A Survey on Product Evaluation using Opinion Mining

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Abstract: The Internet technology is growing very fast and it is becoming reliable, so more and more people using internet in their day to day life. Because of increase in social networking and blogs, more and more people are connected with each other and share information globally. Through this people are sharing their opinions, experiences or feedback regarding any product. These experiences or feedback is very important information for the organizations that are selling or manufacturing the products, which can be used for changing designs, personalization and better understanding of product. Also these opinions regarding any product are important information for other people who want to buy the same product. But it is difficult for a potential customer to read hundreds of reviews. So data mining approaches are used to mine the opinions, to summarize all reviews of customer. Most of the existing methods in opinion mining are processing the customer reviews in the form of positive and negative comments. But this approach is not enough for a customer to make decision about product. The proposed approach gives the method of rating the product and also the product features with weights, which is a more customized way of putting the reviews. The approach also compares the products of different brands based on their ratings. This approach will help customers to take decisions based on their preferences regarding any product or product feature

Keywords: Opinion Mining, Feature extraction and evaluation

I. INTRODUCTION

With the rapid advancement of Web technologies, which facilitate people to contribute rather than simply receive information, a large amount of review texts are generated and become available online. These user-generated opinion-rich contents are credible sources of knowledge that can not only help users make better judgments but assist manufacturers of products in keeping track of customer sentiments.

In fact, online reviews have been shown to be second only to word-out-mouth in a study that compares the factors influencing purchase decisions. Therefore, online reviews can be very valuable, as collectively such reviews reflect the "wisdom of crowds" and can be a good indicator of a product's future sales performance.

However, with tens and thousands of reviews being generated everyday on almost everything, e.g., sellers, products, and services, at various websites, it has become increasingly difficult for an individual to manually collect and digest the reviews of his/her interest. As such, opinion mining has become an active area of research in the past few years, and has produced some important results.

Opinion mining is a type of natural language processing for tracking the sentiment or thinking of the public about a particular product. Opinion mining, which is also called sentiment analysis, involves building a system to collect and examine opinions about the product made in blog posts, comments, reviews or tweets. Automated opinion mining often uses machine learning, a component of artificial intelligence.

Opinion mining can be useful in several ways. If you are in marketing, for example, it can help you judge the success of an ad campaign or new product launch, determine which versions of a product or service are popular and even identify which demographics like or dislike particular features. For example, a review might be broadly positive about a digital camera, but be specifically negative about how heavy it is. Being able to identify this kind of information in a systematic way gives the vendor a much clearer picture of public opinion than surveys or focus groups, because the data is created by the customer.

An opinion mining system is often built using software that is capable of extracting knowledge from examples in a database and incorporating new data to improve performance over time. The process does deep parsing of the data in order to understand the grammar and sentence structure used.

An important task of opinion mining is to extract people's opinions on features of an entity. For example, the sentence, "I love the GPS function of Motorola Droid" expresses a positive opinion on the "GPS function" of the Motorola phone. "GPS function" is the feature. The sentence, "The picture of this camera is amazing", expresses a positive opinion on the picture of the camera. "picture" is the feature. How to extract features from a corpus is an important problem[11]

II. SOURCES OF COLLECTING OPINIONS

There are various sources of data for collecting views and feedback of people about a particular product. Some major sources are discussed below.

A. Ecommerce Sites

Electronic commerce, commonly known as e-commerce, is a type of industry where buying and selling of product or service is conducted over electronic systems such as the Internet and other computer networks. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange, inventory management systems, and automated data collection systems. Electronic commerce is generally considered to be the sales aspect of e-business. It also consists of the exchange of data to facilitate the financing and payment aspects of business transactions[34]. Also it is a huge source of information about the views of people about any product. If the site is on cloth industry for a particular brand then we will get plenty of information about what people think about that brand.

B. Blogs

A blog is a web log which is a discussion or informational site published on the World Wide Web and consisting of discrete entries or posts typically displayed in reverse chronological order that is the most recent post appears first. A majority is interactive; allowing visitors to leave comments and even message each other via GUI widgets on the blogs, and it is this interactivity that distinguishes them from other static websites. In that sense, blogging can be seen as a form of social networking. Indeed, bloggers do not only produce content to post on their blogs, but also build social relations with their readers and other bloggers[34]. There are different types of blogs like, such as media blog which discuss about any media issue or any particular media only. Political blog which discuss about any political issue or about any politician. Travel blog contains the reviews of people about travel companies or agencies and their travel experiences with them. Health blog contains the opinions of people about any disease or about any hospital. In the same way there are educational blog, device blog, corporate blog ect.

C. Review Sites

A review site is a website on which reviews can be posted about people, businesses, products, or services. These sites may use Web 2.0 techniques to gather reviews from site users or may employ professional writers to author reviews on the topic of concern for the site. Review sites are generally supported by advertising. Some business review sites may also allow businesses to pay for enhanced listings, which do not affect the reviews and ratings. Product review sites may be supported by providing affiliate links to the websites that sell the reviewed items. With the growing popularity of affiliate programs on the Internet, a new sort of review site has emerged - the affiliate product review site. This type of site is usually professionally designed and written to maximize conversions, and is used by e-commerce marketers[34]

D. Data Sets

This dataset is a subset of the opinion mining datasets released by Dr. Bing Liu's group from University of Illinois at Chicago. Their dataset is available from http://www.cs.uic.edu/~liub/FBS/sentiment-analysis.html This subset consists of plenty of review comments each for various different products. This subset is used for the experiments conducted in various research papers. Dr. Bing Liu's group is very much active is the field of opinion mining and has too many research papers based on the opinion mining theory. These datasets are prepared by this group for the purpose of research in the field of opinion mining.

III. CHALLNEGE IN OPINION MINING

Opinion mining is a relatively recent discipline that studies the extraction of opinions using Artificial Intelligence and/or Natural Language Processing techniques. More informally, it's about extracting the opinions or sentiments when given a piece of text. This provides a great source of unstructured information especially opinions that may be useful to others, like companies and their competitors and other consumers.

For example, someone who wants to buy a camera, can look for the comments and reviews from someone who just bought a camera and commented on it or written about their experience or about camera manufacturer. He can get feedback from customer and can make the decision. Also a manufacturing company can improve their products or adjust the marketing strategies.

Opinion Mining needs to take into account how much influence any single opinion is worth. This could depend on a variety of factors, such as how much trust we have in a person's opinion, and even what sort of person they are. It may differ from person to person like an expert person and any non-expert person. There may be spammers. Also we need to take into account frequent vs. infrequent posters

Consider a following segment of few sentences talked about iPhone.
(1) I bought an iPhone a few days ago. (2) It was such a nice phone. (3) The touch screen was really cool. (4) The voice quality was clear too. (5) However, my mother was mad with me as I did not tell her before I bought it. (6) She also thought the phone was too expensive, and wanted me to return it to the shop"[28]

The question is: what we want to mine or extract from this review? The first thing that we notice is that there are several opinions in this review. Sentences (2), (3) and (4) express some positive opinions, while sentences (5) and (6) express negative opinions or emotions. Then we also notice that the opinions all have some targets. The target of the opinion in sentence (2) is the iPhone as a whole, and the targets of the opinions in sentences (3) and (4) are \touch screen" and \voice quality" of the iPhone respectively. The target of the opinion in sentence (6) is the price of the iPhone, but the target of the opinion/emotion in sentence (5) is \me", not iPhone. Finally, we may also notice the holders of opinions. The holder of the opinions in sentences (2), (3) and (4) is the author of the review (\I"), but in sentences (5) and (6) it is \my mother"[28].

From the above example we understand that in general, opinions can be expressed about anything, e.g., a product, a service, an individual, an organization, an event, or a topic, by any person or organization. We use the entity to denote the target object that has been evaluated. An entity e is a product, service, person, event, organization, or topic. The entity consist of components or parts, sub-components, and so on, and there are set of attributes of entity. Each component or sub-component also has its own set of attributes [28].

For example, a particular brand of cellular phone is an entity, e.g., iPhone. It has a set of components, e.g., battery and screen, and also a set of attributes, e.g., voice quality, size, and weight. The battery component also has its own set of attributes, e.g., battery life, and battery size.

There are two main types of opinions: regular opinions and comparative opinions. Regular opinions are often referred to simply as opinions in the research literature. A comparative opinion expresses a relation of similarities or differences between two or more entities, and/or a preference of the

opinion holder based on some of the shared aspects of the entities. A comparative opinion is usually expressed using the comparative or superlative form of an adjective or adverb, although not always. An opinion is simply a positive or negative sentiment, attitude, emotion or appraisal about an entity or an aspect of the entity from an opinion holder. Positive, negative and neutral are called opinion orientations also called sentiment orientations, semantic orientations, or polarities [28].

IV. ANALYSIS

During the survey of various papers it is found that many researchers used different methods for extracting sentiments or opinions from the given sentences. Also different methods are used to rank or classify these opinions extracted from the sentences.

The paper studies, extraction of opinion units is differentiated in three parts as Subject, Aspect and Evaluation. Subject is a named entity like product or company of a given particular class of interest (e.g. a car model name in the automobile domain). Aspect is a part, member or related object, or an attribute (of a part) of the subject on which the evaluation is made (engine, size, etc.). Evaluation is an evaluative or subjective phrase used to express an evaluation or the opinion holder's mental/emotional attitude (good, poor, powerful, stylish, (I) like, (I) am satisfied, etc.)[2].

The system given in paper performs the summarization in two main steps: feature extraction and opinion direction identification. The inputs to the system are a product name and an entry page for all the reviews of the product. The output is the summary of the reviews. In this method NLProcessor linguistic parser (NLProcessor 2000) is used, which parses each sentence and yields the part-of-speech tag of each word (whether the word is a noun, verb, adjective, etc) and identifies simple noun and verb groups (syntactic chunking). Once the part-of-speech tags are extracted they are used to find the frequency of features referred, which in turn gives us an idea about what is the opinion direction i.e. what are the features people are talking about more as compared to others [3].

The paper studies the opinion mining data and presented in the form of reputation of the product in the market. The system performs two function opinion extraction and reputation analysis. The user has to put a product name, then the search engine will extract the web pages contacting any information about the product, then the opinions are extracted. The evaluation-expression dictionary will be prepared and used to evaluate the opinions. Then opinion likeliness is calculated in which is in turn used for calculation of reputation of product [5].

The paper, classified the opinions into four classes unigrams, bigrams, trigrams and distance 3 patterns. This classification is done based on the number of words used for giving the opinions. Final representation of result is based on how much percentage of people has given opinion in uniform pattern, how many number of people has given opinion in bigrams pattern and how many number of people has given opinion in trigram and distance 3 patterns. This classification is done for both positive and negative opinions [6].

The paper uses automatic text summarization where frequent sequences are found by using single word, two words or multi word patterns. These frequent sequences are then used as topic and again the document is searched for these topics and candidate sentences are extracted. These sentences are used to extract opinions and final customer concerns are identified [7].

The paper studies the problem of identifying comparative sentences in text documents. The problem is related to but quite different from sentiment/opinion sentence identification or classification. Identifying comparative sentences is also useful in practice because direct comparisons are perhaps one of the most convincing ways of evaluation, which may even be more important than opinions on each individual object. This paper proposes to study the comparative sentence identification problem. It first categorizes comparative sentences into different types, and then presents a novel integrated pattern discovery and supervised learning approach to identifying comparative sentences from text documents [8].

The paper studies a text mining problem, comparative sentence mining. A comparative sentence expresses a relation between two sets of entities with respect to some common features Given a set of evaluative texts, identify comparative sentences from them, and classify the identified comparative sentences into different types (or classes). Extract comparative relations from the identified sentences. This involves the extraction of entities and their features that are being compared, and comparative keywords. Types of Comparatives sentences taken out are Non-Equal gradable which means relations of the type greater or less than that express a total ordering of some entities with regard to certain features. This type also includes user preferences. Equative which means relations of the type equal to that state two entities as equal with respect to some features? Superlative, which means relations of the type greater or less than all others that rank one entity over all others. Non-Gradable which means sentences which compare features of two or more entities, but do not explicitly grade them [9].

The paper focuses on clustering or grouping of synonym features. The first step is to connect feature expressions using sharing words, like many feature expressions are phrases consisting of multiple words, e.g., "customer service", "customer support", "service". The next step is merge components using lexical similarity. Lexical similarity based on WordNet which is widely-used in the NLP area to measure the similarity of two words. It is another piece of knowledge that can be utilized for our grouping task. For example, "picture" and "image" has very high similarity in WordNet. In next step it selects the leader components as labeled data. This step selects k leader components from the selected set p components [10].

The paper focuses on the problems of double propagation. Double propagation assumes that features are nouns/noun phrases and opinion words are adjectives. Opinion words are usually associated with features in some ways. Thus, opinion words can be recognized by identified features, and features

can be identified by known opinion words. The extracted opinion words and features are utilized to identify new opinion words and new features, which are used again to extract more opinion words and features. This propagation or bootstrapping process ends when no more opinion words or features can be found. The advantage of the method is that it requires no additional resources except an initial opinion lexical analyzer [11].

The paper presents a method for identifying an opinion with its holder and topic. Opinion holders are like people, organizations and countries, i.e. the entity who has given opinion for some product. An opinion topic is an object an opinion is about. In product reviews, for example, opinion topics are often the product itself or its specific features, such as design and quality as "I like the design of iPod video", "The sound quality is amazing". Opinion topics can be social issues, government's acts, new events, or someone's opinions. The overall steps include identifying opinions, labeling semantic roles related to the opinions, find holders and topics of opinions among the identified semantic roles and storing <opinion, holder, topic> triples into a database [13].

V. APPLICATIONS

Opinions are so important that whenever one needs to make a decision, one wants to hear others' opinions. This is true for both individuals and organizations. The technology of opinion mining thus has a tremendous scope for practical applications.

Opinion mining is useful for Individual consumers. If an individual wants to purchase a product, it is useful to see a summary of opinions of existing users so that he/she can make an informed decision. This is better than reading a large number of reviews to form a mental picture of the strengths and weaknesses of the product. He/she can also compare the summaries of opinions of competing products, which is even more useful.

Study of reviews about the product is important for manufacturing organizations and businesses. This is important for the organizations to make improvements in the products. For example, it is critical for a product manufacturer to know how consumers perceive its products and those of its competitors. This information is not only useful for marketing and product benchmarking but also useful for product design and product developments. Manufacturing companies can even think of increasing or decreasing the manufacturing of some product.

Opinion mining is also useful for the advertisement companies. These companies can get an idea about the market flow. The type of products people liked most, what is the overall thinking of people about something, all such points can be extracted using opinion or review mining. This is important for creating and designing the advertisement by the advertisement company.

VI. EVALUATION & DISCUSSION

The objectives and performance of various approaches are given in Table 1. In the opinion reviews, it is found that there are different types of sentences. Some are comparative, some are non comparative, some are objective, and some are subjective. In opinion mining basically there are three steps, feature identification and extraction, feature evaluation and opinion direction identification or representing the opinion. From the study of various approaches it is found that different approaches used different methods for all the three steps. Also some methods used different approaches for identifying the type of sentence.

Opinion mining or sentiment analysis is the area of research that attempts to make automatic systems to determine human opinion from text written in natural language. This is a new research area now days. Because of increasing competitions in the market, and the organizations are becoming more and more customer oriented, this field is getting very much importance. Customer service and customer feedback is very important for organizations. Reliability on internet is increasing, and as plenty of brands are available in market for same product, people are also trying to compare the products and share their experiences on net. Opinion mining is based on Natural Language Processing. As the new techniques will be developed in the field of Natural Language Processing, opinion mining will also get the strength.

VII. CONCLUSION AND FUTURE SCOPE

Opinion mining is a new field of study. This is important because, in this competitive world, every customer try to compare multiple products before purchasing. Also the organization needs customer opinion about their products to be in the competition and to put improvements in their products. This is a recent trend in research also. Very less research is done in this particular area. This is based on natural language processing and as there will be advancement in natural language processing, opinion mining will also get advancement.

Opinion Mining has become a latest trend in the information mining industry. There is plenty of future scope for opinion mining as it requires Natural Language Processing and also Artificial Intelligence. While the development of the opinion mining tools described shows very much work in progress and initial results are promising, but still it requires a lot of refinements. Since this is a study of sentiments of a person, so it requires a lot of precision. Whenever any person talk about something, then the context in which he is talking and how the sentence is formed may change the parsing method to catch the exact opinion said by that person. If we try to concentrate on one pattern of sentence then we may lose any other pattern of sentence from our parsing method. This is a major challenge in front of the opinion mining methods.

Sr. No.	Approach	Objective
1	Nozomi et al., 2007	extraction of opinion units in the form of triplets as Subject, Aspect and Evaluation
2	Bing et al., 2004	two main steps: feature extraction and opinion direction identification
3	Satoshi et al., 2002	performs two function opinion extraction and reputation analysis by preparing evaluation-expression dictionary
4	Kushal et al., 2003	opinions are classified into four classes unigrams, bigrams, trigrams and distance 3 patterns
5	Jiaming et al., 2009	automatic text summarization where frequent sequences are found by using single word, two words or multi word patterns
6	Nitin et al., 2006	study the comparative sentence identification problem. Classify comparative sentence into different types
7	Zhongwu et al., 2011	clustering or grouping of synonym features
8	Lei et al., 2010	focuses on the problems of double propagation
9	Soo-Min et al., 2006	extraction of opinion in the form of triplets as opinion, holder, topic
10	Krisztian et al., 2006	Identifying the mood patterns by discovering irregularities in temporal mood patterns appearing in a large corpus of blog posts
11	Andrea et al., 2006	Performs text classification into objective or subjective text
12	Dekang et al., 1998	automatic construction of thesaurus
13	Michael Chau	Analyzing the web blogs and perform network analysis
14	Christopher Scaffidi	Extracting frequently used feature and identifying the direction of opinion
15	Gamgarn Somprasertsri	Mining product feature by applying dependency relation and ontological knowledge
16	Bing Liu & Minqing Hu	An automated system called OpinionObserver to extract the features and find the number of positive opinion and negative opinion.
17	Kunpeng Zhang	Identification of features, identification of sentence orientation and construction of bidirectional graph
18	Wei-Hao Lin	Identification of perspective on sentence and document level.

Table 1. Summary of Various Approaches

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