Sentiment Analysis On Ipusnas Application Reviews In Google Play Store Using Naive Bayes Classifier

Analisis Sentimen pada Ulasan Aplikasi iPusnas di Google Play Store Menggunakan Naive Bayes Classifier

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Abstrak

Perkembangan teknologi informasi telah membawa perubahan signifikan dalam akses dan literasi informasi, terutama melalui perpustakaan digital. Di Indonesia, iPusnas, aplikasi perpustakaan digital yang dikelola oleh Perpustakaan Nasional Republik Indonesia, menjadi salah satu platform populer yang menawarkan akses gratis ke berbagai buku digital. Penelitian ini bertujuan menganalisis sentimen ulasan pengguna iPusnas di Google Play Store menggunakan algoritma Naive Bayes. Penelitian ini menggunakan 700 ulasan pengguna yang dikumpulkan, diproses, dan diberi label sentimen berdasarkan rating ulasan. Setelah melalui tahap pre-processing, termasuk case folding, tokenization, dan stemming, data dibagi menjadi set data latih dan uji dengan rasio 80:20. Hasil analisis menunjukkan bahwa 75,1% ulasan bersentimen positif, mengindikasikan tingkat kepuasan pengguna yang tinggi. Algoritma Naive Bayes menunjukkan akurasi 58%, dengan nilai precision 69%, recall 81%, dan f1-score 75%. Temuan ini konsisten dengan penelitian sebelumnya yang juga menunjukkan kualitas layanan dan kepuasan pengguna yang tinggi terhadap iPusnas. Hasil penelitian ini dapat digunakan oleh pengembang iPusnas untuk meningkatkan kualitas layanan berdasarkan umpan balik pengguna. Penggunaan analisis sentimen yang lebih canggih dan integrasi teknologi lainnya dapat lebih meningkatkan evaluasi sentimen dan kualitas layanan di masa depan.

Keyword: analisis sentimen, algoritma naive bayes, iPusnas, kepuasan pengguna, perpustakaan digital

Abstract

The development of information technology has brought significant changes in information access and literacy, especially through digital libraries. In Indonesia, iPusnas, a digital library application managed by the National Library of the Republic of Indonesia, has become one of the popular platforms offering free access to various digital books. This study aims to analyze the sentiment of iPusnas user reviews on the Google Play Store using the Naive Bayes algorithm. This research uses 700 user reviews that are collected, processed, and labeled with sentiment based on the review rating. After going through the pre-processing stage, including case folding, tokenization, and stemming, the data is divided into training and test data sets with a ratio of 80:20. The analysis results show that 75.1% of the reviews have positive sentiment, indicating a high level of user satisfaction. The Naive Bayes algorithm showed 58% accuracy, with 69% precision, 81% recall, and 75% f1-score. These findings are consistent with previous research that also shows high service quality and user satisfaction with iPusnas. The results of this study can be used by iPusnas developers to improve service quality based on user feedback. The use of more sophisticated sentiment analysis and integration of other technologies can further improve sentiment evaluation and service quality in the future.

Keyword: Digital library, iPusnas, Naive Bayes algorithm, Sentiment analysis, User satisfaction

1. INTRODUCTION

One of the most prominent changes in modern life stemming from the digital revolution is that of literacy and availability to information. For instance, the creation of digital libraries is one solid step forward in this area where consumers have a huge library of digital books to read. One of the best known digital library apps in Indonesia, iPusnas is managed by the National Library of Republic Of Indonesia This means, the iPusnas app may be a portal so that users can access many digital books free of charge. User reviews on the Google Play Store are also rising as individuals use this, providing a good base of data regarding what works and does not in both functionality and quality. These are ratings reflecting user experience and the joy that users have as a result of using your app, with which you developers can learn valuable knowledge to improve upon what they do. Several previous studies have examined iPusnas satisfaction and quality of service. Maulana (2018) analyzed user satisfaction using PIECES framework and experienced 4.14 as the highest score of their users on average, that goes with respecively satisfied [13]. The Types of Service Quality and Customer Satisfaction In this type of research has been done by Taryani & Wijayanti et al. (2023) to assess the level service quality as well customer satisfaction used WebQual 4.0 approach which capability measurement tool that can be applied on almost every websites in particular could comprised tourism web sites [11]. The application's service quality is rated at a level of 84.7% and the user happiness percentage emerges as being equal to that with Figures in the scope of approximately 86.1%. [14] Furthermore, Lestari et al. The review by (2023) employed the Support Vector Machine (SVM) technique to analyze how often a mood is present in user reviews regarding the iPusnas program. Their results revealed that, based on this survey items comprised of 75.1% favorable and 24.9% negative statements [15].

Sentiment analysis of these evaluations can provide a wealth of information on user experiences and opinions. Sentiment analysis is the approach taken to recognize and group the various perspectives articulated in a text so as to identify the author's attitude— whether positive or negative, neutral— towards what is being said on a certain topic [16]. This will help you make more informed decisions based on feedback received from users without having to go through every single comment manually. Naive Bayes algorithm is considered as a widely used tool for sentiment analysis because it is simple and efficient in text classification. Naive Bayes is based on the assumption that all features are independent of each other which makes it easy to calculate probabilities using Bayes' Theorem [17]. The success of Naive Bayes method has been demonstrated in sentiment analysis of app reviews, with a decent accuracy rate [1]. The primary aim of the research was to assess user perception towards the iPusnas app by analyzing reviews obtained from the Google Play Store using the Naive Bayes method. A secondary goal of this study is to uncover user sentiments towards iPusnas and the contributing factors that influence their satisfaction levels. It is hoped that the findings of this study would provide valuable inputs to enhancing the quality of Indonesian digital library services— a laudable goal indeed.

2. MATERIALS AND METHOD

This inquire about handle starts with the information arrangement organize, which incorporates collecting audit information from the iPusnas application on the Google Play Store stage. The collected information will at that point be handled, counting information cleaning and estimation labeling of the information. After the information planning is total, the following step is to perform preprocessing to guarantee that the information is prepared to be coordinates into the demonstrate. This prepare incorporates a arrangement of steps that are performed successively. The another organize in this inquire about is the application of estimation examination. This prepare incorporates isolating the surveys into preparing and testing information bunches, as well as performing include extraction to change over the content into a numerical organize prepared for handling. Opinion will be classified through the Credulous Bayes calculation. After getting the comes about, the show will be checked on and different tests will be conducted to progress its adequacy. This whole handle is sketched out in Figure 1.
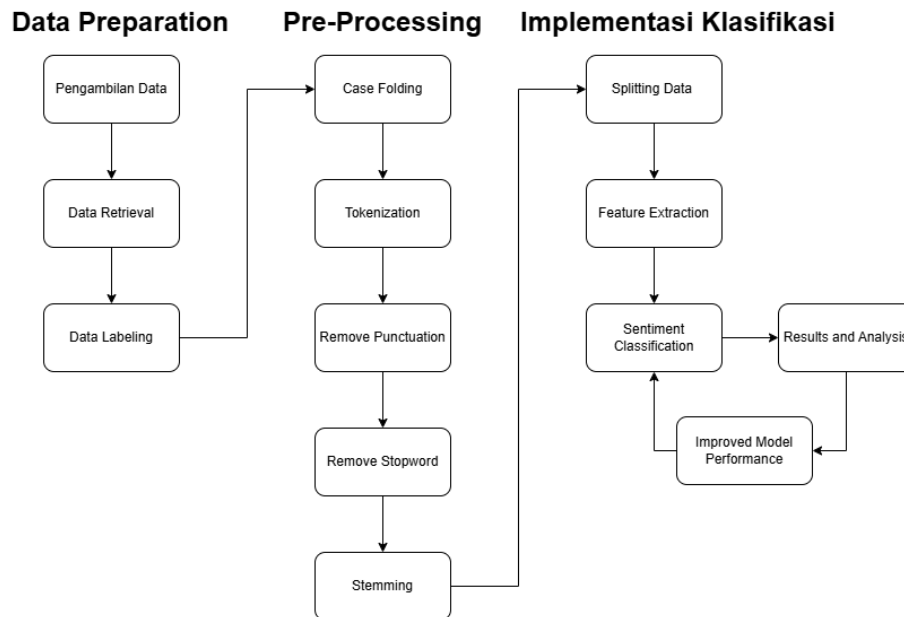
Figure 1. Research Phases

2.1 Data Preparation

The research looks at information taken from user evaluations that were taken from the Google Play Store and applied to the iPusnas application. Reviews like this are collected and examined in order to improve understanding of user opinions and feelings about the iPusnas application. User evaluations are immediately obtained from the Google Play Store and stored in a dataset for further analysis as part of the gathering process.

2.2 Pre-Processing Data

Preprocessing is fundamental to guarantee that the information is prepared for estimation checks. To preserve consistency, all data must be case-sensitive and changed over to lowercase. Dispensing with delays and highlights, which have no impact on demeanor, permits tokenization to partition the fabric into individual words. By lessening words to their most fundamental system, stemming eventually ensures a reliable representation of words. Conclusion investigation picks up precision and consistency as well as made strides data quality by utilizing these procedures.

2.3 Sentiment Analysis

The Gullible Bayes approach is utilized for estimation examination taking after information handling. This program classifies content agreeing to the opinion communicated in it by applying the concepts of likelihood and measurements. The opinion categories that are utilized in this setting are "positive," "negative," and "unbiased." To ensure exact classification on obscure information, the framework was prepared utilizing preparing information.

2.4 Evaluation

The exactness, exactness, review, and F1-score levels of the categorized comes about are measured in arrange to assess the demonstrate. This assessment is critical for evaluating how well the Credulous Bayes strategy works for assumption categorization. The rate of redress forecasts among all the estimates made is measured by precision. Recall indicates the percentage of properly recognized positive instances among all really positive events, whereas precision measures the ratio of right forecasts to the total number of predictions. In contrast, the F1-score is a statistic that assesses how well a classification strikes a compromise between recall and accuracy.

3. RESULTS AND DISCUSSION

3.1 Data Retrieval

The reviews of these apps are retrieved using the reviews() function of google-play-scraper. Before data retrieval, several parameters must be specified, including app id, language, and country. The language and country used by default are language "id" (Bahasa Indonesia) and country "id" (Indonesia). The review data is organized based on the most recent date of writing. Using these parameters, 700 raw reviews that were most relevant within the last five years were selected.

Table 1. Example of a Scrapped Document

Document	Ulasan
Document 1	Perangkat saya kompatibel dengan aplikasi ini tapi ketika aplikasi dibuka selalu berhenti sendiri. Tolong diperbaiki lagi aplikasinya agar bisa dipakai di semua perangkat dengan baik. Sayang sekali mau baca jadi tidak bisa.
Document 2	Sangat mengecewakan, sekelas apk nasional namun sering crash, mau login tidak bisa, buka buku tidak bisa di scroll, tolong segera diperbaiki
Document 3	Luar biasa banget... Pemerintah harusnya makin memberdayakan aplikasi seperti ini dan koleksi bukunya makin dilengkapi lagi.. Banyak buku yang sulit diperoleh di pasaran justru ada di ipusnas
…	…
Document n	Koleksi bukunya banyak banget! Meski harus ngantri buat baca bukunya kalau nggak kebagian stok, nggak papa yang penting bisa baca dengan gratis 😊. Tapi ada beberapa buku yang nggak ada misalnya series Lockwood & co yang kedua 🙁 saya harap kedepannya bisa ditambahkan ☺ ☐ 🙏

3.2 Data Labeling

Data labeling is done automatically based on the rating given to the review. Three labels are assigned: negative, neutral, and positive. Reviews rated 1 and 2 are classified as negative due to their low ratings. Reviews rated 3 are deemed neutral as they fall in the middle range. Conversely, reviews rated 4 and 5 are regarded as positive, indicating favorable assessments. Thus, this data labeling helps categorize reviews based on the sentiments contained in the ratings given by users.

Table 2. Example of Labeling Result Document

Document	Ulasan	Sentiments
Document 1	Perangkat saya kompatibel dengan aplikasi ini tapi ketika aplikasi dibuka selalu berhenti sendiri. Tolong diperbaiki lagi aplikasinya agar bisa dipakai di semua perangkat dengan baik. Sayang sekali mau baca jadi tidak bisa.	Negative
Document 2	Sangat mengecewakan, sekelas apk nasional namun sering crash, mau login tidak bisa, buka buku tidak bisa di scroll, tolong segera diperbaiki	Negative
Document 3	Luar biasa banget... Pemerintah harusnya makin memberdayakan aplikasi seperti ini dan koleksi bukunya makin dilengkapi lagi.. Banyak buku yang sulit diperoleh di pasaran justru ada di ipusnas	Positive
…	…	…
Document n	Koleksi bukunya banyak banget! Meski harus ngantri buat baca bukunya kalau nggak kebagian stok, nggak papa yang penting bisa baca dengan gratis 😊. Tapi ada beberapa buku yang nggak ada misalnya series Lockwood & co yang kedua 🙁 saya harap kedepannya bisa ditambahkan ☺ ☐ 🙏	Positive

3.3 Pre-Processing Data

The first process is Case folding. In this process, all characters in the text are converted into lowercase letters. This is done to ensure consistency in the use of capital and lowercase letters, so that the text can be analyzed and processed more easily. As an illustration, the result of case folding is shown in Table 3.

Table 3. Case folding process

koleksi bukunya banyak banget! meski harus ngantri buat baca bukunya kalau nggak kebagian stok, nggak papa yang penting bisa baca dengan gratis 😊. tapi ada beberapa buku yang nggak ada misalnya series lockwood & co yang kedua 🙁 saya harap kedepannya bisa ditambahkan ☺ ☐ 🙏

Next is Tokenization, where the entire text is broken down into small meaningful parts or commonly called tokens. These tokens can be words, phrases, or other symbols. The implementation of Tokenization is shown in table 4.

Table 4. Tokenizing Process

['koleksi', 'bukunya', 'banyak', 'banget!', 'meski', 'harus', 'ngantri', 'buat', 'baca', 'bukunya', 'kalau', 'nggak', 'kebagian', 'stok,', 'nggak', 'papa', 'yang', 'penting', 'bisa', 'baca', 'dengan', 'gratis', '😊.', 'tapi', 'ada', 'beberapa', 'buku', 'yang', 'nggak', 'ada', 'misalnya', 'series', 'lockwood', '&', 'co', 'yang', 'kedua', '☹', 'saya', 'harap', 'kedepannya', 'bisa', 'ditambahkan', '☺ 🙏']

Then Remove Punctuation is performed, which is a step to eliminate symbols and punctuation in the dataset, the arena does not affect the results of sentiment analysis. The application of Remove Punctuation can be seen in table 5.

Table 5. Remove Punctuation Process

['koleksi', 'bukunya', 'banyak', 'banget', 'meski', 'harus', 'ngantri', 'buat', 'baca', 'bukunya', 'kalau', 'nggak', 'kebagian', 'stok', 'nggak', 'papa', 'yang', 'penting', 'bisa', 'baca', 'dengan', 'gratis', 'tapi', 'ada', 'beberapa', 'buku', 'yang', 'nggak', 'ada', 'misalnya', 'series', 'lockwood', 'co', 'yang', 'kedua', 'saya', 'harap', 'kedepannya', 'bisa', 'ditambahkan']

After Remove Punctuation, next is Remove stop words. In this process, all words that are considered not important or significant will be removed from the text. examples such as "and", "which", "in", and others. The application of Remove Stopwords can be seen in table 6.

Table 6. Remove stopwords

['koleksi', 'bukunya', 'banyak', 'ngantri', 'baca', 'bukunya', 'kebagian', 'stok', 'baca', 'gratis', 'buku', 'nggak', 'ada', 'series', 'lockwood', 'co', 'kedua', 'harap', 'ditambahkan']

Stemming is the process of eliminating affixes including prefixes, suffixes, confixes, and other particles listed in KBBI from a word. In this research, the Sastrawi library is used to run the stemming process on text in Indonesian. The application of stemming on the text can be seen in Table 7.

Table 7. Stemming process

['koleksi', 'buku', 'banyak', 'antri', 'baca', 'buku', 'bagi', 'stok', 'baca', 'gratis', 'buku', 'nggak', 'ada', 'series', 'lockwood', 'co', 'dua', 'harap', 'tambah']

3.4 Splitting Data and Naive Bayes Implementation

This study divides the data into two groups for use in classification trials. The data division is done using the hold-out method. In the hold-out method, review data will be segmented into two groups: training data and testing data. The training data aims to hone the model and explore patterns or attributes that are not visible, while the testing data is tasked with assessing the performance of the model after training. The proportion of data sharing is set at a ratio of 80:20, with 80% for training and 20% for testing. In this case, with a total of only 700 data, there will be 560 used as training data and 140 data that will be used as test data after the division process.

Furthermore, testing is carried out using the Confusion matrix. Confusion matrix is used as a method to evaluate the performance of classification models, including sentiment analysis models used to predict the sentiment of iPusnas application user reviews. This matrix produces a 3x3 dimensional table that shows how the model classifies data correctly and incorrectly. Detailed information about the confusion matrix can be found in Table 8.
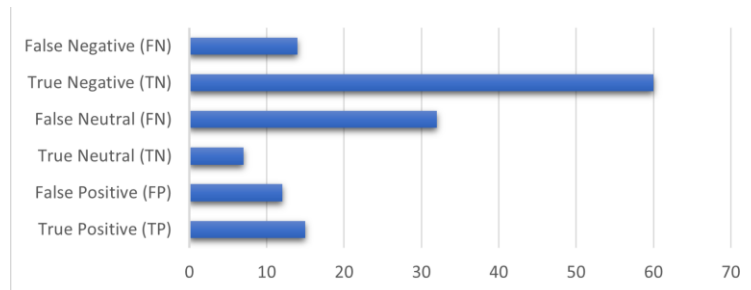
Table 8. Confusion matrix

Prediction Data	Actual Data		
	Positive	Neutral	Negative
Positive	**True Positive**	False Positive	False Positive
Neutral	False Neutral	**True Neutral**	False Neutral
Negative	False Negative	False Negative	**True Negative**

The results of the analysis with confusion matrix produce data as shown in the following table.

Analisis Sentimen Pada Ulasan... (Hamzah et al, 2025)

Table 9. Confusion matrix result

Prediction Data	Actual Data		
	Positive	Netral	Positive
Positive	**15**	6	6
Neutral	11	**7**	21
Negative	12	2	**60**

Figure 3. Confusion matrix distribution

Using the Hold-Out method in data sharing, the Naïve Bayes algorithm managed to obtain an accuracy rate of about 58%. In addition, Figure 2 also displays the precision, recall, and f1-score values obtained from the analysis.

```
MultinomialNB Accuracy: 0.5857142857142857
MultinomialNB Precision: 0.5706598392533057
MultinomialNB Recall: 0.5857142857142857
MultinomialNB f1_score: 0.5551994933982513
```

Figure 4. Accuracy Results, Precision, Recall, and f1-score Hold-Out Method

User sentiment trends related to the iPusnas application available on the Google Play Store platform are shown in Figure 3. These reviews have been analyzed to determine the general attitude of users, which can be an indicator of their satisfaction with the application.

```
              precision    recall  f1-score   support

     Negatif       0.39      0.56      0.46        27
      Netral       0.47      0.18      0.26        39
      Positif       0.69      0.81      0.75        74

    accuracy                           0.59       140
   macro avg       0.52      0.52      0.49       140
weighted avg       0.57      0.59      0.56       140
```

Figure 5. Sentiment result

Based on this figure, it can be seen that the majority of responses to the iPusnas application on the Google Play Store platform show positive results. This result is supported by data showing a precision rate of 69%, a recall of 81%, and an f1-score of 75%. This indicates that the application has successfully met the expectations of most of its users.

4. CONCLUSION

This research looks at the opinions that users have left on the iPusnas app on the Google Play Store. The user reviews are categorized and analyzed using the Naive Bayes approach. According to the data, 75.1% of evaluations are favorable, which suggests that users are generally satisfied with iPusnas' services. Classifying emotion is another area in which the Naive Bayes model performs admirably, yielding acceptable precision, recall, and f1-score values at a 58% accuracy rate. These findings are consistent with other studies that demonstrate iPusnas's high level of customer satisfaction and strong service quality.

As a result, designers may utilize the assumption analysis's discoveries as a establishment for upgrading iPusnas administrations over time. iPusnas can maintain a tall degree of client bliss and improve the in general client involvement by routinely investigating client surveys and reacting fittingly to concerns that are found. The exactness and viability of estimation assessment can moreover be expanded by consolidating other

innovations and utilizing more complex estimation examination procedures [13][14][15]. Hence, it is expected that these activities will back iPusnas in raising benefit guidelines and client fulfillment levels going forward.

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Analisis Sentimen Pada Ulasan... (Hamzah et al, 2025)

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