



# International Journal for Innovative Engineering and Management Research

A Peer Reviewed Open Access International Journal

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IJIEMR Transactions, online available on 11<sup>th</sup> Jan 2023. Link

[:http://www.ijiemr.org/downloads.php?vol=Volume-12&issue=Issue 01](http://www.ijiemr.org/downloads.php?vol=Volume-12&issue=Issue 01)

**DOI: 10.48047/IJIEMR/V12/ISSUE 01/75**

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Volume 12, ISSUE 01, Pages: 814-822

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## A Product Recommendations based on Emotion detection Using Artificial Intelligence

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### Abstract

Automating user purchase preferences after trying to figure out what they like is a very difficult task to do. Recommender systems which recommend information to users with them having the choice of selecting their preferred options among a huge number of options were developed, primarily with the help of reviews. A certain user might find it easy to make good decisions with the help of the opinions made by peers, Although, it might become very difficult for them to read through all the reviews and make a proper decision if the amount of reviews are high. We decide whether to recommend a product to a user or not based on the sentiment distribution of the reviews for that product. Initially, we consider 7 different products and the review dataset for those products. By analyzing the sentiment of reviews using rule- based sentiment analysis, we obtain sentiment distribution and then decide whether the product should be recommended or not.

**Keywords:** Sentiment Analysis, Recommendations, Reviews, Natural language processing, text processing, Data pre-processing

### Introduction

The massive growth of the internet and the number of people using it has posed huge challenges in front of people find valuable information. The perpetually increasing

data flow is the result of this digital world, big data is affecting the company's service to its consumers. By analyzing the patterns, reviews and the faults within a market, big data can help create better and more

creative products, The invent of Recommender systems is a great example. A lot of review-based recommender systems have been developed lately with the purpose of increasing the amount of valuable information in user reviews and recommending products accordingly, significantly increasing the quality.

Recommender systems usually predict how much a user could like the product and therefore, recommends it accordingly. For example, Instagram suggests posts based on how much similar users like the respective posts and thus, uses a recommender system beneath the hood to detect how much the current user would like it. This, gives us an idea of how and where Recommender systems are useful. Applications such as documents, movies, music and products effectively use Recommender systems .The recommender system produces a list of recommendations such as movies to see, products to buy, news to read, and so on.

There are two major paradigms of recommender systems, collaborative filtering and content-based methods. Collaborative filtering is a process where we analyze items based on the reviews and opinions of people with similar interests, whereas, Content-based methods

evaluate the item descriptions to recommend specific items to the users. The main problem with user reviews is the quality of the review and the credibility of the reviewer. Multiple researchers have thus opined on the consideration of the review quality and the credibility of the reviewer.

User reviews for a product contain valuable information about the product features and provide great explanations which might be extremely useful for the customers to make appropriate decisions.

Sentiment analysis is a method to analyze an information to determine the sentiment backing it up. It uses a combination of Machine learning and Natural Language processing (NLP). We can determine if the sentiment behind a text is positive, negative or neutral using sentiment analysis. It is a very important technique in artificial intelligence which is also used for a lot of business purposes. Tokenization, stemming, parsing, etc. are a few powerful techniques.

E-commerce recommender systems mostly consider the product reviews reviewed by multiple customers and use them for its benefit. A lot of recommender systems which recommend information to users with them having the choice of selecting their preferred options among a huge

number of options were developed, primarily with the help of reviews recently.

## Literature Review

There are previously present researches which are done for product recommendations. Product recommender systems usually check E-commerce sites such as flipkart, big basket, etc. and media services such as Prime video, Netflix etc. They use various techniques like sentiment analysis based recommendation, content based and collaboration filtering paradigms etc.

**J. A. Konstan and J. Riedl**, A recommender system tries to recommend products based on the user reviews, and is sort of a specialized information filtering system. They are used in many various applications such as movies, books etc.

Automated recommender systems have changed the market of e-commerce by substantially increasing its quality of content and delivery. In this paper, we track the advances in collaborative filtering recommender systems which are focused on user experience with the recommender. We state that the given conventional measures are not enough to evaluate user experience with

recommenders and we need additional methods.

In [2], **Guerreiro and Rita** contributed in searching factors within the reviews which reveal the positive and negative triggers for direct recommendations using a lexicon based approach. Reviews by peers help in significantly reducing the prospects of a bad decision. A large amount of reviews will still become hard to be read though. Thus, the readers who give a proper personal recommendation often turn out to be more helpful to the users. Such reviews exemplify a personal connection and hold more value for obvious reasons. Such reviews are found and identified using a text mining method. Negative reviews which are personal trigger negative direct recommendations and the positive ones trigger positive direct recommendations.

In [3] **Chelliah and Sarkar** used text-mining processes for feature specific sentiment analysis, and also used several other techniques for the analysis of user reviews. User reviews for a product contain valuable information about the product features and provide great explanations which might be extremely useful for the customers to make appropriate decisions. E-commerce

recommender systems mostly consider the product reviews reviewed by multiple customers and use them for its benefit. We provide various methods for the E-commerce websites to use the reviews proportionately, such as the text mining process for the feature specific sentiment analysis etc.

In [4] **L.S Gallege et al and R. R. Raje.** Developed product reviews and CLF using sentiment analysis. Efficient product recommendations were produced using external attributes. Selection of a software service for a few given recommendations is based on the review quality and the recommendations associated to it. The existing approaches for big e-commerce websites such as collaborative filtering doesn't consider reviews and information about the products more than the common ones. A constantly updating software cannot be based on the common attribute-value pairs unlike a physical product because of its dynamic ability to constantly change. Thus, we can't apply the product-based recommendations to software. Thus, this research introduces a method for better recommendation of software services which by using external reviews, enhances CBF and CLF algorithms.

In [5], **Quian et al, Y. Zhang, X. Ma, H. Yu, and L. Peng.** proposed EARS which considers many factors such as sentiment analysis, software data etc. for better recommendations

Users are often suggested the products they like by the recommender systems. However, recommender systems often ignore user's emotional changes and rather focus on user's purchase behavior which plays an important role. Thus, this paper introduces an emotion-aware recommender system in which three types of data are used for better recommendations: user rating data is often used as explicit information, user social network data is used as implicit information and sentiment detected from user reviews as emotional information. These results validate the approach by performing better than the orthodox methods.

In [6] **H. H. Do, P. Prasad, A. Maag, and**

**A. Alsadoon,** Sentiment analysis which are derived and driven by texts are studied on a deep level. A lot of recent works in this field have prioritized aspect-based sentiment analysis. Aspect-based sentiment analysis assigns sentiments to certain topics or features and is thus



better than the conventional sentiment analysis.

The high amount of constantly growing user reviews and content on the internet made sentiment analysis a very important part of recommender systems. There are two goals for the improvement of granularity at aspect level:-

Classification of product reviews and target dependent tweets on the basis of sentiment. Deep learning approaches have proved to be very useful in achieving these goals. In this paper, we hope to provide a review of deep learning approach to aspect-based sentiment analysis.

### Proposed System

We take review a dataset, use sentiment analysis-based method to classify the reviews into positive, negative and neutral. Based on the distribution of reviews product will be classified as recommended or not. By analyzing the sentiment of reviews using rule based sentiment analysis, we obtain sentiment distribution and then decide whether the product should be recommended or not. The decision of whether to recommend the product to the user or not is made by considering the sentiment distribution of the reviews for

that product.

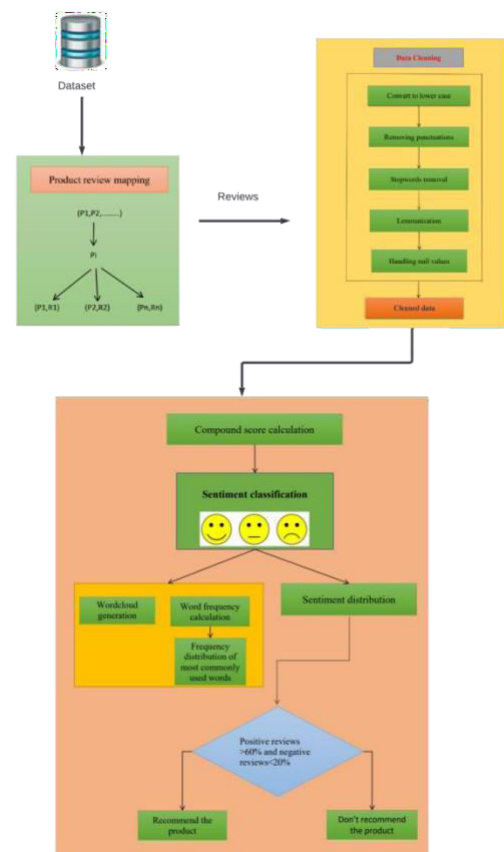


Fig 1:A proposed framework for sentiment analysis

### Data Collection:

It refers to a procedure for obtaining information. The primary goal of data collecting is to get high-quality data that can be used for analysis.

### Data cleaning:

Data pre-processing is done using data cleaning approach, which consists of cleaning the data by checking the missing data and handling it. It changes the unsophisticated data into a structured and a clean one, it also involves cleaning the duplicates up.

### Sentiment Analysis:

It involves the identification of a sentiment in a text and classifying them as positive, negative or neutral. For better understanding of our data at user level , we also used visualizations techniques like word clouds and frequency distributions for better representations.

### Methodology

The proposed system uses the below given method for sentiment analysis.

### Acquiring datasets

Input dataset of product reviews was obtained from Kaggle.

product	No.of Reviews
Amazon Alexa Voice Remote	2965
Amazon Echo Studio	4821
Ring Security Camera	2615
Amazon Kindle	243
Sennheiser Wireless Headphones	175
The Four Winds	572
K95 Face Mask	615

Table-1 products considered

### Cleaning the data

It is the process of converting the data into a more useful and a structured one by removing duplicates, inconsistencies etc. When multiple sources are used, data is mixed up and many duplicates can be found, thus, we need to clean the data

before the usage. Removing special characters, numerical and punctuations, converting all the words into lowercase is a part of data cleaning.

### Converting to lowercase

All the review data is converted into lowercase for uniformity. So, that the data can be analyzed in more efficient way.

### Removing the punctuations

Removing punctuation is a common preprocessing step in many data analysis. when working on user-generated text data one would encounter too much punctuation in sentences, which may not be useful for the task at hand, and so removing all of them becomes an essential task.

### Stopwords removal

The removal of these words helps us remove the trivial details and divert the focus onto the more important information. It also helps reduce the size of the dataset and helps us achieve efficient results.

### Lemmatization

Retain only root words (removing prefixes and suffixes of the word). Lemmatization in python can be done using NLTK (natural language processing toolkit) and spacy.

**Handling null values**

Handling the null values is important step before performing any analysis. One of the method to handle the null values would be removal of null ways.

**Calculating the compound score**

Sentiment analysis generally looks at a simple breakdown of positive, neutral, and negative scores. Each word, or collection of words, will have all three scores plus a compound score which is just a combination of individual scores to relay some aggregate measure.

Compound Score of Sentiment is calculated using Sentiment Intensity Analyzer from Vader Sentiment .

**Classifying the sentiment**

Based on Values of compound score , sentiment is obtained as negative, positive or neutral.

A negative compound score indicates that the sentiment is negative. Positive compound score indicates that the sentiment is positive. If the compound score is 0 then the sentiment is neutral.

**Sentiment Distribution**

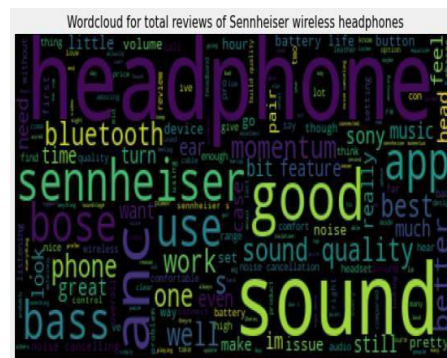
Sentiment distribution is obtained from the sentiment and for visualization

matplotlib is used. Based on sentiment distribution decision on whether or not to recommend the product is made.

**Results**

**Generate the word cloud**

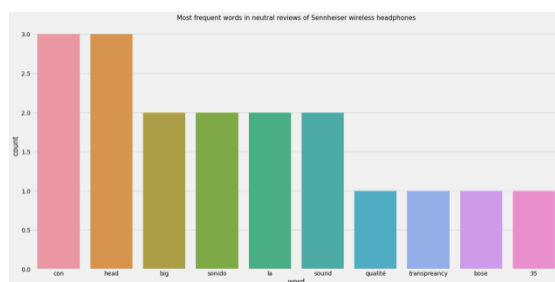
Word cloud: A word cloud is a form of visual representation. It involves grouping and clustering the words in multiple sizes, the most frequent words are usually bold and large in size. Text clouds involve frequency analysis, visual representation of words, font sizing etc. This helps in generating the most important words and emphasized contexts of a user review and are also known as text clouds or tag clouds. They also help in comparing two pieces of information and check the similarities. Using word cloud, generate word cloud for total reviews, positive reviews, negative reviews and neutral reviews.



**Fig 2.** Wordcloud for the reviews of a product



**Most frequently used words** Obtaining top 10 most frequently used words in total, positive, negative and neutral reviews. Initially we find the frequency of each word present in the cleaned data of review dataset. Then we represent the highest occurring 10 words with their count. This can be considered as the phrase which most of the users consider while purchasing the product. So, when a new customer wants to purchase the same product, the chances that he would



**Fig 3.** Frequency distribution of most frequently occurring words in the reviews

### Conclusions:

Products are recommended based on the sentiment distribution of reviews taken from the dataset. Data cleaning plays a major role in increasing the efficiency of results and avoiding unreliable outputs. The datasets considered for the analysis are imbalanced, so using the proper dataset where reviews are more distributed can produce all the outputs taken into consideration. Data visualization also plays a major role in customer

engagement since it gives better understanding to them. In this paper, we used product text review datasets which are obtained from Kaggle and applied sentiment analysis to make a decision on product recommendation.

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