Analyzing the Sentiment of the 2024 Election Sirekap Application Using Naïve Bayes Algorithm

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Abstract—One of the most recent types of elections is the 2024 election, which includes the election of the president as well as legislative members. Along with the development of technology, an application called Sirekap emerged which is used to recapitulate the results of the vote. Although the app only has a one-star rating on the Play Store, reading all the user reviews to know the quality takes quite a while. Therefore, sentiment analysis can be an alternative to get an overview of user reviews so that it can help in making better decisions then, the method that will be used in conducting sentiment analysis in this study is the naïve Bayes algorithm. This research aims to identify and categorize user sentiment, as well as evaluate the quality of the app on reviews provided on the Playstore. This research contributes by providing an efficient method to analyze user reviews of the Sirekap app, which can assist app developers and other stakeholders in making better decisions regarding app development and improvement. In addition, the results of this study confirm that the app’s one-star rating is accurate, with evaluation metrics such as precision, memory, and f1 score reaching 1.00 each.

Keywords: Sentiment Analysis; Data Mining; Naïve Bayes; Sirekap Application; Elections

1. INTRODUCTION

Politics has become an inseparable part of people's lives. Public awareness of politics is increasing and affecting their daily lives. Social interactions carried out by individuals are often related to the political process, showing how important politics is in social life [1]. The meaning of politics continues to evolve and there are five main views on politics. First, politics is an activity carried out by the people to create or provide goodness for others. Second, politics is closely related to the administration of the state and government. Third, politics includes all actions taken by the community to gain and maintain power or position. Fourth, politics functions as a tool or weapon in the implementation of policies for the benefit of the community. Fifth, politics is related to efforts to obtain and maintain various needs as interests [2].

One of the newly held political activities is the 2024 General Election (Election) in Indonesia where this event is included in a very important and historic event, involving active participation from all levels of society. As information and communication technology develops, social media and digital applications have become the main means for people to express their views, opinions, and sentiments on various issues, including politics and elections [3]. One of the important innovations introduced by the General Election Commission (KPU) in order to increase election transparency and efficiency is the application of the Recapitulation Information System (Sirekap).

Sirekap is an application developed to facilitate the electronic vote recapitulation process, thereby speeding up and simplifying the process of collecting and counting votes [4]. This application allows the public to monitor the election results in real-time, thereby increasing transparency and public trust in the election process. However, on the other hand, the use of this application also causes various reactions and sentiments from the public, which needs to be analyzed to understand public perception more deeply. Sentiment analysis is a method used to identify and classify opinions contained in texts, such as positive, negative, or neutral. This method is particularly useful in the context of elections because it can provide insight into how the public responds to various aspects of the electoral process, including the performance of the KPU, the reliability of Sirekap, and overall political dynamics. With sentiment analysis, election organizers can identify issues that may arise and respond to them in a timely manner [5].

The Naïve Bayes algorithm is one of the most effective methods for sentiment analysis. This algorithm uses the principle of probability to classify text based on the occurrence of certain words. Its simplicity and efficiency make Naïve Bayes a popular choice for handling large amounts of text data [6]. The algorithm works by assuming that each feature (a word in a text) is independent of each other, and calculates the probability that a text falls into a certain category of sentiment (positive, negative, or neutral) [7].

In this study, the Naïve Bayes algorithm will be applied to analyze the sentiment of Sirekap application users in the 2024 election. This research will include several main stages, namely data collection, text pre-processing, model training, and evaluation of results [8]. The data to be used in this study comes from a variety of sources, including app reviews, comments on social media, and election-related news. The purpose of this research is to analyze public sentiment towards the Sirekap application in the 2024 Election [9].

Identify trends in positive, negative, and neutral sentiment in the context of using the Sirekap application, Uncover the main issues discussed by application users related to the election process and provide recommendations to the KPU and related parties based on the results of sentiment analysis to increase election transparency and efficiency [10].
Then there are several previous studies that were used as review literature material in this study, first conducted by Alpin et al. This research aims to analyze the sentiment of users who use the JMO application on the Google Play Store by collecting reviews through web scraping. Sentiment analysis is a text mining process used to classify unstructured data to produce sentiment information. In this sentiment analysis, the method used is the Naïve Bayes algorithm. The data was taken from scraping results from September 2018 to February 2023, with a total of 5,000 review data labeled in positive and negative categories. The results show that the JMO application users tend to give negative reviews, with the number of positive sentiment classification predictions as many as 1,472 and negative sentiment as many as 3,528. This indicates that most users have left negative comments against the JMO app, although there are also some who have left positive comments. The Naïve bayes method produces an accuracy of 95%, a precision of 91%, and a recall rate of 90% [11].

Second, Melina et al conducted research on sentiment analysis of the Shopee application on the Google Play Store. As a result, users can analyze reviews to evaluate the service, which requires more than just looking at the number of stars; The content of the comments should also be considered. The sentiment analysis system automatically analyzes reviews for sentiment information, using the Naïve Bayes algorithm. In this study, 1,000 Shopee user reviews were collected as a sample.

The goal is to determine the sentiment analysis of Shopee app reviews using the Naïve Bayes algorithm. The research stages include data collection, labeling, pre-processing, sentiment classification, and evaluation. In the pre-processing stage, cleaning, case folding, word normalization, tokenization, stopword deletion, and stemming are carried out. The TF-IDF method is used for word weighting. The data were grouped into two categories, namely negative and positive, and evaluated using accuracy parameters. The test results showed an accuracy of 81%, indicating that the reviews tended to be negative [12].

In this study, the two methods used to conduct sentiment analysis are Naïve Bayes (NB) and K-Nearest Neighbor (KNN). The results of the study show a comparison of the performance of the two methods, where the Naïve Bayes method provides a sentiment analysis accuracy level of 82.27%, with a precision value of 86.36% and a recall of 76.93%. Meanwhile, the performance of the K-Nearest Neighbor (KNN) method also showed the results of the analysis with an accuracy level of 88.12%, precision of 93.98%, and recall of 81.53%. Based on the results of the analysis, it can be seen that the analysis process using the KNN method is superior to the NB method in measuring sentiment towards the relocation of the National Capital of the archipelago [13].

Similar research was also conducted by Akmali et al. observing that app reviews are not enough just to look at the number of stars; It is necessary to look at the entire content of the review comment to understand the intent of the review. A sentiment analysis system is a system used to analyze reviews automatically. Review data is taken through the Bukalapak application API and then classified using Naïve Bayes Multinomial. A total of 1,000 Bukalapak application user reviews were collected to be used as a sample dataset. The purpose of this study is to determine the accuracy level of sentiment analysis using the Naïve Bayes Multinomial algorithm. The stages of this research include data collection, automatic labeling using Python, pre-processing, sentiment classification, and evaluation. The test results showed an accuracy value of 90%, which indicates that Bukalapak app reviews tend to be negative. This research only seeks accuracy and provides an overview of the Bukalapak application to potential new users [14].

Then it was carried out by Huda et al. This research conducted a sentiment analysis to find out the public's assessment of #MataNajwaMenantiTerawan shows on YouTube. The data was collected through scraping from YouTube video comments #MataNajwaMenantiTerawan. The raw datasets obtained are then processed to facilitate the classification process. The Naïve Bayes algorithm is used to classify comments into categories of positive, negative, and neutral sentiment.

The Naïve Bayes algorithm produces an accuracy of 90.36%. Neutral sentiment is more dominant with a total of 1,232 neutral data, 90 negative data, and 78 positive data [15]. So it can be concluded that conducting sentiment analysis on an application is very important because it can provide views related to the application to people who have already used the application or new users. This sentiment analysis helps users understand the advantages and disadvantages of the app based on reviews and opinions from various users. This information is not only useful for users considering trying out the app, but also for app developers who want to improve the quality and performance of their products.

Furthermore, the Naïve Bayes Algorithm is the right method because it has the ability to classify texts efficiently and accurately. Naïve Bayes' algorithm works on Bayes' theorem which assumes that the features in the data are independent of each other, which although this assumption is simple, often gives excellent results in practice. In addition, the Naïve Bayes Algorithm is also known for its speed and ability to handle large amounts of data, making it suitable for sentiment analysis involving a lot of reviews and comments from app users. The algorithm is also relatively easy to implement and requires fewer computational resources compared to other, more complex algorithms, making it an efficient and effective option for sentiment analysis.

**2. RESEARCH METHODOLOGY**

In figure 1 below is the research flow that includes the initial to final stages.
Data collection is a systematic process of obtaining information or data necessary to answer a research question, achieve a research objective, or test a hypothesis. There are several commonly used data collection methods, including surveys or questionnaires, interviews, and observations. In this study, data collection is carried out automatically using the Google Play Store API which is directly connected to the Sirekap 2024 application. Data retrieval utilizes APIs, where APIs (Application Programming Interfaces) are interfaces that allow software applications to communicate with each other. By using the API, data related to the Sirekap 2024 application can be accessed and collected efficiently and accurately, allowing for more in-depth and reliable analysis. The data collected contains names, comments, dates and others.

2.2 Stage Pre-Processing

In the pre-processing stage, there are several stages that must be done then to clarify that the researcher has made the flow from this stage. The flow can be seen in the view in figure 2 Stages Pre-Processing.

2.2.1 Cleaning

Cleaning is the process of cleaning text from irrelevant or unwanted elements that can interfere with the analysis. These elements can be punctuation, numbers, symbols, or other special characters. The main objective of this stage is to ensure that the text to be analyzed is clean and contains only relevant information. This process is very important because the presence of irrelevant elements can reduce the accuracy of the analysis and lead to errors in the interpretation of the data. For example, the Cleaning process involves removing punctuation marks such as periods, commas, exclamation marks, and so on. In addition, special symbols such as @, #, $, %, and others are also removed. For example, in the text analysis of app user reviews, punctuation marks and special symbols do not provide significant informational value and are therefore omitted in order to make the analyzed text cleaner and focus on the important words.

This clean-up stage is a crucial first step in the pre-processing of text data, ensuring that the data used in subsequent analysis is in an optimal form for further processing. Thus, the results of the analysis obtained will be more reliable and provide clearer insights into the data being researched.

2.2.2 Case Folding

Case Folding is the process of converting all letters in text to lowercase letters to ensure consistency in analysis. This is important because in text analysis, uppercase and lowercase letters are considered different, even though they are semantically the same. By converting all letters to lowercase, we can avoid duplication and errors in the analysis. For example, the words “Hello” and “hello” would be considered as two different entities if case folding was not performed, even though they have the same meaning. For example, the text before case folding is “Hello
World", and after the case folding process, it becomes "hello world". By doing case folding, text analysis becomes more consistent and accurate, as all uppercase and lowercase variations are standardized.

2.2.3 Word Normalizer

Word Normalizer is the process of converting different forms of words that have the same meaning into their basic forms [16]. This can include different spelling handling, plural forms, or other morphological variations. The goal of this stage is to reduce the diversity of the actual same word forms, thus facilitating further analysis. Example of Word Normalizer Process, Changing words like "isn't" to "is not". Changing alternate spellings such as "color" and "colour".

2.2.4 Stopword Removal

Stopword Removal is the process of removing common words that come up frequently but do not provide important information in the analysis, such as "the", "is", "in", etc. These stopwords usually do not carry significant meaning and only interfere with the data analysis process. Example of Stopword Removal Process, Removing words such as "the", "is", "at", "which", "on". Example Text, Before the removal of the stopword: "This is a book on the table" then after the removal of the stopword the word becomes "book table".

2.2.5 Tokenizing

Tokenizing is the process of breaking down text into small units called tokens, which are usually words or phrases [17]. These tokens can then be further analyzed for various purposes, such as frequency counting, sentiment analysis, etc. Example of Tokenizing Process, Breaking down sentences into individual words. Then there is an example of text that before the tokenizing process is carried out, namely "Hello world" After tokenizing becomes ["Hello", "world"].

2.2.6 Stemming

Stemming is the process of reducing words to their basic form or roots by removing suffixes and prefixes. The main purpose of stemming is to eliminate morphological variations of words, so that words that have the same basic meaning can be analyzed as a single entity. For example, the words "running", "ran", and "runner" are all derived from the root word "run". The stemming process will turn all of these variations into a basic form of "run". By doing stemming, text analysis becomes more efficient and accurate because all variations of the same word are treated as a single entity. This is especially helpful in tasks such as text classification, information search, and sentiment analysis, where consistency and uniformity of words are essential.

2.3 Text Transformation

Text transformation is the process of changing text from one form or format to another for the purpose of further analysis or processing. This process is often used in natural language processing (NLP), data mining, and machine learning [18]. Text transformation can involve various techniques and steps, such as normalization, tokenization, stopword removal, stemming, and lemmatization, which aim to simplify, clean, and prepare the text for further analysis.

2.4 Data Mining

Data mining is the process of discovering patterns, trends, and relationships in large datasets using statistical, mathematical, and artificial intelligence analysis techniques and tools [19]. This process involves collecting, cleaning, transforming, and analyzing data to extract useful information that can be used to make better decisions [20]. Data mining is often used in fields such as business, marketing, healthcare, finance, and science to uncover hidden insights and make accurate predictions. Data mining helps organizations turn raw data into valuable information that can be used to improve efficiency, reduce costs, and gain a competitive advantage. In this study, we will use mining data, namely the naïve bayes algorithm [21].

Naïve Bayes' Algorithm is a probabilistic classification method based on Bayes' Theorem with the simple assumption that all features in a dataset are independent of each other. This means that the existence or value of a feature is not related to the existence or value of other features in a particular context [22]. Naïve Bayes calculates the conditional probability of each feature given each class, then uses this probability to classify the new instance by selecting the class with the highest probability [23]. Bayes' theorem on which this algorithm is based is expressed by the formula (1).

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)} \quad (1)$$

The formula of the naïve Bayes algorithm can be seen in (1), then an explanation of the formula where (P(A|B)) is the probability of hypothesis A given data B then to (P(B|A)) is the probability of data B given hypothesis A. Then in the formula there is (P(A)) is the initial probability of hypothesis A and the last (P(B)) is the initial probability of data B.
3. RESULT AND DISCUSSION

After carrying out various stages from start to finish, in this chapter the researcher will explain in more detail the results that have been obtained. This research conducted a sentiment analysis of an application on the Google Playstore, namely Sirekap. In conducting sentiment analysis, researchers used the Naive Bayes algorithm because this algorithm is known for its simplicity and effectiveness in classifying texts. For more details, it will be explained below, according to the naïve bayes algorithm starting from data collection to the calculation of the naïve bayes algorithm.

3.1 Data Collection

The data collection process is carried out automatically using the google collabs application where data is taken directly from the playstore. Then for the application used in this study, the 2024 sirekap application, this application was taken because of the many pros and cons to the 2024 election results. The source code for data collection can be seen in figure 3.

```python
from google_play_scraper import sort, reviews
result, continuation_token = reviews(
    'id.go.kpu.sirekap2024',
    lang='id', #
    country='id',
    sort=Sort.MOST_RELEVANT,
    count=1000,
    filter_score_with=None
)
```

**Figure 3. Data Collection Source Code**

<table>
<thead>
<tr>
<th>No</th>
<th>Username</th>
<th>Score/Stars</th>
<th>Reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>User1</td>
<td>1</td>
<td>Application of Need</td>
</tr>
<tr>
<td>2</td>
<td>User2</td>
<td>1</td>
<td>Application Failed. Likes to Bug</td>
</tr>
<tr>
<td>3</td>
<td>User3</td>
<td>1</td>
<td>The app is not worth using</td>
</tr>
<tr>
<td>4</td>
<td>User4</td>
<td>1</td>
<td>The application failed. Likes to bug, over access</td>
</tr>
<tr>
<td>5</td>
<td>User5</td>
<td>2</td>
<td>Hmm the OCR is tickling, the data doesn't fit, the scan is blurry</td>
</tr>
<tr>
<td>6</td>
<td>User6</td>
<td>2</td>
<td>Please improve it even more, especially the camera</td>
</tr>
<tr>
<td>7</td>
<td>User7</td>
<td>1</td>
<td>Complicating matters, it seems that the apk is not yet worth using</td>
</tr>
<tr>
<td>8</td>
<td>User8</td>
<td>1</td>
<td>Slow application</td>
</tr>
<tr>
<td>9</td>
<td>User9</td>
<td>1</td>
<td>The features of sirekap are not yet fully advanced</td>
</tr>
<tr>
<td>10</td>
<td>User10</td>
<td>1</td>
<td>Does not meet the standards</td>
</tr>
<tr>
<td>11</td>
<td>User11</td>
<td>1</td>
<td>Terrible application. For an election-level app, how can it be like this</td>
</tr>
<tr>
<td>12</td>
<td>User12</td>
<td>1</td>
<td>My suggestion, an AI input that can be edited</td>
</tr>
<tr>
<td>13</td>
<td>User13</td>
<td>1</td>
<td>An application that complicates KPU calculations</td>
</tr>
<tr>
<td>14</td>
<td>User14</td>
<td>1</td>
<td>Really bad, the application is used throughout Indonesia</td>
</tr>
<tr>
<td>15</td>
<td>User15</td>
<td>1</td>
<td>All features are problematic</td>
</tr>
<tr>
<td>16</td>
<td>User16</td>
<td>3</td>
<td>The application is not ready for publishing, still has many bugs</td>
</tr>
<tr>
<td>17</td>
<td>User17</td>
<td>1</td>
<td>There are many shortcomings, the application does not meet expectations</td>
</tr>
<tr>
<td>199</td>
<td>Dummy</td>
<td>1</td>
<td>Image Quality for Blur Simulation Photos</td>
</tr>
</tbody>
</table>

Then the data that has been collected is entered into a group or a labeling process is carried out. The labels in this study are Negative review labels and positive review labels, this is done so that later we know that this application tends to get positive or negative reviews. In table two is an example of a data label that already exists in this study. The variables used are only the reviews, For details of the results of data labeling, see Figure 4.
As can be seen in Figure 4, there are almost no positive comments in this application. Most of the reviews obtained are negative, this is the same as the one in the google playstore where this application gets a 1-star rating.

3.2 Pre-Processing

After carrying out the stages of the data collection process, then the data is grouped or labeled which can be seen in Figure 4. Next, pre-processing stages will be carried out where these stages include cleaning, case folding, stopword removal and others. The results of the pre-processing in figure 5.

Figure 4. Result Labeling Data

Figure 5. Results Pre-Processing
3.3 Data Mining

After completing all the steps in the process, the next step is to perform calculations to evaluate the level of accuracy using the Naïve Bayes algorithm approach. In conducting sentiment analysis using this method, the results obtained are that the sirekap application is an application that has negative reviews and even no positive reviews if giving positive reviews will be followed by negative reviews. So that in the future the government can evaluate this application again because this application is indeed very unsuitable to use.

The results of this sentiment analysis reached an accuracy value of 1%. In addition, there was also a precision result of 1%, which illustrates how accurately the model identifies positive classes of all predicted outcomes as negative. The recall also received a very sad score of 1%, showing how many negative classes were identified from all classes that were actually positive. Meanwhile, the f1-score, which stands at 1%, combines precision and recall into a single value that reflects the balance between the two for the negative class. Then for a summary of the results obtained by this application in this study, it can be seen in figure 6.

```
MultinomialNB Accuracy: 1.0
MultinomialNB Precision: 1.0
MultinomialNB Recall: 1.0
MultinomialNB f1_score: 1.0
confusion_matrix:
[[39]]
```

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**Figure 6. Mining Data Results**

3.4 Word Cloud

The last process carried out in this study is to create a Word Cloud, or word cloud. Word Clouded is a visual representation of text in which words that frequently appear in text are given a larger size than other words. By using Word Cloud, we can quickly understand the frequency of the occurrence of words and identify patterns or themes that may be contained in the text. Word Cloud is often used to analyze and visualize text from a variety of sources, such as user reviews, news articles, or other text data sets. Thus, Word Cloud is a beneficial tool for presenting information visually and aiding in the overall understanding of the text. In figure 7 is the resulting word cloud, the word cloud should be divided into negative and positive reviews, but in this application, the majority give negative reviews so that the word cloud is only one, namely negative reviews. For more details, the Word Cloud can be seen in figure 7.

```
fekerjaan memperlambat sulit tidak perluangan menjadi
memperlambat pekerjaan tidak layak
sulit digunakan sangat sulit
layak tidak
digunakan sangat

Figure 7. Word Cloud
```

4. CONCLUSION

After carrying out various stages from data collection, data labeling, and data cleaning processes to sentiment analysis of the 2024 Election Sirekap application using the Naïve Bayes algorithm, it was found that the majority
of user reviews and responses tended to be negative. Then the use of the naïve bayes algorithm in this study is considered very accurate and successful because the results of this study are the same as the rating score results on the google playstore application. The results show that this application only has negative reviews and in the google playstore it gets 1.3 stars. This indicates that there is dissatisfaction or problems faced by users in using the application. This evaluation has significant implications in the current educational context. This research not only provides a better understanding of users’ perceptions and experiences of political applications, but also highlights the importance of using technology in supporting political education and public involvement in the political process. By improving and improving such apps, developers can create more effective tools to support political education and increase voter participation, including among college students and students. In addition, the results of this research can also serve as a foundation for further research and development in the field of political education and information technology, allowing the development of better solutions to strengthen political education and democratic participation in society as a whole. Therefore, the sentiment evaluation of the 2024 Election Sirekap application not only provides insight into the quality of the application, but also has the potential to help strengthen political education and democratic participation in society. Then there are almost no negative reviews in this application so it can be said that the sirekap application is not worth using. Thus, for the next research, we can conduct research on the sirekap application again but use other algorithms for comparison materials.

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