Product Comments Affection Evaluation Model in Recommender System

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Abstract. Product comments is essential for the recommender platforms and assist to estimate the level of affection or sentiment expressed in customer comments for a certain product. However, existing research only concerns the single evaluation indicator volume of sales and ignore other parameters including product prices, group of buyers and the sale period. In this article, we propose a novel evaluation model to systematically estimate the products comments for recommender system and provide the certain recommend sequences by utilizing the neural networks to distinguish positive and negative comments. Subsequently, the evaluation model concerns other related evaluation parameters by utilizing the analytic hierarchy process. Proposed model can assist businesses to better understand customer opinions and preferences, and improve the customer experience. From our extensive experimental results, we can conclude that our designed mechanism can achieve approximately 82% recommend accuracy, with reasonable communication cost, which is much higher than existing evaluation model.

Keywords: Product comments · Recommender system · Evaluation model · Neural network · Analytic hierarchy process

1 Introduction

Product comments affection evaluation is the process of determining the sentiment or emotion behind a customer's feedback about a product. This information can be useful for businesses to gain insights into how customers feel about their products and make improvements [1]. A product comments affection evaluation model uses artificial intelligence and natural language processing techniques to analyze customer comments and categorize them into positive, negative, or neutral sentiments [2]. This model can provide businesses with a comprehensive understanding of customer opinions and help them make data-driven decisions to improve customer satisfaction and increase sales.

Recommender systems are becoming increasingly popular in e-commerce and online shopping platforms [3]. Their main goal is to provide customers with personalized recommendations for products they may be interested in based on their purchase history, demographic information, and other factors. However, these traditional approaches can have limitations and may not always provide the most relevant recommendations for

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customers [4]. The product comments affection evaluation model is a novel approach to recommendation systems that takes into account the sentiments expressed by customers in their comments about a product [5]. This model uses natural language processing techniques to analyze customer comments and categorize them into positive, neutral, or negative sentiments. By considering the affection or sentiment expressed in customer comments [6], the model can provide a more personalized recommendation experience for customers [7].

Recommender systems analyze patterns in user behavior, item attributes, and other data sources to understand the user's interests and suggest items that are most likely to be of interest to them [8]. The recommendations can be based on user-item interactions such as purchase history, rating history, or item similarity [9].

The goal of a recommender system is to provide relevant and valuable recommendations to users, improving their experience and increasing engagement with the platform [10]. Therefore, the evaluation of comments for system is essential to improve the recommend quality and enhance the accuracy of system.

However, existing research ignore the other related parameters in recommender system when evaluating the user comments. In this article, we propose a novel evaluation model to systematically measure the comments affection by utilizing the mathematical and neural networks. The remainder structure of this paper is consisted by four sections including a preliminaries introduction, model framework, experimental results, conclusion and future improvement methods.

2 Preliminaries

In this section, we illustrate the primary symbols and corresponding explanation that used in this article. Following Table 1 demonstrates the detail information about primary symbols. Subsequently, we introduce the used methods including neural network and analytic hierarchy process.

Neural network is a type of machine learning algorithm modeled after the structure and function of the human brain. It is designed to recognize patterns and make predictions based on input data. Neural networks consist of layers of interconnected nodes, called

Table 1. Primary symbols and descriptions

Symbols	Description
{C,P}	Pairs set of comment and product information
Nc	Neural cells of network
Po	Positive comments
Ne	Negative comments
W	Weighted values
εi	Hierarchy levels
R	Evaluation results

artificial neurons, which process and transmit information. The neural network is utilized to distinguish the positive and negative comments in this proposed method.

Each neuron receives input from other neurons, performs a computation on that input, and then passes the result on to other neurons in the next layer. By adjusting the strengths of the connections between neurons, a neural network can be trained to recognize patterns and make predictions on new data.

The analytic hierarchy process is a decision-making tool used to evaluate complex problems and prioritize alternatives based on multiple criteria. Analytic hierarchy process is a structured approach to decision-making that helps individuals and organizations make informed decisions by considering all relevant factors.

Analytic hierarchy process involves breaking down a complex problem into smaller, more manageable parts and then evaluating each part based on a set of criteria. The criteria are then ranked in order of importance [11], and the alternatives are evaluated based on their impact on each criterion. This process helps to ensure that all relevant factors are considered and weighted appropriately, leading to more effective and efficient decision-making.

3 System Framework Preliminaries

In this section, we demonstrate the general framework of structure of proposed evaluation model in following Fig. 1. Product comments affection evaluation can play a crucial role in recommender systems as it provides valuable insights into customer opinions and preferences. The following is a general method for incorporating product comments affection evaluation into a recommender system. The whole structure is consisted by data collection component, sentiment analysis part, recommendation engine and evaluation results.

Data collection component is to gather product comments and feedback from customers. This data can be obtained from online product reviews, customer surveys, or other sources. The collected data must be pre-processed to remove any irrelevant information, such as stop words and punctuation, and to standardize the data for analysis.

Sentiment analysis means the pre-processed data must then be analyzed to determine the sentiment behind each comment. This can be done using neural network with positive and negative neural cells, which is demonstrating in above Fig. 1.

Recommendation Engine: The sentiment analysis results can then be incorporated into the recommender system. Specifically, the system can recommend products that have received high ratings and positive comments to users, increasing the likelihood of them making a purchase.

Evaluation results is the effectiveness of the product comments affection evaluation model can be evaluated using various metrics, such as precision, recall and F1 score.

By incorporating product comments affection evaluation into a recommender system, organizations can gain valuable insights into customer opinions and preferences, allowing them to make informed decisions and improve customer satisfaction.

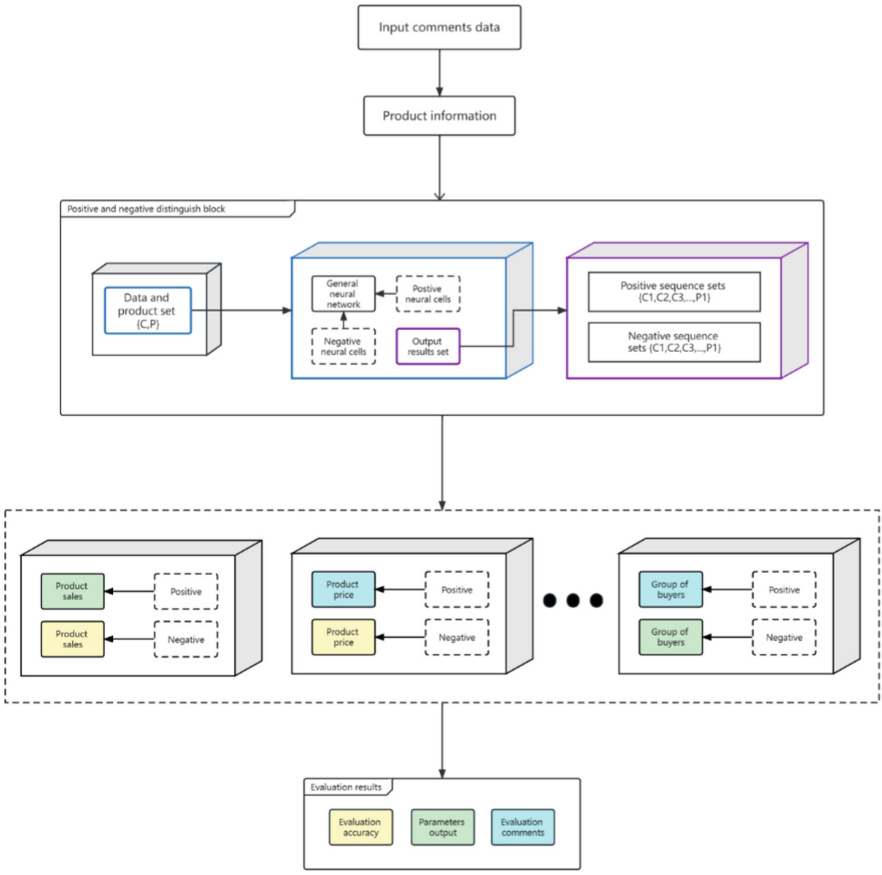

Fig. 1. System framework of proposed model.

4 Experimental Results and Analysis

In this section, we demonstrate the detail dataset that used in experimental process and illustrate the results of evaluation, which is compared with existing evaluation models.

4.1 Dataset Introduction

We utilize the Amazon product reviews as the input dataset, the dataset is a large, publicly available dataset that contains over 140 million customer reviews of products sold on Amazon. The dataset includes reviews for a wide range of products, including books, electronics, clothing, and more, and covers a variety of product categories. Each review includes information such as the customer's rating of the product, the date the review was written, and the text of the review itself.

Amazon product reviews dataset provides a rich source of customer feedback on products and can be used for various applications, including product comments affection

evaluation in a recommender system. By analyzing the sentiment expressed in customer reviews, a recommender system can better understand customer opinions and preferences and make more accurate and personalized product recommendations.

In addition to sentiment analysis, the Amazon Product Reviews dataset can be used for various other purposes, including product recommendation, opinion mining, and market research. The dataset's size and the variety of products represented make it a valuable resource for researchers and data scientists alike.

4.2 Evaluation Results

We load our model with different values of comments and simulate the three products including books, drinks and cloths to evaluate the recommend accuracy. Following Fig. 2 demonstrates the detail simulation results.

In addition, we compare our proposed model with baseline and existing evaluation model MAP. The baseline is without sentiment analysis to determine the impact of sentiment analysis on recommendations. Mean Average Precision (MAP) is metric measures the average precision across all users and all recommended items, taking into account both the ranking of recommended items and the relevance of the items to the user. Figure 3 demonstrates the comparison results.

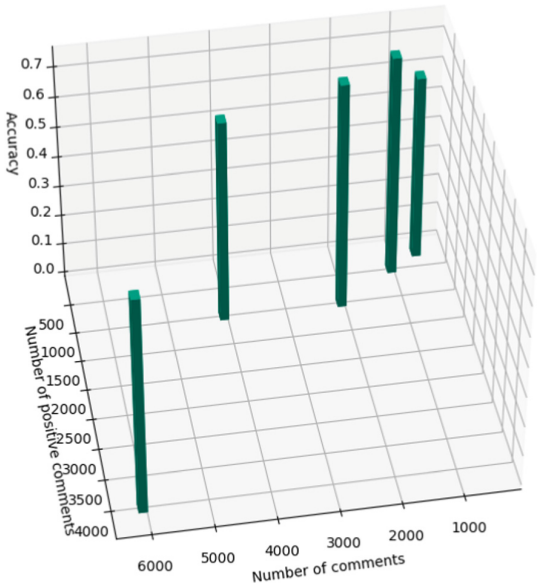

Fig. 2. Evaluation accuracy with different conditions.

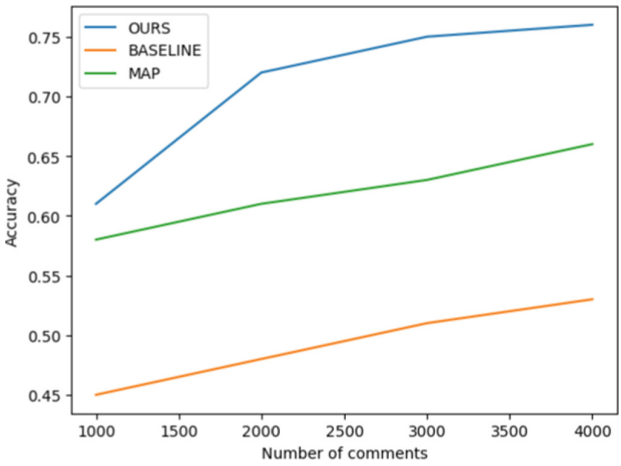

Fig. 3. Comparison results.

5 Conclusion and Future Improvement

In conclusion, incorporating product comments affection evaluation into a recommender system can provide valuable insights into customer opinions and preferences, helping organizations to make informed decisions and improve customer satisfaction. By analyzing customer feedback, a recommender system can better understand customer preferences and make more accurate product recommendations, leading to increased customer engagement and sales. However, it is important to ensure that the sentiment analysis algorithm used in the product comments affection evaluation model is accurate and reliable. Inaccurate sentiment analysis can result in incorrect recommendations and negatively impact customer satisfaction. Additionally, the model should be regularly evaluated and updated to ensure that it continues to accurately reflect customer preferences and opinions.

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