



Analyzing User Sentiment Toward the Stimuler AI: English Fluency Application Through Google Play Store Reviews

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Abstract

This study aims to analyze user sentiment toward the Stimuler AI: English Fluency application based on reviews collected from the Google Play Store using the IndoBERT model. The increasing popularity of AI-based language learning applications has generated numerous user reviews containing opinions, experiences, and complaints. Therefore, sentiment analysis is needed to understand user perceptions and evaluate application quality efficiently. This research employed a quantitative approach using sentiment analysis techniques. User reviews were collected through web scraping using Python and the google-play-scraper library. A total of 3,640 reviews were initially collected, and after language filtering, 1,653 Indonesian-language reviews were selected as the final dataset. The preprocessing stages included case folding, cleaning, stopword removal, and slang normalization. Exploratory data analysis and topic analysis were also conducted to identify dominant sentiment patterns and user concerns. The sentiment classification process utilized the IndoBERT model with three sentiment classes: positive, neutral, and negative. The results showed that positive sentiment dominated the dataset, indicating that most users were satisfied with the application's learning features and speaking practice capabilities. Meanwhile, the main negative issues included bugs, subscription problems, and voice detection issues. Furthermore, the IndoBERT model achieved an accuracy score of 90.57% and an F1-score of 89.01%, indicating effective performance in classifying Indonesian-language application reviews.

Keywords: Sentiment Analysis, IndoBERT, Google Play Store Reviews, AI Learning Application, Stimuler AI

1. Introduction

The rapid development of artificial intelligence (AI) technology has significantly transformed various sectors, including education and language learning applications (Tang & Zhang, 2026). AI-based applications are increasingly utilized to support interactive and personalized learning experiences, particularly in English language acquisition (Xu, 2024). One of the applications currently attracting public attention is Stimuler AI: English Fluency, an AI-powered platform designed to improve users' English-speaking skills through conversational practice, pronunciation evaluation, and interactive learning features (Du & Daniel, 2024). The increasing popularity of this application is reflected in the large number of downloads and user reviews available on the Google Play Store.

User reviews on digital platforms have become an important source of information for evaluating application quality and user satisfaction (Simarmata, 2025). Reviews generally contain opinions, experiences, complaints, and suggestions that reflect users' perceptions of the application (Amrullah et al., 2026). However, the large volume of reviews makes manual analysis difficult and time-consuming. Therefore, sentiment analysis is widely used to automatically classify user opinions into positive, neutral, and negative sentiments using computational approaches and natural language processing techniques (Lee & T. N. Nguyen, 2023).

Several previous studies have applied sentiment analysis to analyze user reviews on mobile applications and digital platforms. Methods such as Naïve Bayes, Support Vector Machine (SVM), and lexicon-based approaches are commonly used in sentiment classification research (Kustiyahningsih & Permana, 2024). Along with the development of natural language processing, transformer-based models such as IndoBERT have recently gained attention because they are able to better understand the context of Indonesian-language text, including informal expressions, slang, and abbreviations commonly found in user reviews (Setiawan et al., 2025).

Recently, transformer-based models have become increasingly popular in sentiment analysis research because they can better understand the context of text data. One of the models frequently used in Indonesian natural language processing is IndoBERT, which was specifically developed for Indonesian-language text. Several previous studies

showed that IndoBERT achieved good performance in sentiment classification tasks, especially for Indonesian reviews containing informal language and slang expressions (Reynald Manoppo, 2025).

Despite the growing number of sentiment analysis studies, research focusing on AI-based English learning applications remains relatively limited, particularly studies examining user reviews of the Stimuler AI: English Fluency application (Jantakoon et al., 2025). Previous sentiment analysis studies have examined user reviews from various digital platforms such as e-commerce applications, social media, movie reviews, and financial technology services. Along with the growing popularity of AI-based learning applications, analyzing user reviews can provide useful insights into user experiences, application performance, and user satisfaction toward English learning applications (Marliana et al., 2024).

Based on these conditions, this study aims to analyze user sentiment toward the Stimuler AI: English Fluency application using the IndoBERT model. This study also explores the dominant positive and negative topics discussed by users through exploratory data analysis and topic analysis techniques. The novelty of this research lies in the integration of exploratory analysis, topic analysis, and transformer-based sentiment classification using IndoBERT on reviews of an AI-powered English learning application. Furthermore, this study contributes to providing insights for developers regarding user satisfaction, application performance, and aspects requiring improvement based on user-generated reviews from the Google Play Store.

2. Method

This study employed a quantitative approach using sentiment analysis techniques to analyze user reviews of the Stimuler AI: English Fluency application obtained from the Google Play Store (Dermawan et al., 2026). The research stages consisted of data collection, data preparation, exploratory data analysis, topic analysis, sentiment classification using IndoBERT, and model evaluation (Jati et al., 2026).

The data collection process was conducted on May 16, 2026 by scraping user reviews from the Google Play Store using Python and the google-play-scraper library. Initially, 3,640 user reviews were collected from the application. Afterward, language filtering was applied to select only Indonesian-language reviews using the langdetect library. As a result, 1,653 Indonesian reviews were used as the final dataset in this study.

The collected reviews underwent several preprocessing stages to improve text quality before the classification process. The preprocessing techniques included case folding, cleaning, tokenization, stopword removal, and slang normalization. Case folding was performed by converting all text into lowercase letters. Cleaning was conducted to remove symbols, punctuation, numbers, URLs, and unnecessary characters. Stopword removal was applied using the Indonesian stopword list from the Sastrawi library combined with additional custom stopwords (Adhim & Cahyono, 2025). Furthermore, slang normalization was conducted by converting informal Indonesian words into their standard forms using a manually defined slang dictionary.

After preprocessing, exploratory data analysis (EDA) was carried out to identify the characteristics and distribution of the dataset. Several visualizations were generated, including sentiment distribution charts, pie charts, and word cloud visualizations. Topic analysis was also conducted by grouping frequently discussed keywords into positive and negative topics to identify the main issues and user experiences discussed in the reviews.

The sentiment classification stage utilized the IndoBERT model, specifically indobenchmark/indobert-base-p1, which is a pretrained transformer-based language model for Indonesian text processing (Abadi et al., 2026). Sentiment labels were categorized into three classes: positive, neutral, and negative. The labeling process was performed automatically based on user rating scores from the Google Play Store, where ratings 4 - 5 were categorized as positive, rating 3 as neutral, and ratings 1 - 2 as negative.

The dataset was divided into training and testing data using an 80:20 ratio. The classification process was implemented using the Hugging Face Transformers library with one training epoch and a batch size of 4. Model performance was evaluated using accuracy, precision, recall, F1-score, confusion matrix, and classification report metrics (Koto et al., 2020).

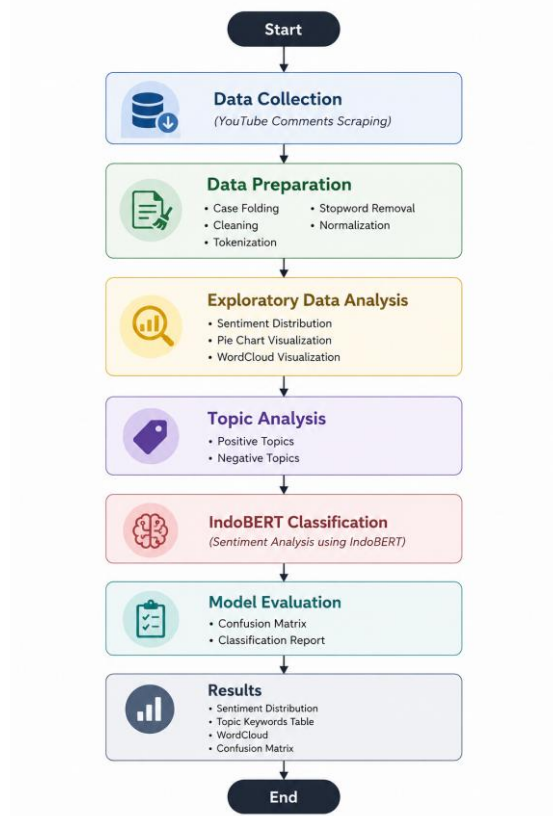


Figure 1. Research Framework

3. Result and Discussion

3.1. Data Collection

The data collection process was conducted by scraping user reviews of the Stimuler AI: English Fluency application from the Google Play Store using Python and the google play scraper library. A total of 3,640 user reviews were successfully collected from the Google Play Store. After the language filtering process, 1,653 Indonesian-language reviews were selected as the final dataset used in this study.

The dataset consisted of review text, rating scores, review dates, language identification, and sentiment labels representing positive, neutral, and negative sentiments. The collected reviews reflected various user experiences and opinions regarding learning features, application performance, subscription systems, and technical issues encountered while using the application.

index	review	score	date	language	sentiment
0	bagus ko apk nya tapi tolong pas telponan sama ia kaya percakapanya ga nyambung ia nya juga ngomongnya di ulang ulang padahal aku minta ganti topik, dan juga pas aku pake voice kadang suaraku ga kediteksi	2	2026-05-15 15:26:26	id	negative
1	baik untuk isi waktu kosong dan baik untuk memperbaiki bahasa inggrisku	5	2026-05-15 12:17:51	id	positive
2	sangat membantu	4	2026-05-15 11:35:01	id	positive
3	speakersnya kurang akurat sama suaranya sering mendem kalau pake earphone	2	2026-05-15 10:59:48	id	negative
4	sangat membantu untuk belajar bahasa inggris	5	2026-05-15 09:05:21	id	positive

Figure 2. Example of Scraped User Review Dataset

3.2 Data Preparation

Before conducting sentiment classification, the dataset underwent several preprocessing stages to improve text quality and reduce unnecessary noise. The preprocessing process included case folding, cleaning, tokenization, stopword removal, and slang normalization (Saputra et al., 2026).

Case folding was applied by converting all text into lowercase letters. Cleaning was performed to remove punctuation marks, symbols, URLs, numbers, and irrelevant characters from the review text. Stopword removal eliminated commonly used Indonesian words that did not contribute significantly to sentiment analysis. Furthermore, slang normalization converted informal Indonesian expressions into standardized forms to improve text consistency (Singgalen, 2025).

1 to 5 of 5 entries Filter ?		
index	review	clean_review
0	bagus ko apk nya tapi tolong pas telponan sama ia kaya percakapanya ga nyambung ia nya juga ngomongnya di ulang ulang padahal aku minta ganti topik, dan juga pas aku pake voice kadang suaraku ga kediteksi	bagus ko apk nya tapi tolong pas telponan sama ia kaya percakapanya ga nyambung ia nya juga ngomongnya di ulang ulang padahal aku minta ganti topik dan juga pas aku pake voice kadang suaraku ga kediteksi
1	baik untuk isi waktu kosong dan baik untuk memperbaiki bahasa inggrisku	baik untuk isi waktu kosong dan baik untuk memperbaiki bahasa inggrisku
2	sangat membantu	sangat membantu
3	speakernya kurang akurat sama suaranya sering mendem kalau pake earphone	speakernya kurang akurat sama suaranya sering mendem kalau pake earphone
4	sangat membantu untuk belajar bahasa inggris	sangat membantu untuk belajar bahasa inggris

Figure 3. Preprocessing Results

The preprocessing stage successfully produced cleaner and more structured review text, thereby improving the quality of the dataset used for sentiment classification and topic analysis.

3.3 Exploratory Data Analysis

Exploratory Data Analysis (EDA) was conducted to identify the distribution and characteristics of user sentiment toward the application (Giganti et al., 2025). Based on the sentiment distribution results, positive sentiment dominated the dataset with a percentage of 86.5%, followed by negative sentiment at 9.2% and neutral sentiment at 4.3%.

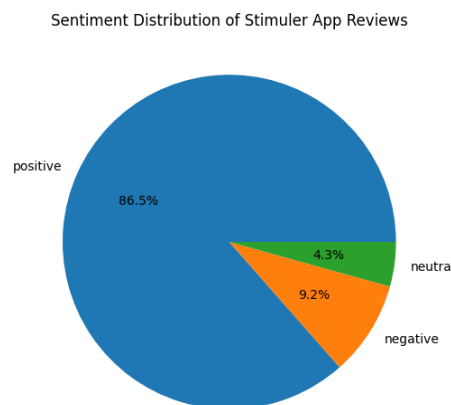


Figure 4. Sentiment Distribution of Stimuler App Reviews

The results indicate that most users expressed positive opinions and satisfaction regarding the application's learning features and usability. This suggests that the application generally provides beneficial experiences for users learning English.

To further explore user opinions, word cloud visualization was performed for both positive and negative reviews. The positive review word cloud revealed dominant terms such as “belajar,” “membantu,” “bagus,” “pemula,” and “bahasa.” These findings indicate that users generally perceived the application as beneficial for improving English-speaking skills and supporting independent learning activities. The frequent appearance of words related to learning assistance and ease of use suggests that the application successfully provided an interactive and accessible learning experience for users, particularly beginners seeking practical English conversation practice (Albedah, 2025).



Figure 5. Positive Review Word Cloud

Meanwhile, the negative review word cloud highlighted frequently appearing words such as “error,” “bug,” “berlangganan,” “loading,” and “premium.” These findings indicate that technical problems and subscription-related issues were the main complaints expressed by users while using the application. The frequent occurrence of these terms suggests that application stability, loading performance, and premium subscription systems still require further improvement to enhance user satisfaction and provide a more consistent learning experience.



Figure 6. Negative Review Word Cloud

Overall, the exploratory analysis demonstrates that users generally showed positive perceptions toward the application, particularly regarding its effectiveness in supporting English learning and speaking practice. The dominance of positive sentiment indicates that the application successfully delivered interactive learning experiences and fulfilled user expectations in language learning activities. However, despite the strong positive responses, several technical issues such as bugs, loading problems, and subscription-related complaints remained frequently discussed in negative reviews. These findings suggest that application quality is influenced not only by educational features but also by technical stability and system performance, which play important roles in shaping overall user satisfaction and learning experience (Shakira et al., 2026).

3.4 Topic Analysis

Topic analysis was conducted to identify the dominant themes discussed in positive and negative reviews. The analysis grouped keywords into thematic categories based on user experiences and opinions.

The positive topic analysis showed that the most dominant topic was learning experience with a frequency of 574 occurrences. Other frequently discussed positive topics included AI features, user-friendly functionality, and speaking practice. These findings indicate that users highly appreciated the application's ability to provide interactive and accessible English learning experiences. The dominance of learning-related topics suggests that the application successfully fulfilled user needs in improving speaking skills and supporting independent language learning activities through AI-based features (López-Minotta et al., 2025).

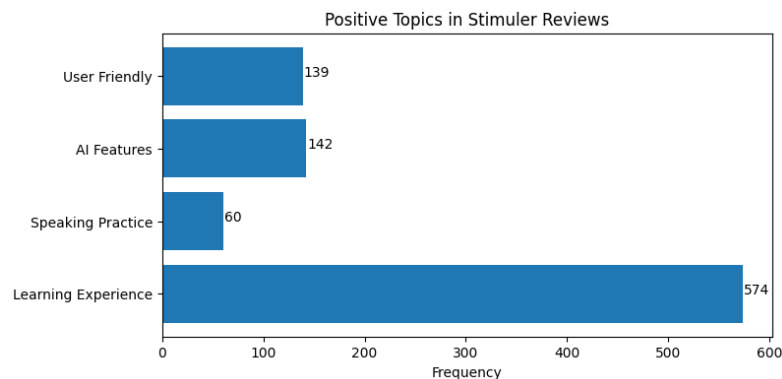


Figure 7. Positive Topics in Stimuler Reviews

In contrast, the negative topic analysis revealed that bugs and errors were the most frequently discussed issues with 50 occurrences, followed by subscription-related problems with 44 occurrences. Other complaints included voice detection problems and login-related issues. These findings indicate that technical performance and system stability remain major challenges affecting user experience while using the application (Sahut & Laroche, 2025). The frequent discussion of subscription and voice detection problems also suggests that users expect more reliable premium services and better feature functionality to support uninterrupted learning activities.

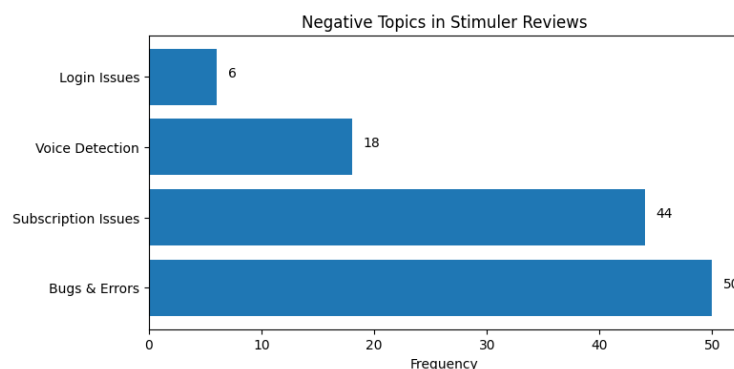


Figure 8. Negative Topics in Stimuler Reviews

The topic analysis results suggest that although the application successfully provides valuable and interactive English learning experiences, several technical and system-related issues still negatively affect user satisfaction. Problems related to application stability, loading performance, subscription systems, and voice detection were frequently discussed in negative reviews, indicating that users expect more reliable functionality and smoother system performance. Therefore, improving technical quality and premium service management is essential to enhance overall user experience and maintain user satisfaction toward the application (Tedja et al., 2024).

3.5 IndoBERT Classification

The sentiment classification process in this study utilized the IndoBERT model (indobenchmark/indobert-base-p1) to classify user reviews into positive, neutral, and negative sentiment categories. Before the classification stage, the dataset was divided into training data and testing data using an 80:20 ratio. The model training process was conducted using one training epoch with a batch size of 4.

The IndoBERT model demonstrated strong capability in understanding contextual meanings within Indonesian language reviews, including informal expressions and slang commonly found in Google Play Store reviews. The transformer-based architecture enabled the model to capture semantic relationships between words more

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effectively compared to conventional machine learning approaches. The training results of the IndoBERT model are presented in Table 1.

Table 1. IndoBERT Training Results

Metric	Result
Training Loss	0.4877
Validation Loss	0.3008
Accuracy	90.57%
Precision	87.75%
Recall	90.57%
F1-Score	89.01%

Based on Table 1, the IndoBERT model achieved strong classification performance with an accuracy score of 90.57% and an F1-score of 89.01%. In addition, the relatively low validation loss indicates that the model successfully learned sentiment patterns from the dataset and performed effectively in sentiment classification tasks involving Indonesian-language application reviews.

3.6 Model Evaluation

The performance of the IndoBERT model was further evaluated using a confusion matrix to analyze the classification results for each sentiment category. The confusion matrix visualization is presented in Figure 9.

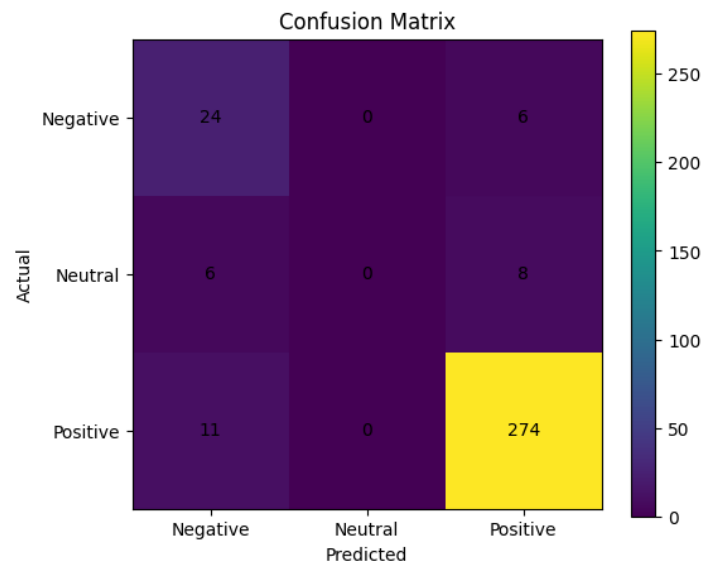


Figure 9. Confusion Matrix of IndoBERT Model

Based on the confusion matrix results, the IndoBERT model demonstrated excellent performance in classifying positive sentiment reviews, where most positive reviews were correctly predicted. However, several neutral reviews were misclassified into other sentiment categories due to the imbalance in the dataset distribution. The negative sentiment category also achieved relatively good classification performance compared to the neutral class.

Overall, the confusion matrix confirms that the IndoBERT model effectively classified Indonesian-language user reviews and successfully captured sentiment patterns within the dataset.

4. Conclusion

This study successfully analyzed user sentiment toward the Stimuler AI: English Fluency application using the IndoBERT model based on Indonesian-language reviews collected from the Google Play Store. A total of 1,653 Indonesian-language reviews were analyzed through several stages, including data preprocessing, exploratory data analysis, topic analysis, sentiment classification, and model evaluation.

The results showed that positive sentiment dominated the dataset, indicating that most users expressed satisfaction with the application, particularly regarding learning experience, speaking practice, and AI-based learning features. However, several negative issues were still identified, mainly related to bugs and errors, subscription systems, voice detection problems, and login issues. These findings indicate that although the application provides valuable learning support for users, technical performance and system stability remain important aspects requiring further improvement.

Furthermore, the IndoBERT model demonstrated strong performance in sentiment classification tasks, achieving an accuracy score of 90.57% and an F1-score of 89.01%. The evaluation results indicate that the transformer-based IndoBERT model effectively captured contextual meanings and sentiment patterns within Indonesian-language user reviews.

The findings of this study can provide useful insights for application developers to improve user experience, optimize technical performance, and enhance the quality of AI-based English learning applications. In addition, this study contributes to the development of sentiment analysis research using transformer-based models on educational application reviews. Future studies are recommended to utilize larger datasets, implement aspect-based sentiment analysis, or compare IndoBERT with other deep learning models to obtain more comprehensive sentiment classification results.

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