

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.*

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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

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 Getcontact 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

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.

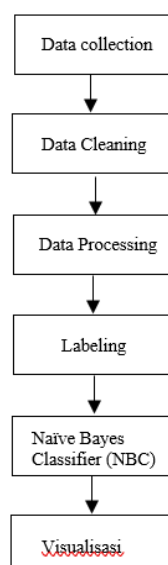


Figure 1. Research Method

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.

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.

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

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

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.

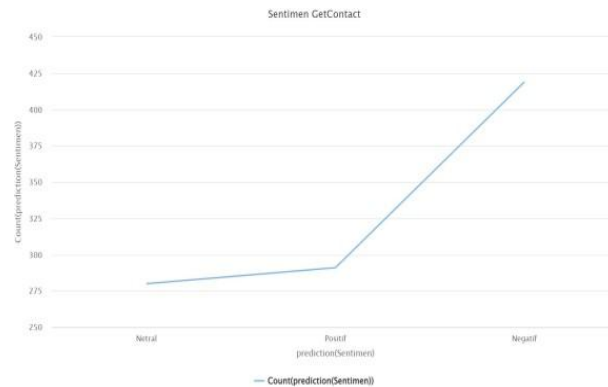


Figure 2. GetContact Sentiment Analysis Results

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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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

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

REFERENCES

- [1] P. Studi et al., "HCI and Social Media: A Case Study of Sentiment Analysis of the 2024 Presidential Election on Twitter Using Naive Bayes," vol. 14, no. 2, pp. 297–309, 2024.
- [2] A. R. Thalib and F. A. Rabani, "Community Protection in Addressing Giveaway Fraud on Instagram Social Media," pp. 1403–1412, 2023.
- [3] S. Rita, D. Indrayana, and A. Pambudi, "Using Support Vector Machines for Sentiment Analysis of Truecaller and Getcontact App Reviews," Bit (Faculty of Technol. Inf., Budi Luhur University), vol. 20, no. 2, p. 131, 2023, doi:10.36080/bit.v20i2.2493.
- [4] R. Maulana, M. Raihan, and I. Santoso, "Comparison of Naive Bayes and K-Nearest Neighbor Algorithms in Sentiment Analysis of Tokopedia App User Reviews," J. Technol. Inf. J. Scientific and Apl. Bid. Tech. Inform., vol. 7, no. 2, pp. 177–189, 2023, doi: 10.47111/jti.v7i2.10071.
- [5] D. Diandra Audiansyah, D. Eka Ratnawati, and B. Trias Hanggara, "Sentiment Analysis of the MyXL Application Using the Support Vector Machine Method Based on User Reviews on the Google Play Store," Pengembang. Technol. Inf. dan Ilmu Comput., vol. 6, no. 8, pp. 3987–3994, 2022, [Online]. Available: <http://j-ptiik.ub.ac.id>
- [6] E. Daryfayi, P. Daulay, and I. Asror, "Sentiment Analysis of Google Play Store Reviews Using the Naïve Bayes Method," e-Proceeding Eng., vol. 7, no. 2, pp. 8400–8410, 2020.
- [7] R. Wahyudi and G. Kusumawardana, "Sentiment Analysis of the Grab Application on the Google Play Store Using Support Vector Machine," J. Inform., vol. 8, no. 2, pp. 200–207, 2021, doi: 10.31294/ji.v8i2.9681.
- [8] M. N. Akbar and Nirwana Samrin, "Sentiment Analysis of User Comments on the Threads Application on the Google Play Store Using the Multinomial Naive Bayes Classifier Algorithm," AGENTS J. Artif. Intell. Data Sci., vol. 3, no. 2, pp. 21–29, 2023, doi: 10.24252/jagti.v3i2.67.
- [9] M. K. Khoirul Insan, U. Hayati, and O. Nurdiawan, "Sentiment Analysis of the Brimo Application Based on User Reviews on Google Play Using the Naive Bayes Algorithm," JATI (Jurnal Mhs. Tek. Inform.), vol. 7, no. 1, pp. 478–483, 2023, doi:10.36040/jati.v7i1.6373. *Subset and Neural Network with WEKA Tools*. Springer Singapore.
- [10] T. D. Putra, E. Utami, and M. P. Kurniawan, "Sentiment Analysis of the 2024 Election Using Naive Bayes Based on Particle Swarm Optimization (PSO)," Explore, vol. 13, no. 1, pp. 1–5, 2022, [Online] Available: <https://ojs.utmmataram.ac.id/index.php/explore/article/view/617>
- [11] Ernianti Hasibuan and Elmo Allistair Heriyanto, "Sentiment Analysis of Amazon Shopping App Reviews on Google Play Store Using Naive Bayes Classifier," J. Tech. and Sci., vol. 1, no. 3, pp. 13–24, 2022, doi: 10.56127/jts.v1i3.434.
- [12] A. Adiansyah, "Sentiment Analysis on Home Credit Application Reviews Using SVM and K-NN Methods," J. Comput. Antart., vol. 1, pp. 174–181, 2023, [Online]. Available: <https://ejournal.mediaantartika.id/index.php/jka/article/view/50%0Ahttps://ejournal.mediaantartika.id/index.php/jka/article/download/50>.
- [13] Farhan Nufairi, Nunik Pratiwi*, Fariz herlando, "Sentiment Analysis on Threads Application Reviews on Google Play Store Using Support Vector Machine Algorithm," JIPI (Scientific Journal of Informatics Research and Learning) Journal homepage: <https://jurnal.stkipgritlungagung.ac.id/index.php/jipi> ISSN: 2540-8984 Vol. 9, No. 1, March 2024, pp. 339-348.
- [14] Fathoni, Inneke Via Mariska, Marco Saputra, Nadia Epriyanti, Qothrunnada Wafi Anadia, Ali Ibrahim, "User Experience Analysis of the Getcontact Application Using the HEART Metrics Method," Jutisi: Scientific Journal of Informatics Engineering and Information Systems Vol. 14, No. 1, p-ISSN: 2089-3787.
- [15] Talitha Dwi Septyorini, Khothibul Umam, Maya Rini Handayani, "Public Opinion Dynamics Related to Quarter-Life Crisis on Social Media X Using Support Vector Machine," Jurnal Informatika: Jurnal Pengembangan IT, Vol. 10, No. 3, 2025 ISSN: 2477-5126, DOI:

- 10.30591/jpit.v10i3.8648.
- [16] Cindy Caterine Yolanda, Syafriandi, Yenni Kurniawati, Dina Fitria, "Sentiment Analysis of DANA Application Reviews on Google Play Store Using Naïve Bayes Classifier Algorithm Based on Information Gain," UNP JOURNAL OF STATISTICS AND DATA SCIENCE Volume 2 Number 1 Year 2024 Pages 48-55.
- [17] Andi Najemi, Tri Imam Munandardan Aga Hanum Prayudi, "The Dangers of Delivering Fake News Through Social Media," Jurnal Karya Abdi P-ISSN: 2580-1120 Volume 5 Number 3 December 2021.
- [18] Hermanto, Riza Fahlapi, Antonius Yadi Kuntoro, Taufik Asra, "Comparison of Sentiment Analysis Classification Algorithms of Getcontact Application Users in Preventing Online Fraud," J-INTECH (Journal of Information and Technology), E-ISSN: 2580-720X || P-ISSN: 2303-1425.
- [19] Mayana Kris Monika, "Application of Data Mining to Predict the Impact of GetContact Application Use on User Security in Receiving Calls and Messages," COMASIE JOURNAL-VOL.11NO.04(2024).
- [20] N. Aulia, S. N. Sari, N. Wakhidah, "Sentiment Analysis of GetContact Application in App Store Using SVM (Support Vector Machine) Method," Jurnal Informatika: Jurnal Pengembangan IT Vol. 10, No. 1, 2025.
- [21] Nofsa Atia Nevrada, Muhammad Adie Syaputra, "Sentiment Analysis of Telegram App Reviews on Google Play Store Using the Support Vector Machine (SVM) Algorithm." Journal of Applied Informatics and Computing (JAIC) Vol. 9, No. 1, February 2025, pp. 96-105.
- [22] Rizka Fiddiyansyah, Izra Noor Zahara Aliya, Moh Azzam Priyanto, "The Impact of Identity Theft Based on News Articles and Crawling Twitter Sentiment Data," Proceedings of the 2023 National Seminar on Technology and Information Systems (SITASI) Surabaya, September 6-7, 2023.
- [23] Shane Giorgio Alexander, Amadeus Terra Ananto, I Putu Adhitya Pratatama Mangku Purnama, Bayu Liano Leader Habibullah, Nur Aini Rakhmawati, "Sentiment Analysis of Indonesian Public Opinion on Deepfake Content of Public Figures," KAKIFIKOM (Collection of Scientific Articles, Faculty of Computer Science - Vol. 05 No. 02 (October 2023).
- [24] Vina Fitriyana, Lutfi Hakim, Dian Candra Rini Novitasari, Ahmad Hanif Asyhar, "Sentiment Analysis of Jamsostek Mobile Application Reviews Using the Support Vector Machine Method," Jurnal Buana Informatika, Volume 14, Number 1, April 2023: 40-49.
- [25] Rachma Pavita, Firman Noor Hasan, "Evaluation of the Use of the Getcontact Application as Protection Against Fraud Mode Using the User Experience Questionnaire Method," JIPI (Scientific Journal of Informatics Research and Learning) Vol. 9, No. 4, December, Pp. 2054-2063.
- [26] Abdun Nafi, Aris Tri Jaka Harjanta, Bambang Agus Herlambang, Saeful Fahmi, "Sentiment Analysis of Lazada Customer Reviews with Sastrawi Stemmer and SVM-PSO to Understand User Responses," Vol 12 No 02 (2024): J-Intech: Journal of Information and Technology.
- [27] M. Wildan Alvian Prastya, Muhlis Tahir, Ayu Agustyas Ningrum, Aqiqu Putra Zaibintoro, Lumatus Sa'adah, Ummi Mutmainnah, Sabella Kalimatus Sa'diah, "Analysis of Phishing Threats via WhatsApp Application: Review of Literature Study Methods," National Journal of Computing and Information Technology (JNKTI) Vol. 7 No. 3, June 2024.
- [28] Primandani Arsi, Retno Waluyo, "Sentiment Analysis of the Discourse on Relocating Indonesia's Capital City Using the Support Vector Machine (SVM) Algorithm," Journal of Information Technology and Computer Science (JTIK) DOI: 10.25126/jtiik.202183944 Vol. 8, No. 1, February 2021, pp. 147-156.
- [29] Andika Saputra, Firman Noor Hasan, "Sentiment Analysis of the Coffee Meets Bagel Application Using the Naïve Bayes Classifier Algorithm," Sibatik Journal|Volume 2no.2 (January 2023).
- [30] Budi Kurniawan Rachmat, Achmad Suwarisman, Iis Afriyanti, Aditya Wahyudi, Dedi Dwi Saputra, "Sentiment Analysis of Complaints and Non-Complaints on Telkomsel Twitter with SMOTE and Naive Bayes," Jurnal JTIK (Journal of Information and Communication Technology) 7 (1) 2023.

-
- [31] Akhmad Muzaki, Arita Witanti, "Sentiment Analysis of the Community in the Twitter to the 2020 Election in the Covid-19 Pandemic By Method Naive Bayes Classifier," *Jurnal Teknik Informatika (JUTIF)* DOI: <https://doi.org/10.20884/1.jutif.2021.2.2.51> Vol. 2, No. 2, December 2021, pp. 101-107.
- [32] Andriani Nurian, Betha Nurina Sari, "Sentiment Analysis of Google Play App User Reviews Using Naive Bayes," *JITET (Journal of Informatics and Applied Electrical Engineering)* Vol.11 No.3 S1, pISSN:2303-0577 eISSN:2830-7062.
- [33] Ana Nur Rani Hasanah, Rr. Artiana Krestianti, Sutresna Wati, "Implementation of Logistic Regression Algorithm for Binary Classification in SMS and WhatsApp Spam," *INOTEK*, Vol. 7, August 2023.
- [34] Herlawati, Dwi Budi Srisulistiwati, Syafira Cessa Agustin, Prilia Hashifah Syafinal, Nida Rachmatin, Siti Setiawati, "Naive Bayes and Support Vector Machine Methods for Processing Review and Comment Sentiments on Digital Platforms," *Journal of Students' Research in Computer Science (JSRCS)*, Vol. 5, No. 2 (November 2024).
- [35] Efrico Fernando Baharsyah, Armanto, Tri Hasanah Bimastari Aviani, Cindi Wulandari, "User Sentiment Analysis of Ruang Guru Online Learning Application in Google Play Store Reviews Using Naive Bayes Algorithm and Support Vector Machine," *INNOVATIVE: Journal of Social Science Research* Volume 4 Number 3 Year 2024 Pages 2965-2979.
- [36] I Putu Wibina Karsa Gumi, Hartatik, Andri Syafrianto, "Comparison of Naïve Bayes Algorithm and Decision Tree in Sentiment Analysis," *IJCSR: The Indonesian Journal of Computer Science Research* Volume 1, Number 2, July 2022.
- [37] Elisabeth Dwi Kurnia Wardani, Febi Febiola Yo, Wayan Nesa Meylugita, "Implementation of Naïve Bayes Algorithm for User Review Analysis for Seabank Application on Google Play Store" *Journal of Artificial Intelligence and Information Technology* Vol. 4, No. 1, January 2025, pp. 13-24.
- [38] Salya Sahilla1, Firda Amalia, Mulyadi Kartika Mariskhana, "User Sentiment Classification Towards Dana's Official Twitter Account Using the Naive Bayes Classifier Algorithm," *URSISTEKNI (Journal of Information Systems and Information Technology)* Vol. 6, No. 3, September 2024: Pages 580-591.
- [39] Linggar Nursinggah, Ruuhwan, Teuku Mufizar, "User Sentiment Analysis of Application X Towards the Free Lunch Program Using the Naive Bayes Classifier Method," *JITET (Journal of Informatics and Applied Electrical Engineering)* Vol. 12 No. 3, pISSN: 2303-0577 eISSN: 2830-7062.
- [40] Tobby Wiratama Putra, Agung Triayudi, Andrianingsih, "Sentiment Analysis of Online Learning Using Naive Bayes, KNN, and Decision Tree Methods," *Jurnal JTIK (Journal of Information and Communication Technology)* 6 (1) 2022.
- [41] Rizki Wahyudi, Gilang Kusumawardhana, "Sentiment Analysis on Grab App Reviews on Google Play Store Using Support Vector Machine," *JOURNAL OF INFORMATICS*, Vol. 8 No. 2 September 2021, Pages 200~207.
- [42] Ernianti Hasibuana, Elmo Allistair Heriyantob, "Sentiment Analysis on Amazon Shopping App Reviews on Google Play Store Using Naive Bayes Classifier," *Jurnal Jts* Vol 1 No. 3 October 2022 – Pissn: 2828-7002, Eissn: 2828-6871, Pages 13-24.
-