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Sentiment Analysis of Getcontact Application Reviews on Google Play Store Using Naive Bayes Algorithm

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Abstract

In the contemporary digital era, the increasing incidence of fraud and unwanted communications has become a serious concern, driving the adoption of security apps like GetContact. This study aims to analyze public perception of the GetContact app by conducting a systematic sentiment analysis of user reviews on the Google Play Store. Using a text mining framework, 990 user reviews were collected, processed to ensure data quality, and then classified using the Naive Bayes algorithm to determine sentiment polarity. Quantitative results show a significant dominance of negative sentiment, comprising 419 reviews (42.3%), followed by positive sentiment, comprising 291 reviews (29.4%), and neutral sentiment, comprising 280 reviews (28.3%). Qualitative analysis through data visualization reveals that the primary user complaints center on basic functionality issues such as login difficulties, while positive sentiment is driven by the perception that the app is very helpful. These findings provide critical actionable insights for developers to prioritize improvements in areas of greatest user concern. This study advances sentiment analysis by demonstrating the efficacy of Naive Bayes in classifying unstructured app reviews, offering a scalable approach to evaluating user feedback in mobile app development.

Keywords : *Getcontact, Google Play Store, Naive Bayes, Sentiment Analysis.*

1. INTRODUCTION

Indonesia is one of the countries with the largest number of internet users in the world. In addition, communication between humans and computers in an era increasingly dominated by technology has changed the way we communicate and exchange data [1]. As the years go by, all aspects of life are also developing, both in the social, cultural, economic, artistic, and Information and Communication Technology (ICT) fields [16]. One thing that needs to be watched out for due to the sophistication of technology in the field of information is the emergence of news whose truth is unclear or more popularly known as "hoaxes" [17]. In general, the perpetrators of fraud can be official institutions or individuals who appear good and familiar or legitimate parties, such as government institutions, financial or other leading companies and will ask for personal information such as telephone numbers, accounts or credit cards, and the most worrying thing is that the victim unknowingly provides an OTP (One-Time Password) code supported by bank information [18]. Applications such as GetContact are present as a solution to this problem [19]. However, with the existence of this Get Contact application, various reactions and perceptions have emerged from the general public [20]. A person's personal data is something that is often targeted by cyber criminals [22].

User reviews are increasingly important in shaping consumer perceptions of products or services in today's digital age [4]. Highly rated apps with both positive and negative reviews do not indicate that user expectations have been met, and evaluation of user service improvements has ceased [5]. The "Spam Blocker" and "Caller Alert" apps, GetContact, filter out annoying calls and only let selected

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people talk to the user, and using GetContact does not seem to be that difficult [25]. Inconsistencies in reviews, given in ratings, differ from the actual review text, so these inconsistencies can impact the accuracy of the app's actual assessment [6]. Gathering opinions and sentiments from natural language presents its own challenges because it requires a deep level of understanding of explicit and implicit, regular and irregular, and syntactic and semantic language rules [30].

Sentiment analysis not only collects information about the sentiment contained in the text, sentiment analysis also aims to determine the opinions contained in the text regarding problems or objects that tend to have a positive or negative perspective [7]. Sentiment analysis helps developers and businesses understand how users feel and respond to products in depth how to use Getcontect such as dissatisfied, and unhappy when using [8]. This method helps in identifying various opinions and is valuable information in decision making [34]. Mining techniques are the main steps that must be taken in the sentiment analysis process. Sentiment analysis is a process of approaching in processing comments and feedback given by individuals through various media related to a particular product, service, or entity [23]. The text in question is text mining or text analytics is the process of exploring and analyzing a number of unstructured data by taking the essence of text documents, so that significant results are obtained as a specific goal [24].

Sentiment analysis is the process of extracting, processing and understanding data in the form of unstructured text automatically to retrieve sentiment information contained in an opinion sentence [28]. This algorithm functions by finding the optimal hyperplane to separate positive and negative sentiment classes in a high-dimensional feature space [26]. The Naive Bayes Classification Algorithm is considered suitable for use in sentiment analysis because it functions as a classification method into positive and negative categories [9]. Naive Bayes calculates the probability of a word with speed, accuracy and high [10]. The main characteristic of this Naive Bayes Classifier is a very strong assumption of the independence of each condition or event [29]. Most sentiment analysis is widely used for political, economic, business, educational or government purposes in analyzing public opinion on an event so that the policies made are able to target down to the roots and grassroots [31]. The Python programming language will be used in the text mining process, from data preprocessing to sentiment analysis classification with the Naïve Bayes algorithm [32].

Similar research has been conducted previously with the naive Bayes algorithm using review data from the Amazon Shopping application on the Google Play Store. The results of this study obtained an average accuracy rate of 82.15%, precision of 72.25%, recall of 83.49%, and f1-score of 77.41% [11]. The next study is a study that uses data on home credit application reviews with the SVM and K-NN methods. The data amounted to 2,845 with information regarding scores and comments. The results of the study using SVM obtained an accuracy rate of 88%, precision of 89%, recall of 86%, and f1-score of 87%. K-NN has an accuracy rate of 79%, precision of 79%, recall of 80%, and f1-score of 79%. From this study, the SVM method is better than the K-NN method [12]. The Support Vector Machine (SVM) algorithm is an effective method because of its strong ability to optimally separate data into different categories [21].

Further research conducted by Salma Rita et al., entitled The Use of Support Vector Machine for Sentiment Analysis of Truecaller and Getcontact Application Reviews, this research aims to help users in choosing applications to protect themselves from spam call disturbances. very dangerous for individuals and organizations, including identity theft, sensitive data leaks, and even financial losses [2]. Similarly, the WhatsApp application; because WhatsApp is now a very popular chat application for large communities around the world; many WhatsApp accounts are used for spam such as fraud; promotions; etc. [33]. Applications like GetContact can help find callers and protect spam calls and numbers. The GetContact application is an application created to replace the contact feature on cellphones. The results of the study stated that in the 10-fold validation test, Truecaller achieved an

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average accuracy rate of 88.20%, while Getcontact achieved an average accuracy rate of 87.90%. Then the results of the sentiment evaluation on Truecaller showed an average accuracy value of around 60.20%, while Getcontact achieved an average accuracy of around 63.30% [3]. As a country with a very large population and rapid growth in internet connectivity, Indonesia presents a very interesting context for understanding the impact of social media on the culture, behavior, and social dynamics of society [13]. This application provides features such as caller identification, spam blocking, and community tagging [14]. The development of big data technology in recent years has driven the need for large-scale automated text data analysis [15]. This shows that WhatsApp fraud has become a global problem and is not limited to one country [27].

This study was conducted using data from user reviews of the GetContact app on Google Play using the naive Bayes method. The goal of this study was to evaluate user reviews of the GetContact app to generate better and more accurate information that can be used as a reference for maintaining the popularity and quality of the service, as well as correcting errors and improving evaluations. Although previous studies have analyzed various app reviews using SVM or K-NN, research specifically applying the Naive Bayes algorithm to evaluate user feedback on the GetContact app in Indonesia, particularly in the context of identifying usability issues, is still very limited. Many existing studies tend to focus on comparing algorithm performance in general or analyzing apps from different categories, such as e-commerce or financial services. This gap is the primary focus of this study, which is to leverage the efficiency of Naive Bayes to delve deeper into GetContact user sentiment in the dynamic Indonesian market. Therefore, this study aims to analyze sentiment from GetContact app user reviews on the Google Play Store using the Naive Bayes algorithm. Specifically, this study will classify reviews into positive, negative, and neutral categories to identify the aspects most appreciated and complained about by users, thus providing accurate and actionable information for future app development.

2. METHOD

In carrying out this research, the stages carried out include data collection or crawling data from Google Playstore, the second stage is the data pre-processing stage, the third stage is continued with data cleaning, then data labeling is carried out using the naive Bayes algorithm, which results in the creation of training data, and training data testing. Data that has been labeled using the naive Bayes algorithm, will be validated to ensure that the Naïve Bayes Algorithm has good accuracy and precision. and the results of the data will be visualized.

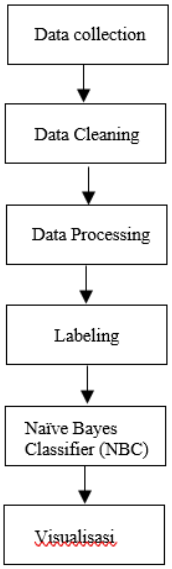

Figure 1. Research Method

2.1. Identification Of Problems

The research was conducted based on the problems previously explained, namely:

1. To determine user sentiment regarding the GetContact app experience. This analysis will yield the number of positive, negative, and neutral user reviews.
2. To identify frequently occurring or frequently used words, both positive, negative, and neutral, to identify word patterns.

2.2. Data Collection

Data collection for this sentiment analysis uses Google Colab and the Google Play package. This data scraping is performed on GetContact application reviews to obtain the required data, such as usernames, reviews, ratings, and so on. The results of this process will be a file in .csv format. Then install the python library, namely pandas, and the javascript runtime, namely node js to help cross-search on the platform in real time [38]. Google Colab is a cloud-based platform that allows users to write, run, and share Python code for free [39].

2.3. Data Cleaning

The raw data obtained through crawling still contained a significant amount of duplicate data, mentions, hashtags, emojis, inappropriate words, and symbols irrelevant for use in this study. The data was then displayed with null values using the isna() and dropna() features [37]. Therefore, data cleaning was performed to ensure that the data was completely clean and readable for further processing.

2.4. Data Processing

This stage is carried out to make the data more structured in terms of language usage so that it is ready for the next process. In this process, the data that was previously ready will then be processed to make it more structured [40]. The stages carried out in this process are Tokenize, Transform Cases, Filter Stopwords, and Filter Token (By Length).

2.5. Labeling

Labeling is done manually with cleaned data labeled as positive, negative, and neutral. Labeling is done with a composition of 50% of the total data. Labeling is a process that can facilitate the model in classifying sentiment classification [35].

2.6. Naïve Bayes Classifier (NBC)

Naive Bayes is a classification algorithm based on Bayes' probability theorem. This algorithm is considered "naive" or "simple" because it assumes that the features used in classification are independent of each other, even though in reality, the features may be related to each other. The basis of the Naïve Bayes Classification technique is from Bayes' theorem with comparable capabilities to decision trees and neural networks [36]. The mathematical formulation of Bayes' Theorem used is as follows:

Where:

- P(c|x) is the posterior probability, which is the probability of sentiment class c (e.g., 'negative') given review data x.
- P(x|c) is the likelihood probability, which is the probability of review x occurring given its sentiment class c.
- P(c) is the prior probability, which is the probability of sentiment class c occurring in the training data.
- P(x) is the marginal probability, which is the probability of review x occurring.

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The model will calculate the posterior probability for each sentiment class (positive, negative, neutral), and classify reviews into the class with the highest probability.

2.7. Model Evaluation and Validation Process

To measure the performance of the Naive Bayes classification model, several evaluation metrics were calculated based on the Confusion Matrix. The metrics used include:

Accuracy:

$$Accuracy = \frac{TP+TN}{TP + TN + FP + FN} \quad (1)$$

Precision: Measures the level of accuracy of the model in classifying the positive class.

$$Precision = \frac{TP}{TP + FP} \quad (2)$$

Recall (Sensitivity): Measures the model's ability to retrieve all positive class data.

$$Recall = \frac{TP}{TP + FN} \quad (3)$$

F1-Score: The harmonic means of precision and recall, providing a balanced picture of model performance.

$$F1 - score = \frac{2 \times Precision \times Recall}{Precision \times Recall} \quad (4)$$

To ensure that model performance can be generalized to new data, the validation process is performed using the k-fold cross-validation method. In this method, the training data is divided into k parts (or folds). The model is trained k times, with each time one part used as test data and the rest as training data. The performance results from these k iterations are then averaged to obtain a more stable and reliable estimate of the model's performance.

3. RESULT

This study collected data from the Google Store from all comments that provided a star rating from one to five. Data was collected randomly from GetContact app raters, resulting in 1,000 entries from the GetContact app. To determine whether the commenters were Indonesian, a filter was applied to select tweets in Indonesian only.

3.1. Data Labeling

Table 1. Data Pelabelan

No	Komentar	Sentimenn
1.	Help me find a familiar number and trace it using the GetContact app. Thank you. GetContact	Positif
2.	In the digital age, applications help contact fraudsters. Thank you. Contact	Positif
3.	Login login verification is difficult	Negatif
4.	Paid, can't open, open black appears white	Netral
5.	Complicated entry, enter the entry code	Netral

Previously unlabeled data was assigned a sentiment label in this stage, as positive, negative, and neutral. Of the 990 data points obtained in the previous stage, 50%, or 495, were manually labeled. The labeled data is referred to as training data. This training data serves to test the unlabeled data using the

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naive Bayes method. The remaining 495 unlabeled data will be automatically predicted using the naive Bayes algorithm.

3.2. Data Visualization

The visualization results for GetContact are displayed using a line diagram as shown in Figure 1.

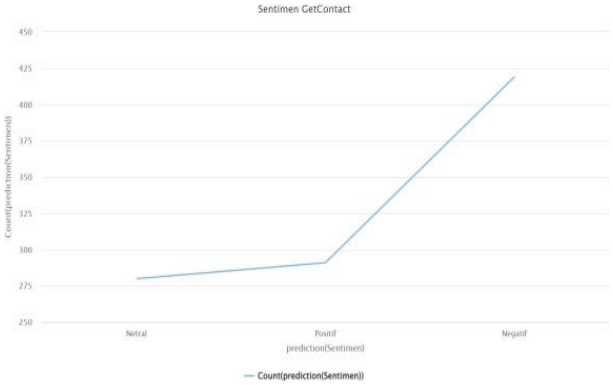

Figure 2. GetContact Sentiment Analysis Results

Figure 2 displays the overall visualization results for GetContact based on 990 data points, with the highest negative score (419), positive score (291), and neutral score (280).

The following is a word cloud data visualization of negative, positive, and neutral data based on the 30 most frequently occurring words.

Figure 3. Negative Word Cloud

Figure 3 shows that the visualization of negative sentiment with the most frequently appearing words being “application”, “login” and “enter”.

Figure 4. Positive Word Cloud

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Figure 4 shows that the visualization of positive sentiment with the most frequently appearing words being “application”, “good” and “helpful”.

Figure 5. Neutral Word Cloud

Figure 5 shows that the visualization of sentiment is neutral with the most frequently appearing words being “application”, “contact” and “login”.

4. DISCUSSIONS

A word cloud for negative sentiment showing words like "app," "login," and "sign in" as the most frequently occurring. The significant occurrence of these words indicates that users' primary complaints centered on basic functionality issues and difficulties accessing the app.. Certainly, based on the analysis of the research document, the following suggestions can be provided to the author, future researchers, and other stakeholders, such as the GetContact app developer.

1. Suggestions for Research Authors

Deepen the Discussion Chapter: The discussion chapter in this document is still a template and has not been completed. The author can enrich this section by comparing their findings (dominant negative sentiment due to technical issues) in more depth with similar studies already cited, such as studies on the Truecaller app or Amazon Shopping. This will provide broader context and enhance the academic merit of the paper.

Elaboration of Algorithm Comparison: In the conclusion, it is stated that Naive Bayes has competitive performance compared to other algorithms. To strengthen the argument, the author could have included a sub-section specifically discussing why the Naive Bayes algorithm was chosen over other algorithms that are also said to be effective, such as Support Vector Machines (SVM). An explanation of Naive Bayes' superiority in terms of speed and accuracy for text classification would have been particularly relevant.

Provide More Specific and Applicable Recommendations: Based on the finding that the words "login" and "sign in" were the main sources of negative sentiment, the author could have provided more concrete recommendations to developers beyond simply "addressing access and functionality issues." For example, suggesting improvements to the OTP verification flow, simplifying the login page interface, or adding alternative login methods.

2. Suggestions for Further Researchers

Expand the Scope and Data Period: As the authors also suggest, future research could expand by using review data from a specific timeframe (e.g., before and after a major update) to analyze sentiment changes. Additionally, conducting a comparative analysis with reviews from other platforms (such as the Apple App Store) could provide more comprehensive insights.

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Apply Comparative Analysis Methods: This study used Naive Bayes as the primary method. Future researchers could conduct direct comparative studies by applying multiple algorithms to the same dataset, such as comparing the performance of Naive Bayes with Support Vector Machines (SVM) and K-Nearest Neighbors (K-NN), which have been shown to have high accuracy in other studies.

Use Deeper NLP Techniques: To gain richer insights, future researchers could use more advanced Natural Language Processing (NLP) techniques, such as topic modeling. This could help identify specific subtopics within each sentiment category. For example, within negative sentiment, whether the "login" issue is related to "verification," "premium ads," or "bugs" in the app.

3. Suggestions for Stakeholders (especially GetContact App Developers)

Prioritize Improvements to Core Functionality: The results of this study are a clear signal. The predominance of negative sentiment (42.3%), driven by the keywords "app," "login," and "sign in," indicates a crucial issue with the basic user experience. Development teams should prioritize improving the login flow and app accessibility to reduce user dissatisfaction.

Leverage Positive Feedback as a Strength: Conversely, positive reviews are dominated by the words "app," "good," and "helpful." This confirms that users highly value the app's core functionality of identifying numbers and providing a sense of security. This feedback can be leveraged in marketing materials to strengthen GetContact's core value proposition.

Implement a Continuous Sentiment Analysis System: This study provides a snapshot of user sentiment. Developers are advised to adopt sentiment analysis as an ongoing monitoring tool. This allows teams to proactively track user perceptions, detect new issues post-update, and measure the impact of improvements.

5. CONCLUSION

Based on sentiment analysis of 990 GetContact app user reviews on the Google Play Store, this study concluded that the majority of user sentiment tended to be negative. Specifically, 419 reviews (42.3%) were classified as negative, while 291 reviews (29.4%) were positive, and the remaining 280 reviews (28.3%) were neutral. This dominance of negative sentiment indicates a significant level of dissatisfaction among users, which is a crucial finding of this study. The success of this classification demonstrates that the Naive Bayes algorithm is an effective and reliable method for sentiment analysis tasks on app reviews. In this study, the review data used is still limited to reviews in the most relevant category, so it needs to be developed in future research by using reviews in other categories or using review data from a certain time period [41].

Further insights were gained through data visualization using word clouds, which highlighted key themes within each sentiment category. In negative reviews, the most frequently occurring words were “app,” “login,” and “sign in,” clearly indicating that users’ primary complaints centered on basic functionality issues and difficulty accessing the app. Conversely, positive reviews were dominated by words such as “app,” “good,” and “helpful,” indicating that users highly appreciated the app’s core functionality of identifying numbers and aiding their digital security. Neutral reviews also highlighted similar keywords to negative reviews such as “login” and “contact,” suggesting comments about features without strong emotions. Furthermore, a comparison of the eight machine learning algorithms used showed that Naive Bayes performed competitively compared to other algorithms [42].

Overall, this study not only successfully mapped GetContact user perceptions but also provided critical and actionable feedback for app developers. The findings regarding the large amount of negative feedback serve as an important reference for future app improvements and development, particularly in addressing access and functionality issues complained about by users. Thus, this study contributes as a

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baseline for evaluation to improve service quality, maintain popularity, and enhance the overall user experience of the GetContact app.

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