

Sentiment Analysis of the Indonesian Police Mobile Brigade Corps Based on Twitter Posts Using the SVM and NB Methods

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Sentiment Analysis of the Indonesian Police Mobile Brigade Corps Based on Twitter Posts Using the SVM And NB Methods

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Abstract. The Brimob Corps is a special police force, just like the special military detachments held by the TNI such as Paskhas and so on. At present brigade corps police national is busy being discussed in the real world and cyberspace, especially on social media twitter. Many opinions about the brigade corps police national so there are positive and negative opinions. Social media twitter now one places to spread information about brigade corps police national. This study uses text mining techniques with support vector machine (SVM) method which aims to classify public sentiments towards brigade corps police national on twitter. The dataset used is tweet in Indonesian with keyword "Brimob" with a total dataset of 1000 tweets. Text mining, transform, tokenize, stemming, and classification, etc. techniques are useful for building classification and analysis of sentiment. RapidMiner and Gataframework are also used to help create sentiment analysis to measure classification values. Accuracy values obtained with support vector machine (SVM) approach 86,96%, with precision values of 86,96%, and recall values of 86,96%. **Keywords**—sentiment analysis, twitter, brimob corps, mako brimob, support vector machine method

4 Introduction

Sentiment analysis or opinion mining is the process of understanding, extracting and processing textual data automatically to get sentiment information contained in an opinion sentence. Sentiment analysis is being using to see opinions or trends in opinion about a problem or object by someone, whether they tend to have a negative or positive opinion. For example, one use of sentiment analysis in the real world is the identification of market trends and market opinions about an object of goods. The magnitude of the influence and benefits of sentiment analysis led to research and application based on sentiment analysis to develop rapidly. In America, there almost 20-30 companies that focus on sentiment analysis



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services. Research about opinion mining began in 2002. Opinion mining can be considered a combination of text mining and natural language processing. One kind of method that can be used to solve opinion mining problems in text mining is Support Vector Machine (SVM). SVM can be used to classify opinions into positive and negative opinions. SVM can function properly as a text classifier method. From the qualitative testing process, it is stated that text can be classified with high accuracy. In the other hand, there is a method that can be used to solve opinion mining problems is Part-of-Speech (POS) Tagging from natural language processing. POS Tagging is used to give a word class (tag) grammatically to each word in a text sentence. This research is intended to develop 96% an opinion mining system to process data on public opinion against the national police Mobile Brigade corps. The system is designed to have three subprocesses, such as the subprocess of document subjectivity, opinion orientation and target detection. Subprocess document subjectivity is intended to recognize the subjectivity of a text document (which one text documents that include opinions and the one that does not include opinions). The opinion orientation subprocess is used to determine the orientation of an opinion sentence, whether it is included in a positive orientation or a negative one. Target detection sub-items are used to identify objects that are targeted by opinions in a document. Hidden Markov Model (HMM) based POS Tagging is used in the document subjectivity and target detection subprocess. The results of the POS Tagging will be analyzed using a rule to determine which documents include opinions and determine which objects are targeted by opinion.

2. Literature Study

2.1. Mobile Brigade Corps

Mobile Brigade Corps often called as Brimob is a special operating unit that is a paramilitary property of the Indonesian National Police. Brimob Corps is also known as one of the oldest units in the Polri organization. Some of the main tasks are handling domestic terrorism, handling riots, high-risk law enforcement, search and rescue (SAR), rescue hostages, and taming bombs (EOD). The Mobile Brigade Corps is also a major component in the National Police trained to carry out anti-separatist and anti-insurgency tasks, and often in conjunction with military operations.

The Brimob Corps consists of 2 (two) branches, namely Gegana and Pelopor. Gegana is tasked with carrying out more specific police operations tasks such as Bomb Disposal, KBR Handling (Chemistry, Biology, and Radioactive), Counter Terrorism, and Intelligent. Meanwhile, Pelopor have the task of carrying out broader and more paramilitary special police operations such as: Riot handling, search and rescue (SAR), security of vital installations, and guerrilla operations and limited forest battles. In general, these two branches both have tactical capabilities as special police units, including ability for freeing hostages in urban settings, raids on armed criminals such as terrorists or separatists, and other operations that support the performance of general police units. Each Regional Police in Indonesia has its own Brimob unit.

Brimob is classified as a "Police Tactical Unit (PTU) and operationally by way of Weapon and Police Special Tactics (SWAT).

2.2. Social Media

Social media is a tool for conveying information to other parties effectively and efficiently. Social media as a platform with very high social dynamics and allows open communication to various parties with diverse backgrounds and interests is the right tools to generate citizen participation in developing cities. As Howard and Parks (2012) pointed out, social media is media that consists of three parts, such as information infrastructure and tools used to produce and distribute media content; media content can be in the form of personal messages, news, ideas, and products-digital products; and then those that produce and consume media content in digital form are individuals, organizations and industries. Social media is used productively by all areas of society, business, politics, media, advertising, police, and emergency services. Social media has become the key to provoking thoughts, dialogue and all actions around social issues.

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2.3. Sentiment Analysis

Sentiment analysis or opinion mining is the process of understanding, extracting and processing textual data automatically to get sentiment information contained in an opinion sentence. The magnitude of the influence and benefits of sentiment analysis led to research and application based on sentiment analysis to develop rapidly. Even in America there are around 20-30 companies that focus on sentiment analysis services (Huang, 2009). In this study, the sentiment analysis was conducted to see an opinion about the national police Mobile Brigade corps, which opinion could be included in the category of positive or negative opinion.

2.4. Twitter

Twitter is a website which owned and operated by Twitter, Inc., which offers microblog social networks. It's called microblog because this site allows users to send and read blog messages as in general but is limited to only 140 characters displayed on user profile pages. Twitter has unique writing characteristics and formats with special symbols or rules. Messages in Twitter are known as tweets.

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2.5. Support Vector Machine

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Support Vector Machine is one kind of classification method using machine learning (supervised learning) that predicts classes based on models or patterns from the results of the training process. Classification is complete by looking for a hyperplane or boundary line (decision boundary) that separates a class from another class, in which case the line acts to separate positive-sent tweets (labeled +1) with negative-sent tweets (labeled -1). SVM searches for hyperplane values using support vector and margin values [9]. In this study, input data that has a vector representation is obtained from the weighting process. By conducting training on SVM classification, it will produce a value or pattern that will be used in the testing process for the SVM testing process, which aims to sentiment label in the tweet.

2.6. Naïve Bayes

Classification is a learning function that classifies an element of data into one of several defined classes. One classification method that can be used is the Naïve Bayes method which is often called the Naïve Bayesian classification. Naive Bayes is a learning algorithm based on Bayes theory by using strong assumptions. Bayes theory is a theory about finding a probability of something based on data that already exists.

3. Research

3.1. Research Object

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This research has an object about twitter post which related to the Indonesian Police Mobile Brigade corps on Twitter.

3.2. Research Method

Research method that will be used is collecting tweet data. Tweet data is taken by the Crawling method from Twitter. The data taken is only tweets in Indonesian, which is 341 tweets with the words Brimob and Mako Brimob. Data are taken randomly from either ordinary user accounts or online media accounts on Twitter.

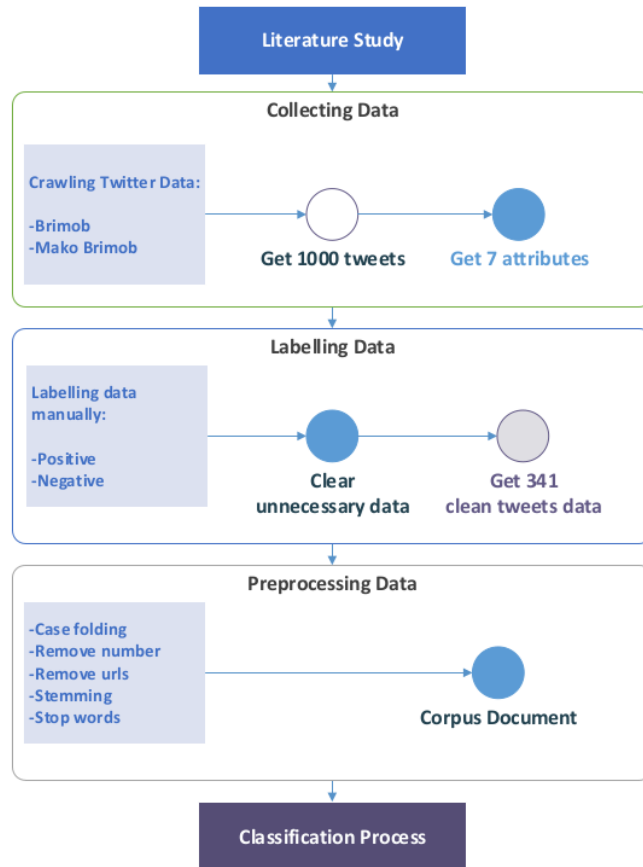


Figure 1. Research Method

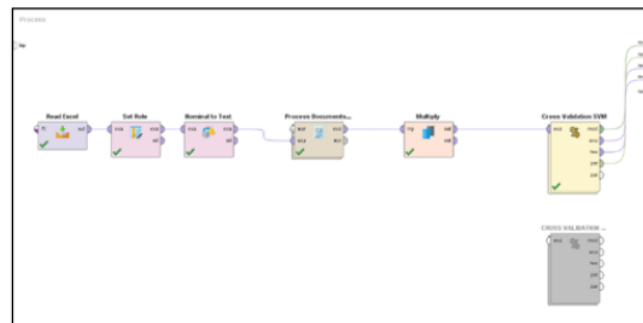


Figure 2. Sentiment Analysis Process Using SVM Method

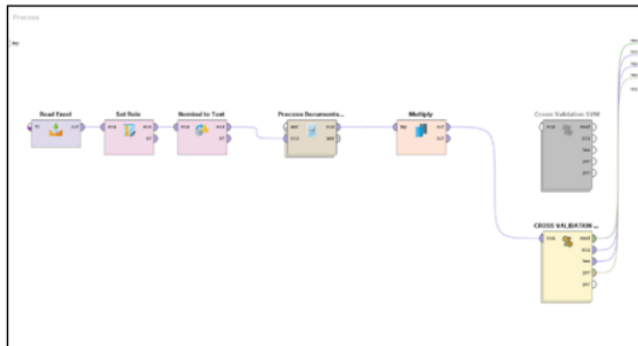


Figure 3. Sentiment Analysis Process Using NB Method

Table 1. Process in Rapid Miner

No	Process	Description
1	Read Excel	All data that has been crawled and stemmed is included in the read excel column.
2	Set Role	Selection of columns that will be used for analysis.
3	Nominal to text	Selection of nominal data becomes text.
4	Process document	Processing all data into one document.
5	Multiply	Process data using certain methods.
6	Cross Validation SV	A method that used to analyse a sentiment.
7	Naïve Bayes	A method that used to analyse a sentiment.

4 Result and Discussion

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

4.1. Labeling Sentiment of Community Comments

The comments given by the community will be classified into 2 types of sentiments, positive and negative. Giving positive, negative, and neutral labels is given to tweets that contain sentiments of these words. For types of comments that do not contain any sentiments. The sentiment labeling from Twitter data is done manually on the dataset. In Table 1, examples of class labeling on the tweets that have been obtained are given.

4.2. *Preprocess Sentiment Text of Community Comments*

The raw data obtained is processed to convert it into data that is ready for use. The preprocessing phase of this data is done manually and uses Gataframework tools.

4.3. *Tokenization*

As many as 341 data tweets which are original data are carried out in a phased tokenization process, which is done by removing URLs or links, numerically, and symbols using the regex function, then the collection of tweets is converted into a lowercase. The result is a tweet that has been changed to lowercase letters that do not have punctuation, symbols, numeric, and URLs.

4.4. *Text Normalization*

Most tweets are the opinions of Twitter users so there are many non-standard words. Non-standard words can be in short words. Text normalization is done to replace non-standard words on tweets with their basic words based on dictionaries that contain non-standard words and their basic words. In this process all the words in the tweet are compared with the dictionary of standard words and non-standard words, after that the process of replacing non-standard words that are tweeted with standard words based on the dictionary has been prepared. Words that are considered non-standard will be replaced by standard words automatically by the system.

4.5. *Stop word Disposal*

At this stage each word contained in the tweet in the discard word list (stop words) is deleted. In this study there were 759 lists of waste words obtained from Indonesian stop words. In the stop words disposal process, it managed to delete 395 terms from 341 tweets in the original data, leaving only a few terms left. The term will be used in the feature selection process.

Table 2. Data Classification Table-Negative Table

No	Data Text	Label
1	Terciduk brimob ngemot kontil mesum kamar berduaan rasain ya kena batunya	Negative
2	Klaim tgl mei ahok divonis lgs ditempatkan rutan mako brimob nov lap banteng direnovasi dan?	Negative
3	Tahanan mako brimob	Negative
4	Klo gabener yg mako brimob mahakarya yg krn sdh menyulap harga sumber waras	Negative

Table 3. Data Classification Table-Positive Table

No	Data Text	Label
1	Korps brimob kirim ratusan pasukan bantu korban gempa ntb prayforlombok doa untuk lombok	Positive
2	Korps brimob kirim ratusan pasukan bantu korban gempa	Positive

- | | | |
|---|--|----------|
| | ntb prayforlombok doa untuk
lombok | |
| 3 | Brimob polda jabar? At
mako sat brimob polda jawa
barat | Positive |
| 4 | Ratusan brimob mabes polri
diberangkatkan menuju
lombok ntb membantu
evakuasi gempa | Positive |

4.6. System planning

In general, the system that will be created in this study is a system that can analyze sentiment regarding the Indonesian Police Mobile Brigade corps agency. The system will provide the results of an analysis of opinion sentiment in an agency that is classified as positive or negative sentiment and will also be conveyed also the opinion factor that is most often discussed in each of these agencies. The general description of the system to be made in this final project is as follows:

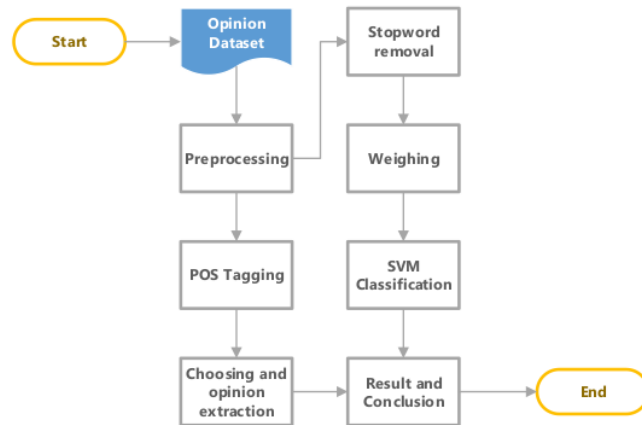


Figure 4. System Planning Process SVM Method

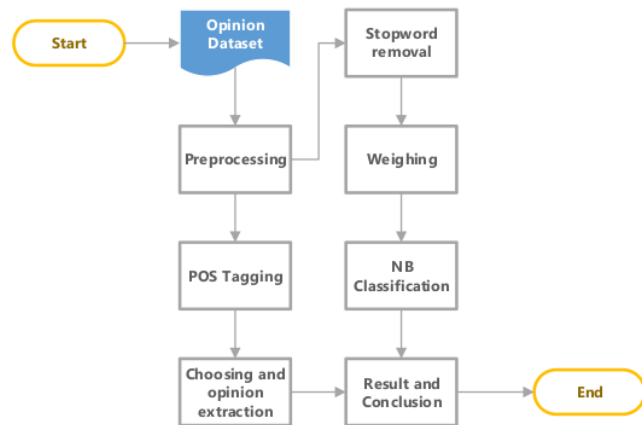


Figure 5. System Planning Process NB Method.

The overall scenario of the system is as follows:

- The system accepts input in the form of a twitter dataset of excel file type. The data is taken from based on crawling from twitter.
- Preprocessing of datasets is carried out to create a dataset according to classification requirements and facilitate processing on the system. Preprocessing consists of data cleansing subprocesses, which are case folding and remove noise, tokenization subprocesses, and word normalization subprocesses
- Search for opinion factors is carried out by two processes, namely tagging words using POS tagging. Then based on the word tag, the word will be selected for the opinion feature extraction selection
- To search the sentiment classification results, a stop word removal process is carried out, which is to delete words that often appear but do not have specific meanings. Then the word weighting is done based on the number of occurrences in the document, so the document can be represented in a vector. Weighting features used are unigram, and weighting method Term Frequency-Inverse Document Frequency (TFIDF). The next process is the classification of data sentiments using the Support Vector Machine (SVM) and Naïve Bayes (NB) method.

4.7. Testing Scenario

To achieve the objectives of this study, three test scenarios were designed. The test scenario is as follows:

- Testing datasets with different composition of testing data and training parameters Testing is done by distributing training data and testing data with compositions based on the distribution of data in the k-fold cross validation with values $k = 2$ to $k = 10$. This test aims to determine the optimal k-fold value in the opinion classification process in the case of this study.
- Testing datasets with different positive data and negative data composition parameters Testing is done by using an unbalanced number of documents between positive data and negative data, that is, with more positive documents than negative documents, as well as the reverse. Tests were carried out several times by randomizing datasets with the intention of paying attention to the level of fairness from the results of testing the data. In the previous study it was said that the composition of positive and negative data needs to be balanced to avoid any bias or deflection of the word with a high number of occurrences on only negative or positive data. Therefore, this test was conducted to prove whether these conditions also apply to the data of this study. This test will be carried out on data which is the data that has the best accuracy from the results of testing scenario 1.
- Testing opinion factors This test is conducted to find out the most dominant opinion factors of each type of transportation dataset. Tests are carried out by using the word class label because of POS tagging, then extracting opinions by selecting words with adjective, adverb, and verb class words. Of the many factors of opinion, ten of them will be stabilized.

4.8. Analysis Result

Based on last experimental models, the results of accuracy for the SVM algorithm, good results are obtained using the RBF kernel without the stop word. When viewed at the same C and γ values, the use of stop words and do not show the same results and tend not to change too much. The best grid search optimization parameters performed occur in the range $C = 2-0.06$ to 20.2 and $\gamma = 2-1.35$ to $2-1.1$ with the accuracy of 88.59%. The results of the Tf method show better accuracy values.

Judul	Pre Processing	Feature Selection	Classifier	Accuracy
Using Social Media to Enhance Emergency Situation Awareness (Ju Yin et al., 2012)	Filter Data Data Cleanzing Annotated	N-Grams	Support Vector Machines (SVM)	87,50 %
Practical Extraction of Disaster-Relevant Information from Social Media (Meiser et al., 2013)	Filter Data Label Data	Part-of-Speech (POS) N-Gram	Naive Bayes (NB)	80 %
TweetHac: Using Incident-Specific Profiles for Classifying Crisis-Related Messages (Imran et al., 2013)	Filter Data Data Cleanzing	N-Grams	Support Vector Machines (SVM)	71%
Identifying Informative Messages in Disaster Events using Convolutional Neural Networks (Caragen et al., 2016)	Tokenization Filter Tokens Transform Cases	N-Gram	Support Vector Machines (SVM)	71.57%

Figure 6. Comparison of related studies

4.9. Analysis of experiment result

The results of the classification model analysis found that the best classification model was using the Support Vector Machine (SVM) method with 86.96% accuracy, 91.06% precision, 83.10% recall, and 0.945. It is different from using the Naïve Bayes (NB) method whose results are 86.48% Accuracy, 88.86% precision, 84.68% recall, and 0.822. With optimal accuracy it does not mean that it has good performance. When looking at the confusion matrix, the data cannot be properly classified so that a number of 0 values emerge, so the SVM model is used with an accuracy of 86.96%. This accuracy value is obtained by the Tf method on frequent word worth 90. Furthermore, to see the performance of the classification results, the precision, recall, and f-measure values are calculated from each class.

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Table 4. Accuracy analysis table. Accuracy: 86.96% +/- 3.46% (micro average: 86.96%)

No		true negative	true positive	class precision
1	negative prediction	275	54	83,59%
2	positive prediction	27	265	90,75%
3	class recall	91,06%	83,07%	

Table 5. Precision analysis table. Precision: 91.06% +/- 5.42% (micro average: 85.40%) (positive class: positive)

No		true negative	true positive	class precision
1	negative prediction	275	54	83,59%

2	positive prediction	27	265	90,75%
3	class recall	91,06%	83,07%	

Table 6. Recall analysis table. Recall: 83.10% +/- 4.52% (micro average: 93.09%) (positive class: positive)

No		true negative	true positive	class precision
1	negative prediction	275	54	83,59%
2	positive prediction	27	265	90,75%
3	class recall	91,06%	83,07%	

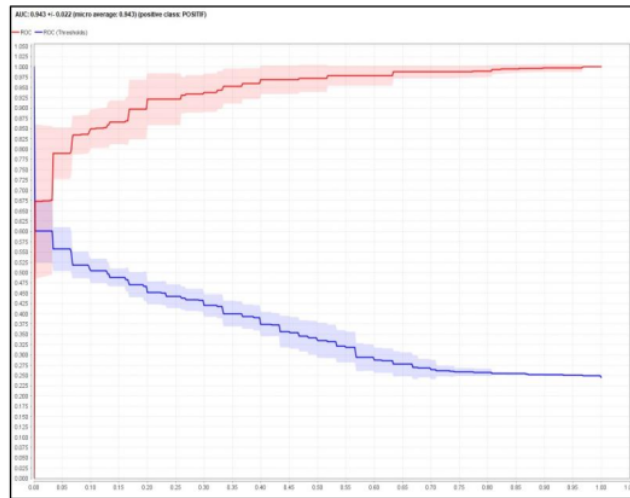


Figure 7. AUC Process SVM

Table 7. Accuracy analysis table. Accuracy: 86.48% +/- 3.14% (micro average: 86.47%)

No		true negative	true positive	class precision
1	negative prediction	276	49	84,49%
2	positive prediction	35	270	88,52%
3	class recall	88,41%	84,64%	

Table 8. Precision analysis table. Precision: 88.86% +/- 5.11% (micro average: 88.52%) (positive class: positive)

No		true negative	true positive	class precision
1	negative prediction	276	49	84,49%
2	positive prediction	35	270	88,52%
3	class recall	88,41%	84,64%	

Table 9. Recall analysis table. Recall: 84.68% +/- 5.66% (micro average: 84.64%) (positive class: positive)

No		true negative	true positive	class precision
1	negative prediction	276	49	84,49%
2	positive prediction	35	270	88,52%
3	class recall	88,41%	84,64%	

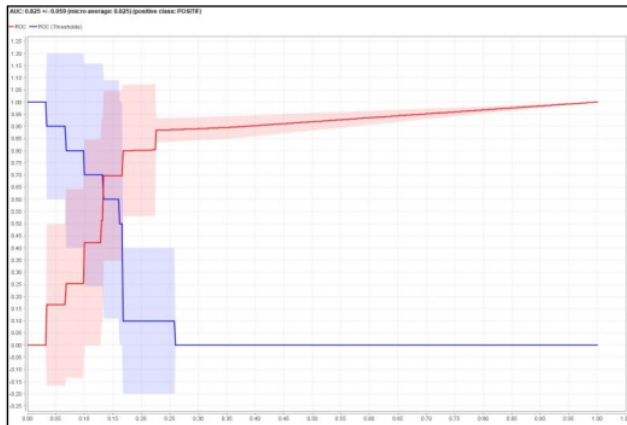


Figure 8. AUC Process NB

5. Closing

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5.1. Conclusion

Based on the results of testing and analysis that has been done in the previous discussion, then some conclusions can be taken as follows:

- Sentiment analysis of Twitter data regarding the national police Mobile Brigade corps can be done using the Support Vector Machine method, with accuracy reaching 86,96% in dataset 1.
- The results of the accuracy of the use of the Support Vector Machine method are influenced by several things, namely:
 - Composition of the amount of training and testing data

- Number of datasets used
- The composition of the number of positive and negative data 3. The dominant factor of opinion from the results of sentiment analysis on the police Mobile Brigade corps

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