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SENTIMENT CLASSIFICATION OF PUBLIC OPINION ON THE HAJJ QUOTA ISSUE USING THE NAIVE BAYES ALGORITHM

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Abstract

The issue of the Hajj quota has become one of the most widely discussed topics on social media in Indonesia due to the increasing number of pilgrims and the limited quota provided each year. Public responses regarding long waiting lists, quota distribution, and government policies have generated various opinions that can be analyzed through sentiment analysis. This study aims to classify public sentiment toward the Hajj quota issue on social media X (Twitter) using the Naive Bayes algorithm. The research applied a quantitative approach with stages including data collection, preprocessing, TF-IDF weighting, classification, and evaluation. Data were collected through a crawling process on X using the keyword "kuota haji" within the period of August 2025 to February 2026. A total of 1,900 tweets were obtained, and after preprocessing stages such as cleaning, case folding, tokenizing, normalization, stemming, and stopword removal, 800 valid tweets were used for analysis. The dataset was divided into training data and testing data for sentiment classification into positive and negative categories. The results showed that negative sentiment dominated public opinion regarding the Hajj quota issue, with 71.8% negative sentiment and 28.2% positive sentiment. Furthermore, the Naive Bayes algorithm achieved an accuracy of 79.42%, precision of 90.26%, and recall of 30.38%. These findings indicate that the Naive Bayes method performs effectively in classifying public sentiment on social media data and can provide useful insights for evaluating government policies related to Hajj quota management and public communication strategies.

Keywords: *Hajj Quota, Naive Bayes, Sentiment Analysis, Social Media, Twitter Data*

INTRODUCTION

The Hajj pilgrimage is a key pillar of Islam and holds high spiritual urgency for the Indonesian people, as the country with the largest Muslim population in the world. However, this pilgrimage consistently faces a classic challenge: the limited quota allocated by the Saudi Arabian government compared to the ever-increasing number of interested pilgrims. The dynamics of the Hajj quota, ranging from additional quota additions, special quota distribution, to departure queues that stretch for decades, have become a sensitive issue, sparking widespread debate in the public sphere(Rofiq & Sholahuddin, 2022). This policy often has a direct impact on public trust in religious authorities(Khairunnisa & others, 2021).

In the past six months, the issue of quota transparency has frequently been intertwined with the increase in the Hajj Travel Cost (BPIH), which has sparked negative responses among netizens (Lestari & Tabrani, 2023). As a real-time and open platform, X provides a platform for the public to freely express their opinions, criticisms, and hopes (Putra & Al-Zauhari, 2020). Complaints about the uncertain waiting period and debates over the proportion of regular and special Hajj quotas often dominate digital conversations, collectively shaping public sentiment toward government performance.

Sentiment analysis is a crucial method for measurably understanding these public perceptions. According to (Prasetyo & others, 2022), sentiment analysis allows for the extraction of information from unstructured textual data to determine opinion trends, whether positive, negative, or neutral. By utilizing data from social media platforms, researchers can capture social phenomena more dynamically than conventional survey methods. Previous research by (Sari & Rosely, 2021) demonstrated that social media is an accurate indicator for capturing the level of public satisfaction with government policies within a short period of time.

The choice of algorithm in sentiment analysis significantly determines the accuracy of the results. One frequently used algorithm due to its efficiency and simplicity is the Naive Bayes Classifier. This algorithm operates based on Bayesian probability theory, assuming that each feature is independent.(Ramadhan & others, 2023) in their research stated that Naive Bayes performs very well in classifying short text categories. However, several recent studies have begun to compare its efficiency with other methods to ensure accuracy on specific religious issues (Maulana & Purwarianti, 2024). Furthermore, word representations such as Word2Vec have also begun to be integrated to capture deeper semantic meaning in texts related to religious issues (Fauzi, 2020).

The main challenge in conducting sentiment analysis on platform X lies in the noisy nature of the data. Users often use slang, non-standard abbreviations, and a mixture of Indonesian and regional languages when expressing criticism regarding the Hajj quota queue. According (Handayani & Fauzi, 2023)), the preprocessing stage, which includes cleansing, normalization, and stopword removal, is a key determinant in improving the performance of classification algorithms. Using an appropriate normalization dictionary is crucial so that words like "queue," "wait," or "quota" can be consistently interpreted by the Naive Bayes model.

In addition to technical linguistic factors, the temporal context of data collection over the past six months provides a more dynamic dimension to the analysis. Sentiment fluctuations typically occur in line with the emergence of official government statements or viral news regarding Hajj diplomacy between Indonesia and Saudi Arabia. As explained by (Fikri et al., 2024), temporal

sentiment analysis allows researchers to observe patterns of changes in public opinion, from skepticism to optimism, or vice versa. By mapping these trends, the research not only produces classification accuracy figures but also provides a sociological narrative regarding how the Hajj quota issue affects public trust in the religious bureaucracy in Indonesia.

Although numerous studies have been conducted on sentiment analysis of government policies, research specifically examining the Hajj quota issue within the last six months is still limited. This period encompasses crucial moments such as the annual quota announcement and the departure operational period. Therefore, this study aims to classify the opinions of social media users regarding the Hajj quota issue using the Naive Bayes algorithm. The results are expected to provide objective input for stakeholders, particularly the Ministry of Religious Affairs, in mapping public responses and improving public communication strategies regarding future Hajj policies.

METHOD

This research uses a quantitative method approach and Naïve Bayes classification. Quantitative methods are used as a tool to present and illustrate data in the form of images, tables, or diagrams so that the data can be easily understood (Sugiyono, 2017) Meanwhile, the Naïve Bayes classification method is a statistical classification method used to predict the probability of class membership (Kursini & Lutfhi, 2009). When using large databases, this method has proven to be fast and accurate (Purnana & Supriyanto, 2013).

Research Stages

This research uses a classification method with the Naïve Bayes algorithm. The data source used was tweets from social media platform X, with a scope in Indonesia. The stages of this research process are shown in Figure 1.

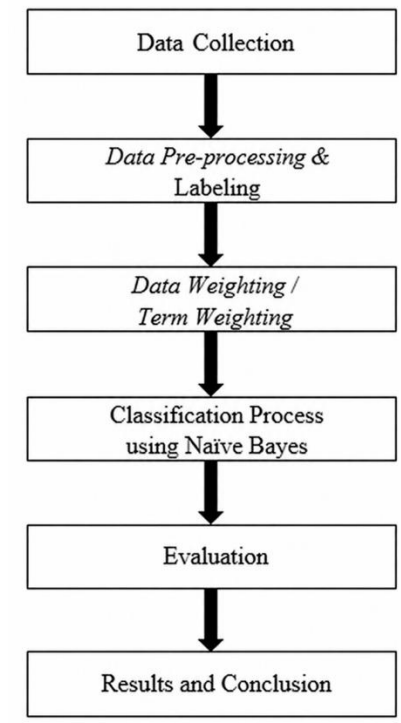

Figure 1. Research Stages

Figure 1 shows the research stages, from data collection (X) to the results and conclusions. The following is a detailed explanation of the research stages in Figure 1:

A. Data Collection

Data collection was conducted using data crawling (X) using RapidMiner, covering a time span from August 10, 2025, to February 10, 2026. The keyword used was "Hajj quota."

B. Data Preprocessing and Labeling

The preprocessing stage includes data cleaning (such as removing noise and inconsistent data), data transformation (data is transformed and consolidated into an appropriate format), and data reduction, including feature selection and extraction. After going through the preprocessing stage, the final data is expected to be considered correct and useful for data mining algorithms (García et al., 2015). In other studies, preprocessing methods used to extract data from online media sources include data cleaning, case folding, tokenizing, normalization, stemming, and stopword removal (Irham et al., 2019). In this study, the pre-processing methods used were as follows:

1. Data cleaning, which removed noisy data and missing values from tweets unrelated to the Hajj quota case. Furthermore, duplicate tweets were removed to ensure more accurate data.
2. Case folding, which changed all capital letters in tweets to lowercase. Then, tokenizing, which broke down sentences in each tweet into individual words, called tokens (Rosid et al., 2020)

This process aims to simplify the text used as input for the classification process (Sutoyo et al., 2021)

3. The next step, normalization, which changed non-standard words such as abbreviations or acronyms into original standard words (Khairunnisa et al., 2021)
4. The next step was stemming, which removed unnecessary affixes from words and returned them to their root words (Herdiansah et al., 2020)
5. In stopword removal, this means removing common words that are considered meaningless and occur frequently in the text (Fahmi et al., 2020)

C. TF-IDF Term Weighting

After data preprocessing, the next step is weighting using Term Frequency Inverse Document Frequency, or TF-IDF. TF-IDF is a method for determining the weight of a word by assigning a different weight to each word in a document based on the word's frequency per document and weighting the word's frequency across all documents.

D. Classification Process

The next stage is the classification process using the Naïve Bayes algorithm. A class attribute value cannot influence or be influenced by the values of other attributes. This is called naive, meaning the appearance of a term in a sentence cannot influence other words. Applied to sentiment analysis, each word has its own weight, which can be used to determine whether the sentence is negative or positive by adding the total weights.

E. Evaluation

This process will calculate the performance of the Naïve Bayes algorithm classification results in sentiment analysis. This evaluation uses several calculations, namely precision, recall, and F-score. To obtain the value of this calculation, it is necessary to create a confusion matrix to evaluate the results of the dataset classification using the Naïve Bayes algorithm. The classification evaluation table is shown in Table 1.

Table 1. Confusion matrix

Actual Value	Predicted Value	
	Positive	Negative
Positive	TP	FP
Negative	FN	TN

Description:

TP: Number of data points with positive values correctly predicted as positive.

TN: Number of data points with negative values correctly predicted as negative.

FP: Number of data points with negative values but predicted as positive.

FN: Number of data points with positive values but predicted as negative.

RESULTS AND DISCUSSION

In this study, the analysis was implemented through several stages: data collection or crawling of data x, pre-processing, and word labeling. After pre-processing, classification was performed using the Naïve Bayes algorithm. The evaluation stage used several calculations, including precision, recall, and F-score. The following is a breakdown of the stages in implementing public sentiment analysis for the Hajj city case:

Data Collection

Data collection using the data crawling technique yielded 1,900 tweets using the keyword "Hajj quota." An example of the successfully collected X data crawl is shown in Table 2.

Table 2. Results of crawling data X

Username	*Tweet*
@Tan_Mar3M	Antrian kuota haji sekarang gila sih 😭 daftar sekarang berangkatnya pas Ubanan kayaknya
@sadidawoaini	udah nabung lama buat haji eh kuotanya dikurangin 😔 semoga tahun depan ada tambahan kuota haji deh
@RadioKita	Pemerintah terus berkoordinasi dengan Arab Saudi terkait kuota haji Indonesia demi pelayanan jamaah yang lebih optimal.
@Askrlfess	di daerah kalian waiting list kuota haji berapa tahun dah? di tempat gw katanya sampe 30 tahunan 😭
@sidonews	Pemerintah berupaya meningkatkan kualitas pelayanan dan memperjuangkan tambahan kuota haji bagi jamaah Indonesia.

Table 2 shows the Username and Tweet attributes. Username is the username of user X, and the Tweet attribute is a tweet from that user containing the term "Hajj quota." The data was taken from social media platform X, which contains tweets containing information from the government and public responses regarding the Hajj quota. Afterward, the data was preprocessed to remove unnecessary variables for analysis.

Data Preprocessing and Labeling

The preprocessing stage involved five steps: data cleaning, case folding, normalization, word stemming, and stopword removal. An example of the preprocessing results is shown in Table 3.

Table 3. Data Preprocessing Results

Fase *Pre-processing*	Result
Kalimat dasar	Antrian kuota haji sekarang gila sih 😭 daftar sekarang berangkatnya pas Ubanan kayaknya
Cleaning data	Antrian kuota haji sekarang gila sih daftar sekarang berangkatnya pas Ubanan kayaknya
Cases folding	antrian kuota haji sekarang gila sih daftar sekarang berangkatnya pas ubanan kayaknya
Tokenizing	'antrian' 'kuota' 'haji' 'sekarang' 'gila' 'sih' 'daftar' 'sekarang' 'berangkatnya' 'pas' 'ubanan' 'kayaknya'
Normalisasi	'antrian' 'kuota' 'haji' 'sekarang' 'gila' 'sih' 'daftar' 'sekarang' 'berangkatnya' 'pas' 'ubanan' 'kayaknya'
Stemming word	'antrian' 'kuota' 'haji' 'sekarang' 'gila' 'sih' 'daftar' 'sekarang' 'berangkatnya' 'pas' 'ubanan' 'kayaknya'
Stopword removal	'antrian' 'kuota' 'haji' 'gila' 'daftar' 'berangkatnya' 'ubanan'

Table 3 shows the pre-processing phases and the results of each process. The data cleaning process removed tweets unrelated to the Hajj quota case and removed duplicate tweets and retweets to improve data accuracy. It also removed special characters and URL links that created noise in tweets. After data cleaning, the resulting data consisted of 800 tweets for the keyword Hajj quota. The case folding phase changed all uppercase letters in tweets to lowercase letters, making them easier to process in the next stage. After pre-processing, the next step was positive and negative labeling by a linguist. The 800 tweets were divided into two sets: training data and test data. The training data consisted of 260 tweets for the keyword Hajj quota, while the test data consisted of 540 tweets for each keyword Hajj quota. The results of the training data labeling are shown in Table 4.

Table 4. Training Data Labeling Results

Keywords	Positive	Negative	Total
Kuota Haji	104 (40%)	156 (60%)	260

Table 4 shows the actual positive and negative labeling data for the keyword "Hajj quota," which totaled 260 tweets. The keyword "Hajj quota" had 104 positive sentiment tweets, and 156 negative sentiment tweets. The training data labeling results showed a dominant negative sentiment (60%) and positive sentiment (40%).

Naïve Bayes Classification Method

The classification process in this study used the Naïve Bayes algorithm, using rapidminer as the tool. The input for this process was training data and test data. The training data served as input for the actual positive and negative data, which were then classified using the Naïve Bayes

algorithm to form a pattern. This pattern was then implemented on the test data for the keyword "Hajj quota," resulting in predictions of positive and negative public sentiment.

The initial step in this algorithm process was to calculate the probability of each word in the tweet. Then, the probability values for positive and negative sentiment were calculated for a total of 540 tweets. Afterward, the highest probability value for each word in the tweet was calculated, either negative or positive, using the formula in equation (1). The calculation results from this formula will yield the highest value between positive and negative sentiment. If a tweet has a higher probability of being positive than negative, the predicted tweet will be positive. However, if the tweet has a higher probability of being negative than positive, the predicted tweet will be negative. The predicted results from the test data for the keyword "Hajj quota" are shown in Figure 2.

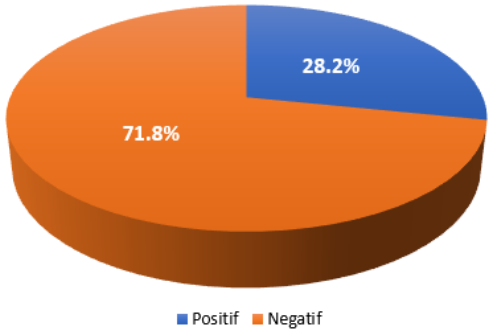

Figure 2. Prediction Results for the Keyword “Hajj Quota”

Figure 2 shows the prediction results using the Naïve Bayes classification method from 540 test tweets, showing positive public sentiment with the keyword "Hajj quota" in 152 tweets (28.2%), and negative sentiment in 388 tweets (71.8%). These results indicate that public response to the Hajj quota increase policy tends to be predominantly negative.

Evaluation

This process is carried out after the classification using the Naïve Bayes algorithm is complete. The purpose of this process is to evaluate the sentiment prediction results through accuracy, precision, and recall values. These values can serve as a benchmark for the performance of the Naïve Bayes algorithm analysis. The evaluation results of the Naïve Bayes classification process are shown in Table 5.

Table 5. Evaluation Results

Keyword	***Accuraccy***	***Precision***	***Recall***
Kuota Haji	79,42%	90,26%	30,38%

Table 5 shows that the classification using the Naive Bayes algorithm with the keyword "Hajj quota" achieved an accuracy of 79.42%, a precision of 90.26%, and a recall of 30.38%. Based on these results, it can be concluded that the evaluation of the analysis using the Naive Bayes classification method was accurate and precise, with values of 79.42% and 90.26%, respectively.

CONCLUSION

This study successfully applied the Naïve Bayes classification method to analyze public sentiment regarding the Hajj quota issue based on social media data from Twitter. The data crawling process obtained 1,900 tweets. After preprocessing steps such as data cleaning, case folding, tokenizing, normalization, stemming, and stopword removal, 800 tweets were selected for classification. The data labeling results indicated that public sentiment toward the Hajj quota issue tended to be dominated by negative sentiment (60%), while positive sentiment was 40%. In the testing phase, using 540 test data sets, the Naïve Bayes classification results showed that negative sentiment reached 71.8%, while positive sentiment was 28.2%. This indicates that the public on social media tends to respond negatively to the Hajj quota issue, particularly regarding long queues, quota limitations, and government policies.

Based on the model evaluation results, the Naïve Bayes algorithm achieved an accuracy of 79.42%, a precision of 90.26%, and a recall of 30.38%. These results indicate that the Naïve Bayes method performs quite well and is capable of providing a high level of accuracy and precision in classifying public sentiment regarding the Hajj quota issue. This research demonstrates that social media-based sentiment analysis can be used as a source of information to quickly and dynamically understand public opinion. Furthermore, the research findings are expected to serve as evaluation material for the government, particularly the Ministry of Religious Affairs, in improving service quality, policy transparency, and public communication strategies related to Hajj quota management in Indonesia.

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