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Sentiment Analysis in Platform X with the Support Vector Machine Method for Generation Z

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Abstract

Advances in information technology and the increasing use of social media have significantly influenced the behavior of Generation Z. The generation born between 1997 and 2012 is known to be very familiar with the digital world, but also faces challenges such as lack of in-person social interaction and the risk of mental health disorders. This study aims to identify and classify public sentiment towards Generation Z on social media, especially on platform X (formerly Twitter). The method used is the Support Vector Machine (SVM). This research was carried out through several stages, namely the collection of 1607 data in the form of text using crawling techniques, pre-processing of text (tokenization, case folding, removal of stopwords, stemming, and normalization), and feature extraction using the Term Frequency-Inverse Document Frequency (TF-IDF) method. The processed data is then classified into three sentiment categories: positive, negative, and neutral using SVM. Evaluation was carried out by measuring accuracy, recall value, and F1-score value through a confusion matrix. The results showed that the measurement of an accuracy value of 85%, a precision value of 85%, a value of recall of 95% and an F1-score value of 90% that SVM was able to classify sentiment with high accuracy and stability. In addition, SVM has been shown to be more effective than other methods studied in previous studies. The data analyzed shows that most sentiment towards Generation Z is negative, reflecting public concern about the behavior and mindset of this generation. This research is expected to be a reference for academics, practitioners, and policymakers in understanding public opinion and designing targeted policies for the younger generation.

Keywords: Sentiment Analysis, Generation Z, Support Vector Machine, Social Media, Machine Learning.

1. Introduction

The rapid development of technology in Indonesia and even the world affects various aspects of life and in all fields. [1].

Generation Z, born between 1997 and 2012, is the age group most exposed to the internet, social media and digital devices since childhood [2]. This generation is growing in the midst of rapid technological innovation and has a very high rate of digital adoption. However, excessive use of technology often triggers dependence, sleep disorders, and physical and mental health problems. The social pressure from social media also increases the risk of anxiety and stress, with many Generation Z feeling trapped in virtual life and burdened with expectations of always looking perfect[3]. In this context, sentiment analysis is a relevant method for understanding public perception of Generation Z. Sentiment analysis utilizes Text Mining techniques and machine learning algorithms to classify user opinions into positive, negative, or neutral sentiment categories [4]. One of the algorithms that has proven to excel in text classification is the Support Vector Machine (SVM), which is mathematically powerful and effective for managing unstructured text data, both linear and non-linear [5]. This phenomenon arises with high exposure to various public opinions on social media can have a good or bad impact on their productivity. The feelings expressed on social media, whether positive, negative, or neutral, can influence the way of thinking, motivation, and concentration of this generation in carrying out productive activities[6]. This is a strong indication that news and discussions on social media have a strategic role in shaping public perception and response to generation z [7]. The use of social media is very closely related to Generation Z. For the younger generation, social media is the main source of information [8].

Previous research has examined the effectiveness of the Support Vector Machine (SVM) method in analyzing social media sentiment. Khan et al. [9] showed that SVM has high accuracy (80.39%) and is superior to other methods in unstructured data processing. Research [10] shows that SVM accuracy reaches 99.64% in social data classification. Meanwhile, [11] a sentiment analysis study on Twitter showed that SVM produced an accuracy of 91.91%, with a precision of 98.34% and an F1-score of 96.55%. Furthermore, the research conducted [12] using SVM and TF-IDF weighting in the Ministry of Home Affairs' PPID application review managed to obtain an accuracy of

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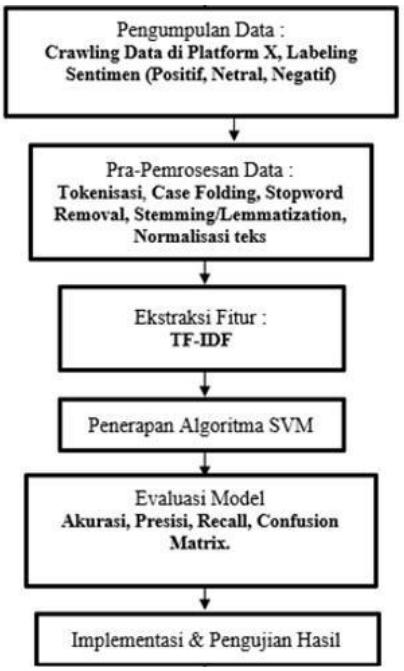
97%. [13] combines SVM and Word2Vec methods to analyze DANA application reviews, making a significant contribution to understanding user behavior. [14] using SVM to analyze the sentiment of users of the digital Qur'an application and obtained an accuracy of 85.11%. Meanwhile, [15] applied SVM with the RBF kernel in the analysis of disability accessibility sentiment in public spaces and achieved an accuracy of 83.37%. Researchers, [16] in an aspect-based study on restaurant customer reviews used SVM and obtained 92% accuracy, with 94% accuracy, 95% recall, and 95% F1-score. From the various results of these studies, it is proven that SVM is a reliable algorithm in the classification of sentiments. Researchers [17] In the evaluation stage of sentiment analysis produced an average k-fold of 88%, precision 94%, recall 100%, f-measure 97%, and accuracy of 97%. Researchers [18] have conducted it, with 25 epochs used achieving the highest accuracy rate of 73.11%. Researchers, Researchers [19] to provide a process stage on how to classify a text data regarding the opinions or opinions of twitter social media users about gay characteristics in the form of their responses that support gay or reject gay in generation z using the Naive Bayes algorithm. Finally, the researcher [20] looked at news data about COVID-19 in Indonesia to detect that the news was hoax news or factual news. The accuracy value reaches 94%. Social media, which is used in the Tokyo media for the first time, now has an influence on various sectors, one of which is the Tourism and Hotel sectors [21]. Sentiment analysis is useful for a wide range of issues of interest to human-computer interaction practices and researchers, as well as those from fields such as: sociology, marketing and advertising, psychology, eco-economics, and political science [22]. System Analysis is a research technique on a system to study the components themselves and their relationship with other components that make up the system so that a decision or conclusion can be obtained about the system, whether it is the weaknesses or advantages of the system Usually a system analyst analyzes a system with the aim of knowing how the system works, so that one of them can be used to develop the system [23]. sentiment analysis has been conducted using various methods, such as machine learning and dictionary-based methods [24]. Knowledge Discovery in Database (KDD) or known as Data Mining is a data collection process that aims to find patterns, knowledge, and information. However, there must be an algoitma or technique used to find such a pattern [25].

Although SVM has been used extensively in sentiment analysis, most research still focuses on app reviews, politics, or general issues. There have not been many studies that specifically analyze public perception of Generation Z in the socio-cultural context in Indonesia. In addition, the use of Indonesian-language data on social media is also still limited. This research is here to fill this gap by systematically applying SVM to social data focusing on Generation Z, using complete text preprocessing stages, TF-IDF weighting, and classification performance evaluation through a confusion matrix.

This research aims to identify public sentiment towards Generation Z expressed through social media platform X. This research also maximizes the application of the Support Vector Machine (SVM) method in classifying sentiment into three categories, namely positive, negative, and neutral. This work was also carried out, to be able to analyze a gen z attitude towards platform X, assess the effectiveness of the method used, evaluate the performance of the classification using a number of metrics, namely accuracy, precision, recall, and F1-score, in order to obtain a comprehensive picture of the success rate of the model in classifying sentiment data appropriately.

2. Methodology

This study uses a quantitative approach with a text mining method to analyze public sentiment towards Generation Z on social media, especially platform X (formerly Twitter). The research framework is the stages followed by the author in conducting the research, which is presented in the form of a flowchart. Here is the research framework used by the authors:



Picture 1. Research Flow Framework Diagram Drawing

Figure 1 above shows The first stage is Data Collection, which aims to acquire relevant datasets. Data is collected through a crawling process using APIs from platform X, with the help of the Python library, and google collab. The data obtained is Indonesian data and

is classified into three sentiment categories: positive, negative, and neutral.
The second stage is that the data obtained is Indonesian data and is classified into three sentiment categories: positive, negative, and neutral.
The third stage is after the data is collected, it is continued to the Preprocessing stage, which is the process of cleaning and normalizing the data so that it is ready to be processed by the algorithm. The steps include tokenization (breaking sentences into words). Case folding (changing the letters to lowercase all) with the aim of getting accurate data in the next process. example

Case folding table 1

Before	After
access to digital information and adapt quickly to new technologies. So for Gen Z, technology is not just a tool but part of the lifestyle and way of thinking. Are you part of the Gen Z generation? #GenZ #TeknologiInformasi #IT #SEO #Web #Email #Domain #Internet	access to digital information and adapt quickly to new technologies. So for Gen Z, technology is not just a tool but part of the lifestyle and way of thinking. Are you part of the generation of gen z? #genz #teknologiinformasi #it #seo #web #email #domain #internet

From the table 1 above, the word "Gen Z" in the text before it was changed to "Gen Z" in the text after to be uniform in data processing. Apart from "Gen Z", all other words like "Email" were changed to "email" to maintain writing consistency. With this process, the system can recognize the same word even though it initially has a difference in letter capitalization.

stopword removal At this stage, it is carried out to remove unimportant phrases according to the phrases contained in the Stopword. If there is a word that matches the word in the stopword, it will be removed from the document because it is considered an unimportant word. The process of Stopword Removal on the training data and test data is presented in the table,

Table 2 stop word removal

Before	After
access to digital information and adapt quickly to new technologies. So for Gen Z, technology is not just a tool but part of the lifestyle and way of thinking. You belong to the generation of gen z	Access to digital information Adapt quickly new technology Gen Z Technology Tools Lifestyle Way Generation Gen Z thinks

From the table 2 above in the previous text, the words "and", "with", and "you" are omitted from the text after to make the analysis more accurate and efficient. This prores aims to reduce irrelevant words so that the focus of the analysis is only on the important words that carry the main meaning. Stopword removal helps reduce the size of the data and speeds up the computational process in text analysis.

The Stemming process will remove every adjective in the word. Voting is done based on a rules approach. The results of the voting process are shown in the table.

Table 3 vote

Before	After
Access to digital information Adapt quickly new technology Gen Z Technology Tools Lifestyle Way Generation Gen Z thinks	Access to digital information Rapid adaptation of new technologies Gen Z Technology Tools for lifestyle How Gen Z Generation Thinks

From the table 3 above, this process aims to equalize words that have the same meaning but different shapes, thus facilitating text analysis. In the previous text, the word "adapt" is changed to "adaptation" and "think" is changed to "think" in the text afterwards. This process is important so that the model can recognize words with similar meanings without being affected by the shape of the word.

Normalization is a stage to remove a number of punctuation marks and numbers, symbols, URLs, and usernames so that the data obtained is more structured for the next process. The results of the normalization process on the training data and test data are presented in the table

Table 4 Text normalization

Before	After
access to digital information and adapt quickly to new technologies. So for Gen Z, technology is not just a tool but part of the lifestyle and way of thinking. Are you part of the generation of gen z? #genz #teknologiinformasi #it #seo #web #email #domain #internet	access to digital information and adapt quickly to new technologies. So for Gen Z, technology is not just a tool but part of the lifestyle and way of thinking. You belong to the generation of gen z

From the table 4 above, normalization helps to overcome variations in the writing of words that are different but have the same meaning. This process also plays an important role in improving the accuracy of the analysis, especially in social media texts that use non-standard language. With normalization, abbreviated words or phrases such as "info" to "information", can be processed consistently by the model.

The fourth stage is Feature Extraction, where the processed text data is converted into numerical forms so that it can be analyzed by machine learning models. One of the common methods used is TF-IDF (Term Frequency-Inverse Document Frequency).

$$Wtf_{t,d} = \begin{cases} 1 + log_{10} tf_{t,d}, if\ tf_{t,d} > 0 \\ 0, \quad otherwise \end{cases}$$

$$\boldsymbol{Wtf_{t,d} = 1 + log_{10}(1) \quad Wtf_{t,d} = 1} \qquad (1)$$

The fifth stage is After the features are obtained, the Application of the Support Vector Machine (SVM) Algorithm is carried out to build a classification model. SVM was chosen because it is effective in accurately separating data into sentiment classes. The model is trained using trained data and validated using validation data.

Table 5 of Support Vector (SV) Calculation Results on Sample Data

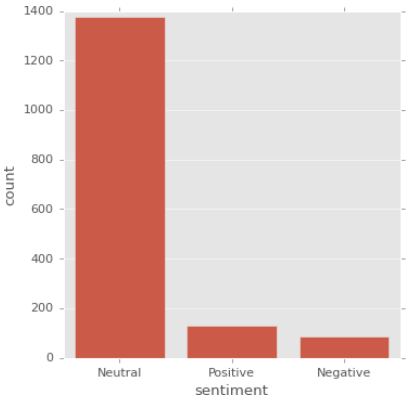
	D1 (+)	D3 (-)	a.y(k+)	a.y(k-)
D1	24.881	1	0.1915	0.0077
D2	1.857	1	0.0128	0.0069
D3	1.000	23.97688259	-0.0064	-0.1539
D4	1.000	1	-0.0007	-0.0007
D5	1.000	1	0.0035	0.0035
	Total		0.2008	-0.1364

From the table 5 above, At this stage, the new alpha value that has been obtained in the previous stage is used to calculate the bias value. The calculation of the bias value is done by determining x+ and x- first. This is done by looking at the new alpha value (iteration 3) in the kernel data with the highest category.

The sixth stage is a Model Evaluation to measure the performance of the algorithm using several metrics, namely: accuracy (the overall correct prediction rate), precision (accuracy in predicting each class), recall (the model's ability to find all relevant data), and confusion matrix (a comparison table between the prediction and the actual label).
The seventh stage is Implementation and Results Testing, where the trained model is tested using never-before-seen test data. This stage aims to determine the generalization ability of the model in real conditions. The results of this test can be used for decision-making, used as a scientific report, or as a basis for further system development.

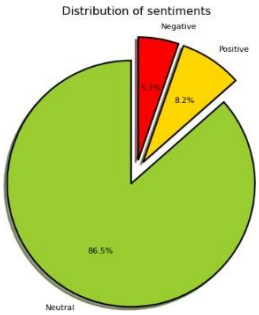
3. Results and Discussion

The results and discussion of these results resulted in a model of Sentiment Analysis in Platform X with the Support Vector Machine Method for Generation Z with data that has gone through the processing process, such as preprocessing and TF-IDF weighting, used as input in the system. Furthermore, the system utilizes the Support Vector Machine (SVM) algorithm to perform sentiment classification.



Picture 2. Visualization Image of Sentiment Distribution Graph in Dataset

Figure 2 above shows Based on the graph, it can be seen that the results of the sentiment classification are dominated by neutral sentiment, with the amount of data approaching 1,400 tweets or texts. Meanwhile, the positive and negative sentiments are only about 100–150 data each. This comparison shows that the majority of opinions or statements analyzed against Generation Z are neutral, or tend not to contain strong emotions either in a positive or negative direction.



Picture 3. Visualization Image of Sentiment Distribution Percentage in Dataset

Figure 3 above shows It can be seen that public sentiment towards Generation Z on platform X tends to be neutral, which is 86.5%, with a much lower level of positive and negative opinions, namely positive at 8.2% and negative at 5.3%. This is an important foundation for understanding public perception in general, which can be used as a consideration in communication strategies or policies targeting Generation Z.

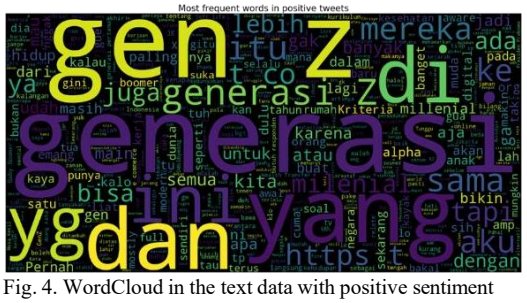


Fig. 4. WordCloud in the text data with positive sentiment

Figure 4 above shows WordCloud which represents the words that appear most often in the text data with positive sentiment towards Generation Z. This WordCloud is generated from the datasets that have been classified by the SVM model into positive categories. From the WordCloud, it appears that words such as "generation", "z", "yang", "gene", "and", "we", and "they" are the words that appear most often. This confirms that the discussion in the dataset does focus on Generation Z as the main topic.

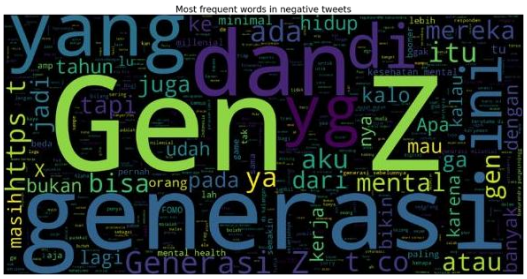


Fig. 5. WordCloud Visualization Images Based on Negative Sentiment Categories

Figure 5 above shows WordCloud which represents the words that appear most often in the text data with negative sentiment towards Generation Z. This WordCloud is generated from a dataset that has been classified by the SVM model into negative categories. Some of the most prominent words include: "Gen Z", "generation", "who", "mental", "live", "work", "mental health", "not", "not", and "want". This indicates that negative conversations with Generation Z touch a lot on aspects of mental health, work ethics, and lifestyle. WordCloud for this negative sentiment provides an overview of the main issues that are the source of dissatisfaction or criticism of Generation Z. Issues such as mental health and perceptions of work patterns are often the center of attention in negative discussions. This indicates that the challenges faced by Generation Z are often associated with societal expectations of independence, responsibility, and emotional stability.

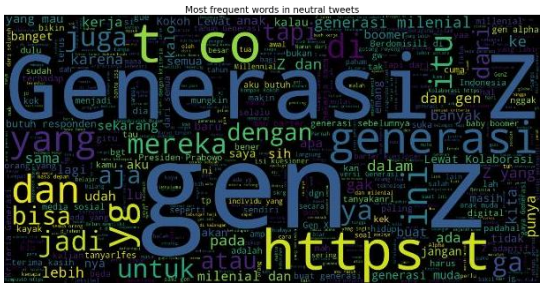


Fig. 6. WordCloud Visualization Images By Neutral Sentiment Category

Figure 6 above shows WordCloud which represents the most frequently appearing words in the text data with a neutral sentiment towards Generation Z. This WordCloud is generated from a dataset that has been classified by the SVM model into neutral categories. WordCloud this neutral sentiment illustrates that most discussions about Generation Z on social media are descriptive, non-subjective, and often in the form of questions, information, or observations without emotional judgment. This is in line with the results of the previous sentiment distribution, where neutral sentiment dominated significantly (around 86.5%).

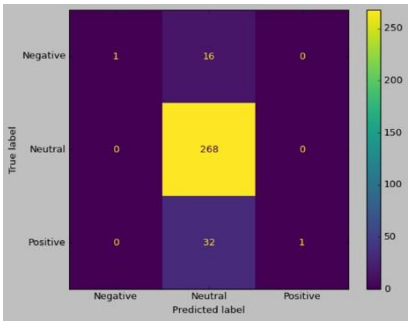


Fig. 7. Confusion Matrix

Figure 7 above shows the confusion matrix predicted by the Support Vector Machine (SVM) model on test data with three sentiment categories: Negative, Neutral, and Positive. This matrix shows how accurate the model is in classifying data based on original labels and prediction labels.

	precision	recall	f1-score	support
Negative	1.00	0.06	0.11	17
Neutral	0.85	1.00	0.92	268
Positive	1.00	0.03	0.06	33
accuracy			0.85	318
macro avg	0.95	0.36	0.36	318
weighted avg	0.87	0.85	0.79	318

Fig. 8. Support Vector Machine (SVM)

Figure 8 above is the result of an evaluation of the performance of the Support Vector Machine (SVM) model used in the classification of sentiment against Generation Z. The evaluation was carried out using precision, recall, and f1-score metrics, which are important to measure the performance of the model comprehensively and fairly against the three sentiment classes: Negative, Neutral, and Positive. And from the image above, it can be seen that the accuracy value is 85%.

4. Conclusion

Based on the results of the research that has been conducted on Sentiment Analysis in Platform X with the Support Vector Machine Method for Generation Z, several conclusions can be drawn as follows:
Based on the classification results, most opinions about Generation Z on platform X are neutral, accounting for 86.5% of all data. Meanwhile, positive sentiment was only 8.2% and negative 5.3%. This suggests that most

users express their opinions in a casual way, without strong emotions

The SVM algorithm was successfully used to classify text sentiment into three categories, namely positive, neutral, and negative. This process begins with data cleansing such as word separation (tokenization), general word removal (stop word), and root word (stemming). After that, the cleaned data is used to train the model. The results of the analysis are also visualized using word cloud and confusion matrix to make it easier to understand.

The SVM model has an accuracy of 85% on the test data, which shows quite good results overall. However, when viewed from other metrics such as recall and f1-score, there is inequality. The f1-score values for negative and positive sentiment are very low, i.e. 0.11 and 0.06)

The goal is to identify public sentiment towards generation z on platform x by using a support vector machine combined with weighting (TF-IDF), through data preprocessing stages such as case folding, cleaning, normalization, stop word removal, stemming, and tokenization, so that public opinion can be classified into positive, negative, and neutral categories systematically and measurably.

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