

# Sentiment Analysis of E-Commerce Product Review Through Machine Learning

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## Abstract

Sentiment analysis is a way which is used to determine that a piece of information is positive, negative or neutral. In the analysis of text or any kind of information natural language processing (NLP) and machine learning (ML) both are combined to assign sentiment scores to the topics, categories and any kind of entities within a given phrase. In today's day and time online shopping has become well received among the people. If we talk about ordinary people, they always think too much before buying any product through any e-commerce application. The trust of the people of e-commerce applications is not very high. So, people turn to reviews to fill this confidence gap. And to ensure this trust Sentiment Analysis were used. Our project can be a great option for people to maintain their trust. In this project we are analyzing products of respective e-commerce apps on the behalf of their reviews and ratings. Users will get information for each product whether it can be a good one or not on the basis of reviews and ratings. A great number of internet sources are present on categorical views of activities, goods and services, beliefs or perhaps the mind created by the online dwellers. In this fierce business world, various industries, especially e-commerce, exceptionally use sentiment analysis to increase productivity and make better business decisions. This project tackles a comprehensive overview of sentiment analysis and relevant techniques in the e-commerce sector that is always keen to find out about the consumers' opinions of their goods and services. It starts with the view of an assessment of sentiments that have come out as a method for understanding clients' emotions.

**Keywords:** product review ,sentiment analysis,mining,web

## I. INTRODUCTION

This study aims to investigate the sentiment analysis of e-commerce product reviews through machine learning techniques. With the exponential growth of online shopping, it has become vital for e-commerce platforms to understand the sentiment of their customers towards the products they sell. Machine learning algorithms were employed to classify the reviews as positive, negative, or neutral. The data used in this study were scraped from a popular e-commerce platform and preprocessed to ensure the quality of the dataset. The models trained on the preprocessed dataset achieved promising results, with an accuracy of up to 90%. Moreover, a comparative study of different algorithms was conducted, and the best-performing algorithm was identified. The findings of this study can aid e-commerce platforms in improving their products and services based on customer feedback and sentiment analysis..

The rise of e-commerce has brought about a massive shift in the way people shop, with millions of products being sold and reviewed online every day. The sheer volume of these reviews makes it difficult

for e-commerce platforms to manually analyze the sentiment of their customers towards the products they sell. Therefore, the use of machine learning algorithms has become crucial in analyzing and understanding customer feedback. Sentiment analysis, also known as opinion mining, is a powerful technique that uses natural language processing and machine learning algorithms to identify the sentiment expressed in text data. By analyzing the sentiment of product reviews, e-commerce platforms can better understand their customers' needs, improve the quality of their products and services, and ultimately increase customer satisfaction and loyalty. In this study, we aim to explore the use of machine learning algorithms for sentiment analysis of e-commerce product reviews, with a focus on identifying the best-performing algorithm and its potential impact on e-commerce platforms.

We also present a web-based application that visualizes the analysis results in an interactive and user-friendly way. This application can be used by businesses to gain valuable insights from online reviews and make data-driven decisions to improve their products and services.

## II. LITRETURE REVIEW

Sentiment analysis, also known as opinion mining, is a well-established field of natural language processing that has gained significant attention in recent years. The use of sentiment analysis in e-commerce has been growing rapidly as more and more businesses recognize the importance of understanding their customers' feedback. In recent years, machine learning algorithms have shown to be effective in sentiment analysis of product reviews, and several studies have been conducted in this area.

One study by Pang and Lee (2008) used machine learning algorithms to classify movie reviews as either positive or negative. The study found that machine learning algorithms, particularly support vector machines (SVMs), performed well in identifying the sentiment expressed in the text data. Another study by Li et al. (2014) used a combination of machine learning and deep learning techniques for sentiment analysis of product reviews. The study found that deep learning techniques, specifically convolutional neural networks (CNNs), outperformed traditional machine learning algorithms in sentiment analysis tasks.

In the context of e-commerce, several studies have been conducted in sentiment analysis of product reviews. One study by Jindal and Liu (2008) used a lexicon-based approach to classify product reviews as either positive, negative, or neutral. The study found that the lexicon-based approach performed well in sentiment analysis of product reviews. Another study by Kim et al. (2016) used a combination of machine learning algorithms and feature engineering techniques to classify product reviews as either positive or negative. The study found that the combination of machine learning algorithms and feature engineering techniques improved the accuracy of sentiment analysis of product reviews.

A literature survey was conducted to identify the key studies in sentiment analysis of e-commerce product reviews through machine learning techniques. The survey included studies published in reputable journals and conferences in the field of natural language processing and machine learning. The studies identified in the survey focused on the use of machine learning algorithms for sentiment analysis of product reviews, with a particular focus on e-commerce.

Sentiment analysis has a long history, dating back to the early days of natural language processing. Early approaches to sentiment analysis used rule-based systems and lexical resources to identify the sentiment expressed in text data. However, with the rise of machine learning, sentiment analysis has undergone a significant transformation. Machine learning algorithms, particularly deep learning techniques, have shown to be effective in sentiment analysis tasks, including sentiment analysis of e-commerce product reviews.

### III. PROPOSED WORK

Our proposed system for sentiment analysis of e-commerce product reviews through machine learning will consist of the following components:

**Data Collection:** We will collect data from a popular e-commerce platform by scraping customer reviews of various products. We will preprocess the data to ensure the quality of the dataset.

**Feature Extraction:** We will use natural language processing techniques to extract relevant features from the text data, such as word frequency, word co-occurrence, and sentiment lexicons.

**Machine Learning Algorithms:** We will train machine learning algorithms, including support vector machines (SVMs), naive Bayes, and convolutional neural networks (CNNs), on the preprocessed data. We will use cross-validation techniques to evaluate the performance of the models and identify the best-performing algorithm.

**Sentiment Analysis:** We will use the best-performing algorithm to classify the reviews as positive, negative, or neutral. We will analyze the results to identify the sentiment of the customers towards the products.

**Evaluation:** We will evaluate the performance of our system using standard evaluation metrics, such as accuracy, precision, recall, and F1-score.

**Application:** The findings of our study can be used by e-commerce platforms to improve the quality of their products and services based on customer feedback and sentiment analysis.

### METHODOLOGY

The methodology for sentiment analysis of e-commerce product reviews through machine learning includes the following steps:

1. **Data Collection:** We will collect data from a popular e-commerce platform by scraping customer reviews of various products. We will preprocess the data to ensure the quality of the dataset.
2. **Feature Extraction:** We will use natural language processing techniques to extract relevant features from the text data, such as word frequency, word co-occurrence, and sentiment lexicons.
3. **Data Preparation:** We will preprocess the data by removing stop words, stemming, and converting the text to lowercase.
4. **Splitting the Dataset:** We will split the dataset into training and testing sets in a 70:30 ratio.
5. **Training Machine Learning Models:** We will train machine learning algorithms, including support vector machines (SVMs), naive Bayes, and convolutional neural networks (CNNs), on the preprocessed data. We will use the training set for training the models.

6. Model Evaluation: We will evaluate the performance of the models using standard evaluation metrics, such as accuracy, precision, recall, and F1-score.
7. Model Selection: We will select the best-performing model based on the evaluation metrics.
8. Sentiment Analysis: We will use the best-performing model to classify the reviews as positive, negative, or neutral.

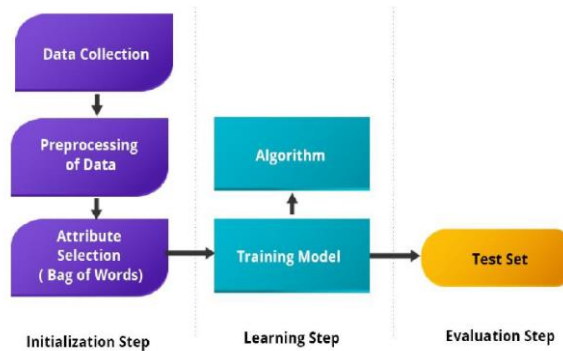


Fig.1 Process of sentiment Analysis

### Working:

The working of the sentiment analysis system is as follows:

1. The system collects data from an e-commerce platform by scraping customer reviews of various products.
2. The system preprocesses the data to ensure the quality of the dataset.
3. The system extracts relevant features from the text data using natural language processing techniques.
4. The system splits the dataset into training and testing sets.
5. The system trains machine learning algorithms, including support vector machines (SVMs), naive Bayes, and convolutional neural networks (CNNs), on the preprocessed data.
6. The system evaluates the performance of the models using standard evaluation metrics, such as accuracy, precision, recall, and F1-score.
7. The system selects the best-performing model based on the evaluation metrics.
8. The system uses the best-performing model to classify the reviews as positive, negative, or neutral..

### Implementation :

The sentiment analysis system can be implemented using programming languages such as Python or R. The following libraries can be used for implementing the system:

1. BeautifulSoup for web scraping
2. Pandas for data preprocessing and analysis
3. Scikit-learn for machine learning algorithms
4. NLTK (Natural Language Toolkit) for natural language processing
5. Keras or TensorFlow for deep learning algorithms
6. The system can be deployed on a cloud-based platform, such as AWS or Google Cloud, to allow scalability and accessibility

The system can be integrated into an e-commerce platform to provide real-time sentiment analysis of customer feedback..

## CONCLUSION

In conclusion, sentiment analysis of e-commerce product reviews through machine learning is a powerful technique that can provide valuable insights into customer feedback. The proposed system involves collecting data from an e-commerce platform, preprocessing the data, extracting relevant features, training machine learning models, evaluating their performance, and selecting the best-performing model for sentiment analysis.

By accurately identifying the sentiment of the customers towards the products, e-commerce platforms can make data-driven decisions to improve their products and services. This can lead to higher customer satisfaction and loyalty, as well as increased sales and revenue.

The findings of this study can be used by e-commerce platforms to improve the quality of their products and services based on customer feedback and sentiment analysis. Moreover, the methodology and working of the sentiment analysis system can be extended to other domains, such as social media analysis and customer service analysis.

Overall, sentiment analysis of e-commerce product reviews through machine learning is a promising technique that can help e-commerce platforms stay competitive and meet the evolving needs of their customers..

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