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Sentiment Analysis on the Impelementation of the 2024 Presidential Election on X Application Using Naive Bayes and Support Vector Machine (SVM) Methods

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Abstract **This article discusses sentiment analysis of the 2024 Presidential Election through data collected from platform X. This research was starting from looking at the statistics of public participation data in the last few years, revealing declines and fluctuations, then the spread of fake news reducing trust in presidential candidates and ongoing public apathy in the election. This research uses Naive Bayes Classifier and Support Vector Machine Methods. Naive Bayes is effective and accurate for text classification because it assumes independent features. SVM excels for unbalanced data and commonly used in text processing. Naive Bayes classification has accuracy of 92% with precision values of 93% for positive, 90% for negative, 98% for neutral sentiments, and recall values of 94%, 97%, and 64%, respectively. SVM classification accuracy is 73%, with precision values of 75% for positive, 72% for negative, 67% for neutral sentiments, and recall values of 70%, 86%, and 10%, respectively.**

Key words**: Sentiment Analysis, Presidential Election, Naive Bayes Classifier, SVM.**

I. INTRODUCTION

Platform X, previously known as twitter, is a major social networking site platform that facilitates users to send and read text-based messages [1]. In 2024, users are busy discussing politics because this year is close to the democratic party which will be held in February. Many users give opinions, and express sentiments related to presidential candidates and political issues raised during the election period.

General elections as a pillar of democracy are a crucial moment in the life of a country. Elections are not only a means of selecting leaders, but also a mirror of the health of a nation's democracy. According to Henry B Mayo's view cited by Sorik as a democratic country, the implementation of elections is one of the important conditions for the creation of a democratic country [2]. In the 2024 elections, Indonesia is once again welcoming a challenging democratization process. However, in the midst of enthusiasm and political dynamics, there are serious concerns about the phenomenon of decreased public participation, high levels of apathy towards the election of presidential candidates, and the circulation of hoaxes against presidential candidates.

Presidential elections in Indonesia are an implementation of the democratic process that takes place every five years, but there has been a fluctuating trend in election participation in recent years. Based on data from Komisi Pemilihan Umum (KPU), the level of Voter Participation in Indonesia, before the reform in the 1997 election, the last election of the new order, the level of voter participation was 93.6% but in the legislative elections in 2009, voter participation decreased to as much as 70.9% and voter participation in the presidential election in 2009 increased slightly to 71.7%. In the 2014 legislative elections, voter participation reached 72%. While in the 2014 presidential election, voter participation reached 69.58% [2].

But in 2019 there was a change where there was an increase in participation in the election. The number of voter participation in the 2019 presidential election was 81%. The high level of political participation compared to the previous year, this can show that people in a country pay attention to various state issues. It can also show that the elected government in a country has high legitimacy [3]. This increase is encouraging information because people use their voting rights well. This is what we need to maintain and can be improved again in the next 5 years.

One of the main problems that arise is the fluctuation and decline in public participation in the electoral process every year. Although elections are the rights and obligations of citizens, there is a tendency for a decrease in interest and active participation in voting [4]. This phenomenon is an important issue because it can jeopardize the essence of democracy, which should involve as many elements of society as possible.

Then there is fake news / hoaxes about presidential candidates that are widely circulated [5]. Fake news or hoaxes circulating about presidential candidates can harm their image, reducing the positive assessment given by the community. Presidential candidates who are victims of these hoaxes must be careful because the negative assumptions spread can influence people's elections. Each

presidential candidate is worried that the hoaxes spread will damage their reputation, so the possibility of not being elected by voters becomes greater.

Not only that, indifference or apathy towards presidential candidates is also a serious challenge in maintaining the quality of democracy [6]. The existence of apathy has the potential to produce voters who are less informed and less concerned about the direction of state policy. Therefore, this research tries to open the curtain and in-depth analysis of public sentiment related to the implementation of the 2024 election, especially through social media Twitter (X).

By conducting this sentiment analysis, the success team of each presidential candidate can use the results as an in-depth self-evaluation. Positive sentiments received can serve as a foothold to maintain an effective strategy, while negative sentiments can serve as valuable learning opportunities. Through reflection on the negative sentiments, the success team can identify areas where improvements are needed in their campaign strategy. This not only increases the effectiveness of the campaign, but also allows the presidential candidate to appear as a better figure in the eyes of the public. Thus, there is hope that at the time of voting, the presidential candidate who has undergone this evaluation and improvement will gain greater support from the public.

This research uses a dataset in the form of user reviews about presidential candidates in 2024 on platform X that has been collected and then uses the lexicon method to get positive, negative and neutral sentiment labels. Furthermore, it uses the Naïve Bayes Classification method and Support Vector Machine (SVM) to predict and further analyze the sentiment patterns in the dataset. By combining these lexicon methods and machine learning algorithms, the research aims to improve accuracy and effectiveness in sentiment classification.

II. Literature Review

Democracy, as a system of government that involves direct or indirect participation of citizens, has the main objective of giving people a say in determining the country's leaders and policies [7]. Democratic theory emphasizes the importance of people's active participation in the political decision-making process as a strong foundation for a democratic system.

Public participation in elections is a vital indicator of the health of a country's democracy. According to experts, voter participation is an essential element in maintaining political stability and building a well-functioning society [7]. Therefore, an in-depth understanding of the factors that influence public participation is crucial in the context of elections.

Social media, particularly Twitter now X, has become a major vehicle for people to express their opinions, opinions and sentiments towards various events, including elections. Sentiment on social media reflects people's feelings and views on a topic or event. Sentiment analysis on social media provides valuable insights into public response and the dynamics of public opinion [8].

Political apathy reflects an individual's indifference or disinterest in the political process. An indifferent attitude towards elections, especially towards presidential candidates, can result in a negative impact on democracy, given that low participation can be detrimental to the integrity and representativeness of democratic systems [9]. Political apathy is often caused by a lack of knowledge or indifference to political policies. Therefore, understanding the factors that drive apathy in the context of presidential elections is essential in efforts to increase public political participation and awareness.

Sentiment analysis or opinion mining, is a part of data mining. Sentiment analysis involves computational research into sentiments, emotions, and opinions expressed in text [10]. When given a set of text documents containing sentiments about an object, sentiment analysis aims to identify the attributes and components of the object commented on in each document, and determine whether the comments are positive, negative, or neutral. The main goal of sentiment analysis is to understand the author's attitude or opinion towards a particular topic.

There was a similar previous research conducted by Lia Durrotul Mahbubah and Eri Zuliarso, with the title Twitter Sentiment Analysis in the 2019 Presidential Election using the Naïve Bayes algorithm [13]. He got the accuracy of this Naïve bayes method of 73%. By comparing the two journals, it can be seen that despite using the same method, the author has contributed in terms of better accuracy and additional use of additional methods, namely SVM in the 2024 Presidential Election.

In this study, researchers will implement the use of Naïve Bayes Classification and Support Vector Machine methods in determining the classification of positive, negative and neutral sentiments in sentiment analysis regarding the 2024 presidential election. The classification results will then be calculated for accuracy using the confusion matrix and classification report. The results of this study are expected to be useful to help conduct research on public opinion on platform X regarding the 2024 presidential election which contains positive, negative and neutral sentiments.

This model uses probability-based classification techniques and has been proven effective in identifying sentiment polarity from text. The identification of sentiment labels using lexicon methods is believed to provide positive, negative and neutral sentiments precisely and efficiently. More specifically, the model is applied to unstructured text data on social media platforms, including the results of a “twitter harvest” technique.

To represent this research so that it is easy for readers to understand, it is made in the form of visualization. Visualizations are in the form of pie charts, bars and there is also a wordcloud. Wordcloud is a visual representation of text data used to display the most commonly occurring words in the text.

III. RESEARCH METHODOLOGY

The research framework will be presented in Figure 1.

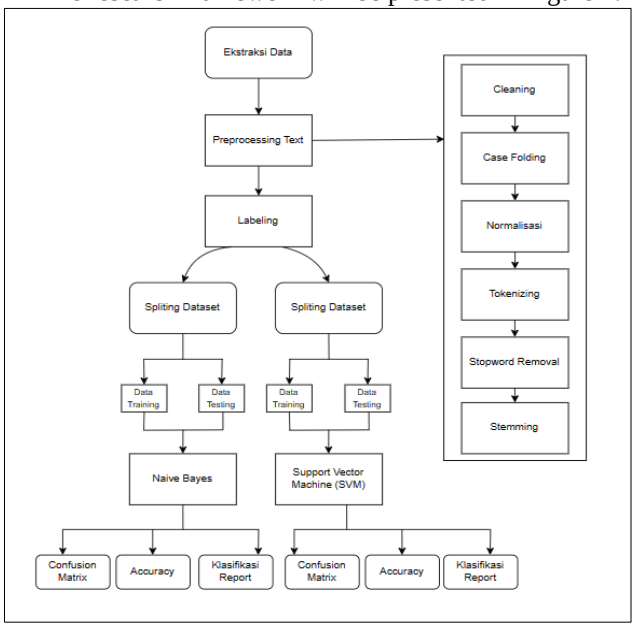

Fig. 1. Research Framework

A. Data Extraction

The process of data extraction or better known as data retrieval is done by using Twitter Harvest. "Twitter harvest" refers to the technique or process of collecting tweets from the Twitter social media platform. This is often done for data analysis, research, trend monitoring or other purposes. The author extracted twitter tweet data based on the time period of January 23, 2024 to February 10, 2024. In this process (and subsequent processes), the data is saved in a csv format file. A total of 900 tweets were collected.

```
# Crawl Data

filename = 'kata kunci.csv'
search_keyword = 'kata kunci lang:id'
limit = 1500

!npx --yes tweet-harvest@2.2.8 -o "{filename}" -s "{search_keyword}" -l {limit} --token {twitter_auth_token}
```

Fig. 2. The Tweet Retrieval Process

B. Preprocessing Text

In this process, data cleaning is carried out, the data that has been obtained is taken as much as 900 data with each candidate there are 300 tweet data. Furthermore, in order to produce an accurate representation of sentiment, it is necessary to clean the data. This data cleaning involves removing elements such as urls, mentions, hashtags, stopwords, emoticons, punctuation marks, and numbers, normalizing and converting uppercase letters to lowercase letters.

C. Sentiment Labeling

The next step in this research is to determine sentiment with the lexicon method on each tweet that has been collected, totaling 900 tweets. Sentiment determination using the lexicon method is a commonly used approach in sentiment analysis. This method involves using a lexicon that has been labeled with positive, negative, and neutral sentiments.

```
positive_lexicon = set(pd.read_csv("positive.tsv", sep="\t", header = None)[0])
negative_lexicon = set(pd.read_csv("negative.tsv", sep="\t", header = None)[0])
netral_lexicon   = set(pd.read_csv("netral.tsv", sep="\t", header = None)[0])

# fungsi untuk menentukan sentimen

def determine_sentiment(text):
  positive_count = sum(1 for word in text.split() if word in positive_lexicon)
  negative_count = sum(1 for word in text.split() if word in negative_lexicon)
  if positive_count > negative_count :
    return "Positive"
  elif positive_count < negative_count :
    return "Negative"
  else:
    return "Netral"

# Tentukan sentimen untuk setiap ulasan
data['sentiment'] = data['full_text'].apply(determine_sentiment)
data.head()
```

Fig. 3. Labeling With Lexicon Method

D. Splitting Dataset

At this stage, splitting the dataset is done before applying the Naive Bayes and SVM methods. Splitting the dataset means dividing the data into two parts: training data and test data. This step is important to evaluate the performance of the model later. In the Naive Bayes method, an 80:20 ratio is used, while the SVM method uses a 70:30 ratio. This division is done to suit the characteristics of the algorithm and ensure optimal evaluation.

E. Naive Bayes Method

This method is based on Bayes' Theorem which assumes that each feature (word in the text) is independent of other features. Naive Bayes can help identify and understand public opinion on each candidate quickly and efficiently [11]. The Naive Bayes equation used to determine the class of a comment is shown in the following equation.

$$P(A \mid B) = \frac{P(B \mid A) \cdot P(A)}{P(B)}$$

Description:
A = Data hypothesis is a particular class
B = data whose class is still unknown
P(A|B) = probability of hypothesis A based on B
P(B) = probability B
P(B|A) = probability of hypothesis B based on A (likelihood)

The first step in calculating the class probability of data is to determine the likelihood based on the existing dataset, using a method that is appropriate for the type of data. The calculated likelihood is then multiplied by the probability of each class. The result of that process will be used as a reference to classify new data. In practice, P(B) is often ignored because its value is always constant [14].

F. Support Vector Machine (SVM)

The SVM method is used in classifying text containing public opinion into positive, negative, or neutral sentiment categories. The application of SVM classification algorithm in sentiment analysis of presidential candidates enables identification and in-depth understanding of public opinion [12].

G. Evaluation

This stage is an evaluation conducted after the application of the Naive Bayes and SVM methods. This evaluation involves three main steps: confusion matrix, accuracy, and classification report.

1. Confusion Matrix

Confusion matrix is a table used to evaluate the performance of a classification model by comparing the actual labels and the predictions generated by the model [14]. This table consists of four main components: True Positives (TP), True Negatives (TN), False Positives (FP), and False Negatives (FN). The confusion matrix provides a detailed overview of the types of errors made by the model and allows in-depth analysis of the classification performance.

2. Accuracy

Accuracy is a simple and commonly used metric that indicates how often a classification model makes correct predictions.

3. Classification report

Classification report is a summary of key metrics used to assess the predictive quality of a classification model. These metrics include precision, recall, F1 score, and support. Precision measures the ratio of correct positive predictions to total positive predictions. Recall (or sensitivity) measures the ratio of correct positive predictions to the total true cases in the class. F1 score is the harmonic mean of precision and recall, which provides a balance between the two. Support indicates the actual number of occurrences of each class in the dataset [14].

IV. Result and Disccussion

A. Survey of 2024 presidential candidate pairs

The following shows the presidential candidate pair survey results from the sites mentioned below. This survey displays curves taken from January 2023 to February 10, 2024. It can be seen in the plot graph in the Figure 4.

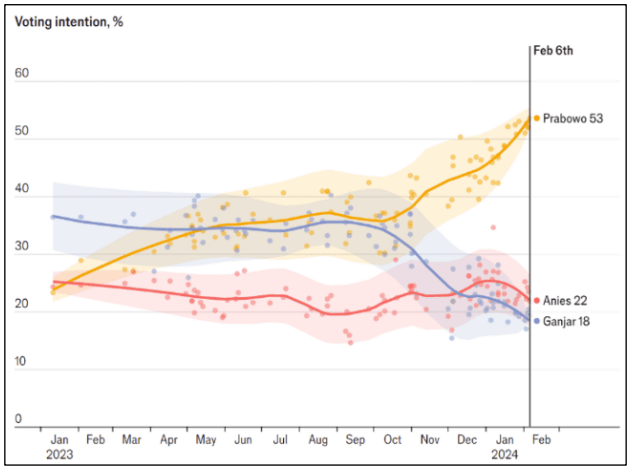

Fig. 4. Presidential Candidate Survey

Where candidate pair number 2 shows a gradual increase while candidate pair number 01 can be said to be stable and presidential candidate pair 03 has more supporters than the other 2 candidates but has decreased in September 2023. The increase or decrease of this curve is influenced by the electability of each candidate and the implementation of the debate where we can find out the perspective, mindset and behavior of each candidate.

B. Table of Sentiment Labeling Results with Lexicon Method

The following is a sentiment labeling table with the lexicon method, the data is broken down into 3 parts / each presidential candidate in 2024. After the data has been preprocessed, then labeling is carried out into 3 kinds of sentiment, namely positive sentiment worth 1, negative sentiment worth -1, and neutral sentiment worth 0. This labeling is an important stage before continuing with the Naive Bayes method and the SVM method to ensure that each data has been labeled accordingly, so that the algorithm can learn existing patterns more accurately.

TABLE I. Sentiment Labeling with Lexicon Method

No	Full text	Sentiment
1.	please ga sabar dipimpin sama pak anies dan sederet timnya yang keren pintar dan lawak juga	Positive
2.	orang pintar pilih anies	Positive
3.	Merendahkan maksud lu kelakuan anies dan ganjar di debat capres 3 parah emang sih itu	Negative
4.	pemimpin itu ya begini cuma pasangan prabowo - gibran yang berani melanjutkan hilirisasi yang lain mana berani saatnya generasi now kita bangga sama prabowo gibran	Positive

5.	prabowo masih menhan gibran masih walikota jokowi masih presiden	Neutral
6.	intinya semua ga ada yang bersih tapi kita bisa melihat dan menilai dari ke 3 paslon tersebut mana yang lebih sedikit lumpurnya	Neutral
7.	ganjar pranowo panutan bagi pemuda terus dukung hak masyarakat adat no one l3ft behind ganjar pranowo terbukti lebih baik	Positive

The lexicon method works by relying on a dictionary of words that have been classified as positive, negative, or neutral. First, data from the positive, negative, and neutral dictionaries is read and put into three separate sets containing positive, negative, and neutral words respectively. The sentiment determination function then analyzes the text by counting the number of words included in the positive, negative and neutral dictionaries. If the number of positive words is greater, the text is considered positive; if the number of negative words is greater, the text is considered negative; if the number is equal, the text is considered neutral. This function is applied to each review in the dataset to determine the sentiment of each review.

C. Community Sentiment Wordcloud and Labeling Visualization

From the results of labeling research using the lexicon method by doing the preprocessing stage to get the sentiment of each presidential candidate with a total of 300 data can be seen in the pie chart below.

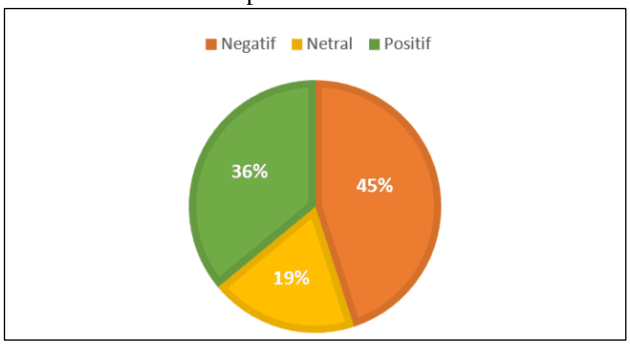

Fig. 5. Public Sentiment Candidate pair 01

Candidate pair 01 received 36% positive sentiment, 45% negative sentiment and 19% neutral sentiment.

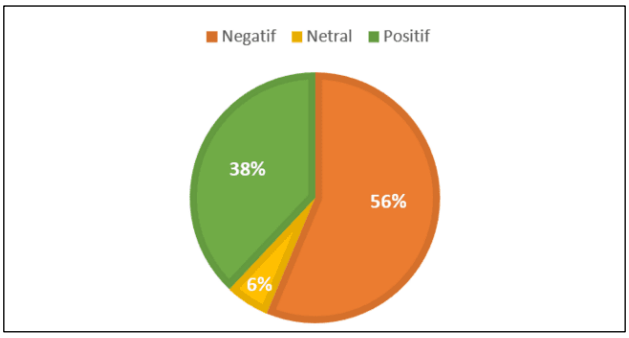

Fig. 6. Public Sentiment Candidate pair 02

Candidate pair 02 received 38% positive sentiment, 56% negative sentiment and 6% neutral sentiment.

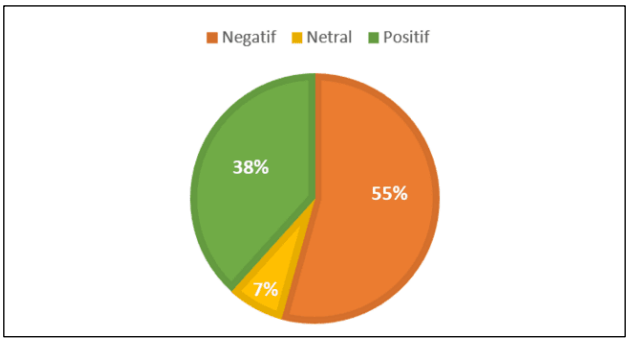

Fig. 7. Public Sentiment Candidate pair 03

Candidate pair 03 received 38% positive sentiment, 55% negative sentiment and 7% neutral sentiment.

The following are the results of wordcloud of the three presidential candidates and wordcloud of positive, negative and neutral sentiments from datasets that have been crawled using the twitter harvest technique. This wordcloud is done using the wordcloud library in the python programming language.

Fig. 8. Third Candidate Wordcloud

Figure 8 above shows that public tweets on app X (twitter) mostly use the words anies, prabowo, then gibran and ganjar. This indicates that these four figures are at the center of public attention in discussions related to presidential debates, campaigns and interview coverage from journalists.

Fig. 9. Negative Sentiment Wordcloud

The picture above contains negatively charged words as can be seen in the picture. There are the words bukan, ga, tidak, kalah, rendah and many others.

Fig. 10. Positive Sentiment Wordcloud

The picture above contains positively charged words as can be seen in the picture. There are the words dukung, pilih, menang, mantap, and many others.

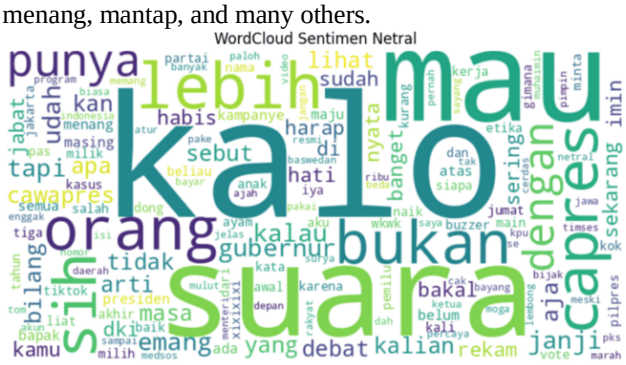

Fig. 11. Neutral Sentiment Wordcloud

The image above displays neutrally charged words or those that have no sentiment. Some examples of words that can be seen in the image are kalau, seiring, bijak and many others.

From the results of the lexicon method research labeling by already doing the preprocessing stage to get the sentiment of each candidate with a total of 300 data can be seen in the bar graph below.

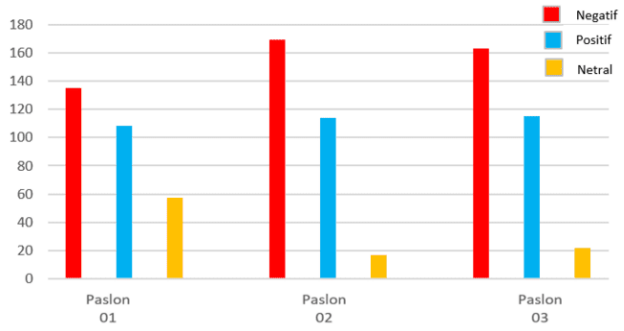

Fig. 12. Candidate Sentiment Distribution

Candidate pair 1 received a positive sentiment of 108 comments, a negative sentiment of 135 comments and a neutral sentiment of 57 comments. Paslon 02 received positive sentiment as many as 114 comments, negative sentiment as many as 169 comments and neutral sentiment as many as 17 comments. Paslon 03 received a positive sentiment of 115 comments, a negative sentiment of 163 comments and a neutral sentiment of 22 comments.

D. Naive Bayes Method Confusion Matrix and Accuracy

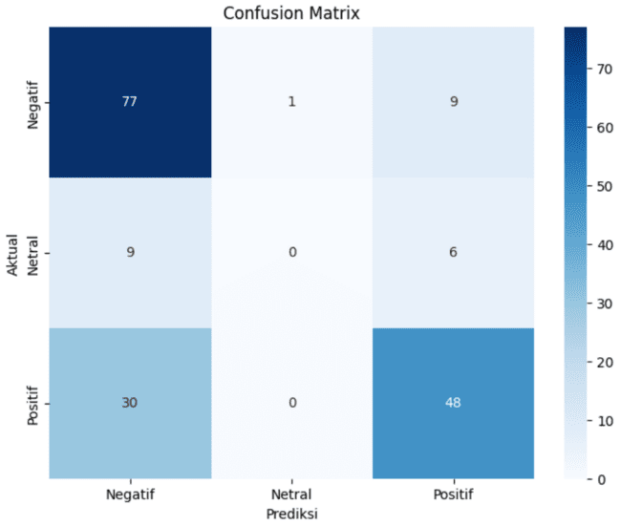

Fig. 13. Confusion Matrix of Naive Bayes Method

The confusion matrix on Figure 13 provides an overview of the performance of the Naive Bayes model in classifying the data into three different classes. From the results, it can be seen that the model is quite effective in recognizing positive, negative and neutral classes.

Classificcation Report on Training Data:

	precision	recall	f1-score	support
Negative	0.90	0.97	0.93	380
Netral	0.98	0.64	0.78	81
Positive	0.93	0.94	0.93	259
accuracy			0.92	720
macro avg	0.94	0.85	0.88	720
weighted avg	0.92	0.92	0.92	720

Fig. 14. Naive Bayes Classification Report

The Naive Bayes model evaluated using the classification report showed good overall performance with an accuracy of 92%. Precision and recall for the "Negative" and "Positive" classes were quite high, reaching values of 0.90 to 0.93. However, the "Neutral" class has a low recall of 0.64.

The confusion matrix on Figure 15 shows the performance of the SVM model in classifying the data into three different classes. From the results, it can be seen that the model has a good tendency to recognize the positive and negative classes but has difficulty in classifying the neutral class.

E. SVM Method Confusion Matrix and Accuracy

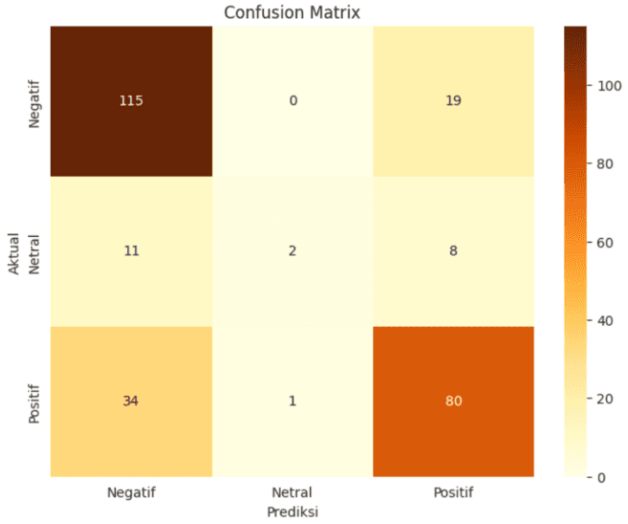

Fig. 15. Confusion Matrix of SVM Method

	precision	recall	f1-score	support
Negative	0.72	0.86	0.78	134
Netral	0.67	0.10	0.17	21
Positive	0.75	0.70	0.72	115
accuracy			0.73	270
macro avg	0.71	0.55	0.56	270
weighted avg	0.73	0.73	0.71	270

Fig. 16. SVM Classification Report

The SVM (Support Vector Machine) model evaluated using the classification report showed good performance. In terms of precision, the model had relatively high precision for the "Negative" (0.72), "Neutral" (0.67), and "Positive" (0.75) classes, indicating the ability of the model to correctly classify instances into the correct class. However, the recall for the "Neutral" class was relatively low (0.10).

The difference in the use of this sentiment analysis method, namely the Naive Bayes method and the SVM method, indicates that the Naive Bayes method is better used in this study, from the results of the sentiment accuracy that has been obtained, this method is higher than the SVM method. And if you look at the results of the confusion matrix of the two methods, there are also differences in the results. Naive Bayes displays a more effective model than SVM.

V. Conclusion And Suggestion

A. Conclusion

Based on the analysis and discussion, the conclusion of this research The tweet data (X) collected from January 23, 2024 to February 10, 2024 so that 900 tweet data can be seen below.

(1) It has formed a perception pattern, it is found that the tweet dataset in the study is as follows, candidate pair 01 gets positive sentiment as much as 36%, negative sentiment as much as 45% and neutral sentiment as much as 36%. Candidate pair 02 received positive sentiment as much as 38%, negative sentiment as much as 56% and neutral sentiment as much as 6%. Candidate pair 03 received 38% positive sentiment, 55% negative sentiment and 7% neutral sentiment.

(2) The lexicon method can properly provide sentiment labeling. The use of this method does not require translation to English, in other words, it directly uses Indonesian, so the use of this method can be said to be efficient.

(3) The Naive Bayes method is better used than the SVM method judging from the accuracy obtained, the Naive Bayes method has an accuracy of 92% while the SVM method has an accuracy of 73%. This model shows a high level of consistency in precision and recall for all classes.

(4) The performance of the Naive Bayes model is more effective than the SVM method, when viewed from the confusion matrix evaluation section.

(5) Sentiment analysis can also provide deep insights into trends and patterns of feelings during campaign and election periods. This can help stakeholders, including candidates, political parties and electoral bodies, to better understand the dynamics of public opinion and respond accordingly.

B. Suggestion

1. Deeper Analysis

Conducting a more in-depth analysis of specific subtopics or issues that appear in negative sentiment can provide more specialized insights. This can help to design more effective communication strategies.

2. Interactive Engagement

Developing interactive engagement features in X app, such as polls or discussion forums, can help gather more views from users. This will not only increase participation, but also expand data sources for sentiment analysis

3. Suggestions for future research

For similar research related to this study, it can be focused again on several events during the election period, for example, problems in elections such as the issue of postponing elections or rigging election results.

REFERENCES

[1] Manullang, O., Prianto, C. and Harani, N.H., 2023. Analisis Sentimen Untuk Memprediksi Hasil Calon

[2] Pemilu Presiden Menggunakan Lexicon Based Dan Random Forest. *Jurnal Ilmiah Informatika*, *11*(02), pp.159-169.

[3] Juanita, S., 2020. Analisis Sentimen Persepsi Masyarakat Terhadap Pemilu 2019 Pada Media Sosial Twitter Menggunakan Naive Bayes. *Jurnal Media Informatika Budidarma*, *4*(3), pp.552-558.

[4] Nanda, V.S., 2017. *Pengaruh Kesadaran Politik Warga Masyarakat terhadap Tingkat Partisipasi Politik dalam Pemilihan Kepala Daerah (Studi Deskriptif di Kabupaten Majalengka)* (Doctoral dissertation, FKIP Unpas).

[5] Lengkoan, I.C.J., Liando, D.M. and Kumayas, N., 2022. Efektivitas Program Relawan Demokrasi Dalam Meningkatkan Partisipasi Politik Masyarakat Dalam Pemilihan Umum 2019 Di Kota Bitung. *Governance*, *2*(1).

[6] Lorentika, E.M., Hoax di Tahun Politik Sebagai Pemecah Belah Kesatuan Anak Bangsa.

[7] Nansi, W.S. and SH, M., 2024. BAB 5 Pendidikan Politik Bagi Generasi Z. *Pendidikan Politik*, p.57.

[8] Textonik, R.F., 2023. *Implementasi dan Efektivitas Pengawasan Partisipatif Pada Penyelenggaraan Pemilu 2019 (Studi Di Kabupaten Kepahiang Provinsi Bengkulu)* (Doctoral dissertation, Universitas Islam Indonesia).

[9] Widayanti, C. and Fridiyanti, Y.N., 2023. Analisis Pengaruh Debat Calon Presiden 2024 Pertama Terhadap Elektabilitas Calon Presiden Perspektif Pandangan Masyarakat. *Journal of Social and Economics Research*, *5*(2), pp.1720-1731.

[10] Ulfah, N., Hidayah, Y. and Trihastuti, M., 2021. Urgensi Etika Demokrasi di Era Global: Membangun Etika dalam Mengemukakan Pendapat bagi Masyarakat Akademis Melalui Pendidikan Kewarganegaraan. *Jurnal Kewarganegaraan*, *5*(2), pp.329-346.

[11] Fitriyyah, S.N.J., Safriadi, N. and Pratama, E.E., 2019. Analisis Sentimen Calon Presiden Indonesia 2019 dari Media Sosial Twitter Menggunakan Metode Naive Bayes. *JEPIN (Jurnal Edukasi dan Penelitian Informatika)*, *5*(3), pp.279-285.

[12] Nugroho, G., Murdiansyah, D.T. and Lhaksmana, K.M., 2021. Analisis Sentimen Pemilihan Presiden Amerika 2020 di Twitter Menggunakan Naïve Bayes dan Support Vector Machine. *eProceedings of Engineering*, *8*(5).

[13] Lukmana, D.T., Subanti, S. and Susanti, Y., 2019, June. Analisis Sentimen Terhadap Calon Presiden 2019 Dengan Support Vector Machine Di Twitter. In *Seminar & Conference Proceedings of UMT*.

[14] Mahbubah, L.D. and Zuliarso, E., 2019. Analisa Sentimen Twitter Pada Pilpres 2019 Menggunakan Algoritma Naive Bayes.

[15] Hidayatullah, M., Alam, S. and Jaelani, I., 2021. Sentiment Analysis of Police Performance On Twitter Users Using Naïve Bayes Method. *RISTEC: Research in Information Systems and Technology*, *2*(2), pp.29-40.