

Sentiment Analysis of User Reviews for the POLRI Super App on Google Play Store Using the Naive Bayes Algorithm

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Abstrak

This study aims to identify the sentiment of user reviews of the POLRI Super App on Google Play Store using the Multinomial Naive Bayes algorithm. The application is a digital service provided by the Indonesian National Police; however, its effectiveness and user satisfaction levels still require further examination. The data used in this study consist of user reviews obtained directly from the Google Play platform. The analysis process began with text preprocessing stages such as tokenization, stopword removal, and stemming, followed by sentiment labeling into three categories: positive, negative, and neutral. The Naive Bayes model was trained using an 80% training set and a 20% testing set. Model evaluation results show that this algorithm achieved an accuracy rate of 87%, with the best performance in classifying neutral sentiments. These findings indicate that the Multinomial Naive Bayes is quite effective for sentiment classification in short review texts. This research is expected to serve as a reference for developing public opinion monitoring systems based on user reviews of digital public services.

Keywords: *sentiment analysis, Naive Bayes, user reviews, public service application, text classification.*

1. Introduction

In the era of digital transformation, government institutions are increasingly developing public service applications to engage more closely with the community. One example is the POLRI Super App, which provides various services such as driver's license (SIM) verification, police clearance certificate (SKCK) issuance, incident reporting, and complaint submission in a digital format. Nevertheless, the level of effectiveness and user satisfaction with this application remains in question. One method to evaluate public acceptance is sentiment analysis of user reviews on the Google Play Store, which can classify opinions into positive, negative, or neutral categories. This study employs the Naive Bayes algorithm to automatically classify sentiments. The results of this analysis are expected to provide valuable insights for the Indonesian National Police (POLRI) in improving the quality of their digital services.

The research problems in this study are as follows:

1. How do you classify sentiment on user reviews of the POLRI Super App on the Play Store?
2. How is the Naive Bayes algorithm applied to sentiment classification of app review text?
3. The objectives of this research are:
4. To classify user reviews into positive, negative, and neutral categories.
5. To apply the Naive Bayes algorithm to build a classification model.
6. To evaluate model performance using accuracy, precision, recall, and F1-score metrics.

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2. Literature review

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2.1. Analisis Sentimen

Sentiment analysis is a technique in the field of Natural Language Processing (NLP) that is used to identify and group opinions or emotional expressions from users towards an entity, such as a product, service, or institution. In the context of this research, sentiment analysis is used to categorize user reviews of the POLRI Super App application into positive, negative, or neutral sentiments. Research by [1] applies the lexicon and K-Nearest Neighbor (KNN) methods to analyze Indonesian people's sentiments towards online learning from social media Twitter. The results of the study show that this approach is effective in classifying sentiments into positive, negative, and neutral, with an accuracy of 80.92% using the lexicon method and 80.66% using KNN.

2.2. Klasifikasi teks

Text classification is the process of grouping documents or texts into specific categories based on their content or topic. In sentiment analysis, text classification plays a crucial role in identifying the polarity of an opinion. Common approaches to text classification involve preprocessing processes such as tokenization, stemming, and vectorization, followed by the application of classification algorithms. Furthermore, it demonstrates that a combination of text mining techniques with classification algorithms such as Naive Bayes and SVM can be used to analyze public opinion sentiment regarding trade relations between Indonesia and China. This study emphasizes the importance of text preprocessing processes, including tokenization and vectorization, in improving the performance of classification models[2].

2.3. Algoritma naïve bayes

Naive Bayes is an algorithm often used to predict an event or determine the probability of an event. In sentiment analysis, this algorithm operates on the assumption that the appearance of one word has no influence on another, in other words, it is independent.[3] In this study, Naive Bayes was used to build a classification model capable of determining sentiment from user reviews.

2.4. Polri super app

The POLRI Super App is the official public service application of the Indonesian National Police (POLRI). It is designed to provide the public with various conveniences in accessing police services, such as online driving licenses (SIM), online police clearance certificates (SKCK), public complaints, and emergency reporting. User reviews on the Play Store are an important indicator of public perception and satisfaction with these services.



Fig 1: POLRI Super App display on Google Play Store

2.5. User reviews as a source

User reviews on app distribution platforms like the Google Play Store and the App Store are a rich source of data and are often used in research to evaluate the quality and acceptance of apps. User review data reflects genuine, spontaneous opinions about the features, usability, and issues encountered during app use. Therefore, these reviews are the main material in sentiment analysis-based research[9].

3. Research Methods

This study uses a supervised machine learning approach with a text classification method using the Multinomial Naive Bayes algorithm. The research flow is designed to classify the sentiment of POLRI Super App user reviews taken from the Google Play Store into positive, negative, and neutral categories. The research process begins with data collection through web scraping, followed by text pre-processing, sentiment labeling, data division into training and test data, model training, performance evaluation, and analysis of the results.

3.1. Algoritma naïve bayes

Naive Bayes is a probabilistic learning-based classification algorithm that utilizes Bayes' Theorem, assuming that each feature is independent of all other features. This method is often used in natural language processing due to its computational simplicity and good performance on textual data.

$$P(F | E) = \frac{P(E | F) \cdot P(F)}{P(E)}$$

with description:

Table 1: Description of Notations in the Naive Bayes Algorithm

E	Data whose classification is unknown or whose inclusion in a particular class cannot be confirmed.
F	States that data belongs to a specific class.
$P(F E)$	The probability that hypothesis F is true, given the data E. This value is known as the posterior probability.
$P(F)$	The initial probability that hypothesis F is true before considering data E is called the prior probability.
$P(E F)$	The probability of the occurrence of data E assuming that hypothesis F is true.
$P(E)$	The probability of occurrence of data E in general, without reference to a particular class

3.2. Sources and data collection

The data used in this study was obtained through web scraping of user reviews of the POLRI Super App on the Google Play Store. Data collection was performed using the Python programming language in the Google Colab environment, utilizing the google-play-scrape library.

The data captured includes two main attributes:

1. Username — is only used as additional information and is not directly involved in the analysis process to maintain privacy..
2. Review content — the review text which is the main object of sentiment analysis.

The scraping process was conducted between May 21, 2025, and yielded 3,000 reviews. The obtained data was then saved in CSV format to facilitate pre-processing and analysis using the Naïve Bayes algorithm.

3.3. Research stages

This research was conducted through several systematic stages aimed at classifying the sentiment of user reviews of the POLRI Super App on the Google Play Store. Each stage was structured to produce an accurate and reliable sentiment classification model.

A Multinomial Naive Bayes model was trained using training data. Once the model was developed, testing was conducted using test data to assess its ability to classify sentiment.

These stages include:

1. Data Collection
2. Data was obtained through web scraping of user reviews available on the POLRI Super App page on the Google Play Store. A total of 3,000 reviews were collected.
3. Text Pre-processing
4. The obtained review data was then cleaned through a pre-processing stage, which included tokenization, stopword removal, and stemming. The purpose of this process was to simplify the text and reduce noise in the data.
5. Sentiment Labeling
6. After the pre-processing process, each review was assigned a sentiment label based on its content, which was grouped into three categories: positive, neutral, and negative.
7. Data Distribution

8. The data was then divided into two parts: 80% training data and 20% testing data. The training data was used to build the model, while the testing data was used to evaluate its performance.
9. Training and Testing Model

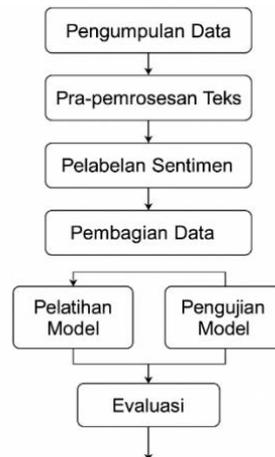


Fig 2: Research Flowchart

The flowchart illustrates the stages involved in the research process, starting from data collection, pre-processing, sentiment labeling, data sharing, model training and testing, to the evaluation stage.

3.4. Tools dan software

In this research, the authors used several software and supporting tools to support the data analysis process and the development of sentiment classification models. The main tools used are as follows:

1. Google Colaboratory (Google Colab):

Google Colaboratory, or Google Colab, is a cloud-based platform provided by Google for running Python code interactively through a web browser. Google Colab was chosen because it provides a practical programming environment without the need for local installation and supports free code execution with GPUs/TPUs, making it ideal for research..



Fig 3: Google Colaboratory SVG Logo

2. Python Libraries:

Some libraries used during data processing and model training include:

1. Pandas – for manipulation and analysis of tabular data (dataframes)
2. NumPy – for numerical computation
3. Scikit-learn (sklearn) – for the Naive Bayes classification algorithm and model evaluation
4. Matplotlib and Seaborn – for graphical visualizations such as bar charts and confusion matrices
5. WordCloud – for creating word visualizations for each sentiment category
6. Sastrawi – for stemming Indonesian



Fig 4: Python Libraries Logo

4. Results and discussion

A multinomial naive Bayes model was implemented to classify user reviews of the POLRI Super App into three sentiment categories: positive, neutral, and negative. The dataset consisted of 3,000 reviews obtained through web scraping from the Google Play Store. The data was divided into 80% training data and 20% test data.

4.1. Pembagian data

Data slicing is the process of dividing a dataset into several parts for the purposes of model training and testing. It is generally divided into:

1. Training Data: Used to train the model to learn patterns from the data.
2. Testing Data: Used to test the performance of the trained model.
3. Validation Data (optional): Used for hyperparameter tuning.

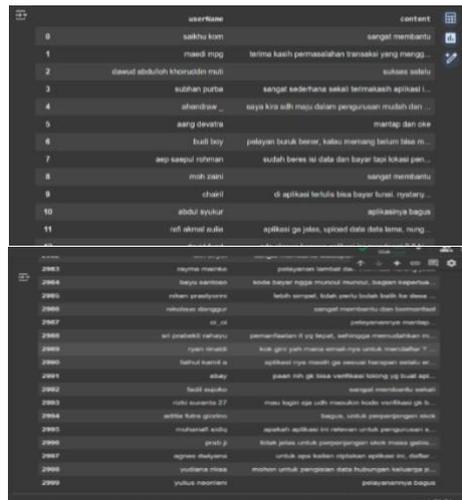


Fig 5: Sample User Review Dataset

4.2. Results of pre-processing implementation

The review data obtained through web scraping from the Google Play Store is then cleaned through three pre-processing stages, namely Tokenization, the tokenization stage of separating text into single words.

4.2.1. Tokenisasi

Table 2: Tokenisasi

No	Before Tokenization	After Tokenization
1	Thank you, the problem of the transaction hanging, the transfer was successful, the application status was successfully resolved even though the application status expired, the STNK was still sent, the star changed to the star 🍌	thank you, problem, transaction, hanging, transfer, successful, status, application, successful, resolved, even though, status, application, expired, STNK, still, sent, star, change, star, 🍌

4.2.2. Stopword,

Table 3: Stopword

NO	Before Stopword	After Stopword
1	Thank you, the pending transaction issue (transfer successful but status in the app is not successful) has been resolved, even though the status in the app expired, the STNK was still sent. I changed the star rating to 5 stars 🍌	Thank you, the problem of the transaction hanging, the transfer was successful, the application status was successfully resolved, even though the application status expired, the STNK was still sent, the star changed to the star

4.2.3. Stemming

Table 4: Stemming

NO	Before Stemming	After Stemming
1	terima kasih permasalahan transaksi menggantung transfer berhasil status aplikasi berhasil terselesaikan walaupun status aplikasi expired stnk tetap dikirim bintang ubah bintang	terima kasih masalah transaksi gantung transfer hasil status aplikasi hasil selesai walaupun status aplikasi expired stnk tetap kirim bintang ubah bintang

4.3. Results of the Naive Bayes

A Naive Bayes model was implemented to classify user reviews into positive, negative, or neutral categories. Model training was performed by dividing the data into training and test data in an 80:20 ratio. The Naive Bayes algorithm used is Multinomial Naive Bayes because it is suitable for text in the form of words or discrete features.

Confusion Matrix:

Table 5: Confusion Matrix

	Positive Prediction	Netral Prediction	Negatif Prediction
Positive Actual	165	11	7
Netral Actual	63	219	17
Negatif Actual	37	5	76

4.4. Hasil Evaluasi Model

Evaluasi dilakukan menggunakan metrik-metrik evaluasi yang umum digunakan dalam pengujian model kasifikasi, yaitu:

1. Accuracy: How well the model can correctly classify data.
2. Precision: How accurately the model classifies positive data.
3. Recall: How many positive data points are correctly classified.
4. F1-score: A measure of the harmony between precision and recall.

Table 6: Model Evaluation Results

	Precision	Recall	Fi-score	Support
Negatif	0.76	0.64	0.70	118
Netral	0.93	0.73	0.82	299
Positif	0.62	0.90	0.74	183
Accuracy	0.77	0.77	0.77	0
Macro avg	0.77	0.76	0.75	600
Weighted avg	0.80	0.77	0.77	600

5. Kesimpulan

Based on the research results, the Multinomial Naive Bayes algorithm successfully classified the sentiment of POLRI Super App user reviews with 87% accuracy. The best performance was achieved in the classification of neutral sentiment, while negative sentiment performed lower due to unbalanced data distribution and vocabulary similarity with positive reviews. These findings demonstrate that the Naive Bayes method remains relevant for short text sentiment analysis in digital public services and can be used as a basis for developing a data-driven public opinion monitoring system.

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