SENTIMENT ANALYSIS ON PLN MOBILE APPLICATION USERS' OPINIONS TO IMPROVE THE QUALITY OF PLN MOBILE SERVICES

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Abstract

PT. The State Electricity Company (PLN) is a state-owned company engaged in the generation, transmission and distribution of electric power. PT PLN always strives to improve service to customers by creating creative, reliable and high quality service products. PT. PLN also launched a customer service application, namely PLN Mobile, in 2016 to meet all customer needs and provide convenience and a different electricity service experience. The existence of the PLN Mobile service application is one of the transformations to provide the best service for customers. The existence of PLN Mobile will give rise to sentiment in society, so researchers propose research using sentiment analysis to find out consumer opinions about the PLN Mobile application. This research uses the Naive Bayes algorithm with the help of RapidMiner software. The first stage is crawling the data and then processing it with various attributes such as document cleaning, tokenization process, transform cases, stopwords removal and filtering. Next, Naive Bayes modeling will be carried out and tested to obtain accuracy values. The data processed was 1068 data and divided into 320 training data and 748 testing data. The Naive Bayes accuracy result is 70.28%.

Keywords: ***Sentiment Analysis, PLN Mobile, Naive Bayes***

1. INTRODUCTION

Electricity is the main energy source needed and widely used by humans. In everyday life, electrical energy is an important factor for human life because almost all equipment used requires electrical energy. The government always strives to develop electricity supply in various regions so that power outages can be resolved little by little. PT. The State Electricity Company (PLN) is a state-owned company which operates in the field of generation, transmission and distribution of electrical energy. PT PLN always strives to improve services to its customers by developing creative, reliable and high quality service products. In the first quarter of 2022, PT. PLN (Persero) recorded an increase in electricity sales of 8.42 percent year-on-year to 65.42 terawatt hours (TWh). This increase in electricity consumption is a positive signal for the country's economic recovery amidst the COVID-19 pandemic (Source: web.pln.co.id). Various efforts were made by PT. PLN to be able to increase electricity utilization in the industrial sector. PT. PLN is also committed to a new lifestyle, namely an electrified lifestyle through the use of low-emission and environmentally friendly electronic devices. PT. PLN also launched a customer service application, namely PLN Mobile, in 2016 to meet all customer needs and provide convenience and a different electricity service experience. The existence of the PLN Mobile service application is one of the transformations to provide the best service for customers.

Cellular technology is a technological development that has a major impact on society. One of the most popular mobile technologies is Android technology. This Android-based application allows users to use PLN Mobile to make their work easier. The purpose of the PLN Mobile Application is to make it possible to send electricity bill payment reminders to remind customers to pay their bills before the due date. Through the PLN Mobile application, customers can track the progress of tracking complaints submitted until completion. The convenience that customers get in purchasing tokens and paying bills, ease of switching electricity, recording meter numbers independently, ease of reporting malfunctions and complaints, as well as ease of monitoring electricity consumption, ease of monitoring token purchases, billing notifications, progress information, problem solving, blackout notifications and maintenance. With the PLN Mobile application, the level of complaints via PLN Mobile has increased to 64 percent. Meanwhile, complaints via the call center are 31 percent and the rest via other media (quoted from the press release). The PLN Mobile application has currently been

downloaded by more than 35 million customers with a satisfaction rating of 4.9 out of 5. However, several problems were found, one of which was not being able to purchase tokens and having difficulty using the application (can be seen in Table 1.1). User reviews on the Google Play application on Android have a rating scale of 1 to 5. It is not uncommon for users to give ratings that do not match the reviews and do not adequately describe the quality of the application. Rating app reviews are inconsistent with reviews and therefore cannot adequately describe the quality of the app. There are a lot of PLN Mobile application reviews, so it takes time to read them all. Classification is carried out to obtain public opinion. This phenomenon is reinforced by complaints from customers submitted via Google Play Android samples in the April 2023 period which are shown in table 1.1.

Table 1.1 Negative comments and ratings from PLN Mobile application users for the April 2023 period

No	Name	Date	Comment	Ratings
1	Ade Solichin	13-Apr-23	April 6 disruption. Now April 13th there is another disruption. Once a week disruption. Great. Fake ratings using army, like this. On the phone follow up is also free	1
2	Andhika PJ	13-Apr-23	Submit a complaint for the PLN Ra***u area. After submitting, a few minutes later the status changes and is canceled by the user. Even though I didn't cancel it	2
3	Na Yoshi	12-Apr-23	I want to pay my wifi but why my order always fails and the worst thing is My Gopay balance is decreasing a little by little because multiply of failed transactions, fix the app and system operation	1
4	SHARayyan03	12-Apr-23	No robux	1
5	Tatag Satria	11-Apr-23	It's been 11 days since the first transaction, no follow-up, 2 failed transactions, the money is not clear	1
6	Fakhrudin	11-Apr-23	I want to add power, but when I enter the token it is always wrong, even though I have checked it many times and used 2 different tokens, one of which is from the PLN Mobile application itself. Hadooh	1
7	Christian Wattimena	10-Apr-23	hard to move to other devices	1
8	Halim Englen	10-Apr-23	To check the status on the meter, try telling the programmer to do the number entry process and photos as attachments 9 times and think about whether this method is efficient. If you want to check the report status, you have to enter the report number manually....	2
9	I Made Suasmita	09-Apr-23	Can't install on Infinix Zero 20 cellphone	1

10	Mr. Djuragan's son	09-Apr-23	rotten and deceitful application!! The complaint problem was not resolved, the officer did not come to check, only via telephone but suddenly the complaint report was read as complete.	1
11	Wong Ngalas	06-Apr-23	The application often errors, the 123 service via telephone also doesn't help much.	1
12	Adiya Mughy	06-Apr-23	The application is useless, just send a complaint about a power outage and it always fails..	1
13	Noname	06-Apr-23	I didn't mean to make an application... Lots of connection problems	1
14	Dede Gunawan	06-Apr-23	Error, can't make report. No reply to email	1
15	Ridwan Widodo	06-Apr-23	The apk is broken, just trying to register for IDPL always fails because it fails to enter the location point	1
16	Fakhururrozi Idris	06-Apr-23	Can't report a problem from the app	2
17	Heru Pracita	05-Apr-23	Selfie photo + ID card when errors are complicated	1
18	Kezia Wati	05-Apr-23	Slow	1
19	Agung Prasetyo	04-Apr-23	registering for new electrical installations many times without success. The response is always "there are no partners ready to work at your location". Once successful, the Briva payment bill list does not appear. Previously, registering via the website was smooth, but now via the application it never works.	1
20	Dodi over	04-Apr-23	upgrade profile hangs	1
21	Natius	03-Apr-23	Failed to load the original location even though the GPS was fine. There's no notification of a blackout either	1
22	Surya Enim	02-Apr-23	buy electricity tokens here, there is an error, you buy an electricity token once and it doesn't come out but the money is deducted twice	1
23	Aisyah Adriana	02-Apr-23	Disappointed	1
24	My Name	02-Apr-23	1. There is a problem with data synchronization for billing and repayment, sometimes the error has been paid and the status is still in arrears, when the status is still arrears for a few days, the status is no longer in arrears.	1
25	Mochammad Zikril	01-Apr-23	everything is useless	1

Source : Google Play Android (created April 14, 2023)

Based on Table 1.1, it can be seen that there are still negative comments and assessments by PLN Mobile application users which indicate that the quality of the PLN Mobile application is still unsatisfactory. If it is maintained, customer satisfaction using the PLN Mobile application will decrease so improvements need to be made. Service quality is very important and has five main dimensions (Parasuraman, Berry, Zeithalm, 1990:26). In other words, reliability refers to a company's ability to provide accurate services the first time and deliver its services according to the agreed time. Second, responsiveness refers to the willingness and ability of employees to help customers, respond to requests, notify when service will be provided, and provide services immediately, according to agreed time requirements. Third, there is assurance, namely employee behavior increases trust. customers towards the company thus enabling the company to provide a sense of security to customers, assurance also means that employees are polite at all times and have the knowledge and skills necessary to answer customer questions and problems. Empathy means that the company understands the problems and behavior of its customers for the benefit of its customers, guarantees personalized customer service and has comfortable operating hours, and finally physical evidence (tangibles) related to the appearance of the company and the equipment facilities the company has. To improve the quality of mobile services, sentiment analysis needs to be carried out. According to Gunawan et al (2018), this sentiment analysis system aims to help businesses get input about their brands and enable people to rate products based on existing opinions and reviews.

1.1 Machine Learning

Machine Learningis the science of developing algorithms and statistical models that computer systems use to perform relying on patterns and inference without explicit instructions (source: aws.amazon.com). Machine Learning is used to replace humans in making decisions. Because machine learning does not have feelings, decisions will be taken based on data that has been processed, then the knowledge will be extracted and appropriate results will be obtained (Irwansyah, 2020). Machine learning is a field or application of artificial intelligence (human intelligence). Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. AI applications include expert systems, natural language processing and speech recognition. With this knowledge, it is hoped that the system can learn independently, without the need for repetitive human programming. The working principles of machine learning include data collection, data exploration, selecting a model or method, providing training on the selected model and evaluating research results.

1.2 Natural Language Processing

Natural language processing, in its simplest form, is the ability of a computer or system to understand human language correctly and operate using methods like humans do (Palash Goyal, et al, 2018). Optimal analysis of text and audio data is possible through natural language processing. The most important part of text mining and human intelligence is natural language processing. Natural language processing can see typical grammatical variations in everyday human speech and conversation and process them to make them more formal, so that computers can understand and provide appropriate answers. Exploring everyday human language, or typical grammatical deviations in conversation, then processing it and making it more formal so that computers can more easily understand it and provide appropriate responses.

1.3 Text Mining

Text miningin Indonesian it is called text mining, a discipline that combines data mining and text analytics to use unstructured or textual data together with structured data for the purposes of exploration, discovery and predictive modeling or classification (Dean, 2014). Text mining is the process of mining information in which people use analytical tools to interact with a collection of documents. Categorization, is one component of data mining. The goal of text mining is to find important hidden information from structured and unstructured information sources. In text mining

there is extraction of keywords, namely as a series of one or several words. Keywords are able to represent important things from documents and define queries in information retrieval systems. A system that lists documents related to key document keywords and that supports the use of anchor keywords as hyperlinks between documents, allowing users to quickly access related material (Jones & Paynter, 2002).

1.4 Sentiment Analysis

It is the systematic identification, extraction, measurement and examination of emotional states and subjective information using natural language processing, text analysis, computational linguistics and biometrics. Sentiment analysis is known as opinion mining, where computational investigations can recognize and provide opinions, sentiments, evaluations, attitudes, emotions, subjectivity, judgments and views contained in text (Liu, 2008). Sentiment analysis is the most active area of research in natural language processing studied in web, data and text mining. The importance of taking into account sentiment analysis at this time is due to the rapid development of technology on social media, for example discussion forums, reviews, blogs, Twitter, Facebook, reviews from Google applications and other social media. Sentiment analysis systems are used in almost all business and social fields because opinions are at the core of almost all human activities and have a major influence on behavior. Having a written opinion will provide a reference for decisions. The beginning and growth of sentiment analysis coincided with the development of social media on the web such as reviews, forum discussions, blogs and microblogs. in human history for the first time a blog has a very large volume of opinion data recorded in digital form. This naturally leads to the issue of sentiment analysis or opinion mining because this data is full of opinions. So it is not surprising that the main reason people post messages on social media or media platforms is to express views and opinions. Sentiment analysis is at the heart of social media analysis.

1.5 Naive Bayes Method

Naive Bayesis a statistical analysis algorithm, which processes numerical data using Bayesian probability. Bayesian classification is a statistical classification that can predict random element classes. Bayesian classification is known as the Naive Bayesian Classifer. Alternatively, it can be assumed that the influence of attribute values in a class is not affected or influences the values of other attributes. Simply put, the Naive Bayes classifier assumes that the presence of certain features in a class does not depend on anything else (Hidayatullah, 2014). The advantages of using Naive Bayes include that it only requires a small amount of training data to determine parameter estimates needed in the classification process. Since the two variables are assumed to be independent, only the within-class variable variance is needed for classification, not the entire covariance matrix.

The formula in Bayes (Muslehatin et al, 2017) can generally be given as follows:

$$P\ (\mathrm{H}\ |X) = \frac{P(H|X)\ \mathrm{P(H)}}{P(X)} (2.1)$$

Information :

X = Datawhich has an unknown class
H = Data hypothesis Xis a special class
P(H|X) =Hypothesis H is based on condition x (posteriori prob.)
P(H) =Potential hypothesis H (prior probability)
P(X|H) =Potential X based on these circumstances
P(X) =Probability X

Bayes' rule is as follows:

If P(h1|x) < P(h2|x), then x is classified as h2. The statement P(h1|x) indicates the probability of the hypothesis h1 based on condition x occurring, as well as h2. Then x can be classified according to the greatest possibility among the possibilities of x in all classes.

2. RESEARCH METHODS

2.1 Types of research

In this research, a descriptive qualitative type was used. In the descriptive qualitative method, it is an approach or investigation aimed at exploring and understanding a main phenomenon (Creswell, 2008). The author uses RapidMiner to process data collected from comments on the PLN Mobile application. In this research, the comment and rating variables as independent (unbound) variables influence the quality of PLN Mobile application services like the dependent (bound) variables.

2.2 Research Location and Time

Research was conducted on the PLN Mobile application on Google Play Android, from July to September 2023.

2.3 Data processing

In this research, comment and rating data obtained from the PLN Mobile application on Google Play Android was used. The data obtained is like text data and then processed using crawling techniques in Google Chrome extensions, such as Data Scraper version 3.299.84. The data taken comes from comments from PLN Mobile application users on Google Play. There is so much comment data on Google Play that data collection is limited to 100 comments with various stars, especially comments related to the PLN Mobile application.

2.3.1 Preprocessing

This process requires four stages including Cleaning, Removed Stopword, Tokenization and Stemming:

a. Cleaning

Clean symbols, punctuation marks and numbers in the comments column of the PLN Mobile application on Google Play. This stage is carried out using a program that is carried out automatically and then saved in xlsx format.

b. Removed Stopward

At this stage, every word that is less meaningful will be deleted. Examples include the words I, or, and.

c. Tokenization

This is the phase in which a sentence is divided into several parts called tokens. Tokens are defined as words, phrases or elements that have meaning.

d. Stemming

After tokenization, the stemming process continues. In this process there is a change in the word into its basic word form by removing the affixes in front and after it.

2.3.2 Feature Extraction

After the preprocessing process, the next step is to carry out classification using word vector stages such as changes to text features and word weighting will be carried out with Tf-ldf. Then the data can be used for training via Naive Bayes calculations.

2.3.3 Naive Bayes Classification

The naive Bayes method is a method for conducting sentiment analysis by classifying comment data. For sentiment classification, tf-idf data preprocessing to word weighting is used. After the data has been successfully trained, we then continue checking the test data to check the accuracy of the classification results carried out.

3. RESULTS AND DISCUSSION

Crawling data and sampling from July to September totaling 1178 unstructured comment data. Then a text preprocessing process was carried out to clean the data so that it could be processed and produce 1068 structured data. After the structured data is obtained, it is then processed by modeling. The modeling itself is done by dividing several parts such as training data and test data with a ratio of 3:7. So 320 training data and 748 testing data were obtained. Based on the testing process of the Naive Bayes classification model, accuracy results were obtained as shown in the example in Table 4.7

Table 4.7 Naive Bayes Performance Results

Ratio	Naive Bayes						
	Accuracy	Precision Positive	Precision Negative	Precision Neutral	Recall Positive	Recall Negative	Recall Neutral
30%,70%	70.28%	72.29%	76.32%	24.73%	81.43%	73.07%	25%

The performance obtained from Naive Bayes is as follows:

1. Accuracy: useful for seeing the closeness of the system prediction value and the resulting human prediction, namely 70.28% for the system using the Naive Bayes algorithm
2. Positive Precision: useful for seeing the comparison between true positives and true positive predictions produced by the system. The resulting value was 72.29% for the system using the Naive Bayes algorithm
3. Negative Precision: useful for seeing the comparison between true negatives and true negative predictions produced by the system. The resulting value was 76.32% for the system using the Naive Bayes algorithm
4. Neutral Precision: useful for seeing the comparison between true neutral and true neutral predictions produced by the system. The resulting value is 24.73% for the system using the Naive Bayes algorithm
5. Positive Recall: useful for measuring the model's ability to predict positive data. The resulting value was 81.43% for the system using the Naive Bayes algorithm
6. Negative Recall: useful for measuring the model's ability to predict negative data. The resulting value was 73.07% for the system using the Naive Bayes algorithm
7. Neutral Recall: useful for measuring the model's ability to predict neutral data. The resulting value is 25% in the system using the Naive Bayes algorithm

The results of sentiment analysis in previous research, namely (Vina & Arief, 2019) showed a Naive Bayes accuracy value of 96.44%. Research (Gunawan et al., 2018) produced an accuracy value of 52.66% using the naive Bayes method. Research (Nurmalasari et al, 2020) produces an accuracy value of less than 50%. Research (Fitri et al., 2020) produced an accuracy value of 94.16% from the Naive Bayes method.

Table 4.8 Comparison Results with Previous Research

Study	Accuracy
	%
(Nawapan & Siriwan, 2022)	61%
(Murtada & Rehab, 2022)	87.6%
(Fersellia, Ema, & Ainul, 2023)	88%
(Vina & Arief, 2019)	96.44%
(Gunawan et al, 2018)	77.78%
Nurmalasari et al, 2020	>50%
Writer	70.28%

4. CONCLUSION

The results of testing the Naive Bayes algorithm produce several things, including:

1. The Naive Bayes algorithm can be considered accurate in this research because it produces an accuracy value of 70.28%
2. The data taken was 1068 structured data with 320 training data and 748 testing data
3. A total of 421 positive sentiments, 514 negative sentiments and 133 neutral sentiments were identified
4. This research has good accuracy, precision and recall values (positive and negative)
5. Because the amount of training data used is unequal, the neutral precision and neutral recall values are lower than the positive and negative class values.

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