

Introduction

E-commerce has become a platform that facilitates interaction between sellers and buyers. With the rapid growth of technology, people from all walks of life can easily conduct sales transactions. According to research conducted by CupoNation, Tokopedia is the most visited e-commerce platform in Indonesia [6]. Tokopedia offers a variety of products accompanied by user reviews. Customer reviews offer advantages to both potential consumers and platform stakeholders. They enable buyers to gain deeper insights into the products offered within the marketplace. For the marketplace, these reviews serve as feedback to improve the quality of the marketplace [7].

The development of e-commerce platforms is inseparable from consumer opinions about positive, negative, or neutral reviews. Analyzing review sentiment on Google Play Store is one way to monitor customer opinions about e-commerce platforms [8]. Sentiment analysis is used to determine whether users' opinions are positive, negative, or neutral [9]. However, conventional sentiment analysis has limitations in identifying detailed sentiments focused on specific aspects of concern to consumers, such as service, quality, or the price of a product offered. For example, research discussing sentiment analysis on user reviews using conventional algorithms such as Random Forest [6] can only provide an overall assessment without considering the diversity of aspects in the reviews. User reviews often cover various aspects with different sentiments for each aspect. Therefore, aspect-based sentiment analysis (ABSA) techniques are needed to evaluate sentiment in detail.

The CNN model is one of the deep learning methods suitable for aspect-based sentiment analysis. For example, in studies using CNN [2], [3], and [4], high accuracy was achieved compared to other models. However, the authors provide several recommendations for improvement for future research. Study [2] achieved an accuracy rate of 85.54%, but it only used Word2Vec for feature representation, so user comments were not fully represented. Study [3] showed that CNN was the best model compared to GRU and TCN models, achieving an accuracy rate of 97.56%. However, the model still struggled to distinguish between aspects with similarities. In Study [4], the CNN model achieved an accuracy of 98.29% in aspect classification, outperforming the BiLSTM model when analyzing sentiment based on aspects in reviews of tourist attractions in Asian countries with three aspects, mosques, halal food, and toilets. BERT was chosen as the word embedding model because this Transformer model is suitable for text classification tasks and is a modern model for ABSA [16]. For example, studies [1] and [5] demonstrate BERT's suitability for combination with deep learning models like CNN. Study [5] outperforms other word embeddings when analyzing a dataset from restaurant reviews. And study [1] shows BERT's ability to analyze sentiment and assess polarity toward its aspects, achieving an accuracy of 82.32%.

In this experiment, the BERT-CNN method will be used to analyze user reviews of the Tokopedia app on Google Play, focusing on three important aspects: service (customer service responsiveness, seller, and delivery time), quality (app performance), and price (promotions or discounts). The main objective of this paper is to assess the effectiveness of the BERT-CNN model combination in aspect detection and aspect-based sentiment classification tasks. The research results are expected to further demonstrate the BERT-CNN model's capability in performing aspect-based sentiment analysis tasks.