

Sentiment analysis of the 2024 election using the naïve bayes method using data x

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ABSTRACT

Text mining is a process for utilizing the vast amounts of data generated in today's digital era. The rapid growth of social media usage has produced extensive textual data, one of which can be analyzed through sentiment analysis. This study uses the social media platform X to analyze public opinions regarding the 2024 Indonesian General Election. The analysis was conducted using 126 user comments as the dataset and 103 reviews as the testing data, which were then processed using the Naive Bayes method. Text mining with the Naive Bayes algorithm can be applied to examine public opinions and sentiments toward the 2024 election on X. The results of the analysis classify sentiments into positive, negative, and neutral categories.

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1. INTRODUCTION

Elections are pivotal moments in a nation's democratic life, serving not only to select leaders but also to reflect social, political, and economic conditions. In Indonesia, elections enable citizens to exercise their sovereignty directly and fairly, as stipulated in Article 1, paragraph 1 of Law No. 7 of 2017 on General Elections, covering the House of Representatives, Regional Representative Council, President and Vice President, and Regional Legislative Councils (Sholihah et al., 2024). These events are critical in sustaining the country's representative democracy, as they allow citizens to participate in shaping governance and public policy (Thomas et al., 2021).

In the digital era, social media platforms, particularly X (formerly Twitter), have become central arenas for public discourse, where citizens express diverse opinions, emotions, and reactions to political events (Mariani et al., 2025). The massive volume of textual data generated on such platforms presents an opportunity to systematically analyze public sentiment and understand societal responses to electoral processes (Prarono et al., 2024). Public sentiment can range from positive to negative or neutral, reflecting the electorate's perceptions, concerns, and expectations regarding candidates and policies (Yusuf Ramadhan Nasution et al., 2024).

Sentiment analysis has emerged as a powerful tool to examine these opinions, offering insights for researchers, policymakers, and the media (Muliana et al., 2024). Among the various techniques, the Naive Bayes method is widely favored for its simplicity, efficiency, and effectiveness in text classification (Sulaiman et al., 2024). Theoretically, the Naïve Bayes algorithm operates on the principle of probabilistic inference based on Bayes' theorem, assuming conditional independence between features. This assumption, although simple, aligns well with short and unstructured text data such as tweets, where individual words often contribute independently to sentiment classification (Zhang & Li., 2023). Compared to Support Vector Machine (SVM) or Long Short-Term Memory (LSTM) models, Naïve Bayes offers interpretability, lower computational cost, and high accuracy in sparse and high-dimensional datasets typical of social media contexts (Kim et

al., 2024). Its probabilistic nature allows effective handling of noisy, imbalanced, and contextually diverse textual inputs, making it theoretically relevant and empirically robust for political sentiment analysis on platforms like X.

The process involves preprocessing textual data through case folding, tokenizing, filtering, and stemming to refine unstructured content into analyzable data, often enhanced by text mining algorithms such as TF, IDF, RF, or TF-IDF (Ismawan & Saputra, 2024). Data crawling via platform APIs further allows systematic collection of user-generated content, which can then be classified and interpreted to identify dominant sentiments, trends, and patterns in public opinion (Wahyudi et al., 2024).

Despite the growing use of sentiment analysis in political research, there is a lack of focused studies on public responses to Indonesia's 2024 General Election (Hari et al., 2025). This research not only addresses that empirical gap but also contributes to the development of political sentiment analysis in Indonesia by providing real-time, data-driven insights into public attitudes during the 2024 elections. Unlike previous studies that focus on general political discourse or past election cycles, this study captures immediate voter reactions to the ongoing democratic process, offering empirical evidence of how digital conversations evolve alongside electoral events.

By capturing public sentiment during a critical democratic event, the study contributes to a deeper understanding of voter attitudes, societal dynamics, and emerging political discourse (Nugroho & Susanto., 2025). Furthermore, the findings are expected to enrich the empirical foundation for future computational political communication research in Indonesia, demonstrating how sentiment analysis can be integrated into electoral studies to identify polarization patterns, candidate perception shifts, and digital participation trends. Moreover, system modeling tools such as Data Flow Diagrams (DFD) and flowcharts are utilized to visualize data movement, process sequences, and logical operations, ensuring clarity and replicability in data collection, processing, and analysis.

2. RESEARCH METHOD

The data used in this study were collected from tweets on the social media platform X (formerly Twitter) related to the 2024 Indonesian General Election. The data represent secondary sources, as they were obtained indirectly from existing social media content. Table 1 provides examples of the collected tweets, including the creation date, content, and username of the authors.

Table 1. Example of data from X

Created_at	Full_Text	Username
Fri May 24 16:50:45 +0000 2024	Orang waras. Cerdas dan berakhlak pasti akan mengatakan pemilu 2024 adalah Pemilu paling buruk. Paling rusak. dalam sejarah demokrasi sejak pemilu ada di Indonesia	satrio_aji_
Fri May 24 16:50:45 +0000 2024	Megawati Sebut Pemilu 2024 Dipenuhi Kecurangan.	Indopolitika
Fri May 24 16:50:45 +0000 2024	KETUA Umum PDI Perjuangan (PDIP) Megawati Soekarnoputri mengkritik kinerja sejumlah lembaga negara dalam rangkain Pemilihan Umum (Pemilu) 2024.	mediaindonesia

The data were collected using a web scraping technique implemented in Google Colab, which allows efficient extraction of large datasets from X compared to manual collection. Data collection focused on tweets related to the 2024 election. The process involved observation and extraction of user-generated content, which was then stored for further analysis. Data collection was conducted starting from April 22, 2024, after the research title was approved.

The architecture of this study illustrates the process of analyzing Indonesian public sentiment toward the 2024 General Election using the Naive Bayes algorithm. The system design includes data collection, preprocessing, model training, and sentiment classification, as shown in Figure 1.

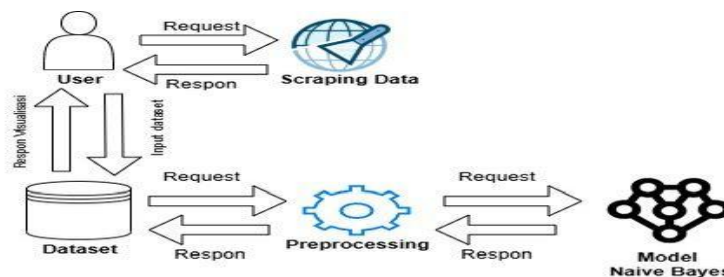


Figure 1. Model architecture

The functional requirements for the sentiment analysis system are categorized into input, process, and output: a) Input Requirements: The dataset consists of tweets from X containing public opinions about the 2024 General Election; b) Process Requirements: Data are collected via web scraping in Python, followed by preprocessing, training the Naive Bayes model, and performing sentiment analysis; c) Output Requirements: The system generates sentiment classification results, categorizing tweets into positive, negative, or neutral sentiments regarding public perception of the 2024 General Election.

Non-functional requirements include the hardware and software needed to support the system’s operation: Hardware Requirements:

Tabel 2. Hardware Requirements

Component	Specification
Processor	AMD Ryzen 5 5500U with Radeon Graphics, 2.10 GHz
Display	14" FHD (1920*1080), IPS-Level
RAM	DDR4 8.00 GB (3200MHz)
System Type	64-bit OS, x64-based processor
Storage	512GB NVMe PCIe Gen3x4 SSD
Graphics	AMD Radeon™ Graphics
Battery	3 cells, 39Whr

Software Requirements: Windows 11, Google Colab, Visual Studio Code, App diagrams (Draw.io) and X (X) API. Conceptual Design: The conceptual design provides a clear overview of the system workflow using flowcharts and Data Flow Diagrams (DFD). The flowchart illustrates the process starting from user input, checking whether data has been preprocessed, performing preprocessing if necessary, training the Naive Bayes model, and displaying accuracy results and plots. Physical Design: The physical design specifies the implementation of the conceptual model, including software scripts, data storage, and processing steps, ensuring the system functions according to the planned workflow.

3. RESULTS AND DISCUSSIONS

This study developed a web-based application for analyzing public sentiment toward the 2024 Indonesian General Election using the Naive Bayes algorithm. The application was implemented in Python and utilizes a MySQL database for data storage. The Naive Bayes model serves as the core mechanism to classify sentiments into positive, negative, and neutral categories (Ramadhan & Wahyudin, 2022). Building the model requires a dataset that has undergone thorough preprocessing, including cleaning, tokenizing, and filtering, to ensure accurate and reliable sentiment classification results.

Crawling tweets is an important initial step in sentiment analysis to capture public opinion regarding the 2024 Indonesian Election. This process allows for rapid and extensive data collection from platform X, allowing researchers to monitor public conversations in real-time and identify sentiment trends. In this study, data collection focused on the topic of the 2024 Election by using Tweet authentication tokens to establish a secure connection between the researcher's code and platform X, allowing relevant tweets to be accessed and extracted efficiently (Deolika et al., 2019).

```
#@title X Auth Token
```

```
X_auth_token = 'd5753d38fc5d1baa12358939e1034e0d0d6f10b4'
```

Figure 2. Token authentication program code

At this stage, after connecting to the X platform, data crawling was conducted using the query "Pemilu 2024 lang:id until:2024-05-25 since:2022-01-01." Using the tweet-harvest@2.6.1 library, around 200 tweets were collected per session and stored in a CSV file named *Pemilu2024.csv* for further analysis.

Crawl Data

```
filename = 'pemilu.csv'
search_keyword = 'Pemilu 2024 lang:id until:2024-05-25
since:2022-01-01'
limit = 200

!npx -y tweet-harvest@2.6.0 -o "{filename}" -s
"{search_keyword}" --tab "LATEST" -l {limit} --token {twitter_auth_token}
```

Figure 3. Data crawl program code

In sentiment analysis, data cleaning is a critical preliminary step that ensures the accuracy and reliability of the text analysis, much like cleaning a lens before viewing clearly. Text data often contain various types of noise that can hinder analysis and lead to misleading conclusions (Muliadi et al., 2020). In this study, the cleaning process involved removing irrelevant characters, typographical errors, HTML tags, emoticons and emojis, as well as abbreviations and slang from tweets related to the 2024 Indonesian General Election collected through data crawling.

	full_text	username	created_at
0	karena intrik politiknya menarik nder bukan cu...	chrocheg	Fri May 24 17:08:54 +0000 2024
1	orang waras cerdas dan berakhlak pasti akan me...	satrio_aji	Fri May 24 16:50:45 +0000 2024
2	pelantikan dan pengambilan umpahjanji panitia ...	bawaslulumajang	Fri May 24 16:39:02 +0000 2024
3	ppk kecamatan matakali mengucapkan selamat ata...	PPKMatakali	Fri May 24 16:31:25 +0000 2024
4	megawati ebut pemilu 2024 dipenuhi kecurangan ...	Indopolitika	Fri May 24 16:31:07 +0000 2024
...
1289	hai kakaniem admin sudah merespon laporan yang...	pln_123	Tue Jun 04 12:50:54 +0000 2024
1290	ini betina ga abis2 nyenggol anieskenapa gak p...	EllaVerella	Tue Jun 04 12:50:32 +0000 2024
1291	alah satu alasan aku kenapa pilih anies selain...	njunjeolmi	Tue Jun 04 12:48:36 +0000 2024
1292	rai amat mbacot loe oal anie yg keturunan...	Parenrengi1927	Tue Jun 04 12:48:16 +0000 2024
1293	udh kehilangan pendukung skrg mau nyabet pendu...	indonesiago1	Tue Jun 04 12:48:11 +0000 2024

1271 rows x 3 columns

Figure 4. Results of data cleaning on the pemilu2024

Data preprocessing is a crucial step in sentiment analysis to ensure accurate and meaningful results. In this study, preprocessing involved normalization, stopword removal, tokenization, and stemming. Normalization addresses the high variability in textual data, such as differences in word forms (e.g., "rumah" vs. "rumahku"), slang expressions (e.g., "keren" vs. "mantap"), and abbreviations (e.g., "tp" vs. "tapi"), which can confuse sentiment analysis algorithms and reduce accuracy. By standardizing the text into a consistent format, normalization facilitates more reliable and precise sentiment classification (Fais Sya' bani et al., 2022).

	full_text	username	created_at
0	karena intrik politiknya menarik nder bukan cu...	chrocheg	Fri May 24 17:08:54 +0000 2024
1	orang waras cerdas dan berakhlak pasti akan me...	satrio_aji	Fri May 24 16:50:45 +0000 2024
2	pelantikan dan pengambilan umpahjanji panitia ...	bawaslulumajang	Fri May 24 16:39:02 +0000 2024
3	ppk kecsamatan matakali mengucapkan selsamat a...	PPKMatakali	Fri May 24 16:31:25 +0000 2024
4	megawati sebut pemikamu 2024 dipenuhi kecurang...	Indopolitika	Fri May 24 16:31:07 +0000 2024
...
1289	hai kakaniess admin sudah merespon laporan yan...	pln_123	Tue Jun 04 12:50:54 +0000 2024
1290	ini betina ga abis2 menyenggol anieskenapa ga...	EllaVerella	Tue Jun 04 12:50:32 +0000 2024
1291	alah satu alasan aku kenapa pilih anies selai...	njunjeolmi	Tue Jun 04 12:48:36 +0000 2024
1292	rai samat mbacot kamu oal anies yang keturunan...	Parenrengi1927	Tue Jun 04 12:48:16 +0000 2024
1293	udah kehilangan pendukung sekarang mau sabet p...	indonesiago1	Tue Jun 04 12:48:11 +0000 2024

Figure 5. Normalization Results on the pemilu2024.csv

Stopword removal is a crucial step in text preprocessing for sentiment analysis, as it eliminates common words that carry minimal meaning and do not contribute significantly to

sentiment interpretation, such as "yang," "dan," "di," "ini," and "itu (Albab et al., 2023)." By removing these words, the analysis can focus on keywords that carry more meaningful information, enhancing the accuracy of sentiment classification and producing more precise conclusions. In this study, the Sastrawi library was employed to perform stopword removal on the 2024 election dataset, ensuring that the model captures the most relevant textual features for sentiment analysis (Alisya Mutia Mantika et al., 2024).

	full_text	username	created_at
0	intrik politiknya menarik nder bukan cuma temp...	chrocheg	Fri May 24 17:08:54 +0000 2024
1	orang waras cerdas berakhlaq akan mengatakan p...	satrio_aji_	Fri May 24 16:50:45 +0000 2024
2	pelantikan pengambilan umpahjanji panitia peng...	bawaslulumajang	Fri May 24 16:39:02 +0000 2024
3	ppk kecamatan matakali mengucapkan selsamat a...	PPKMatakali	Fri May 24 16:31:25 +0000 2024
4	megawati sebut pemikamu 2024 dipenuhi kecurang...	Indopolitika	Fri May 24 16:31:07 +0000 2024

Figure 6. Stopword results in the pemilu2024.csv

Tokenization is a crucial step in sentiment analysis that facilitates text processing by breaking sentences into smaller units, such as individual words (Hariyanti et al., 2024). This process enables the algorithm to more easily identify patterns and meanings within the text. In this study, tokenization was applied to the content of the full_text column, converting each sentence into a collection of words for subsequent analysis (Arsi & Waluyo, 2021).

```

0      [intrik, politiknya, menarik, nder, bukan, cum...
1      [orang, waras, cerdas, berakhlaq, akan, mengat...
2      [pelantikan, pengambilan, umpahjanji, panitia,...
3      [ppk, kecamatan, matakali, mengucapkan, selama...
4      [megawati, sebut, pemilu, 2024, dipenuhi, kecu...
...
214     [bobby, resamai, menjadi, kader, gerindra, men...
215     [partai, aceh, resamai, daftarkan, bacalon, wa...
216     [dukungan, terus, mengalir, presiden, terpilih...
217     [marilah, bersatu, bangsa, indonesia, menerima...
218     [prabowo, pesial, temui, presiden, mbz, uea, b...
Name: full_text, Length: 215, dtype: object
    
```

Figure 7. Results of the tokenization process for the pemilu2024.csv.

In the preprocessing stage, stemming was applied to group words with similar meanings, enhancing the accuracy of sentiment analysis by enabling the algorithm to better interpret the overall text and identify sentiments more precisely (Asro et al., 2023). The processed data from the full_text column, which underwent normalization, stopword removal, tokenization, and stemming, was saved as PreprocessingPemilu2024.csv to manage the time-intensive process (Aulia, 2021). Additionally, the dataset was translated into English to improve system readability and processing accuracy; however, due to limitations of the translation tool, not all data could be successfully translated.

	full_text	tweet_english
0	intrik politik tarik nder bukan cuma tempel te...	political intrigue pull nder not only stick to...
1	orang waras cerdas berakhlaq akan kata milu 20...	sane intelligent people will say that milu 202...
2	lantik ambil umpahjanji panitia awas milu cama...	appointed to take the oath of office of the co...
3	ppk camat matakali ucap selamat atas lantik an...	ppk matakali sub-district head congratulations...
4	megawati sebut milu 2024 penuh curang tco66nyw...	megawati says milu 2024 is full of cheats tco6...
...

Figure 8. Translator results for preprocessing pemilu2024.csv

In this study, the sentiment analysis process began with labeling the preprocessed dataset (preprocessingpemilu2024.csv) by assigning sentiments as positive, negative, or neutral. A total of 103 out of 126 data entries were used to train the Naive Bayes model. The trained model was then

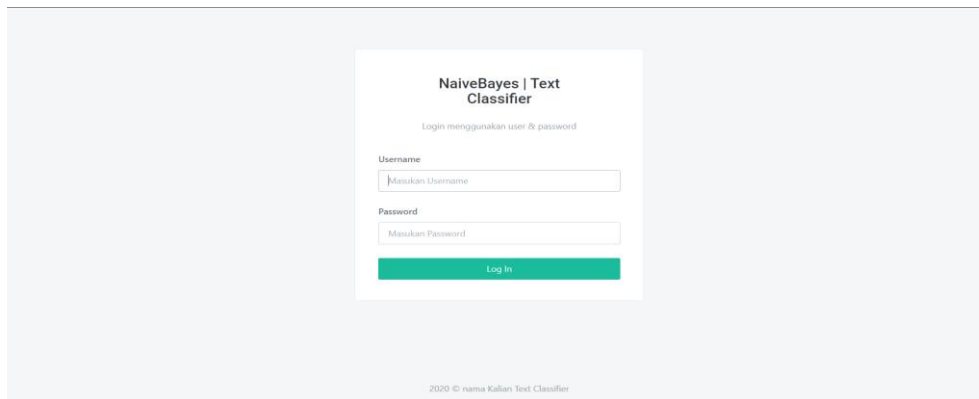


Figure 11. User interface log in

On the dashboard page, after logging in, users are presented with an interface that provides navigation options to access the main menu, dataset management, Naive Bayes analysis, and the logout function, allowing seamless interaction with the application's core features.

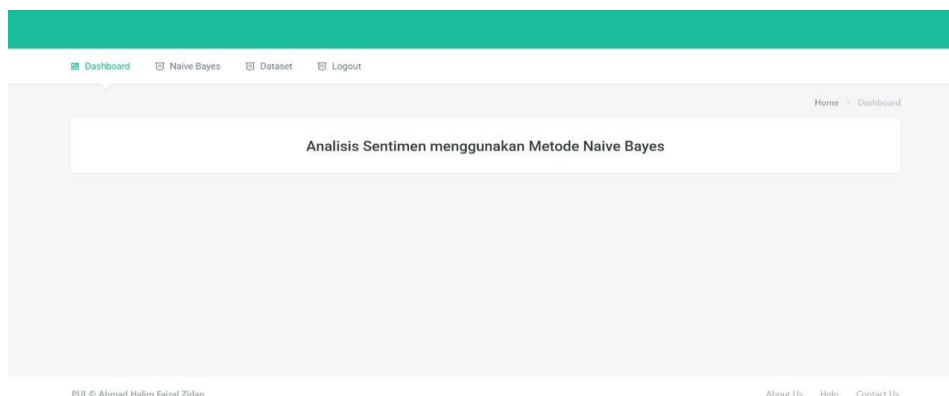


Figure 12. User interface dashboard home

The Naive Bayes page serves as a submodule within the application where user-inputted datasets are displayed in a tabular format (Hidayat, 2020). This page includes several submenus: the Dataset submenu shows the 2024 election data that has been uploaded, Initial Process displays the data after preprocessing, Performance evaluates the training and testing datasets, and Prediction provides the sentiment classification results, indicating public opinion as positive, negative, or neutral (Hermawan & Bellaniar Ismiati, 2020).

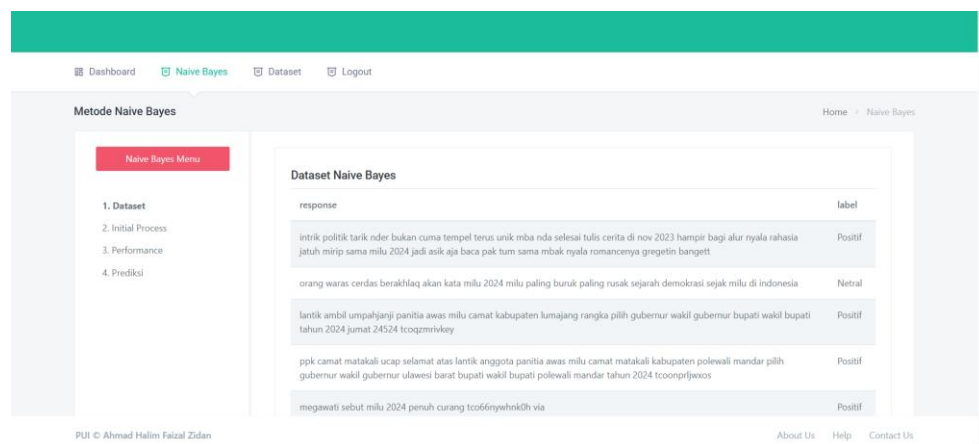


Figure 13. User Interface Naive Bayes submenu dataset

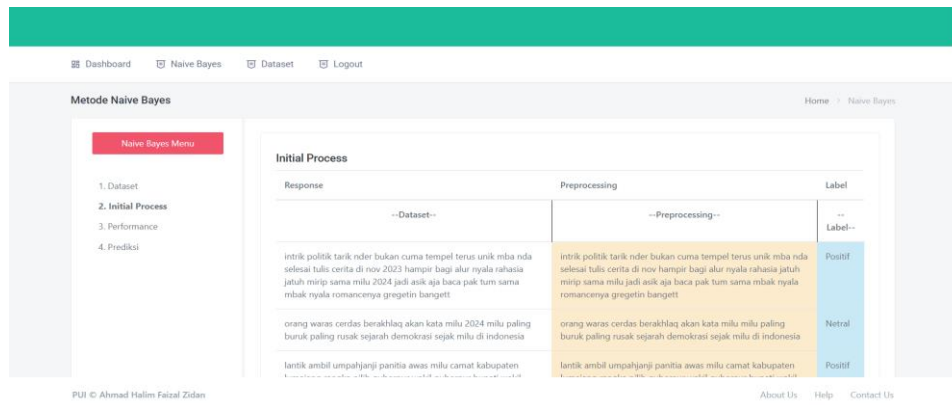


Figure 14. User interface submenu initial process

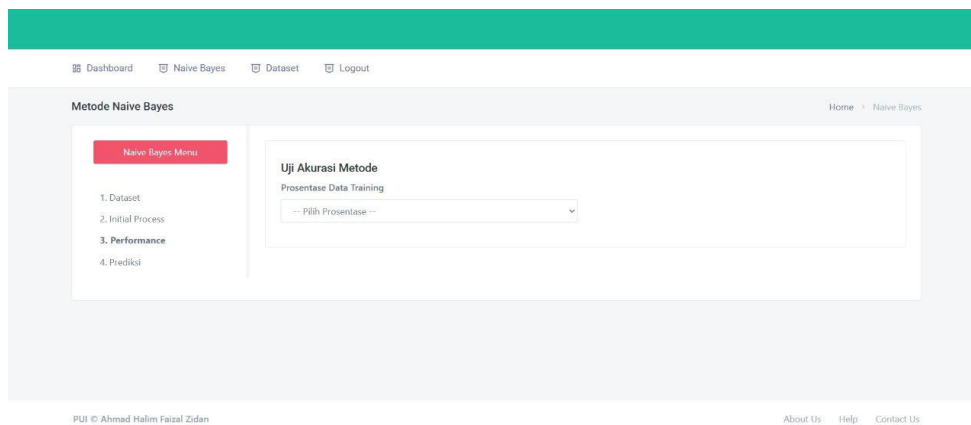


Figure 15. User interface submenu performance

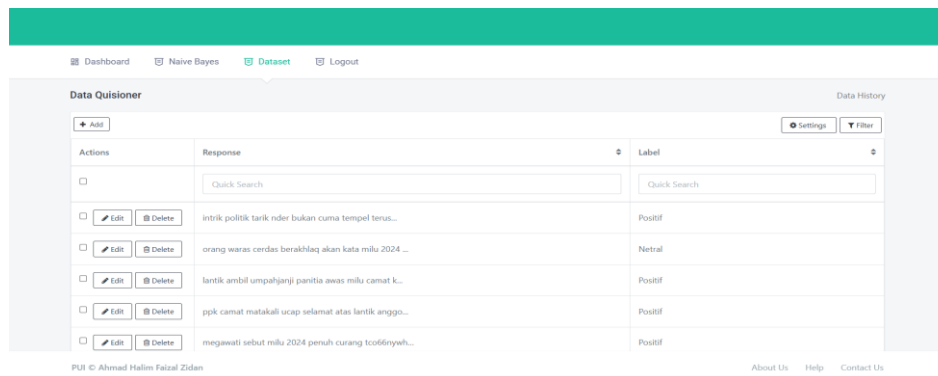


Figure 16. User interface dataset

This study focuses on implementing sentiment analysis of the 2024 Indonesian General Election using the Naive Bayes method and evaluating the model's accuracy with data from X social media. To enhance the application's effectiveness for researchers and other users, further development is planned, including the integration of additional algorithms if the Naive Bayes model does not achieve optimal accuracy (Yafi, 2024). Moreover, a TF-IDF feature will be incorporated to assess the significance of keywords within documents, enabling the identification of important terms across larger datasets and improving the overall precision of sentiment analysis.

4. CONCLUSION

Based on the results and discussion of the sentiment analysis on the 2024 Indonesian General Election using the Naive Bayes method with data from X, it can be concluded that the algorithm was successfully implemented in the system. The Naive Bayes approach enabled the classification

of tweets into positive, negative, and neutral sentiments regarding the election. A total of 200 tweets were collected through data crawling and subsequently underwent cleaning and preprocessing to remove punctuation and irrelevant words, ensuring more accurate classification. The system produced 48 positive, 3 negative, and 52 neutral sentiments, achieving an accuracy of 77.67%, demonstrating the effectiveness of the Naive Bayes method in analyzing public sentiment on social media.

However, it is crucial to acknowledge the ethical implications associated with the use of AI-based political sentiment analysis, particularly regarding user privacy and freedom of expression. Since data are obtained from social media platforms, researchers must ensure that all information used originates from publicly available content and excludes personal or sensitive data to protect individual privacy. Additionally, automated sentiment classification should not be used to monitor, label, or suppress certain political views, as this may infringe upon users' freedom of expression and distort democratic discourse. Therefore, ethical research practices such as anonymizing data, obtaining platform compliance, and maintaining transparency in algorithmic interpretation are essential to uphold fairness, accountability, and respect for digital rights in political sentiment studies.

Beyond its methodological contribution, the findings of this research hold practical potential for integration into real-time public opinion monitoring systems. By applying the Naive Bayes-based sentiment classification framework, government agencies, electoral commissions, or media organizations could detect shifts in public perception, emerging controversies, or candidate popularity trends during the election period. Such insights can support data-driven political decision-making, allowing policymakers to design more responsive public communication strategies and mitigate misinformation or polarization online. In the long term, the system model developed in this study can be adapted as a prototype for continuous digital sentiment tracking to strengthen transparency, responsiveness, and trust in Indonesia's democratic governance.

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