

**Product Recommendation System using Opinion Mining**

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**Abstract:** Social media is becoming a major and popular technological platform that allows users to express personal opinions toward the subjects with shared interests, opinion are good for decision making to People would want to know others' opinion before taking a decision, while corporate would like to monitor pulse of people in a social media about their products and services and take appropriate actions. This paper reviewed about world are realizing that e-commerce is not just buying and selling over Internet, rather it is improve the efficiency to compete with other giants in the market. Their opinions on specific topic are inevitably dependent on many social effects such as user preference on topics, peer influence, user profile information. E-Commerce sites are gaining popularity across the world. People visit them not just to shop products but also to know the opinion of other buyers and users of products. Online customer reviews are helping consumers to decide which products to buy and also companies to understand the buying behavior of consumers. In this paper we have created a prototype web based system for recommending and comparing products sold online. We have used natural language processing to automatically read reviews and used Naive Bayes classification to determine the polarity of reviews. We have also extracted the reviews of product features and the polarity of those features. We graphically present to the customer, the better of two products based on various criteria including the star ratings, date of review, the helpfulness score of the review and the polarity of reviews.

**Keywords-** Product Recommendation , Product reviews

**I. INTRODUCTION**

E-Commerce sites pervade the internet. A wide variety of products are sold online including electronic goods, apparel and household items. With mobile phones becoming a common medium of accessing the internet, m-commerce too is gaining rapid momentum. India is one of the fastest growing E-Commerce and E-Retailing markets with the market expected to grow to around USD 9 billion by 2016. With such a rapid growth in this industry, companies are using sophisticated algorithms to understand the buying patterns of their buyers in order to enrich the customer experience. There is cut throat competition among ECommerce sites in the way they present their products, the promotions and discounts they offer and the shopping experience they provide to customers. These offerings are based on extensive market research and analytics conducted by experts within and outside these organizations. One of the key parameters that companies use to strategize is customer reviews and rating on the e-commerce sites. These reviews are not only used by the companies but also play a major role in consumers deciding whether to buy a product or not. Hence analyzing customer reviews help both shoppers as well as E-Commerce companies. With the availability of robust machine learning algorithms and tools, companies and individuals are able to create platforms that can help to:

- Compare products based on reviews
- Compare E-Commerce sites
- Recommend Products to customers
- Make decisions on pricing and promotion of products

We have used Natural Language Processing techniques to determine the polarity of the reviews. We have also arrived at a score for a specific product by including:

- Star Rating
- Number of Positive Reviews
- Number of Negative Reviews
- Helpfulness score of reviews
- Age of Review

We have used these scores to compare two or more products and recommend the best product to the customer. Our paper is organized as follows. In **Section II** we present background information on review mining and opinion mining. We also present related works in this section. In **Section III** we discuss the methodology of our approach and present details of implementation in **Section IV**. We conclude in **Section V**.

## **II. BACKGROUND AND RELATED WORK**

A platform is provided to express opinions quantitatively through scores, star ratings or votes as well as qualitatively through text and videos. The internet is now filled with such opinions and will serve as a “gold mine” to companies trying to understand their customers. Opinion mining is a rapidly evolving research area with newer and newer technologies and algorithms enabling the automatic processing of data. Opinion mining is the study of people’s sentiments and opinions about objects and the various aspects of the objects [1]. Opinion mining has several applications, some of which include:

- Understanding the attitudes and sentiments of people on social networks like Facebook and Twitter
  - Understanding the buying intention of customers on e-commerce sites
  - Understanding the satisfaction of the customer with specific products through online reviews on e-commerce sites
  - Recommending products and places to customers based on collective opinions
- Opinion mining and sentiment analysis have been extensively used in many situations like political uprisings, launch of high technology gadgets and during natural disasters. Before the advent of computational algorithms for mining and natural language processing, such sentiment analysis was done manually where researchers did a content analysis or a discourse analysis of the opinions, manually classified them and analyzed the results using pure statistical analysis. With more and more advanced tools being developed by the machine learning community, opinion mining has become a rapidly evolving domain where large amount of public opinion data can now be analyzed computationally. Wang et al have proposed a system for Twitter sentiment analysis of 2012 US Presidential Election [2]. Balahur et al have done opinion mining of news paper quotations [3]. Pak and Paroubek perform a linguistic analysis of Twitter messages [4]. Bollen et al in [5] have studied the impact of public mood on the stock market prices. These works show that sentiment analysis finds application in a wide variety of domains. In the specific context of opinion mining being used for mining of customer reviews on e-commerce sites, two types of parameters are considered.
- The objective parameters which include number of star ratings, number of reviews, the age of reviews etc
  - The subjective parameters which include the emotions of reviewers while expressing their opinion about a product and the specific feature of the product about which they are talking

In generic terms, mining of online customer reviews involve the following steps:

- Automatic extraction of review components from e-commerce sites
- Natural Language Processing of text reviews Classifying reviews as positive or negative based on the adjectives used
- Identifying and extracting product features mentioned in the text reviews
- Extracting the opinion expressed about the specific product features
- Combining the objective and subjective parameters to arrive at a product score

## **III. METHODOLOGY**

We have adopted the following methodology to perform opinion mining of customer reviews.

**Step1:** Choosing the e-commerce site: We had to choose between Amazon and Flipkart. In the Indian context, Flipkart ranks better than Amazon and also several products had more number of reviews on Flipkart than on Amazon. Hence we chose Flipkart.

**Step2:** Choosing mobile as the product: Recently Flipkart made big news by launching phones like Xiaomi Mi3 exclusively on their site. This attracted more reviews and ratings. Mobile phones are one of the most viewed and sold products on e-commerce sites.

**Step3:** Extracting reviews: We extracted star ratings, date of review, and text of the review and helpfulness score of each review from Flipkart.

**Step4:** Processing Reviews: Natural language processing of the reviews was done and based on their content they were classified as positive or negative reviews.

**Step5:** Product feature identification: The contents of each review was analyzed to extract the mention of product features and if the review about that feature was positive or negative

**Step6:** Quantitative analysis: A count of the star ratings was taken and average was calculated. The number of positive and negative reviews was counted. Feature based pros and cons were counted.

**Step7:** Product Score: Based on the rating, polarity of reviews, date and helpfulness of reviews, we calculated a product score. **Step 8:** Recommendation to users: A summary of ratings, reviews etc is displayed to users and the high scoring product is recommended to the user.

#### IV. IMPLEMENTATION

In this section, we discuss in detail the methodology adopted to perform opinion mining on customer reviews of mobile phones on flipkart. We exclusively focus on those steps that involved computational tools and algorithms.

##### 1.Extracting Reviews:

There are several tools available for extracting reviews automatically from websites. Some of them are Visual Web Ripper, Scrapy, Handy Extractor, Helium Scraper etc. We used our own python code to extract reviews. We extracted a total of 1039 reviews for Samsung Galaxy DuoS 2 from Flipkart

##### 2.Processing Reviews:

After extracting the 1039 reviews, the text part of the reviews was separated out to perform natural language processing. To process the reviews, Parts of Speech (POS) tagging was done using Treetagger and Natural Language Tool Kit (nltk). POS tagging using nltk. A single review may have both positive and negative comments. Hence each review is split into sentences and then processed to understand the overall tone of 2015 International Conference on Circuit, Power and Computing Technologies [ICCPCT] the review. Naïve Bayes Classifier was used to determine the polarity of the reviews.

##### 3.Feature Extraction from Reviews:

When customers write reviews of products, most of them focus on specific aspect of the product. For example, “Screen Resolution is poor”, “Battery drains too fast” or “Excellent audio quality” are some reviews commonly written for mobile phones. Hence it is not just important to get an overall idea of the review but also to understand what features customers are satisfied with and what features make customers unhappy. This feature based extraction is of immense benefit to both customers and sellers who are looking for making improvements to the product as well as marketing strategies. We used the “Mallet” for this purpose. Mallet is a package mainly used for NLP. Mallet finds applications in a number areas including document classification, topic modeling etc. Topic models are useful for analyzing large collections of unlabeled text. The MALLET topic modeling toolkit contains efficient, sampling-based implementations of Latent Dirichlet Allocation, Pachinko Allocation, and Hierarchical LDA. We used Mallet to identify those sentences that had specific features of mobile phones. Those sentences were extracted and processed for negativity and positivity. Some features that we used are “battery”, “RAM”, “Screen Size”, “Screen Resolution”, “Processor Speed” etc. Once the features are extracted, a graph is generated depicting the count of positive and negative reviews about a specific feature.

$$SF_n = SRA + PR + RPM + HAS$$

##### 4. Product Score Classification:

We have used the star ratings, polarity of the reviews, age of the review and helpfulness score of the review for calculating the score for a product.

- For the star ratings, we calculated the average. This is the star ratings average: SRA.
- For the polarity of the reviews, we subtracted the total number of negative reviews from the total number of positive reviews. This polarity is then divided by the total number of reviews to include in the product score. This is included as the polarity rating: PR.
- For the age of the review, we calculate the difference between date of first review and date of last review. We then divide the total number of reviews by the number of months of reviews. This will give us the reviews per month. A product with higher number of reviews is rated higher considering that more number of people are expressing opinion about it positive or negative. This value is added up as Review per Month: RPM.
- For the helpfulness score, we count the number of “yes” for the “was this review helpful” question on flipkart. Average of the helpfulness scores is taken. We take this as Helpfulness Score Average: HSA.
- The values are summed up to give the score 5. Product Comparison: Based on the product scores as well as the polarity of feature reviews, we display a comparison of 2 products to assist the costumer in choosing the right product.

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#### V. CONCLUSION AND FUTURE WORK

In this paper we have presented our work on product recommendation System reviews on E-Commerce site : Flipkart. We have also done a feature based classification of reviews. The objective is to benefit the customers and assist them in choosing the right product. As future work we propose to offer a summary of reviews for more than 2 products and also automatically rank products based on the features that the user is interested in.

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