

## Twitter Sentiment Analysis on the Iran-Israel Conflict Using the Naïve Bayes Classification Algorithm

Annisa Karima<sup>1</sup>, Athiyatul Ulya<sup>2</sup>, T. Sukma Achriadi Sukiman<sup>3</sup>, Anni Zufia<sup>4</sup>


<sup>1,2</sup>Information System Departement, University of Malikussaleh, Indonesia

<sup>3,4</sup>Informtics Department, University of Malikussaleh, Indonesia

### ABSTRACT

The armed conflict between Iran and Israel, which has attracted global attention, has sparked various public reactions, including from the Indonesian community. Given its potential impact on global social and economic stability, it is important to systematically analyze public perceptions using a sentiment analysis approach. A total of 310 tweets were collected through a crawling process and processed using several preprocessing stages, such as text cleaning, normalization, stopword removal, tokenization, stemming, and translation. Labeling was performed directly using the Naive Bayes algorithm, by comparing three algorithms: Gaussian Naive Bayes, Multinomial Naive Bayes, and Bernoulli Naive Bayes. Performance evaluation was conducted using metrics such as accuracy, precision, recall, and F1-score. The classification results showed that Multinomial Naive Bayes achieved an accuracy of 75.81%, Gaussian Naive Bayes achieved 77.42%, while Bernoulli Naive Bayes achieved 87.1%. Bernoulli Naive Bayes demonstrated superior performance in handling textual data with word frequency representation. This study contributes to strengthening the use of machine learning methods for public opinion analysis on social media, particularly in the context of geopolitical issues. The findings indicate that Bernoulli Naive Bayes is more suitable for classifying public opinion texts compared to the Gaussian and Multinomial variants.

**Keywords:** Naïve Bayes, Gaussian, Multinomial, Bernoulli.

 This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

#### Corresponding Author:

Annisa Karina,  
University of Malikussaleh, Indonesia  
Email : annisakarima@unimal.ac.id

#### Article history:

Received Jul 29, 2025  
Revised Aug 20, 2025  
Accepted Aug 28, 2025

## 1. INTRODUCTION

The conflict between Iran and Israel is one of the major geopolitical issues with significant implications for the stability of the Middle East and global political dynamics. The escalating military tensions between the two nations not only pose a regional threat but also raise international concerns regarding security, humanitarian crises, and global economic instability, such as fluctuations in energy prices and financial markets.

Although Indonesia is not directly involved in this conflict, public responses to the issue have been substantial, particularly on social media platforms like Twitter, which has become a vital channel for the rapid and widespread expression of public opinion (Kalcheva, Marinova, & Todorova, 2023). Therefore, it is important to capture and analyze how the Indonesian public perceives this conflict through a sentiment analysis approach.

Sentiment analysis is a technique used to categorize opinions into positive, negative, or neutral, which helps in illustrating the direction of public perception toward a particular issue. One popular technique used for initial sentiment labeling is the lexicon-based method, such as TextBlob. TextBlob is chosen for its simplicity in measuring the polarity and subjectivity of a text. However, recent studies have noted that TextBlob has limitations in understanding complex sentence contexts, such as irony, negation, or slang commonly found on social media, which may reduce prediction accuracy (Kaur & Singh, 2021).

Therefore, machine learning approaches are considered more adaptive, as they can learn patterns from available data. One of the widely used algorithms for text classification is Naive Bayes. This method is known for being fast and effective when handling large-scale text data. In this study, three Naive Bayes algorithm models are implemented—Gaussian Naive Bayes, Multinomial

Naive Bayes, and Bernoulli Naive Bayes—to compare the performance of sentiment classification based on tweets related to the Iran-Israel conflict.

Previous studies have shown that Multinomial Naive Bayes performs well with text data converted into word frequency features, while Gaussian Naive Bayes is more suitable for continuous features, and Bernoulli Naive Bayes is effective for binary representation (Lestari & Permana, 2022; Wicaksono & Hidayatullah, 2021).

## 2. RESEARCH METHOD/MATERIAL AND METHOD/LITERATURE REVIEW

The research stages are systematically structured to illustrate the workflow from problem formulation to the evaluation phase. Each step is designed to ensure that the sentiment analysis of the Iran-Israel conflict is conducted in a structured and measurable manner. The following diagram presents the overall research flow, starting from data collection to the implementation of the Naive Bayes algorithm and model performance evaluation, which can be seen in Figure 1.

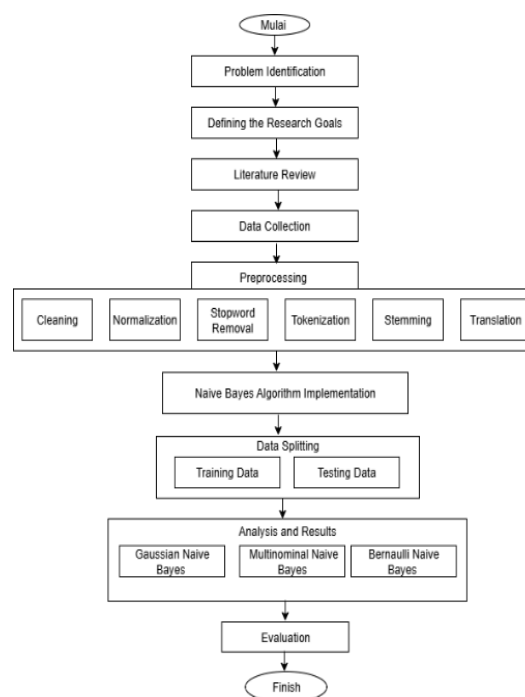


Figure 1. Research Methodology

Based on the diagram above, the research stages can be explained as follows:

1. Start  
This is the initial point of the research process.
2. Problems Identifications  
Identifying the issue or research problem to be addressed, in this case: how to analyze public sentiment regarding the Iran-Israel conflict on social media.
3. Defining the Research Goals  
Formulating the research objectives, such as identifying public sentiment and comparing the performance of Naive Bayes models in sentiment classification.
4. Literature Review  
Conducting a review of literature related to theories, previous studies, and technical approaches concerning sentiment analysis and text classification.
5. Data Collection  
Gathering tweets related to the Iran-Israel conflict, using sources such as the Twitter API or public datasets.

## 6. Preprocessing

This stage aims to clean and prepare the textual data so it can be processed by machine learning models. It is a crucial step, as raw data from social media like Twitter often contains noise such as symbols, URLs, abbreviations, or informal language. Without proper preprocessing, the performance of sentiment classification models may significantly decrease (Wicaksono & Hidayatullah, 2021).

Sub-stages of preprocessing include:

- **Cleaning:** Removing irrelevant characters such as emojis, URLs, mentions (@user), and other symbols.
- **Normalization:** Converting informal or slang words into standard forms. Example: "gk" → "tidak", "bgt" → "banget".
- **Stopword Removal:** Eliminating common words that do not significantly contribute to sentence meaning, such as "and", "the", "in", etc. (Prasetyo et al., 2021).
- **Tokenization:** Breaking down text or sentences into word units (tokens) that can be analyzed by algorithms (Kurniawan & Pramono, 2022).
- **Stemming:** Reducing words to their root forms. For example, "berlari", "lari-lari", and "pelari" would be stemmed to "lari".
- **Translation:** Translating text from Indonesian to English when using lexicon-based tools like TextBlob. This helps improve sentiment analysis accuracy since TextBlob's polarity dictionary is built in English (Kaur & Singh, 2021). This process is crucial for improving accuracy, processing efficiency, and classification precision in the machine learning models used (Sharma & Dey, 2022)

## 7. Naive Bayes Algorithm Implementation

Applying the Naive Bayes algorithm to classify sentiment in the preprocessed tweets. Three types of algorithms are used:

- **Gaussian Naive Bayes:** Suitable for numeric or continuous distribution data.
- **Multinomial Naive Bayes:** Suitable for textual data (word frequency).
- **Bernoulli Naive Bayes:** Suitable for binary data (feature presence/absence).

## 8. Data Splitting

Dividing the dataset into two parts:

- **Training Set:** Data used to train the model.
- **Testing Set:** Data used to evaluate the model's performance.

## 9. Analysis and Results

Evaluating the performance of each algorithm (Gaussian, Multinomial, Bernoulli Naive Bayes). The analysis uses performance metrics such as:

- Accuracy
- Precision
- Recall
- F1-Score
- Confusion Matrix

## 10. Testing

Assessing the classification results of each model and comparing their performance. This testing phase determines which algorithm is most effective for sentiment analysis in this case.

## 11. Finish

The final stage of the research process, including the preparation of the final report, drawing conclusions, and providing recommendations.

### 3. RESULTS AND DISCUSSION

#### A. Data Collection

The data used in this study consists of tweets with the hashtag #konflikiranisrael, collected from June 1, 2025 to June 29, 2025, totaling 310 tweets. The collected data was stored in CSV (Comma Separated Values) format.

id	tweet_id	created_at	username	full_text	retweet_count	reply_count	is_retweeted	is_replied
0	150812222008481	Sat Jun 28 12:04:35 +0000 2025	ichan_jyo	Duli Yang Maha Sultan Ibrahim memberi am...	0	0	0	0
1	150812222008481	Sat Jun 28 11:45:34 +0000 2025	nisa_dea	Konflik Iran-Israel makin memanas. Raket-roket...	0	0	0	0
2	150812222008481	Sat Jun 28 11:45:19 +0000 2025	purnomo_id	DPR menegaskan perhatiannya terhadap situasi W...	0	0	0	0
3	150812222008481	Sat Jun 28 11:40:21 +0000 2025	bambang_srt	@whopping61fatel @mog_russEN @whopping61fatel ...	0	0	0	0
4	150812222008481	Sat Jun 28 11:20:00 +0000 2025	agust_uy	Konflik Iran-Israel Memicu Ketidakpastian Pasa...	0	0	0	0
...	...	...	...	...	...	...	...	...
305	150812222008481	Fri Jun 27 06:39:11 +0000 2025	putri_bkq	Pemimpin Tertinggi Iran Ayatollah Khamenei mem...	0	0	0	0
306	150812222008481	Fri Jun 27 06:39:09 +0000 2025	budi_edr	Harga #Bitcoin dan aset #kripto lainnya jatuh ...	0	0	0	0
307	150812222008481	Fri Jun 27 06:26:49 +0000 2025	raja_trini	Khamenei juga menyebut bahwa Amerika Serikat t...	0	0	0	0
308	150812222008481	Fri Jun 27 06:25:03 +0000 2025	nuri_andani	Sejarah mencatat konflik antara Iran dan Israe...	0	0	0	0
309	150812222008481	Fri Jun 27 06:19:49 +0000 2025	nanda_sari	la juga mengingkarkan bahwa perang ini dapat me...	0	0	0	0

Figure 2. Scraping Results

Next, data preprocessing was carried out by reducing the dataset to only the necessary attributes: full\_text, username, and created\_at.

- The full\_text attribute contains the content of the tweets posted by users.
- The username attribute contains the account names of the users who posted the tweets.
- The created\_at attribute contains the date the tweets were posted, which is relevant to this study.

Below is the result of the data reduction.

```
df = df[['full_text', 'username', 'created_at']]
df
```

	full_text	username	created_at
0	Duli Yang Maha Sultan Ibrahim memberi am...	ichan_jyo	Sat Jun 28 12:04:35 +0000 2025
1	Konflik Iran-Israel makin memanas. Raket-roket...	nisa_dea	Sat Jun 28 11:45:34 +0000 2025
2	DPR menegaskan perhatiannya terhadap situasi W...	purnomo_id	Sat Jun 28 11:45:19 +0000 2025
3	@whopping61fatel @mog_russEN @whopping61fatel ...	bambang_srt	Sat Jun 28 11:40:21 +0000 2025
4	Konflik Iran-Israel Memicu Ketidakpastian Pasa...	agust_uy	Sat Jun 28 11:20:00 +0000 2025
...	...	...	...
305	Pemimpin Tertinggi Iran Ayatollah Khamenei mem...	putri_bkq	Fri Jun 27 06:39:11 +0000 2025
306	Harga #Bitcoin dan aset #kripto lainnya jatuh ...	budi_edr	Fri Jun 27 06:39:09 +0000 2025
307	Khamenei juga menyebut bahwa Amerika Serikat t...	raja_trini	Fri Jun 27 06:26:49 +0000 2025
308	Sejarah mencatat konflik antara Iran dan Israe...	nuri_andani	Fri Jun 27 06:25:03 +0000 2025
309	la juga mengingkarkan bahwa perang ini dapat me...	nanda_sari	Fri Jun 27 06:19:49 +0000 2025

310 rows x 3 columns

Figure 3. Data Reduction

## B. PreProcessing

Before conducting the research, the necessary libraries were prepared in advance.

```
import pandas as pd
import re
import seaborn as sns
import matplotlib.pyplot as plt
import Sastrawi
from Sastrawi.StopWordRemover.StopWordRemoverFactory import StopWordRemoverFactory, StopWordRemover, ArrayDictionary
more_stop_words = ["tidak"]
from Sastrawi.Stemmer.StemmerFactory import StemmerFactory
from translate import Translator
import preprocessor as p
from textblob import TextBlob
import nltk
from nltk.stem import PorterStemmer
from nltk.tokenize import word_tokenize
nltk.download('punkt')
from wordcloud import WordCloud, STOPWORDS
from textblob.classifiers import NaiveBayesClassifier
from sklearn.model_selection import train_test_split
from sklearn.naive_bayes import GaussianNB
from sklearn.feature_extraction.text import TfidfVectorizer
from sklearn.metrics import classification_report, accuracy_score
from sklearn.metrics import confusion_matrix
```

Figure 4. Libraries Used

During the preprocessing stage, several steps were carried out, including:

### 1. Data Cleaning

One of the initial steps in preprocessing is data cleaning. This step aims to remove irrelevant characters such as emojis, URLs, mentions (@username), hashtags, numbers, punctuation marks, and other symbols that may interfere with the analysis process. This process is essential to ensure that the data is in a clean format and ready for further processing. The following is a display of the data after the cleaning stage:

```
[ ] def clean_twitter_text(text):
    text = re.sub(r'@[A-Za-z0-9_]+', '', text)
    text = re.sub(r'#\w+', '', text)
    text = re.sub(r'RT[\s]+', '', text)
    text = re.sub(r'https?://\S+', '', text)

    text = re.sub(r'^[A-Za-z0-9 ]', '', text)
    text = re.sub(r'\s+', ' ', text).strip()

    return text

df['full_text'] = df['full_text'].apply(clean_twitter_text)

[ ] df['full_text'] = df['full_text'].str.lower()

df
```

Figure 5. Cleaning Proses

After the cleaning process, the text data—which initially contained various irrelevant elements such as emojis, URLs, mentions, punctuation, and numbers—has been successfully cleaned. The cleaned results show that the text is now more concise and consists only of important words that will be used in the next analysis steps. Below is an example of the data after the cleaning process:

	full_text	username	created_at
0	duli yang maha mulia sultan ibrahim memberi am...	ichan_jyo	Sat Jun 28 12:04:35 +0000 2025
1	konflik iranisrael makin memanas roketroket ha...	nisa_dea	Sat Jun 28 11:45:34 +0000 2025
2	dpr menegaskan perhatiannya terhadap situasi w...	purnomo_id	Sat Jun 28 11:45:19 +0000 2025
3	maaf saya tidak bisa membagikan lirik lengkap ...	bambang_srt	Sat Jun 28 11:40:21 +0000 2025
4	konflik iranisrael memicu ketidakpastian pasar...	agust_uy	Sat Jun 28 11:20:00 +0000 2025
...	...	...	...
305	pemimpin tertinggi iran ayatollah khamenei mem...	putri_bfq	Fri Jun 27 06:39:11 +0000 2025
306	harga dan aset lainnya jatuh setelah presiden ...	budi_edr	Fri Jun 27 06:39:09 +0000 2025
307	khamenei juga menyebut bahwa amerika serikat t...	raja_trini	Fri Jun 27 06:26:49 +0000 2025
308	sejarah mencatat konflik antara iran dan israe...	nuri_andani	Fri Jun 27 06:25:03 +0000 2025
309	ia juga mengingatkan bahwa perang ini dapat me...	nanda_sari	Fri Jun 27 06:19:49 +0000 2025

308 rows x 3 columns

Figure 6. Cleaning Result

To provide a clearer overview of the cleaning process, the table below presents a comparison between the raw tweet data and the result after the cleaning process. It can be seen that irrelevant elements such as emojis, mentions, URLs, punctuation marks, and numbers have been successfully removed, resulting in cleaner text that is ready for the next stage of processing

Tabel 1. Proses Cleaning Data

Data	Hasil Cleaning data
Duli Yang Maha Mulia Sultan Ibrahim memberi amaran: konflik global seperti Gaza dan Iran-Israel membuktikan undang-undang antarabangsa tidak dapat menjamin keamanan. #SultanIbrahim #ATM #MalaysiaDefense <a href="https://t.co/mOhBZ1zbGU">https://t.co/mOhBZ1zbGU</a>	Duli Yang Maha Mulia Sultan Ibrahim memberi amaran konflik global seperti Gaza dan Iran-Israel membuktikan undang-undang antarabangsa tidak dapat menjamin keamanan.
Konflik Iran-Israel makin memanas. Roket-roket Hamas menggempur wilayah Israel membuat posisi Zionis terdesak. Sementara	Konflik IranIsrael makin memanas. Roketroket Hamas menggempur wilayah Israel membuat posisi Zionis terdesak.

itu Iran dan Rusia dikabarkan memperkuat aliansi strategis dan bersiap mengembangkan teknologi nuklir baru #infoterupdate #jackpot168 #DREAM7EAM_Teaser <a href="https://t.co/1Dzlihurlz">https://t.co/1Dzlihurlz</a>	Sementara itu Iran dan Rusia dikabarkan memperkuat aliansi strategis dan bersiap mengembangkan teknologi nuklir baru
DPR menegaskan perhatiannya terhadap situasi WNI di wilayah konflik Iran Israel. Koordinasi intensif dengan Kemenlu dan instansi terkait dilakukan agar proses evakuasi berjalan aman dan cepat <a href="https://t.co/13EfukcDuh">https://t.co/13EfukcDuh</a>	DPR menegaskan perhatiannya terhadap situasi WNI di wilayah konflik Iran Israel. Koordinasi intensif dengan Kemenlu dan instansi terkait dilakukan agar proses evakuasi berjalan aman dan cepat

## 2. Data Normalization

In the data normalization process, typo words are corrected into standard/common words.

## 3. Stopword Removal

In this stage, stopwords removal is performed to eliminate words that do not carry clear meaning in the Twitter text data. This process is carried out using the Sastrawi library.

## 4. Tokenization

The tokenization process involves breaking down sentences into individual words. This is done to facilitate the stemming process.

Table 2. Tokenization Process

Cleaning Data	Tokenisasi
Duli Yang Maha Mulia Sultan Ibrahim memberi amaran konflik global seperti Gaza dan IranIsrael membuktikan undangundang antarabangsa tidak dapat menjamin keamanan.	['duli', 'maha', 'mulia', 'sultan', 'ibrahim', 'beri', 'amar', 'konflik', 'global', 'gaza', 'iranisrael', 'bukti', 'undangundang', 'antarabangsa', 'dapat', 'jamin aman']
Konflik IranIsrael makin memanas. Roketroket Hamas menggempur wilayah Israel membuat posisi Zionis terdesak. Sementara itu Iran dan Rusia dikabarkan memperkuat aliansi strategis dan bersiap mengembangkan teknologi nuklir baru	['konflik', 'iranisrael', 'makin', 'panas', 'roketroket', 'hamas', 'gempur', 'wilayah', 'israel', 'buat', 'posisi', 'zionis', 'desak', 'itu', 'iran', 'rusia', 'kabar', 'kuat', 'aliansi', 'strategis', 'siap', 'kembang', 'teknologi', 'nuklir', 'baru']
DPR menegaskan perhatiannya terhadap situasi WNI di wilayah konflik Iran Israel. Koordinasi intensif dengan Kemenlu dan instansi terkait dilakukan agar proses evakuasi berjalan aman dan cepat	['dpr', 'tegas', 'perhati', 'situasi', 'wni', 'wilayah', 'konflik', 'iran', 'israel', 'koordinasi', 'intensif', 'kemenlu', 'instansi', 'kait', 'laku', 'proses', 'evakuasi', 'jalan', 'aman', 'cepat']

### 5. Stemming

At this stage, words containing affixes are converted into their root forms. This process uses the Sastrawi library.

Table 3. Stemming Process

Tokenisasi	Stemming
['duli', 'maha', 'mulia', 'sultan', 'ibrahim' 'beri', 'amar', 'konflik', 'global', 'gaza', 'iranisrael', 'bukti', 'undangundang', 'antarabangsa', 'dapat'. 'jamin aman']	duli maha mulia sultan Israel beri amar konflik global gaza iranisrael bukti undangundang antarabangsa dapat jamin aman
['konflik', 'iranisrael', 'makin', 'panas', 'roketroket', 'hamas', 'gempur', 'wilayah', 'israel', 'buat', 'posisi', 'zionis', 'desak', 'itu', 'iran', 'rusia', 'kabar', 'kuat', 'aliansi', 'strategis', 'siap', 'kembang', 'teknologi', 'nuklir', 'baru']	konflik iranisrael makin panas roketroket hamas gempur wilayah 936srael buat posisi zionis desak itu iran rusia kabar kuat aliansi strategis siap kembang teknologi nuklir baru
['dpr', 'tegas', 'perhati', 'situasi', 'wni', 'wilayah', 'konflik', 'iran', 'israel', 'koordinasi', 'intensif', 'kemenlu', 'instansi', 'kait', 'laku', 'proses', 'evakuasi', 'jalan', 'aman', 'cepat']	dpr tegas perhati situasi wni wilayah konflik iran 936srael koordinasi intensif kemenlu instansi kait laku proses evakuasi jalan aman cepat

### 6. Translation

At this stage, the googletans library is used to convert words from Indonesian to English. This process is carried out because the labeling using TextBlob only recognizes English, as shown in the following figure.

```
[ ] from translate import Translator

def convert_eng(tweet):
    translator = Translator(to_lang="en", from_lang="id")
    translation = translator.translate(tweet)
    return translation

data['tweet_english'] = data['full_text'].apply(convert_eng)
data.to_csv('terjemahaniranisrael.csv')
```

Figure 7. Translation Process

The translation results of several data samples can be seen in Table 3.4 below:

Table 4. Results Translation

Indonesia	Tweet_English
duli maha mulia sultan Israel beri amar konflik global gaza iranisrael bukti undangundang antarabangsa dapat jamin aman	his Majesty Sultan Ibrahim gave a warning about the global conflict in Gaza, Iran, proof that international law can guarantee peace
konflik iranisrael makin panas roketroket hamas gempur wilayah Israel buat posisi zionis desak itu iran rusia kabar kuat aliansi strategis siap kembang teknologi nuklir baru	the iranisrael conflict is getting hotter, rockets are hitting Israel's territory, making the position of the Israel urgent, iran Israel strong news, strategic alliances are ready to develop new nuclear technology

dpr tegas perhati situasi wni wilayah konflik iran Israel koordinasi intensif kemenlu instansi kait laku proses evakuasi jalan aman cepat	dpr firmly pay attention to the situation in the area of conflict in iran Israel intensive coordination of the ministry of foreign affairs hook up for the fast safe road evacuation process
---	--

### C. Naïve Bayes Algorithm Implementation

At this stage, the Naive Bayes algorithm is implemented to perform sentiment classification. The first step begins with sentiment labeling using the TextBlob library, which automatically determines the polarity of each text data..

```
#labeling
data_tweet = list(df['tweet_english'])
polaritas = 0

status = []
total_positif = total_negatif = total_netral = total = 0

for i, tweet in enumerate(data_tweet):
    analysis = TextBlob(tweet, classifier=c1)

    if analysis.classify() == 'Positive':
        total_positif += 1
        status.append(analysis.classify())
    elif analysis.classify() == 'neutral':
        total_netral += 1
        status.append(analysis.classify())
    else:
        total_negatif += 1
        status.append(analysis.classify())

    total += 1

print(f'Hasil Analisis Data:\nPositif = {total_positif}\nNetral = {total_netral}\nNegatif = {total_negatif}')
print(f'\nTotal Data : {total}')
```

Figure 8. Labelling Textblob

After the labeling process is completed, the labeled data is then classified using the Naive Bayes algorithm to identify the sentiment tendency (positive, negative, or neutral). The implementation process can be seen in the following figure.

```
[ ] status = pd.DataFrame({"Klasifikasi Bayes": status})
df['klasifikasi_bayes'] = status
```

Hasil Analisis Data:  
 Positif = 151  
 Netral = 136  
 Negatif = 21  
 Total Data : 308

Figure 9. Naive Bayes Classification

The following is the result of the Naive Bayes classification.

Unnamed: 0	full_text	tweet_english	klasifikasi	klasifikasi_bayes
0	duli maha multa sultan ibrahim beri amar konfi...	his Majesty Sultan Ibrahim gave a warning abou...	Neutral	Neutral
1	konflik iranisrael makin panas roketroket hama...	the iranisrael conflict is getting hotter. roc...	Positif	Positif
2	dpr tegas perhati situasi wni wilayah konflik ...	dpr firmly pay attention to the situation in L...	Positif	Positif
3	maaf tidak bagi lirik lengkap boom boom tel av...	sorry not for the complete lyrics boom boom te...	Negatif	Negatif
4	konflik iranisrael picu ketidakepastan pasar e...	iranisrael conflict triggers global economic m...	Positif	Neutral
...	...	...	...	...
303	pimpin tinggi iran ayatollah khamenei ingat am...	Iranian leader Khamenei warns US and israel, c...	Neutral	Neutral
304	harga aset lain jatuh presiden as donald ikut ...	Trump's support for israel against iran cause...	Neutral	Neutral
305	khamenei sebut amerika serikat oleh capai apa ...	Khamenei accuses US of direct involvement in c...	Positif	Neutral
306	sejarah catat konflik iran israel sarat dendam...	Iran-Israel conflict rooted in geopolitical v...	Negatif	Neutral
307	juga ingat perang dapat picu ekstrem radikalis...	Warning: war can incite radicalism and identit...	Neutral	Positif

Figure 10. Result of the Naïve Bayes Classification

The following is the result of the Naive Bayes classification.

Next, the distribution of sentiment categories will be presented in the form of a graphical visualization to provide a clearer overview of the classification results. This graph helps to illustrate the proportion of positive, negative, and neutral sentiments in the analyzed dataset.

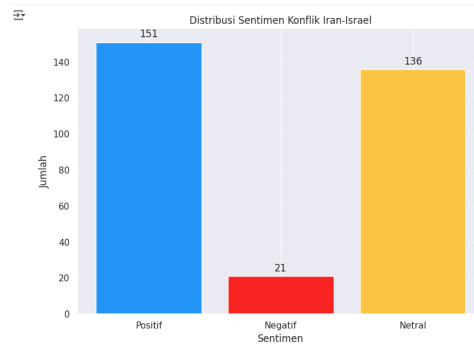


Figure 11. Visualization of Sentiment Classification Results

## D. Data Spilt

Before performing the classification using the Naive Bayes algorithm, the dataset must be divided into training and testing sets. This step is essential to evaluate the model's performance objectively. The training data is used to build and train the model, while the testing data is used to assess the accuracy and generalization capability of the model. In this study, the data was split using the *train\_test\_split* function from the *scikit-learn* library, with a commonly used ratio of 80% training data and 20% testing data. The details of this process can be seen in the figure below.

```
[ ] X_train, X_test, y_train, y_test = train_test_split(
    X_train, y_train, test_size=0.2, random_state=42
)
print("Jumlah data latih:", len(X_train))
print("Jumlah data uji:", len(X_test))

# --- Lihat Isi Data Latih ---
print("\n== Data Latih (contoh 5) ==")
for i in range(5):
    print(f"{i+1}. Kalimat: {X_train.iloc[y_train.index[i]]} | Label: {y_train.iloc[i]}")

# --- Lihat Isi Data Uji ---
print("\n== Data Uji (contoh 5) ==")
for i in range(5):
    print(f"{i+1}. Kalimat: {X_test.iloc[y_test.index[i]]} | Label: {y_test.iloc[i]}")
```

Figure 12. Process Spilt Data

The following is the result of the data splitting process.

```
Jumlah data latih: 246
Jumlah data uji: 62

== Data Latih (contoh 5) ==
1. Kalimat: if you can help directly at least don't be a new conflict spread hold your thumb hold emotions | Label: Positif
2. Kalimat: if you look at the hot situation abroad, let's be calm, not follow the heat to spread educational empathy | Label: Positif
3. Kalimat: Restrain yourself from destructive actions | Label: Netral
4. Kalimat: Stay calm and be a role model for the younger generation | Label: Positif
5. Kalimat: Putin hopes Iran-Israel conflict is now part of history | Label: Netral

== Data Uji (contoh 5) ==
1. Kalimat: Don't let Iran-Israel conflict divide us here; preserve peace | Label: Netral
2. Kalimat: real for Iran there is a national earth ceremony victims of the new conflict israel malaysia madani polite people sahir rtm | Label: Netral
3. Kalimat: don't be buruburu ngejudge complicated diplomacy help away just don't make a noise | Label: Positif
4. Kalimat: if you know the entire context of the Iranian conflict israel mending teach first don't comment it hurts the parties | Label: Positif
5. Kalimat: ambulance cases such as international court dropouts are now linked to commitment commitments on ambulance cases or postponement hooks for
```

Figure 13. Result of the Splitting process

## E. Classification Using the Gaussian Naïve Bayes Algorithm

### 1. Train the Gaussian Naïve Bayes Model

The following is the process of training the model using the Gaussian Naïve Bayes algorithm. In this step, the training data that has been previously prepared is used to build the classification model. The model learns from the features and corresponding sentiment labels in the training set to identify patterns and relationships. This trained model will later be used to classify new or unseen data.

```
[ ] gnb = GaussianNB()
    gnb.fit(X_train, y_train)
    print("\nModel GaussianNB berhasil dilatih.")
```



```
Model GaussianNB berhasil dilatih.
```

Figure 14. Train the Gaussian Naïve Bayes Model

## 2. Prediction

The following is the prediction process using the trained Gaussian Naïve Bayes model. In this step, the model is applied to the testing data to predict the sentiment labels. The predictions generated will later be compared with the actual labels to evaluate the model's performance. The prediction process is illustrated in the figure below.

```

from sklearn.metrics import accuracy_score
import pandas as pd

y_pred = gnb.predict(X_test)
akurasi = accuracy_score(y_test, y_pred)
print("\n== HASIL PREDIKSI ==")
for i in range(min(5, len(y_test))):
    print(f"Teks: {X.iloc[y_test.index[i]]}")
    print(f"Label Asli: {y_test.iloc[i]} --> Prediksi: {y_pred[i]}")
    print("")
    
```

Figure 15. GaussianNB Prediction Process

```

-- HASIL PREDIKSI --
Teks: Don't let Iran-Israel conflict divide us here; preserve peace
Label Asli: Netral --> Prediksi: Netral

Teks: real for iran there is a national earth ceremony victims of the new conflict israel malaysia madani polite people sahh rtm
Label Asli: Netral --> Prediksi: Positif

Teks: don't be buruburu ngejudge complicated diplomacy help away just don't make a noise
Label Asli: Positif --> Prediksi: Positif

Teks: if you know the entire context of the iranisan conflict israel mending teach first don't comment it hurts the parties
Label Asli: Positif --> Prediksi: Positif

Teks: ambulance cases such as international court dropouts are now linked to commitment commitments on ambulance cases or postponement hooks for pr
Label Asli: Netral --> Prediksi: Netral

✅ Hasil prediksi berhasil disimpan ke Google Drive.
    
```

Figure 16. GaussianNB Prediction Result

## 3. Accuracy

```

== AKURASI ==
Akurasi: 77.42%

== Classification Report ==
      precision    recall  f1-score   support

Negatif    0.00    0.00    0.00         2
Netral     0.93    0.74    0.83        35
Positif    0.69    0.88    0.77        25

 accuracy         0.77         62
macro avg    0.54    0.54    0.53         62
weighted avg    0.80    0.77    0.78         62
    
```

Figure 17. GaussianNB Accuracy

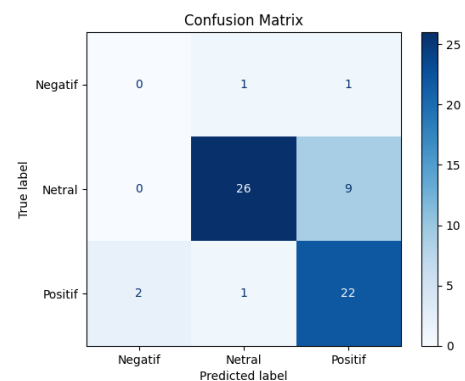


Figure 18. GaussianNB Confusion Matrix

## F. MultinomialNB Algorithm Classification

### 1. Train the Multinomial Naïve Bayes Model

The following is the process of training the model using the Multinomial Naïve Bayes algorithm. In this step, the training data that has been previously prepared is used to build the classification model. The model learns from the features and corresponding sentiment labels in the training set to identify patterns and relationships. This trained model will later be used to classify new or unseen data.

```
[ ] from sklearn.feature_extraction.text import TfidfVectorizer

vectorizer = TfidfVectorizer()
X_train_vector = vectorizer.fit_transform(train_df['tweet_english'])
X_test_vector = vectorizer.transform(test_df['tweet_english'])

[ ] from sklearn.naive_bayes import MultinomialNB

model = MultinomialNB()
model.fit(X_train_vector, train_df['label'])
```

Figure 19. Train MultinomialNB Algorithm Classification

**2. Prediction**

The following is the prediction process using the trained Multinomial Naïve Bayes model. In this step, the model is applied to the testing data to predict the sentiment labels. The predictions generated will later be compared with the actual labels to evaluate the model's performance. The prediction process is illustrated in the figure below.

```
from sklearn.metrics import accuracy_score, classification_report

y_pred = model.predict(X_test_vector)
y_test = test_df['label']

hasil_prediksi = test_df.copy()
hasil_prediksi['prediksi'] = y_pred

print("\n=== Hasil Prediksi ===")
print(hasil_prediksi[['tweet_english', 'label', 'prediksi']].head(10))
```

Figure 20. MultinomialNB Prediction Process

```
=== Hasil Prediksi ===
      tweet_english      label prediksi
0  Don't let Iran-Israel conflict divide us here;...  Netral  Netral
1  real for iran there is a national earth ceremo...  Netral  Positif
2  don't be buruburu ngejudge complicated diploma...  Positif  Positif
3  if you know the entire context of the iranian ...  Positif  Positif
4  ambulance cases such as international court dr...  Netral  Positif
5  wni abroad needs calm which here helps not spr...  Positif  Positif
6  so that the order to manage diplomacy is enoug...  Positif  Positif
7  Prabowo and Malaysian PM support permanent cea...  Netral  Netral
8  Stay calm and radiate positive energy  Positif  Positif
9  dpr has asked wni the conflict area to remain ...  Positif  Positif
```

Figure 21. MultinomialNB Prediction Result

**3. Accuracy**

Akurasi model: 75.81 %

=== Classification Report ===				
	precision	recall	f1-score	support
Negatif	0.00	0.00	0.00	2
Netral	1.00	0.63	0.77	35
Positif	0.62	1.00	0.77	25
accuracy			0.76	62
macro avg	0.54	0.54	0.51	62
weighted avg	0.82	0.76	0.75	62

Figure 22. MultinomialNB Accuracy

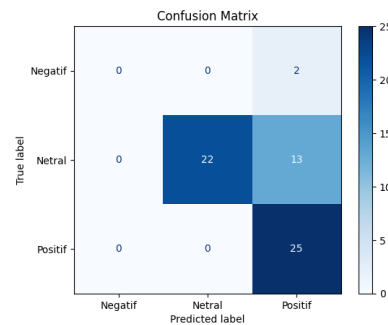


Figure 23. MultinomialNB Confusion Matrix

**G. BernoulliNB Algorithm Classification**

**1. Train the Bernoulli Naïve Bayes Model**

The following is the process of training the model using the Multinomial Naïve Bayes algorithm. In this step, the training data that has been previously prepared is used to build the classification model. The model learns from the features and corresponding sentiment labels in the training set to identify patterns and relationships. This trained model will later be used to classify new or unseen data.

```
[ ] bnb = BernoulliNB()
    bnb.fit(X_train, y_train)
```

Figure 24. Train the Bernoulli Naïve Bayes Model

## 2. Predicion

```
y_pred = bnb.predict(X_test)

df_test = pd.DataFrame({
    'text': X.iloc[y_test.index],
    'label': y_test,
    'prediksi': y_pred
})
print("\n=== Hasil Prediksi ===")
print(df_test.head(10))
```

Figure 25. BernoulliNB Prediction Process

```
=== Hasil Prediksi ===
```

	text	label	predik
288	Don't let Iran-Israel conflict divide us here;...	Netral	Netr
9	real for iran there is a national earth ceremo...	Netral	Posit
57	don't be buruburu ngejudge complicated diploma...	Positif	Posit
60	if you know the entire context of the iranian ...	Positif	Posit
25	ambulance cases such as international court dr...	Netral	Posit
63	wni abroad needs calm which here helps not spr...	Positif	Posit
92	so that the order to manage diplomacy is enoug...	Positif	Posit
184	Prabowo and Malaysian PM support permanent cea...	Netral	Netr
244	Stay calm and radiate positive energy	Positif	Netr
46	dpr has asked wni the conflict area to remain ...	Positif	Posit

Figure 26. BernoulliNB Prediction Result

## 3. Accuracy

```
[ ] print("Akurasi model:", round(accuracy_score(y_test, y_pred) * 100, 2),
        print("\n=== Classification Report ===")
        print(classification_report(y_test, y_pred))
```

```
Akurasi model: 87.1 %
```

```
=== Classification Report ===
```

	precision	recall	f1-score	support
Negatif	0.00	0.00	0.00	2
Netral	0.97	0.86	0.91	35
Positif	0.77	0.96	0.86	25
accuracy			0.87	62
macro avg	0.58	0.61	0.59	62
weighted avg	0.86	0.87	0.86	62

Figure 27. BernoulliNB Accuracy

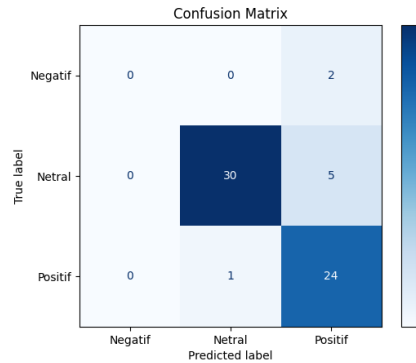


Figure 28. Confusion Matrix BernoullineNB

## 4. CONCLUSION

The following table presents a comparison of accuracy scores obtained from three different Naïve Bayes algorithms used in the sentiment classification process:

Table 5. Accuracy of Naïve Bayes Algorithms

No	Algorithm	Accuracy
1.	GaussianNB	77.42 %
2.	MultinomialNB	75.81%
3.	BernoullineNB	87.1%

Based on the classification results shown above, the BernoulliNB algorithm achieved the highest accuracy, reaching 87.10%, indicating its superior performance in handling the given dataset. The GaussianNB algorithm followed in second place with an accuracy of 77.42%, while the

MultinomialNB algorithm recorded the lowest accuracy at 75.81%. These results suggest that the BernoulliNB algorithm is the most effective among the three for the sentiment classification task in this study. The data processing stages were conducted sequentially, starting from data cleaning to remove noise and potentially biased content. This was followed by standard text preprocessing steps, including normalization, stopword

Removal, tokenization, and stemming. To improve the accuracy of sentiment labeling and classification, the preprocessed Indonesian text was then translated into English. This step was essential, as the labeling tool (TextBlob) performs more accurately with English input. Therefore, using English texts helped minimize classification errors and improved the overall performance of the sentiment analysis process.

Based on the results of this study, several conclusions can be drawn as follows:

1. This study aims to perform sentiment classification on Twitter data using the Naïve Bayes algorithm.
2. The research stages began with data cleaning, preprocessing, translation of text into English, sentiment labeling using TextBlob, and classification using three variants of the Naïve Bayes algorithm (GaussianNB, MultinomialNB, and BernoulliNB).
3. The results show that the BernoulliNB algorithm achieved the highest accuracy at 87.10%, followed by GaussianNB with an accuracy of 77.42%, and MultinomialNB with 75.81%.
4. The high accuracy of BernoulliNB is presumed to be due to the model's suitability for binarized text data (such as the preprocessed tweets, which are short and concise).
5. BernoulliNB is considered the most effective in classifying sentiment on Twitter data in the context of this study.

## REFERENCES

- Arsi, P., & Waluyo, R. (2021). Analisis sentimen wacana pemindahan ibu kota Indonesia menggunakan algoritma Support Vector Machine (SVM). *Jurnal Teknologi Informasi dan Ilmu Komputer*, 8(1), 147.
- Cahayaningtyas, C., Nataliani, Y., Widiyanti, I. R., Informasi, F. T., Kristen, U., & Wacana, S. (2021). Analisis sentimen pada rating aplikasi Shopee menggunakan metode decision tree berbasis SMOTE. *Jurnal ...*, 18(2), 173–184.
- Gultom, M., & Nugroho, H. (2019). Analisis perbandingan metode Naïve Bayes dan SVM dalam klasifikasi sentimen berita online. *Jurnal Teknologi Informasi dan Komunikasi*, 9(2), 88–94.
- Kalcheva, N., Marinova, G., & Todorova, M. (2023). Comparative analysis of the Bernoulli and Multinomial Naive Bayes classifiers for text classification. *Proceedings of IEEE ICAI*.
- Kaur, S., & Singh, R. (2021). Limitations of lexicon-based tools: A study on TextBlob and alternatives. *International Journal of Computer Applications*, 182(10), 22–26.
- Kurniawan, A., & Pramono, D. (2022). Implementasi tokenisasi pada preprocessing teks Bahasa Indonesia. *Jurnal RESTI*, 6(4), 709–715.
- Lestari, R. D., & Permana, Y. A. (2022). Sentiment analysis on social media using Naive Bayes classification. *Jurnal Ilmu Komputer dan Informasi*, 12(2), 115–124.
- Nasution, M. R. A., & Hayaty, M. (2019). Perbandingan Akurasi dan Waktu Proses Algoritma K-NN dan SVM dalam Analisis Sentimen Twitter. *Jurnal Informatika*, 6(2), 226–235.
- Prasetyo, F. D., et al. (2021). Improving sentiment analysis on social media using stopword removal and stemming. *Procedia Computer Science*, 179, 524–530.
- Sentiaji, A. R., & Bachtiar, A. M. (2014). Analisis sentimen terhadap acara televisi berdasarkan opini publik. *Jurnal Ilmiah Komputer dan Informatika (KOMPUTA)*, 2(1), 55–60.
- Sharma, M., & Dey, D. (2022). Evaluating the effectiveness of text pre-processing in sentiment analysis. *Applied Sciences*, 12(3), 1457.
- T. N. Wijaya, R. Indriati, and M. N. Muzaki, "Analisis Sentimen Opini Publik Tentang Undang-Undang Cipta Kerja Pada Twitter" *Jambura J. Electr. Electron. Eng.*, vol. 3, no. 2, pp. 78-83, 2021, doi: 10.37905/jjee.v3i2.10885.
- Vindua, R., & Zailani, A. U. (2023). Analisis sentimen Pemilu Indonesia tahun 2024 dari media sosial Twitter menggunakan Python. *JURIKOM (Jurnal Riset Komputer)*, 10(2), 479. <https://doi.org/10.30865/jurikom.v10i2.5945>

- Wijaya, T. N., Indriati, R., & Muzaki, M. N. (2021). Analisis sentimen opini publik tentang Undang-Undang Cipta Kerja pada Twitter. *Jambura Journal of Electrical and Electronics Engineering*, 3(2), 78-83. <https://doi.org/10.37905/jjee.v3i2.10885>
- Wicaksono, R., & Hidayatullah, M. (2021). Text preprocessing untuk analisis sentimen Twitter menggunakan Naive Bayes. *Jurnal Teknologi dan Sistem Komputer*, 9(2), 123-130.