

## Analysis of Netizen Comments Sentiment on Public Official Statements on Instagram Social Media Accounts

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### ABSTRACT

Statements issued by public officials will be pros and cons in the community, there are those who respond positively, negatively or respond neutrally. Likewise on Instagram social media, every statement written on Instagram will get various responses written by netizens in the comment's column posted. Netizen is an acronym for internet citizens, namely people who are actively using the internet. Due to the large number of comments, it is difficult to see whether the public response is a positive, negative or neutral comment when responding to statements from public officials. Whether the statements issued by public officials through Instagram have a positive, negative or neutral impact, so that if they can be grouped into labels, it can be seen how much public opinion is against these public figures. On social media accounts, not all comments written by netizens have the same writing structure, so we need a mechanism that is able to help analyze comments from netizens by classifying them into positive, negative or neutral response classes. By applying POS Tagging to determine opinion sentences or not and also the Naïve Bayes Classifier method and the tf-idf feature to be able to classify comments into several classes of positive, negative or neutral comments. The classification testing stage uses the cross validation method to test the accuracy of the naive bayes classification algorithm and the tf-idf feature.

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## 1. INTRODUCTION

Every statement issued by a public official will be the pros and cons in the community, there are those who respond positively and there are also those who respond negatively or respond neutrally. Likewise on Instagram social media, every statement written by the @jokowi account will get various responses written by netizens in the comment's column posted. The word ne.ti.zen /nètizèn/ in the KBBI [1] is a synonym for war.ga.net /warganèt/, warganet is an acronym for internet citizens, namely people who actively use the internet. Every post made by a public figure will be commented on by his followers, comments can amount to thousands or even tens of thousands of comments every what is posted. Due to the large number of comments, it is difficult to see whether the public response is a positive, negative or neutral comment when responding to

@jokowi's statement. Every statement issued by public officials will also become pros and cons in the community, some are responding positively and there are also those who respond to negative or respond neutrally, so that the digital team of public officials should need to post and compile sentences that can increase positive responses to improve public trust in public officials.

In this case, it is necessary to analyze netizen comments on statements posted on Instagram social media accounts of public figures. Does the statement issued through the Instagram social media account have a positive, negative or neutral impact, so that if it can be grouped into these labels it can be seen how much public opinion is against the public figure. In addition to knowing the classification of public opinion, it can also be taken into consideration in posting and compiling sentences that can increase the positive response of public opinion.

Sentiment analysis or opinion mining is a field of study to analyze one's opinion, one's sentiments, one's evaluation, one's attitude and one's emotions into written language [2]. On Instagram social media accounts, not all comments written by netizens have the same writing structure, so we need a mechanism that is able to help analyze comments from netizens by classifying them into positive, negative or neutral response classes. Process Tagging with POS Tagging is applied to find out the opinion sentence or not. To find out the classification of comments into several classes, the Naïve Bayes Classifier method combined with the tf-idf feature is needed, because with this method the text classification process can be done easily and simply. Naive Bayes Classifier is a machine learning method that has a model in forming probabilities and opportunities [3].

The benefits of this research are to realize a system that can inform netizens' responses processed from comment data on the Instagram account of public officials, so that it can be seen how much public opinion to the statement of public officials classified into positive, negative or neutral responses, and also the hope can be used As a material consideration by the digital communication team of public officials in posting and compiling sentences that can increase the positive response of public opinion.

## 2. RESEARCH METHOD

### 2.1. Literature Review and Literature Study

The Naïve Bayes method is used by [4] in developing a sentiment analysis application from Twitter media, the purpose of their research is to build an opinion classification application by applying the Naïve Bayes approach to Indonesian-language tweets. The advantage of the NBC classification method is that it is simple but has high accuracy [5]. The use of Naive Bayes classification is often used in the process of sentiment analysis. According to [6] Sentiment Analysis aims to analyze the opinions, sentiments, evaluations, attitudes, judgments, and emotions of a person whether the speaker or writer relates to a particular topic, product, service, organization, individual, or activity. Sentiment analysis or opinion mining can be thought of as a combination of text mining and natural language processing, one of the methods of natural language processing that can be used in opinion mining problems is Part-of-Speech (POS) Tagging. According to [7] POS Tagging is used to give grammatical word classes (tags) to each word in a text sentence.

There are three ways in post tagging:

- 1) Rule-based tagging, is a top-down way that is a linguistic expert consultation by defining the rules commonly used by humans.
- 2) Stochastic Tagger, is a bottom-up way of using Corpus as a data training for probabilized the best tags for a word (in a context).
- 3) Transformation-based tagger, is a combination of rule-based tagging techniques with Stochastic Tagger, still learning from Corpus, but the knowledge learned is declared as rule.

One of the probabilistic-based tagging tools is POS Tagging for Indonesian made by Alfian Farizki Wicaksono [8] using a Hidden Markov Model (HMM).

Text mining or information extraction is needed in the process of sentiment analysis, Text mining is a process to extract useful information from a data source through the identification and exploration of certain patterns [9]. The text mining process requires several stages, considering that

text data has more complex characteristics than ordinary data. [10] states that in general a document has the following characteristics:

- 1) Database Text has a large size (Large Textual Database)
- 2) Has a high dimension, one dimensional (high dimensionality)
- 3) Contains phrases and between phrases and other phrases can have different meanings and are interdependent with each other (dependency)
- 4) Contains many ambiguous words/sentences (ambiguity)
- 5) Contains noise data, such as abbreviations, terms and spelling mistakes.
- 6) Contains non-standard structures, for example abbreviations in words such as "km di mn?".

Application in sentiment analysis is generally carried out with data collection, preprocessing, classification with the classification method, as has been done by [11]. The application of the technique of extracting and filtering words in the document is simultaneously weighted with the level of importance of the words. In the process of converting text into structured text, this process is often called text pre-processing. [12]. The process of changing documents in determining the level of prediction accuracy by calculating the importance of each word in a document using the tf-idf calculation. Term frequency is the number of certain words that appear in a document, while document frequency is the number of documents containing certain words [13].

The way tf-idf works is by calculating the relative frequency of a word that appears in a document compared to the inverse proportion of that word that appears in the entire document. The calculation results are used to determine the level of importance of the word in the text or document. The formula for calculating tf-idf can be seen in equation (1).

$$tfidf(d, w) = tf(d, w) \times \log \frac{N}{dfw} \dots (1)$$

Note:  $tf(d, w)$  is the frequency of occurrence of term  $w$  in documents  $d$  :  $N$  = total number of documents and  $dfw$  is number of documents containing term  $w$ .

## 2.2. System Analysis

The system built is a system design that can perform the process of retrieving comment data from Instagram. To get comment data from Instagram, namely via the exportcomments.com website by entering the URL address of the Instagram post that we will take the comments from. The comment data is then labeled first for the data to be used as a dataset, the labeling is done by the researcher by reading the contents of the comments objectively. Data labeling is divided into three categories of comment labeling, namely positive labels, negative labels and neutral labels. The Instagram comment data is then processed through a preprocessing mechanism to extract comments, then the probability value is calculated using tf-idf, with a naive Bayes classifier model to produce comment classification predictions. Can be shown in Figure 1.

Explaining research chronological, including research design, research procedure (in the form of algorithms, Pseudocode or other), how to test and data acquisition [1-3]. The description of the course of research should be supported references, so the explanation can be accepted scientifically [2, 4]. Tables and Figures are presented center, as shown in Table 1 and Figure 1, and cited in the manuscript and should appeared before it.

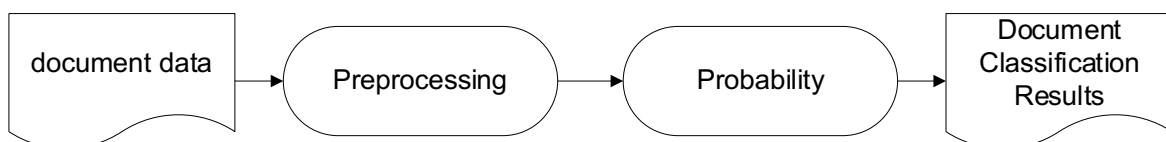


Figure 1. System Stage

## 2.3. System Design

The process flow of the system to be built globally is shown in Figure 2.

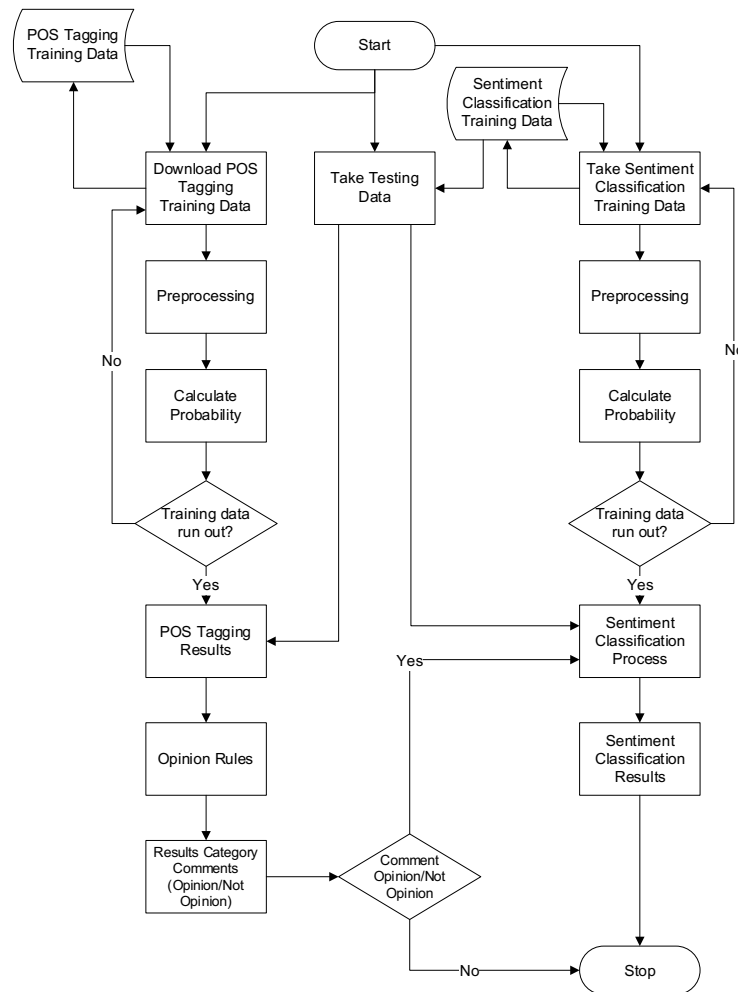


Figure 2. System Flowchart

The system will store post training data tagging and data training data classification in the database. Dataset training post tagging is taken from the tagset that has been developed by [14], there are approximately 1 million word tagset stored. The main process in the system is the sentiment classification process using the Naïve Bayes Classifier. Instagram comment data is collected from the Instagram application server, then the data that has been collected is stored in a database. The collected comment data is divided into two parts, namely comment data for training and comment data for testing. Training data will be labeled or categorized as positive comments, negative comments and neutral comments on each comment.

In the learning process, the training data will be used for preprocessing so as to produce clean data in the form of word features. The tf-idf feature is used to determine the importance of each word in the document, so these words will be used by the naive Bayes classifier learning algorithm to obtain a classification model. The classification model will then be used to identify category labels on the new comment data as testing data. The new comment data (testing) will be preprocessed and produce word features, then using the tf-idf technique and the naive Bayes classifier method to generate probability data on sentiment classification results based on the classification model from the learning stage.

#### 1) Preprocessing

Preprocessing of comments includes a number of stages, including casefolding, filtering, tokenizing, slang replacement and stopword removal [15]. The process of determining the label or sentiment category is carried out on the training data for each Instagram comment,

then the data is processed for the preprocessing stage. The design of the preprocessing stage can be seen in Figure 3.

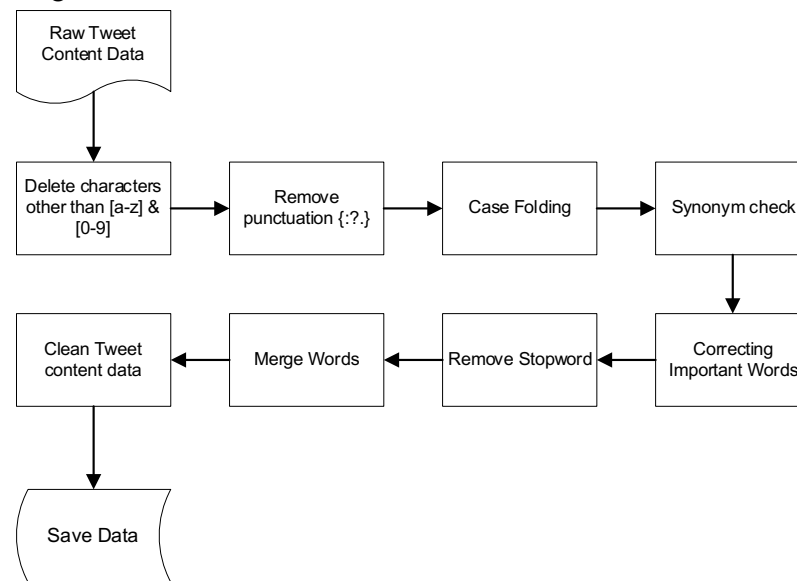


Figure 3. Preprocessing Flowchart

## 2) POS Tagging Function

The use of POS Tagging is used to search for comments that are classified as opinion categories or not opinions, the provisions of opinion sentences use tags containing verbs (verbs) and nouns (nouns) with the elements of the Tags "NN", "NNP", "NNS", "VB", "VBD", "VBG", "VBN", "VBP" or "VBZ".

## 3) Naive Bayes Classification Model

In this section, the Instagram comment data classification process is carried out using the naive Bayes classification method. This classification stage begins with the formation of the weight of each term from the collected comment data using the tf-idf technique. For example, the training and testing data that will be weighted can be seen in the illustration in Table 1.

Table 1. Example of training and testing tweet data

No	IG Comment	Label
1	Yang banyak uang sibuk .mencari suara rakyat...rakyat sibuk mencari uang ... Huehuehue	Negative
2	Saya orang Probolinggo, terimakasih banyak pak jokowi atas kerja kerasnya selama ini, lanjut periode dua, insa allah... Indonesia semakin maju, dan saya bangga, sebagai rakyat Indonesia ..	Positive
3	Tukang ngibul lg pencitraan...jokodok raja ngibul	Negative
4	Semangat pak 🙏🙏	Positive
5	Cek postingan @menuju_sehat15 yang ga berani jangan liat serem soalnya.. ada bapak bapak yang lagi nolongin untuk membersihkan jalanan yang berlumuran merah darah 🤔🤔	Neutral
6	Pak jokowi untuk transportasi barang lebih bijak kalau harga tol diberi subsidi untuk para supir barang	Positive
7	Jual FOLLOWER MURAH.. minat kak? Cek bio aja kak utk DM. Atau bisa jg 085847445638 via (whatsaap) 🙏🙏	Neutral
8	Lebay,, ni lagi kampanye nyapres apa lagi tugas jadi presiden yah. Hhhhh	Negative
9	AlhamdulillahAh beres bpk, semoga trus terbangun sampai asembagus situbondo nggeh pak, biar klo mudik g susah, Amiinn 🙏🙏	Positive
10	Jangan dzolimi ulama ya pak, jangan pas nyapres aja baru datang ke ulama.	Negative
11	2 periode pakkk semangat 🙏	?

There are three weighting classes, namely the positive, negative and neutral categories calculated by equation (2), the weights of each category are:

$$P(v_j) = \frac{dok_j}{training} \dots (2)$$

$$P(\text{Positive}) = \frac{4}{10} = 0,4$$

$$P(\text{Negative}) = \frac{4}{10} = 0,4$$

$$P(\text{Neutral}) = \frac{2}{10} = 0,2$$

Then each word is calculated its probability value for each category by using equation (3). In the process of testing (testing) the classification for new data is not yet known for the data category.

$$P(z_i|v_j) = \frac{n_i + 1}{n + vocabulary} \dots (3)$$

The results of the calculation of the training data will then be stored and used for the classification stage. In the process of testing (testing) the classification for new data is not yet known the category of the data label. The calculation results will be compared with the probability value for each category using equation (4), the highest probability value is the prediction of the new data class.

$$V_{MAP} = \operatorname{argmax} P(v_j) \times \pi_i P(z_i|v_j) \dots (4)$$

#### 4) Table Structure

The ER diagram has been generated and will then be used as a reference in creating a database of the system. The data stored in this database are comment data downloaded from Instagram, data for the training and testing process, probability value data for determining categories. In detail the table design used is described as follows:

##### a. Comment Data Table

The data contained in this table is used to accommodate comment data. The required attributes in the table can be seen in Table 2.

Table 2. Comment data attribute

Field Name	Datatype
* id_comment	int
id_posting	int
account	varchar
date_comment	datetime
like	int
comment	varchar
link_comment	varchar
label	char

##### b. Token Data Table

The data contained in this table is used to store token data. The required attributes in the table can be seen in Table 3.

Table 3. Token data attribute

	Field Name	Datatype
*	id	int
	id_comment	int
	id_posting	int
	token	varchar
	tagger	char
	label	char

## c. Training Probability Data Table

The data contained in this table is used to accommodate training probability data whose categories are known as the result of preprocessing and classification. The required attributes in the table can be seen in Table 4.

Table 4. Training probability attribute

	Field Name	Datatype
*	id_prob	int
	token	varchar
	jml_token	int
	tf_idpositive	double
	tf_idnegative	double
	tf_idnetral	double

## d. Synonym table

The data contained in this table is used to hold synonym word data. The attributes needed in the table can be seen in table 5.

Table 5. Synonyms table attribute

	Field Name	Datatype
*	is_sinonim	bigint
	Kata	varchar
	Sinonim	varchar

## e. Stopward table

The data contained in this table is used to hold the word data to be deleted. The table consists of two fields namely id\_stopword as a primary key, and words. The attributes needed in the table can be seen in table 6.

Table 6. Stopword table attribute

	Field Name	Datatype
*	id_stopword	int
	stopword	varchar

### 3. RESULTS AND DISCUSSION

#### 3.1. Comment Data

Instagram comment data on the @jokowi account is stored in the database and class labeling has been done manually. The data collected consists of the name of the Instagram account, the date of the comment, and the content of the comment. Shown in Figure 4.

ID	No Posting	Account	Date Comment	Comment	Label
1	1	dave0924	Sat, 23 Mar 2019 08:58:05 GMT	@inul.d Semangaaast ????????	T
2	1	mibebdiary	Sat, 23 Mar 2019 08:58:05 GMT	Mateng kon yg suka sembarang ngomong ga ada hormatnya sama pemimpin... mingkem dah pada skrg	P
3	1	oham1225	Sat, 23 Mar 2019 08:58:05 GMT	????????????????	P
4	1	susandipratiwi	Sat, 23 Mar 2019 08:58:05 GMT	@early.delia Wah serius tuh ka ? Jadi kepo nih ???? Kira kira aku juga bisa nambah berat badan ga ya ka ?	T
5	1	fnyfanisha	Sat, 23 Mar 2019 08:58:06 GMT	Bagaiman dgn pidato bapak tentang kubu2 itu, itu lgsg dr mulur	N
6	1	jktfans	Sat, 23 Mar 2019 08:58:06 GMT	Selama ini mereka sudah keterlaluan, sudah saatnya bapak melawan... Hajar mereka pak, jangan kasi ampun.	P
7	1	kuloreza	Sat, 23 Mar 2019 08:58:06 GMT	Lawan!!	P
8	1	lidyavalopez	Sat, 23 Mar 2019 08:58:06 GMT	Lawan pantang mundu????????	P
9	1	gilakamundro	Sat, 23 Mar 2019 08:58:07 GMT	Lawan Pak!!!	P
10	1	jay_tuber_id	Sat, 23 Mar 2019 08:58:07 GMT	Bagi saya menjadi presiden itu mudah...cukup cuci muka...cuci kaki...gosok gigi...pergi ketempat tidur...tidur...lalu bayangkan jadi presiden...insyaallah didalam mimpi...bisa jadi presiden dan punya rakyat...	T

Figure 4. Comment Data

#### 3.2. Preprocessing Results

The result of the preprocessing process is clean data which consists of a set of clean comment data display words, which can be seen in Figure 5.

No	ID Comment	ID Posting	Token	Tagger	Label
1	2	1	mateng	NN	P
2	2	1	kon	NN	P
3	2	1	suka	VB	P
4	2	1	sembarang	NN	P
5	2	1	ngomong	VB	P
6	2	1	ga	NN	P
7	2	1	ada	VB	P
8	2	1	pemimpin	NN	P
9	2	1	mingkem	NN	P
10	2	1	dah	NN	P

Figure 5. Preprocessed Data

#### 3.2. TF-IDF Weighting and Classification Results

The learning outcomes in the form of the probability value of each category and the probability value of each word in each category are referred to as the classification model shown in Figure 6.



No	Token	Jumlah Komentar	TF-IDF Positive	TF-IDF Negative	TF-IDF Netral
1	a	7	0.00167922667398065	0	0.0021540054599409
2	aaaaa	1	0.000640857704891372	0	0
3	aaaaaaa	1	0.000640857704891372	0	0
4	aaamin	1	0.000640857704891372	0	0
5	aaasiapppp	1	0.000640857704891372	0	0
6	aamin	17	0.00624405946666089	0	0.00167922667398065
7	aammiin	1	0.000640857704891372	0	0
8	aammiin	1	0	0	0.000640857704891372
9	abadi	2	0.0011793590698766	0	0
10	abab	1	0.000640857704891372	0	0

Figure 6. TF-IDF result data

An example of the process of weighting classification results on certain words can be seen in Figure 7.

No	Token	tf_idpositive	tf_idnegative	tf_idnetral
1	Hello	0.992	0.578	0.71

Hasil : 1.32392839

Kesimpulan : Positif

Figure 7. Data classification results of words

## DISCUSSION

There are 4,324 Instagram comment data that have been downloaded, from the results of data collection, 2,535 comments have been manually labeled and 1,789 have not been labeled to be classified using Naive Bayes as shown in Figure 8.

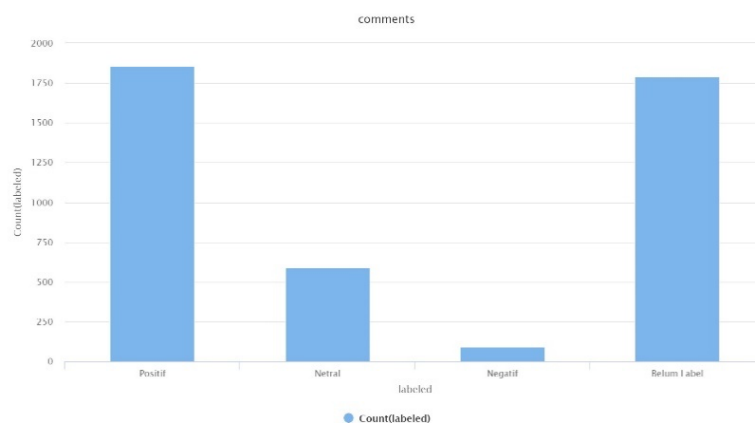


Figure 8. Comment classification data

The testing process is carried out through the preprocessing stage to clean up comments and prepare Instagram comments for the classification process. Furthermore, the process of calculating the probability of each word based on training data using the TF-IdF feature. There are 29,997 words from the results of preprocessing, 12,396 words labeled positive, 4,515 words labeled neutral and 406 words labeled negatively labeled manually on the comments data, the remaining 12,680 words that do not have a label. Furthermore, the data is tested to produce labels of each word can be seen in Figure 9. Total words labeled positively as many as 20,538, neutral 8,874 and negative 585.

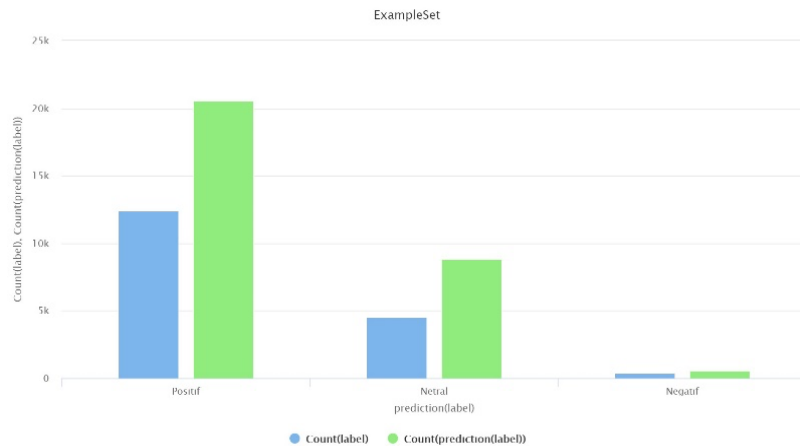


Figure 9. Number of Comments Classification Labels

Testing the classification process is testing the accuracy of learning outcomes (naïve Bayes classifier classification model) using the cross validation method. The process of testing accuracy is carried out in two ways, namely precision testing to get the accuracy of the test data and recall testing to get the accuracy of the training data. To calculate the accuracy value, equation 5 [16] is used.

$$Accuracy = \frac{\text{correct amount of classification data}}{\text{number of test data}} \times 100\% \dots (5)$$

Testing was carried out using RapidMiner version 9.3.001 with the Naive Bayes method and the tf-idf feature is shown in Figure 10. Applying the training data to the testing data uses the apply model operator and evaluating it with the performance operator.

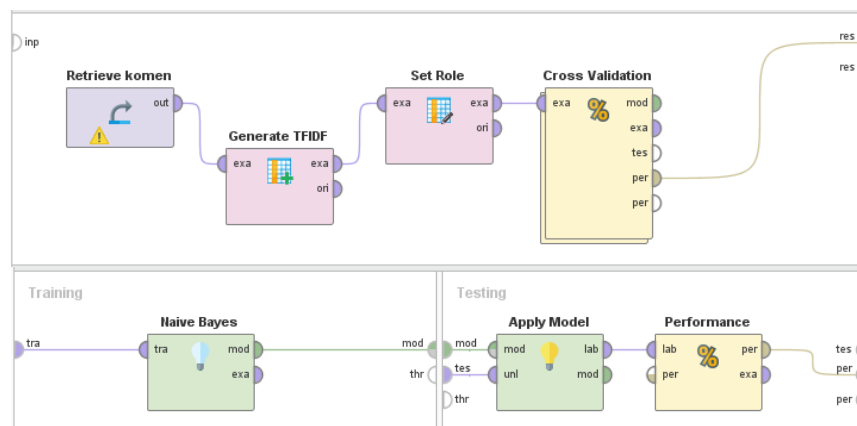


Figure 10. Training and Testing Process with Naive Bayes and the tf-idf feature

In Figure 11 the performance view table on RapidMiner shows that the average accuracy is obtained at 94.12%.

accuracy: 94.12% +/- 0.39% (micro average: 94.12%)

	true Positif	true Netral	true Negatif	class precision
pred. Positif	19237	291	46	98.28%
pred. Netral	1294	8581	123	85.83%
pred. Negatif	7	2	416	97.88%
class recall	93.67%	96.70%	71.11%	

Figure 11. Classification accuracy with the Naive Bayes Method and the tf-idf feature on RapidMiner

#### 4. CONCLUSION

Research has succeeded in building a model to classify Instagram comments based on positive, negative and neutral comment labels. The stages of the process are data collection comments, preprocessing, POS Tagging and classification using the naive bayes method and the tf-idf feature. A total of 20,538 words or 3,072 comments were labeled positively, 8,874 words or 1,119 comments were labeled neutral and 585 words or 53 comments were labeled negatively. The test accuracy results obtained are 94.12% with RapidMiner using the cross validation method. In making the dataset, it is recommended that the combination of data should have almost the same amount, so that the accuracy for each class can produce an accuracy value that is not much different.

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