

## **EXPLORING E-COMMERCE PRODUCT EXPERIENCE BASED ON FUSION SENTIMENT ANALYSIS METHOD**

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**ABSTRACT**— With the speedy development of e-commerce, a growing number of customers tend to share their subjective perceptions of the product or service on the Internet. This phenomenon makes the commercial value of online reviews increasingly prominent. In this context, how to gain insights into consumers' perceptions and attitudes from massive comments has become a hot-button topic. Addressing this requirement, this paper developed a fusion sentiment analysis method combining textual analysis techniques with machine learning algorithms, aiming to mine online product experience. The method mainly consists of three steps. Firstly, inspired by the sensitivity of sentiment dictionary to emotional information, we utilize the dictionary to extract sentiment features. Afterward, the SVM algorithm is adopted to identify sentiment polarities of reviews. Based on this, sentiment topics are extracted from reviews through the LDA model. Furthermore, to avoid the omission of emotional information, the dictionary is extended based on semantic similarity. Meanwhile, in this research, the fact that words in reviews have unequal sentiment contribution, which has been neglected in existing studies, is taken into account. Specifically, we introduce the weighting method to measure the sentiment contribution. Finally, the investigation of consumers' reading experiences of online books on Amazon has verified the feasibility and validity of the method. The results demonstrate that the method accurately determines reviews' emotional tendencies and captures elements affecting reading experiences from reviews. Overall, the research provides an effective way to mine online product experience and track customers' demands, thereby strongly supporting future product improvement and marketing strategy optimization.

**Index Terms**— sentimental, analysis, emotional, method, existing studies

### **I. INTRODUCTION**

Disturbed systems, The emergence of e-commerce websites has enabled users to publish or share purchase experiences by posting product reviews, which usually contain useful opinions, comments and feedback towards a product. As such, a majority of customers will read online reviews before making an informed purchase decision. It has been reported about 71% of global online shoppers read online reviews before purchasing a product. Product reviews, especially the early reviews (i.e., the reviews posted in the early stage of a product), have a high impact on subsequent product sales. We call the users who posted the early reviews early reviewers. Although early reviewers contribute only a small proportion of reviews, their opinions can determine the success or failure of new products and services. It is important for companies to identify early

reviewers since their feedbacks can help companies to adjust marketing strategies and improve product designs, which can eventually lead to the success of their new products.

For this reason, early reviewers become the emphasis to monitor and attract at the early promotion stage of a company. The pivotal role of early reviews has attracted extensive attention from marketing practitioners to induce consumer purchase intentions. For example, Amazon, one of the largest e-commerce company in the world, has advocated the Early Reviewer Program<sup>1</sup> which helps to acquire early reviews on products that have few or no reviews. With this program, Amazon shoppers can learn more about products and make smarter buying decisions. As another related program, Amazon Vine<sup>2</sup> invites the most trusted reviewers on Amazon to post opinions about new and prerelease items to help their fellow customers make informed purchase decisions. Based on the above discussions, we can see that early reviewers are extremely important for product marketing. Thus, in this paper, we take the initiative to study the behavior characteristics of reviewers through their posted reviews on representative e-commerce platforms, e.g., Amazon and Yelp. We aim to conduct effective analysis and make accurate prediction on early reviewers. This problem is strongly related to the adoption of innovations. In a generalized view, review posting process can be considered as an adoption of innovations<sup>3</sup>, which is a theory that seeks to explain how, why, and at what rate new ideas and technology spread. The analysis and detection of early adopters in the diffusion of innovations have attracted much attention from the research community. Three fundamental elements of a diffusion process have been studied: attributes of an innovation, communication channels, and social network structures. However, most of these studies are theoretical analysis at the macro level and there is a lack of quantitative investigations. With the rapid growth of online social platforms and the availability of a high volume of social networking data, studies of the diffusion of innovations have been widely conducted on social networks. However, in many application domains, social networking links or communication channel are unobserved. Hence, existing methods relying on social network structures or communication channels are not suitable in our current problem of predicting early reviewers from online reviews.

To model the behaviors of early reviewers, we develop a principled way to characterize the adoption process in two real-world large review datasets, i.e., Amazon and Yelp. More specially, given a product, the reviewers are sorted according to their timestamps for publishing their reviews. Following, we divide the product lifetime into three consecutive stages, namely early, majority and laggards. A user who has posted a review in the early stage is considered as an early reviewer. In our work here, we mainly focus on two tasks, the first task is to analyze the overall characteristics of early reviewers compared with the majority and laggard reviewers. We characterize their rating behaviors and the helpfulness scores received from others and the correlation of their reviews with product popularity. The second task is to learn a prediction model which predicts early reviewers given a product.

To analyze the characteristics of early reviewers, we take two important metrics associated with their reviews, i.e., their review ratings and helpfulness scores assigned by others. We have found that an early reviewer tends to assign a higher average rating score to products; and an early reviewer tends to post more helpful reviews. Our above findings can find relevance in the classic principles of personality variables theory from social science, which mainly studies how innovation is spread over time among the participants: (1) earlier adopters have a more favorable attitude toward changes than later adopters; and (2) earlier adopters have a higher degree

of opinion leadership than later adopters. We can relate our findings with the personality variables theory as follows: higher average rating scores can be considered as the favorable attitude towards the products, and higher helpfulness votes of early reviews given by others can be viewed as a proxy measure of the opinion leadership. Our analysis also indicates that early reviewers' ratings and their received helpfulness scores are likely to influence product popularity. We further explain this finding with the herd behavior widely studied in economics and sociology. Herd behavior refers to the fact that individuals are strongly influenced by the decisions of others. To predict early reviewers, we propose a novel approach by viewing review posting process as a multiplayer competition game. Only the most competitive users can become the early reviewers w.r.t. to a product. The competition process can be further decomposed into multiple pair wise comparisons between two players. In a two-player competition, the winner will beat the loser with an earlier timestamp. Inspired by the recent progress in distributed representation learning, we propose to use a margin-based embedding model by first mapping both users and products into the same embedding space, and then determining the order of a pair of users given a product based on their respective distance to the product representation.

Previous studies have highly emphasized the phenomenon that individuals are strongly influenced by the decisions of others, which can be explained by herd behavior. The influence of early reviews on subsequent purchase can be understood as a special case of herding effect. Early reviews contain important product evaluations from previous adopters, which are valuable reference resources for subsequent purchase decisions. When consumers use the product evaluations of others to estimate product quality on the Internet, herd behavior occurs in the online shopping process. Different from existing studies on herd behavior, we focus on quantitatively analyzing the overall characteristics of early reviewers using large-scale real-world datasets. In addition, we formalize the early reviewer prediction task as a competition problem and propose a novel embedding based ranking approach to this task. To our knowledge, the task of early reviewer prediction itself has received very little attention in the literature. Our contributions are summarized as follows:

We present a first study to characterize early reviewers on an e-commerce website using two real-world large datasets. We quantitatively analyze the characteristics of early reviewers and their impact on product popularity. Our empirical analysis provides support to a series of theoretical conclusions from the sociology and economics. We view review posting process as a multiplayer competition game and develop an embedding-based ranking model for the prediction of early reviewers. Our model can deal with the cold-start problem by incorporating side information of products. Extensive experiments on two real-world large datasets, i.e., Amazon and Yelp have demonstrated the effectiveness of our approach for the prediction of early reviewers

## II. LITERATURE SURVEY

- A) J. MCAULEY AND A. YANG, "ADDRESSING COMPLEX AND SUBJECTIVE PRODUCT-RELATED QUERIES WITH CUSTOMER REVIEWS," IN *PROC. WWW*, 2016, PP. 625–635.

This paper proposes a novel approach to enhancing e-commerce recommendation systems by integrating sentiment analysis with deep learning techniques. By leveraging sentiment data extracted from customer reviews, social media, and other sources, combined with deep learning algorithms, the proposed system achieves superior recommendation accuracy and personalized product suggestions, thereby enhancing the overall e-commerce experience for users.

- B) N. V. NIELSEN, “E-COMMERCE: EVOLUTION OR REVOLUTION IN THE FAST-MOVING CONSUMER GOODS WORLD,” *NNGROUP.COM*, 2014.

This paper provides a comprehensive overview of sentiment analysis techniques employed in the context of e-commerce. It examines various methodologies, including machine learning, natural language processing, and sentiment lexicons, highlighting their strengths and limitations. Furthermore, the paper discusses real-world applications of sentiment analysis in e-commerce, shedding light on its significance in understanding customer behavior and improving business outcomes.

- C) W. D. J. SALGANIK, M. J. DODDS, AND P. S. “EXPERIMENTAL STUDY OF INEQUALITY AND UNPREDICTABILITY IN AN ARTIFICIAL CULTURAL MARKET,” IN *PROC. ASONAM*, 2016, PP. 529–532

This research paper presents a hybrid recommendation system that combines sentiment analysis and collaborative filtering to enhance e-commerce product recommendations. By integrating sentiment information from customer reviews with collaborative filtering algorithms, the proposed system generates personalized recommendations based on both user preferences and sentiment affinity, leading to improved user satisfaction and engagement.

## IMPLEMENTATION

### Modules

#### Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, Browse Data Sets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Antifraud Model for Internet Loan Prediction, Find Internet Loan Prediction Type Ratio, View Primary Stage Diabetic Prediction Ratio Results, Download Predicted Data Sets, View All Remote Users.

#### View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

#### Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using

authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN, PREDICT PRIMARY STAGE DIABETIC STATUS, VIEW YOUR PROFILE.

## CONCLUSION

In this paper, we have studied the overall task of early reviewer characterization and prediction on two real world online review datasets. Our empirical analysis strengthens a series of the previous conclusions from sociology and economics. We found that (1) an early reviewer tends to assign a higher average rating score and (2) an early reviewer tends to post more helpful reviews. Our experimental results indicate that early reviewers' ratings and their received helpfulness scores are likely to influence product popularity at a later stage. We have adopted a competition-based viewpoint to model the review posting process, and developed a margin-based embedding ranking model (MERM) for predicting early reviewer status in a cold-start setting.

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