentiments and opinions depending upon their positive and negative aspects. So here are some terms and definitions describe in this context.

E. Opinion Sentence Examples

1) I bought an active Honda nine months ago.

2) It's my favorite scooter

3) The engine quality is amazing

4) The battery quality is quite good.

5) However my sister thinks it is too heavy for her.

Here are some important points need to discuss The above example has no. of both positive and negative opinions. ii) evaluate positive review about Honda active iii) evaluate positive review about engine quality iv) evaluate positive review about battery life v) evaluate negative review about the weight of the scooter. From the above observation we can define opinion in many terms. Here in the above example "good" is a sentiment word but shows any sentiment neither positive nor negative. Sarcastic sentence are also sometimes not showing any emotion or sentiment. As discussed earlier sentiment analysis focuses on various sentiments and opinions depending upon their positive and negative aspects. So here are some terms and definitions describe in this context.

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An opinion has mainly two components t as a target and s as a sentiment.. A target can defined any aspect for an entity and s can be defined as positive , negative and neutral sentiment.. Opinion definition can be describe as the combination following tuples e.g.

Opinion (T, s, h, t)

Where T can be defined as opinion target, s can be as sentiment h can be defined opinion holder, and t as a instance when the opinion was expressed. An opinion can also be defined in various categories. [1,7,14]

11) *Regular & Comparative Opinion:* A regular opinion can be direct or indirect according to different aspects of the entity. A direct Opinion used where immediate opinions are required without knowing the previous details. It can find out the direct opinions for any aspect. E.g. engine quality is great. The indirect opinion indirectly applied on an aspect of an entity. Its effects can also be applied on some other entity. Direct opinions are very easy for handling. [2,14]

12) *Comparative opinion:* A comparative opinion can be used to find a comparision between mixture of sentences for a statement. For example the sentences "Dairy milk tastes better than milky bar" and "Diary milk tastes the best " shows two comparative opinions.

13) *Explicit and Implicit Opinion:* Explicit opinion: This type of opinions analyze the subjective way for a mixture of sentences e.g.,

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Diary milk tastes is good ," and "Diary milk tastes better than Milky bar."

Implicit opinion: An implicit opinion is an statement that implies a regular or comparative opinion. Such an objective statement usually expresses a desirable or undesirable fact, e.g.

"I bought the scooter a week ago, and a valley has formed," "the battery life of active Honda is longer than TVS Scooty."

An objective sentence describes some relevant information about the world, while a subjective sentence shows some personal sentiments, belief & feelings.

An objective sentence is "This car is a Honda product."

A subjective sentence is "I like Honda product."

A subjective sentence has many forms like beliefs, emotions, and sentiments. Emotions show our feelings and thoughts. Emotions can be analyzed in various fields like sociology, philosophy and lot of different studies. [4,8,14]

14) *Opinion Search sources on web:* Web contains lot of valuable information and opinion reviews about a particular topic. There are two typical opinion search queries involves in the searching process. Firstly, query can be used to find public opinions . E.g. find public opinion about a movie or a political issue. E.g. find PM modi opinion about abortion. This type of search involves new emerging areas about any relevant aspect. Secondly, query should be based on the opinion of a person. When a user collects some information about any topic the collected information sometimes will be relevant and sometimes it should be irrelevant. It involves mainly two tasks [2,4]Only relevant information should be collected for the given documents

Documents should be ranked or queued in appropriate manner. Retrieval of information also involves two subtasks

he first subtask involves traditional web search technique or retrieval of the information.

The second subtask involves sentiment analysis to find out whether the information is positive negative or neutral. It finds out whether the document or sentence expresses relevant information about the relevant topic. [16]

III.   BIG DATA SOURCES IN SENTIMENT ANALYSIS

As we discussed earlier sentiment analysis plays an important role to analyze the sentiments of various social networks. This is a tool that discovered how to handle people emotions and sentiments about any product or we can also say that it is used to analyze human behavior. This type of behavior is also can helpful in large organizations to analyze different types of reviews. Reviews are dependent to sentiments. Sentiments can be positive negative or sometimes neutral. Emotions can be find from various sources of data. Some are described as follows. Sentiment inquiries. Every sentiment for a new product can be compared to the past reviews of that product. This can be helpful to increase the quality of each product. That's why inquiries can be done on the basis of different products according to their quality. Customer service When a customer look for a product on web sources. He is always looking for reviews of that product. Sometimes ask "Hi, Can anyone help or give some information about the product". Sentiment analysis makes a track of this type of information where a customer can easily find the solutions and reviews of their problems.

A. Customer's interactions

When a customer express their views about any product a question arise about their satisfaction and their happiness of using online products. Some customers can be happy and satisfied and some unhappy and dissatisfied. Sentiment scores can be really helpful to find their feelings and emotions about various reviews. [24]

B. Organizations and Sentiment data

Sentiment analysis can also be used by many of large organizations. As large organizations are eager to know about reviews about their products and services. There are many no. of topics on the internet that can explain various positive and negative organizational aspects. When we talk about gathering data from multiple sources in multiple formats whether in unstructured format or in semi structured format Hadoop distributed file system or also called Hadoop cluster is used to store data in multiple formats. Hadoop provides flexible way of managing data Data can be analyzed and transfer to existing relational database management system such as Mysql and Oracle. This method helps in using some of the existing BI & Reporting tools. We can also store data for future analysis (e.g. comparing the old data with new data by doing tests like ANOVA test). Data can also be analysed for the point of impact). [10,23]

IV.   EVALUATION OF SENTIMENT ANALYSIS

Emotions produce feelings and thoughts. Emotions can study in various fields. Emotions can produce in various ways according to the different reviews. Emotions are of different types as lovingness, happiness, sadness, angriness, peacefulness etc. Many social networks eagerly check their sentiments day by day on the basis of these sentiments. Emotions or sentiments can produce with different intensities with different scenario. These scenarios are based on the reviews of the any product, place, or an object. Sometimes sentiments can also be connected to the people opinions about other person. [15, 14]

A.   Rational Evaluation

This type of evaluation related to external reviews about any product that will leads to the creation of physical beliefs. These type of sentiments are based on the clear sentiments about any product or opinion. For example, the following sentences express the different sentiments in a rational way

"The voice of this bell is clear,"

"This scooty is worth the price," and "I am happy with this scooty."

"Mind will be upset if it creates too much rational decisions."

"The battery life of this phone is mind blowing."

B.   Emotional Evaluation

This type of evaluation connects directly to the human mind sometimes non tangible beliefs are the real example of such evaluation. [17,18] This type of beliefs can also produced emotional responses. For example, the following sentences express sentiments in a emotional way:

"I love this food,"

"I am so angry with their service people"

"This is the best scooter ever built."

V.   KEY CHALLENGES IN SENTIMENT ANALYSIS

As we already discussed about the various sentients that comes under the practices of sentiment analysis. Sentiment analysis is also called opinion mining which can express customer opinion about various products available on different websites. The technique has a tendency to analyze the ratings in terms of sentiment scores.web is a huge source of sentiments, emotions and opinionated texts. So sentiment analysis has been introduced to fulfill the requirements of customers and challenges to handle large organizational aspects by reviewing and analyzing online products. As day by day data on web sources increasing the need of sentiment analysis will also be increases. [15]

A.   Name Entity Recognition

This problem arise when we don't find the idea behind people opinion what they talking about whether about a place or any person or any object? What a person actually talking about, e.g. 'Planet of the Apes' is a group of animals or a name of a movie?

B.   Resolution

This type of analysis discovered appropriate noun and pronoun . "We danced last night and went to dinner; it was wonderful. "But what does 'it' belongs to?

C.   Parsing

It resolves the problem for subjective and objective sentence to analyze various social aspects. [24]

D.   Sarcasm

Opinions can be positive or negative, good or bad according to the different scenario. But sometimes it's really difficult when we don't know who will be the opinion holder?

E.   Twitter

Social networks like on twitter problem arises like wrong spellings, abbreviations, poor grammar, poor writing skills due to which the meaning of whole sentence or document can produce different meaning. [23]

Relation between machine learning and human Human is always busy in doing research and analysis. He made machines and produce many analytical results. But there is a need for more bonding between humans and machines. We need a technique to fulfill this challenge whether in technical terms or whether in social terms.

F. Adopt Research Analysis and Surveys

When we try to observe expressions on various social sites and web sources for example a customer reviews about any product. Sometimes it is very difficult to find what is good or bad about the product. How the consumer react in terms of positive sentiments or negative sentiments.

VI.   SENTIMENT ANALYSIS TASKS

Some of the important tasks involves in sentiment analysis. Polarity classification is one of the most emerging techniques if we talk about people liking and disliking about any product. This type of reviews about the products can really help consumers to make a decision about the product before purchasing it. Sometimes "thumbs up" and "thumbs down, "can also be used to express consumer's reviews about any product. Agreement detection is another task of sentiment analysis which is used to find polarity of two paired sentences in a document after that the degree of positiveness or negativeness will be decided about that document. Some task involved on the basis of expressions and other are on the basis of massage. Here are some examples to describe the levels of tasks. There are two main aspects of describing tasks:

 For a given context word or phrase of an instance will be checked for the positive, negative and neutral opinion. Classification of tasks can be arranged for the boundaries of the marked instance. The boundary limits can't help to recognized the entity level tasks. [24]

 There are huge amount of data in terms of massages available on internet and web sources. Tasks are involved to check whether these massages are positive negative or neutral. After this process these massages can be chosen on the basis of strongest sentiments. Sentiments of each massage can based on the consumers opinion about any product or place or an object. [11,23]

 When we take a data set from any web sources i.e. a bundle of massages 13-15k massages of different range of topics. Division of topics can be based on any entity like products, or events.

 Data can be collected on the basis of trials i.e. 1500 twitter massages.

 Data can be trained on the basis of trail data i.e. 6000k-10000k twitter massages including data of trail set.

Training data then be converted in to the development data. i.e. 2000 massages of training data must be involved to develop a strong data set of sentiments. After developed a strong data set of various sentiments data can be tested on the basis of various 1500-3000 twitter massages.

VII.   APPLICATIONS AND TOOLS

Sentiments Analysis uses various methods and techniques that can be very helpful for the people point of view. It is good when we take and observe other opinions but when we want to make a decision for ourselves we can't rely on others opinions. So we need a strong idea or information that can help people to make their own decisions. Sentiment analysis provides efficient tools to create and share new ideas with everyone related to that aspect on internet or World Wide Web. Blogs, Forums, social networks content sharing services all are provided by sentiment analysis to make the task easier and efficient. [18] Some applications tools like polarity detection and emotion recognition are new emerging areas developed under the umbrella of opinion mining.

Sentiment analysis can also provide solutions in various feature based selection methods. It is also connected with   machine learning approaches like supervised learning and lexicon based approach. *[14]* It is used in the various social media networks to track various customers' reviews about any product and it can also find analyze the opinions of people about any product, place or an object. Sentiment analysis can analyzed the sentiments of thousands of text document just in number of seconds. This technique is very efficient for various business purposes. Many organizations are adopting sentiment analysis for various purposes. Sentiment analysis also support in the area of natural language processing by using powerful tools like python NLTK (Natural language tool kit) R,TM (text mining). These tools are very useful in terms of finding sentiments of various textual sources. [15] Huge amount of data is available on the internet with high volume, variety and velocity. This data is very difficult to fetch manually. Automatic sentiment analysis can access large volume of data in minimum delay with high accuracy and low cost.

Sentiment analysis is most widely used in the field of business intelligence. It includes extraction of information from various unstructured documents to analyze consumer's perspective about any product. i.e. "Why aren't consumers buying our car?" such type of information can be extracted from various newsgroups, social networks , individual opinions, and collect data from these web documents also group together as a individual review and group review. [14]

Some important tools used in sentiment analysis is given below :

A. *Hoot suite insights*

Hootsuit is an important tool used in sentiment analysis to find sentiments on twitter that tweets keywords like 'thanks' 'superb' , 'happiness' ect. it provides an easy to read meter. Easy to read is a quick way to find the percentage of quality of any product in sentiment point of view. [18]

B. *Twitter Advance Search :*

1) It is a free online tool help to find tweets based sentiments. its is used as sentiment analysis tool
2) Enter the keyword by using sentiment analysis tool.
3) Check for the positive or negative sentence.
4) Positive or negative sentence can be used to find customers good or bad expressions and complaints [12]

C. *Brand watch*

This type of sentiment tool is used only for single user interface to monitor and analysze various social networks sentiments to make real time decisions and take action on them. This type of tool allow to access 70 million traffic sources and alos quickly monitor the tone of posts and data being scanned.

D. *Semantria*

Semantria lexalytics is an important tool used to analyze the importance aspect of every sentence and evaluate suitable context based on it. It always take full context of the post and find the sentiments or expressions based on the given context of the post. [21]

E. *Rapidminor*

This type of sentiment tool use special text mining approach to find the sentiments of any brand or product. It will combine the unstructured sources to structured sources of data. E.g. online review or social media post can be analyzed along with some official publications or document. [13]

All tools discussed above has their impact on various review sites from which training data can be taken. Various opinion retrieving techniques can also be used by the help of retrieving components. These components are useful to find opinionated and non opinionated sentiments of different documents. some of the existing retrieval techniques are discussed below :

There are many methods of opinion retrieval in sentiment analysis. It involves task as a two stage process. In first stage documents are ranked according to the topical relevance. In second stage documents are re-ranked by their opinion scores. There are two ways to calculate opinion scores machine learning based sentiment classifier and lexicon based sentiment classifier using sentiment lexicon. Opinion about any advance research topic can also be used to calculate integrated scores for ranking the document. First component used for retrieving relevant document for each query this should be a relevant document to find the sentiments of any query. The second component is used to classify the retrieving document whether in the category of opinionated document or non opinonated document. Opinionated document can be positive negative or neutral. [15]

VIII. CONCLUSION & FUTURE SCOPE

The Paper starts from the understanding of emotions and sentiments express by people on social networks and various web sources. Sentiments are the biggest source to analyze the reviews of any product and services. Sentiment analysis plays a biggest role in finding those emotions and sentiments on World Wide Web. Sentiment analysis is very helpful technique for people from whom they can express their views about any topic, test, content or product. Sentiment analysis will analyze these expressions of social networks by using various techniques and tools and techniques. Sentiment analysis classifications are divided into various levels. i) Document level can check the whole document ii) Sentence level analyze the sentence of a document iii) Aspect level care about people opinions of social media about any product or any content related to that product. iv) Sentiment lexicon focus on the opinion words. Sometimes words have neutral meaning neither positive nor negative. Customer services, Customer interactions, Sentiment

inquiries and large organizational data are the sources of data useful to express various feelings and data. Comments, irregular opinions, fake comments, Sarcasm challenges related to social media like twitter. Due to these techniques like sentiment analysis came in to light and produces tremendous results by solving such problems. Several problems & challenges are still unsolved in the field of machine learning, however when we talk about sentiment analysis its useful techniques and approaches help a lot to solve various problem domains in the machine learning. These solutions can be very useful to handle upcoming challenges in the field of sentiment analysis. Current research in sentiment analysis focused on improving the efficiency of algorithms to find opinion and reviews it leads to the reduction of human efforts. Sentiment classfication involves various lexicon and corpus of words.

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