Applications, Issues and Challenges in Sentiment analysis and Opinion Mining– A User's perspective

Harshali P. Patil[1] and Mohammad Atique[1]

[1] Research Scholar Department of Computer Science & Engineering Sant Gadge Baba Amravati University, Amravati, Maharashtra, India, Emails: harshali.patil9@gmail.com, mohd.atique @gmail.com

Abstract: In academic and industrial research, sentiment analysis became an interesting topic due to epidemic growth of opinions and in the accessibility of reviews on the social media or in any field. Now a day's Web 2.0 internet based applications are mainly used to share an experience, feelings, and reviews about any product or an event. Lots of facts are generated using social media .With the ease of sharing such reviews, it is very hard to study them, summarize them and take their help to examine and take the decision. Reviewers views plays an vital role in appraisal or recommendations in different application areas like politics, business, finance etc. Hence, this paper gives an idea how sentiment analysis will be used in different areas. Along with this we will try to throw some light on the different challenges in this sentiment analysis area.

Keywords: Sentiment Analysis, Applications, Opinion mining, reviews, Challenges, Social media

1. INTRODUCTION

Now a day's people can contribute to share their experience, feelings, and opinions publically with the help of social media, forums, and e-commerce web sites. Currently these sites are very famous and become the source of opinions. It is well-known that experience of other community are very essential information to take some decision .So; these inputs are very significant in decision making process, but to take the advantage of such valuable source, one need to dig out and analyze it properly.

This condition demands automatic textual data processing tools that extract and analyze the people Sentiments from these unstructured texts. Lots of research are undergoing in this direction. This research domain is called sentiment analysis and Opinion mining. Sentiment analysis tries to classify the sentiment contained in texts and aims to classify these texts into different categories, including positive, negative and neutral [3].

Technically speaking, sentiment analysis is a quite exigent task, which has many procedures: text pre-processing, feature extraction, text expression and classification. Despite the difficulty and obscurity of this problem, many companies and research institutes are developing new tools.In this context, our main focus is to highlight the different application areas of sentiment analysis. The paper concludes by discussing various issues that are being faced by this technique where further researches are essential.

This paper is ordered as follows: We discuss the Opinion Mining and Sentiment Analysis in Section 2 in brief. Section 3 discusses its application. Some issues related to sentiment analysis and opinion mining fields are presented in Section 4. Finally, we conclude this paper in Section 5.

2. OPINION MINING AND SENTIMENT ANALYSIS

It is an expansion of data mining which utilizes natural language processing techniques to haul out people's view from Social media. The recent trend in public media that encourages people to contribute their feelings and suggestion resulted in the large source of valuable information in the web. The sentiment or Opinion mining systems analyze unstructured data and observe which part can contribute to collect opinions, and who has written these reviews. Sentiment analysis analyzes each word of opinion or phrase and classify, whether it is positive or negative or neutral. It gives the classification of opinion of a user. Sentient analysis can be done at word level, sentence level and document level.

3. APPLICATIONS OF SENTIMENT ANALYSIS AND OPINION MINING

3.1. Finance

Finance can be defined as the skill of money management and the study of investments. Finance aims to price property based on their risk intensity and their predictable rate of return .In this section; we have discussed how opinion mining and sentiment analysis assist to track the updates about finance.

3.1.1. To monitor financial news on the web.

Every day millions of financial news flooded on line due to escalation in social media. So, it is very difficult to track the current events in the financial world. Financial markets are associated with financial news because financial market is influenced by financial news. We observed that strong cohesion in financial news indicates activities in the financial markets. Therefore a system for automatic detection of sentiment is extremely useful to monitor financial news on the internet.

3.1.2. To observe fiscal markets Social media analytics

It is assuring forecast of financial markets. Sentiment of Financial Market is the general widespread mind-set of investors as to predict price development in a market based on variety of fundamental and technical factors, including price history, economic reports, seasonal factors, and national and world events. Sentiment analysis provides insight to financial market for investors to realize, react and respond to market opinions. To analyze and monitor the overall sentiment of financial market we can utilize sentiment analysis or opinion mining.

3.1.3. Automated trading system

Automated trading system is the best way to study market for the new comers and people who are on the move & can't watch the market, sentiments 24/7, is automated trading system. Trading spot currencies involves threat and there is always the possibility for loss. Your trading results may fluctuate. Computer trading in economic markets is a rapidly developing field with an increasing number of applications. Automation for news examination and computation of market reactions is vital. We can analyze the role of different Classes of traders and categories alternative types of automated trading. If we will be able to examine the technology and the common methods for news sentiment analysis whereby qualitative news data is changed into market response. The effect of news on liquidity and automatic trading is significantly examined. Finally it can be very easy for the beginners to explore the trading system using this type of automation. The sentiment analysis used in automated trading system also allows monitoring the financial risk.

3.2. Business

A business also recognized as an enterprise, organization, institute or a firm. It is very important for business owner to know the sentiments of the customer to survive in the business. Here we put some light how exactly sentiment analysis plays vital role for it.

3.2.1. Brand Reputation management (BRM)

Brand Reputation management (BRM) is a product and company pays attention rather than customer. It mainly deals with the management of your reputation in market. Opinions from consumers or any additional group can spoil or improve your reputation. Nowadays, **many**-to-many conversations are taking place online at a high rate. That creates opportunities for organizations to manage and strengthen brand reputation. Now Brand insight is determined by sum of the discussions about, advertising, public relations and corporate messaging. Sentiment analysis is useful in judging how company's product name, product or service is being perceived by people online.

3.2.2. Online advertising Sentiment analysis

Online advertising Sentiment analysis or Opinion Mining plays a vital role in marketing and advertising domains. Advertiser has to examine popularity and performance of ads that he/she posted on site. After studying the reviews or comments of web users, advertisers can decide what type of advertisements should put up on which type of web pages. Sentiment analysis helps such websites by changing unhappy customers into promoters by analyzing this huge volume of opinions.

3.2.3. On-line commerce

On-line commerce is important part of business. The most common use of sentiment analysis is or opinion mining is an ecommerce activities. Websites permit their users to share their feelings or experience about purchasing, product features, and qualities. They give automatic summarized description for the product and different features of the product by assigning ratings or scores. Customers can easily distinguish views or opinions and recommendation information on whole product as well as specific product features. Now a day's graphically also this type of data is provided to the customers with the help of data visualization technique so that they can see the summary very easily and take their decisions.

3.2.4. Blogger Centric Contextual Advertising Analyzer

Blogger Centric Contextual Advertising Analyzer can study what type of sentiments blogger has about any specific entity so that his /her views can be collected and accordingly with the same context ant advertise can be shown on his/her blog [8].

3.3. Hospitality Industry

Today's travelers are eager to share their experiences with hotels and travel providers. They can disseminate their experiences online through Facebook and Twitter. Even they are more appropriate to share those online reviews on sites such as Yelp and Trip Advisor, as well as directly with the agents through surveys, emails, calls and other more conventional means. From the check-in process to the quality of a property's spa, this comment contains precious suggestions that hospitality providers can use to improve the guest experience with their brands. They can give offers to the regular consumers. So, it's becoming gradually more important for companies to handle the hospitality customer experience, not only by studying the customer feedback from a variety of channels, but also by analyzing reviews to extract valuable business observations and using those observations to improve the customer experience with their hotels [6][10].

3.4. Politics

- Voting advise applications
- To track how voters think about various issues
- How they relate to the speeches and actions of the candidates.
- To enhance the quality of information that voters have access to [7] [11].

3.5. Public Actions

3.5.1. Monitoring real-world events

In the computer science the world, the flow of information in online social media during events has been widely studied. Given the enormous popularity and multiplicity of various online social networks, studying several online social networks during an event can expose much more information about the event, than a single online social network. It has also been shown how information selected from online social media can assist to eventually aid eventful, especially, disaster situations in real life. However, most of the effort is paying attention on a single source of social network for studying such events, mostly Twitter using sentiment analysis.

3.5.2. Monitoring people's opinions

Monitoring opinions that people submit about pending policy or government-regulation proposals.

One tool can be prepared for collecting and analysis of valuable suggestions about pending policy or government-regulation proposals to improve proposal or policy. This way sentiment analysis can be effectively used.

3.5.3. Blawgs

Legal matters sometimes also known as "blawgs" .Weblogs are Internet sites, arranged chronologically, where any person can post their experience and messages for the entire world to see. Blawg, the combination of words "law" and "blog" into one word is called as Blawg. So, with the help of Blawg opinions about the law can be studied and some tools can be implemented using sentiment analysis or opinion mining.

3.5.4. eRulemaking

Sentiment analysis is lending a hand in eRulemaking, which results in the automatic analysis of the reviews, experience or opinions that people submit about awaiting policy or government-regulation

3.5.5. Transportation

- Modern intelligent transportation systems (ITSs).
- To collect and analyze the public opinions exchange.

3.5.6. Entertainment(Advertisement)

Every company wants to tap into the view and thoughts of its target audience, so that it can assist any company to personalize its offerings to offer customers exclusively what they want. We can really discover what people feel or think about something by observing what they're sharing through social media and other digital channels. By using the power of sentiment analysis, organizations can classify textual information as positive, negative or neutral, providing valuable insights into audience experience, preferences and individuality that can help predict future behavior. For e.g. for movie database we can effectively apply sentiment analysis to know the data analytics about movies characters, story etc [9].

3.5.7. Traffic Analysis

Social media is flourishing day by day and along with that sentiment analysis has developed rapidly in recent years. However, only a minute number of studies focused on the field of transportation, which failed to meet the rigorous requirements of safety, efficiency, and information swapping of intelligent transportation systems (ITSs). We can collect reviews on web or using traditional system for today traffic scenario and propose some new tool to tackle the issues related to current traffic system.

3.5.8. Medical Field

•   To monitor views of doctors and patients about medicine, treatments, and about hospital facility.

•   For clinical documents. Clinical documents give idea of a patient's health status in terms of observations and contain information such as descriptions of examination outcome, diagnoses and interventions.

•   To evaluate this information appropriately, assessing helpful or unhelpful clinical outcomes or judging the impact of a medical condition on patient's well being are essential.

3.5.9. Industry and Government Intelligence

Sentiment analysis helps government in assessing their strength and weaknesses by studying opinions from public. For example, "If this is the situation, how will you expect reality to come out? The MP who is investigating 2g scam himself is corrupt." .This example obviously shows negative sentiment about government. Whether it is tracking citizens' opinions on a new 108 system, identifying strengths and weaknesses in a recruitment drive in government job, evaluating success of online compliance of tax returns, or many other areas, we can see the potential for sentiment analysis.

3.5.10. Application of Opinion Mining method in Talent Management

Workers are the significant part of any organization. . Quantitative analysis about such person is essential. Workers are the essential part of any organization. Opinion mining is an important method needed to measure the performance of top placed workers. We can analyze opinion of the manager with respect to their attributes. Here significant features of managers such as decision making, understanding, communication skill, modesty, inspiration and integrity are considered with weighted value. Subordinates view about their cardinality of that team leader are taken into consideration. With the help of such tool, organization head can make conclusion on project allocation and provides suggestions to improve their performance. Along with this it can tell you in which area you are lagging and need to focus for future best performance.

3.5.11. Comparative analysis of two documents

If we are referring the different documents for the same topic then to compare we them one can use sentiment analysis tool. For e.g. News article on the social media related to same topic can be compared using this field.

3.5.12. Detection of Affectual Using Social Media

Most commonly, it is used to refer to the task of automatically finding the polarity of a piece of text, whether it is positive, negative, or neutral. However, more generally, it refers to determining one's approach towards a particular target or topic. Here, the technique can mean an evaluative conclusion, such as positive or negative, or an emotional attitude such as frustration, joy, anger, sadness, excitement, and so on However, there is some work required on automatically detecting arousal and rising interest in detecting emotions such as irritation, frustration, unhappiness, and optimism using sentiments.

3.5.13. Education Field

To improve education by monitoring student's performance and trying to understand the students' learning sentiment analysis can be used. Taking reviews from students at the end of the semester, to analyze the student opinion about the course, academic environment etc. This would allow students and lecturers to address teaching and learning issues in the most effective way for the students. To beneût the students, analyze students' feedback using sentiment analysis techniques can classify the students' positive or negative feelings, or even more reûned emotions, that students have towards the current teaching learning process. Response can be collected via social media such as Twitter, Face book and how using sentiment analysis on academic data can help improve teaching [5].

3.5.14. Recommendation Systems

To take the decision before purchasing any product or availing any service we can use any recommendation system which is based totally based on consumer's experience. It will categorize the people's opinion into positive and negative, the system can declare which one should get recommended and which one should not get recommended.

3.5.15. Detection of "Flame"

The observation of online news channel and forums, blogs and social media is easily possible by sentiment analysis. Opinion mining and sentiment analysis can automatically identify egotistical words, over heated words or loathing language used in face book, emails or forum entries or tweets on various internet sources [4].

3.5.16. Opinion Spam Detection

Sometime to increase the reputation of the product or to promote their product some company gives fake comment about their own product, since internet is available to all, anyone can upload anything on web, and this increased the possibility of spam content on the web. People may write spam content and give wrong impression to mislead the people. The opinion spam identification task has great impacts on industrial communities. If the services which provide opinion contain huge number of spam's, they will impinge on the users' experience. Furthermore, if the user is cheated by the provided opinion, he will not at all use the system again. So, there is need to sort the content into' spam' and 'not spam' using Opinion mining and sentiment analysis.

3.5.17. Banking Sector

Sentiment analysis and the information it yields can improve banks' credit-rating models, and it can also help with rating models, banks can use the sentiment index as an additional rating factor. Information gleaned from textual content searches is aggregated quarterly into a sentiment index for each company. After statistical analysis, the index is then included into the rating system at a suitable weight. This can be particularly important in assessing new a corporate customer for which banks normally has only limited information, most of it provided by the customer. A systematic selection of civic information can expose important additional insights. In emerging markets, where reliable customer data are limited, the analysis of textual content can give up insights.

Another use is in early-warning systems. Due to the appropriateness of the information and the high level of automation that is possible, we foresee a great advantage in applying the sentiment index as an early indication of a company's troubles, either by itself or incorporated into an early-warning system. In such a system, the sentiment analysis would automatically monitor all related news articles.

3.5.18. Tool for analyzing employer's data

Conventional wisdom suggests that employers would be willing to take the most qualified candidates who cause no significant risks to the new proprietor. Furthermore, one would also expect the converse to be true: employee

will be able to find out employer data like the environment at employer's place, working culture, promotions, and projects.

3.5.19. Insurance Sector

Insurance is a high contribution product, as it is an expense. Consumers get information about insurance from advertisements, salespeople, friends, family, neighbors and associates. They recognize little difference among brands. However, most buyers today have access to a more trusted experiential source of information in the form of social networking sites. Here, buyers share their brand knowledge, which is then accessible to a larger audience. Social media analysis gives us key insights about Positive or negative sentiments around the brand, Loyal customers, Customer complaints, Competitor analysis.

Table 1
Application areas of Sentiment Analysis

Sr. No.	Areas
1	Finance
2	Business
3	Hospitality Industry
4	Politics
5	Public Actions

4. CHALLENGES

Since opinion mining is a relatively novel filed, thus there are several challenges to be faced and solved. These challenges can be categorized into two parts, one is challenges with respect to computations and another is with respect to dataset. These challenges are discussed in this section.

4.1.1. Incremental Approach

Analysis of real time data is not one time operation. Whenever data is added we need to do analysis then if we will be able to use the previous analysis result then it will be very easy for analyzer. Incremental approach permits an existing result to be updated using only new individual data instances, without having to re-process past instances. This may be useful in saving time to reanalysis.

4.1.2. Parallel Computing For Massive Data

If we divide the computation into tasks or processes that can be executed simultaneously, then there can be an improvement in speed with the use of parallelism, it is necessary to achieve this in sentiment analysis for massive data of social media, where massive instant messages are published every day so that we can utilize the overall computing power.

4.1.3. Credibility/Behaviour/Homophily

Behaviors in social media are only observed by the traces they leave in social media. We rarely observe the driving factors that cause these behaviors; nor can we interview individuals regarding their behaviors. Even if a behavior is analyzed on social media and related patterns are gleaned, it's hard to verify the legality of these activities patterns. Evaluation becomes even more exigent for industries in which important decisions are to be made based on observations of individual activities.

4.1.4. Ironic and sarcastic statements

Sarcasm can be used to hurt or offend or can be used for comic affect. It means false positives. Ironic and Sarcastic sentences exist in text. Detecting sarcasm or irony from the expressions and finding out the correct context related sentiments is a challenging task. So, opinion in a statement can be hard to recognize as sarcastic or ironic which can lead to wrong orientation and deceptive opinion mining. It is an ironical or satirical comment that seems to be appreciative for someone or something but is really taunting or cutting.

4.1.5. Grammatically Incorrect Words

There are many approaches that analyze sentiments but hardly any work accomplished on grammatical errors. The results of sentiment analysis can be improved if these types of errors can be mapped to correct words.

4.1.6. Review Author Segmentation

Opinion towards a target may be specified by many people who can be called as review authors. Depending on the commenting style of these authors, they should be categorized so that credibility evaluation will be easy. In decision making this credibility evaluation is helpful.

4.1.7. Refinement of existing Lexicons or Updating/Down-dating Lexicons

Many people comments, the Performance of sentiment analyzer depend on the correctness of the lexicon. Fine-tuning of existing lexicons is required to accommodate new words and destroy the words which are no more used for better results. Lexicon expansion through the use of synonyms has a weakness of the wording loosing it primary meaning after a few recapitulation.

4.1.8. Handling Noise and Dynamism

Social media data are enormous, noisy, unstructured, and dynamic in nature, and thus novel challenges arise, introduces representative research problems of mining social media. Identifying and removal of noisy data is a challenging task.

4.1.9. Handling abbreviations of the words

There are many ways to express the opinion or sentiments about any object. When authors or reviewers use short forms or short cuts for any word like 'adv' while analyzing the opinion this word can be considered as an advertisement or advice. So, it is really difficult to handle such type of short forms with respect to correct context.

4.1.10. Improving the precision of algorithm

The result of opinion detection is dependent on the accuracy of the algorithm. The algorithm which reduces human effort and improves accuracy is very essential.

4.1.11. Object recognition

In opinion mining or sentiment analysis, firstly you have to recognize the objects in a review on which opinion have been given. This problem is vital because without knowing the object on which an opinion or sentiments has been expressed, the opinion is of small use. However, there is a difference in opinion mining, only those objects in the review are to be evaluated which is in competition to each other. The system thus needs to separate relevant objects and irrelevant objects.For e.g. in the review objects identified are "Narendra Modi", "Kejriwal",

"Rahul Gandhi". But in the analysis only "Kejriwal" and "Narendra Modi" are being compared. So, these are the only relevant entities to be considered for comparison.

4.1.12. Feature Extraction

The characteristics or features of phone are identified as "camera", "sound" and "voice". It is always a challenge to recognize features of the objects. Recently noun based approaches are being used. Verbs can also be the features of an object. But they are complicated to identify.

4.1.13. Grouping synonyms

It is required to cluster synonym features, as people often utilize different words or phrases to describe the same feature. For example, "voice" and "noise" both refer to the same feature. Different prose or phrases can be used to refer to the similar feature of the object. So, such words (synonyms) should be recognized and grouped together. It is a hard chore to identify these words. A lot of research is required to be done on this issue as it has not been much addressed in the past.

4.1.14. Real-time opinion mining

Opinions are subjective expressions that summarize people, appraisals, feelings or sentiments toward objects, events and their properties. Recently there has been an enormous growth in use of Social Networking sites such as Twitter, Facebook etc. to express people's opinions. Encouraged by this growth, companies, media, review groups are progressively looking for ways to mine Twitter for information about what people think and experience about a particular an item or service. So for collecting, and analyzing tweets or reviews in near real time environment, it is a demand to have an automated system.

4.1.15. Demand of automation

Due to increase in the demand of opinion mining or sentiment analysis for the different reviews which are available on social media, there is a need to decrease the human effort needed to analyze those reviews or contents.

Table 2
Challenges of Sentiment Analysis

Challenges with respect to Computations	*Challenges with respect to data*
Incremental Approach	Credibility/Behaviour/Homophily
Parallel Computing for massive data	Ironic and sarcastic statements
Improving the precision of algorithm	Grammatically Incorrect Words
Real time opinion mining	Review Author SegmentationRefinement Of existing Lexicons or Updating/Down-dating Lexicons
Demand of automation	Handling Noise and Dynamism
	Handling abbreviations of the words
	Object recognition
	Feature extraction
	Grouping synonyms
	Opinion mining using audio & Videoexpressing emotions in mother tongue using English alphabets
	Variations in Opinions with time

4.1.16. Opinion Mining using Audio & Video

Sentiment analysis or opinion mining explored work is based on textual data. If the dataset is audio or video to mine the opinion then several audio and video features can be used like smiles, sadness, pitch, intensity are used in order to detect the feelings of a customer.

4.1.17. Expressing emotions in mother tongue using English alphabets

The truth that remarks or views entered by people who are dissimilar from each other in the way they write, their use of language, abbreviations and their knowledge is a challenge on its own. People also do not articulate opinion in the same way. They may express their feelings in mother tongue but using English alphabets so there is a need for conversion mother tongue to English language so that the different opinions can be analyzed.

4.1.18. Variations in Opinions with time

Another challenge lies in the issue of being able to observe opinions changing with the time. Opinions are dynamic in nature. It varies over time. This helps us to monitor if a certain product gets enhanced with time, or people change their opinion about a product and get influenced for it with time.

The summary of different application areas and challenges with respect to computations and data are as shown in the Table 1 and Table 2 respectively.

5. CONCLUSION

Opinions are very important for individuals as well as companies to know the fondness of products. Instead of studying long reviews they can study summarized opinion regarding different products. Thus, any individual can take the decision to buy a product or any companies can provide what exactly customer want and establish better customer relationship by solving their problems. In this paper, we explored different applications of sentiment analysis and opinion mining in different areas. All of them are very essential to implement using this domain. In order to accomplish the aim of this paper, we found some challenges in this. This study provides an innovative aspect for researchers to study and apply sentiment analysis in various domains. Researchers can select the area where they can implement sentiment analysis effectively or they can try to resolve different challenges which we face in this domain.

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