

# CHAPTER 1

## INTRODUCTION

People like to use various beauty products, and society sees a high demand for them. Consequently, more and more products are being manufactured and launched. A forum is created to discuss beauty products, where many reviews are posted daily and require analysis. To analyze reviews automatically necessitates sentiment analysis. Therefore, this research performs aspect extraction in Indonesian beauty product reviews using pre-trained language models, namely IndoBERT and mBERT.

### 1.1 Rationale

Based on data from the Coordinating Minister for the Economy, the number of beauty industries in Indonesia increased from 913 in 2022 to 1,010 by mid-2023, indicating a growth of 21.9% [1]. This is due to the increasing trend of people's needs and interests in beauty and skincare products. This increase leads to a large number of skincare and beauty products in the market today. Female Daily is a forum discussing beauty products; and it is the first beauty review platform in Indonesia.

Every day, many internet users give reviews on several products, so the number of reviews ranges from hundreds to thousands and contains various opinions. With the increasing use of beauty products, the provision of reviews by the public for beauty products is also growing rapidly. Based on data from Brightotal in Consumer Review 2019, 82% of respondents delay transactions if there is a negative review, and 84% trust the review [2]. Manually helping consumers get useful information from a large number of reviews is an impossible task. For this purpose, sentiment analysis (SA) is needed to analyze reviews automatically.

There are three levels of sentiment analysis (i.e. document, sentence, aspect level). However, SA on the aspect level can provide more specific information because it can classify each aspect into positive and negative classes. This makes producers or consumers consider the product according to the required aspects. There are three steps in aspect-based sentiment analysis: extracting aspects and opinions or features, identifying sentiments, and summarizing the results [3]. This study only considers aspect extraction. One way to

conceptualize aspect extraction is as a sequential labeling task, where each input token is given a label. The labels take on values from the set {B, I, O} (Beginning, Inside, Outside), which stand for the beginning of the aspect term, the inside of the aspect word, and the non-aspect tokens, respectively [4].

Many studies deal with aspect extraction using deep learning, especially in Indonesian [5] [6] [7] [8]. Although the performance is superior, deep learning requires one hundred thousand to a million labeled data for the training process. However, obtaining those data is challenging, especially in Indonesian [4]. To overcome the problem of those large training data, transfer learning is applied.

There is a previous study on aspect extraction conducted by Yanuar et al. with Indonesian Tourist Spot Review using multilingual BERT, because, at that time, there was no pre-trained model in Indonesia, and it achieved a 73.8% F1-score [9]. Currently, pre-trained language models specifically for Indonesians are available, namely IndoBERT from IndoNLU. IndoBERT models from IndoNLU outperform fastText, XLM-R, XLM-MLM, and mBERT on 8 out of 12 tasks [10]. A previous study on aspect category detection in Vietnamese demonstrates that the monolingual model PhoBERT outperforms multilingual models with an F1-score of 86.53% and 79.16%. This finding highlights the advantage of monolingual models trained on language-specific corpora, making them more effective for tasks in their respective languages compared to multilingual models [11]. The reason for using a monolingual pre-trained model is that reviews are generated from Indonesian users, and the platform environment is Indonesian [12].

The contributions of this research are outlined as follows:

- This study addresses the absence of labeled datasets in the field by manually annotating a dataset of beauty product reviews using the BIO (Beginning, Inside, Outside) scheme.
- The research proposes an aspect extraction system designed explicitly for Indonesian beauty product reviews, utilizing advanced pre-trained language models, namely mBERT and IndoBERT.

## 1.2 Statement of the Problem

With the increase of online beauty product reviews in Indonesia, there is a growing need to identify key aspects for manufacturers. Information from aspect-based sentiment analysis on beauty products is essential for manufacturers to improve product quality, adjust marketing strategies, and design product innovations that better suit customer needs and preferences. While there have been several studies on beauty product reviews in Indonesian [13] [14] [15] [16] [17], there remains a limited focus on aspect extraction using advanced pre-trained language models like IndoBERT and mBERT. This creates a gap in fully leveraging sentiment analysis to address the needs of manufacturers in improving product quality and customer satisfaction. This study uses IndoBERT and mBERT to extract aspects from Indonesian beauty product reviews to address the problem. The research question is: How do IndoBERT and mBERT perform in extracting key aspects (such as price, packaging, and texture) from Indonesian beauty product reviews, and what are the differences in their performances measured by the F1-score?

## 1.3 Objective and Hypothesis

The purpose of this research is to propose aspect extraction on Indonesian beauty product reviews using mBERT and IndoBERT.

This research hypothesizes that when using IndoBERT, its performance is better because in [10] [13] experiments conclude that IndoBERT outperforms in almost all tasks and using pre-trained monolinguals can give better results as in the study of [11] [19].

## 1.4 Scope and Delimitation

The scope is only to focus on examining one of the stages in aspect-based sentiment analysis, namely aspect extraction. The limitation of this study is that the data used comes from beauty product reviews on the Female Daily site. The dataset contains 13,130 reviews with 9 product categories and three aspects (price, packaging, and texture). Then, the pre-trained language model used is IndoBERT and mBERT.

## **1.5 Importance of the Study**

The results of this research can help both manufacturers and consumers of beauty products. Manufacturers can identify the strengths and weaknesses of each aspect of the products they market, allowing them to improve product quality and better meet customer needs. Conversely, consumers can more easily analyze reviews and make informed decisions about which products to buy based on specific aspects. Additionally, this research can assist other researchers in exploring aspect extraction, particularly in Indonesian, and in utilizing the BERT model further for similar tasks.