

SENTIMENT ANALYSIS OF USE ON TWITTER ON POLICE INSTITUTION SERVICES USING NAÏVE BAYES CLASSIFIER METHOD

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ABSTRACT

Twitter is one of the social media used to respond to various services of public service institutions, including the police. The research aim to determine the community's assessment of the service and performance of police institutions delivered via Twitter. This study uses the Naïve Bayes Classifier algorithm to classify topics and public sentiment towards tweets from police agencies. The results obtained were 181 positive tweets, 322 negative tweets, and 33 neutral tweets. Sentiment analysis showed 55% respondent positively to police activities, 19.1% responded positively to public comments, and 91.8% respondent positively to social services. It can be concluded that most people support police activities and services, but most people are still dissatisfied with police performance.

Keywords : naïve bayes classifier, police institutions, sentiment analysis, topic classification, twitter

INTRODUCTION

Social media allows users to create and change content, even users can exchange web-based content (Kaplan and Haenlein, 2010). Various social media can be seen as media that can provide services that enable communities to collaborate and facilitate with content created or shared by users, and involved online (McCay-Peet & Quan-Haase, 2016).

In a report, Twitter said there were 126 million active users every day during the fourth quarter (Q4) 2018 (Pratomo, 2019). The addition of the quantity of information available on the internet is a result of the growth in users and content created by users consistently on many web sites, social networks, and other online platforms. (Araque, et al, 2018) . The content has value related to a number of businesses, both online and offline. Not only business problems, even in various applications ranging from evaluating reputation, product reviews, political parties, and public health (Al-Thubaity, A., et al, 2018). Customer feedback helps organizations improve their services by improving their weaknesses (Vyas, V., dan Uma V., 2015). This has an impact on interest in opinion mining techniques as a way to extract and analyze opinions / opinions that are made by users (Liu, 2015).

Sentiment Analysis (SA) has a major role in the analysis of opinions / opinions. Sentiment analysis aims to classify sentiments from opinions, opinions or attitudes expressed by humans on certain topics of conversation, represented by text. For this purpose, the text can be labeled into several categories, for example positive or negative. The analysis is very useful because it allows us to get an overview of broader public opinions or attitudes towards certain topics, products or services (Boudad, N., et al., 2018).

Based on Law No. 2 of 2002 concerning the National Police of the Republic of Indonesia states that the Police of the Republic of Indonesia is a state instrument that plays a role in maintaining security and public order, law enforcement, as well as providing protection, protection and service to the public in the context of maintaining internal security. Security and public order is a dynamic condition of society as one of the prerequisites for the implementation of a national development process in the context of achieving national goals which are marked by the security, order and upholding of law, and the establishment of peace, which contains the capacity to develop and develop community potential and strength in counteracting , preventing, and overcoming all forms of violations of law and other forms of disturbance that can disturb the community. Domestic security is a condition that is characterized by guaranteed security and public order, orderly and upholding the law, and the implementation of protection, protection

and service to the community. various forms of media as services to the community were prepared by the police.

Polri's public relations division is one of the divisions in the Polri's organizational structure. The Information and Documentation Management Bureau (Ro PID) in the Police Public Relations Division is in charge of fostering, collecting, processing, presenting data, information and documentation in supporting the implementation of information delivery both internally and externally at the National Police. In carrying out its duties, one of the functions of Ro PID is the preparation of media and the distribution of information and documentation widely in accordance with statutory provisions, and management of information on public complaints concerning services, protection, protection and law enforcement by the National Police. One of the media managed by the National Police Public Relations Division is the Indonesian Public Relations Division twitter account with an account @ DivHumas_Polri. Until now, the @DivHumas_Polri account has 1.17 M followers, and 32.1 K tweets (twitter.com/divhumas_polri).

This study will conduct a sentiment analysis of community assessments delivered through the National Police Public Relations twitter account, with the aim of finding out community assessments of the services and performance of police institutions.

Sentiment Analysis

In the general definition, Sentiment Analysis (SA) is a way to identify and classify text patterns given at the level of documents, sentences and phrases (Coletta, 2014). The main challenges of the Twitter sentiment analysis are: (1) most tweets are written in informal; (2) short messages make sending sentiments / signs limited; and (3) many tweets use acronyms and abbreviations (Ankit dan Saleena, N., 2018).

Naïve Bayes Classification

Data classification is a two-step process, consisting of a learning step (where a classification model is constructed) and a classification step (where the model is used to predict class labels for given data). (Han, J., et al., 2012). Bayesian classifiers are statistical classifiers. They can predict class membership probabilities such as the probability that a given tuple belongs to a particular class. Bayesian classification is based on Bayes' theorem.

Let X be a data tuple. In Bayesian terms, X is considered "evidence." As usual, it is described by measurements made on a set of n attributes. Let H be some hypothesis such as that the data tuple X belongs to a specified class C . For classification problems, we want to determine $P(H|X)$, the probability that the hypothesis H holds given the "evidence" or observed data tuple X . In other words, we are looking for the probability that tuple X belongs to class C , given that we know the attribute description of X .

$P(H|X)$ is the posterior probability, or a posteriori probability, of H conditioned on X . In contrast $P(H)$ is the prior probability or a priori probability of H . The posterior probability, $P(H|X)$, is based on more information than the prior probability, $P(H)$, which is independent of X . Similarly $P(X|H)$ is the posterior probability of X conditioned on H . $P(X)$ is the prior probability of X .

$P(H)$, $P(X|H)$, and $P(X)$ may be estimated from the given data, as we shall see next. Bayes' theorem is useful in that it provides a way of calculating the posterior probability, $P(H|X)$, from $P(H)$, $P(X|H)$, and $P(X)$. Bayes' theorem is

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

METHOD

The data used in this study is the data of tweets obtained from the account @Divisi_humas_Polri. A collection of tweet data is obtained using the twitter API. The data taken is data tweets in the 2017-2018 period. These data will be saved in CSV format. The steps of the research carried out can be seen in Fig. 1.

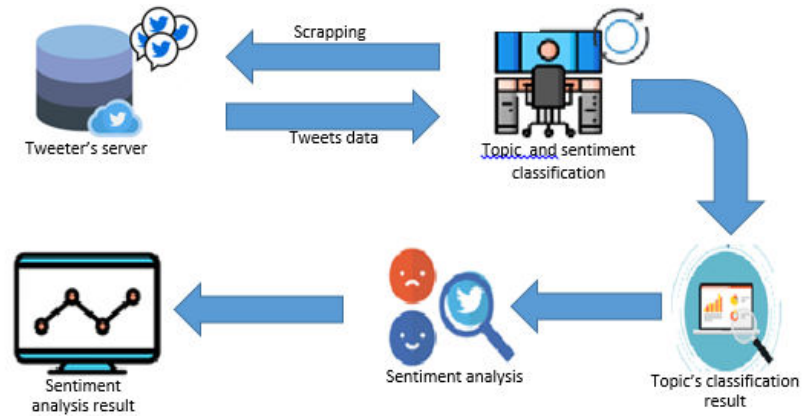


Fig. 1. Research steps

The data that has been obtained will be processed in the stages of the text preprocessing with the following steps, (a) *Case Folding*, the process of converting letters to text into lowercase letters. (b) *Tokenizing*, the process of deciphering sentences into words and eliminating non-meaningful characters, such as point (.) and comma (,). (c) *Filtering*, the process of taking words that have meaning and discard non-essential words such as "to", "from", "and", "or", "that", "with". (d) *Stemming*, is a normalization process that is used to find the basic words in a sentence such as "spend" into "shopping".

After the text preprocessing process is complete, the next step is to label the training data. Labeling is done for topic classification, and sentiment analysis. Topics are grouped into 3, i.e.

1. Police activities, become a category for tweets that inform the police agenda that has been or is ongoing.
2. Community comments, is a collection of tweets from the community directed to the police such as complaints, praise and reports to the police.
3. Community service, an advertisement that presents social messages that aim to arouse public awareness of a number of problems they must face, namely conditions that can threaten harmony and general life.

After grouping topics, sentiment analysis was carried out on each topic using 3 classifications, namely negative, positive, and neutral. Accuracy of data is calculated using the following equation.

$$\frac{\text{the number of correct data}}{\text{the amount of overall data}} \times 100\%$$

RESULT AND DISCUSSION

Of the 1067 training data used in topic classification, labeling 459 data is done manually and 608 other data are labeled results of the system. There are three topic classifications, namely 1) community comments for example "selective police in law enforcement", 2) public services as an example of "millennial anti-hoax youth", and 3) the last topic of community activities for example is "police chief leads troop title". All data labeling is done based on the subjectivity of the researcher.

For sentiment analysis, 3709 training data were used, where manual labeling was carried out on 451 data, and for other remaining data labeling was sourced from kaggle.com. All data labeling is done based on the subjectivity of the researcher. For sentiment analysis 3 classifications were used, namely positive, negative, and neutral.

Data from 536 test data obtained from tweets from the date of 12-03-2018 to 12-06-2018, the results obtained as shown in Fig. 1.

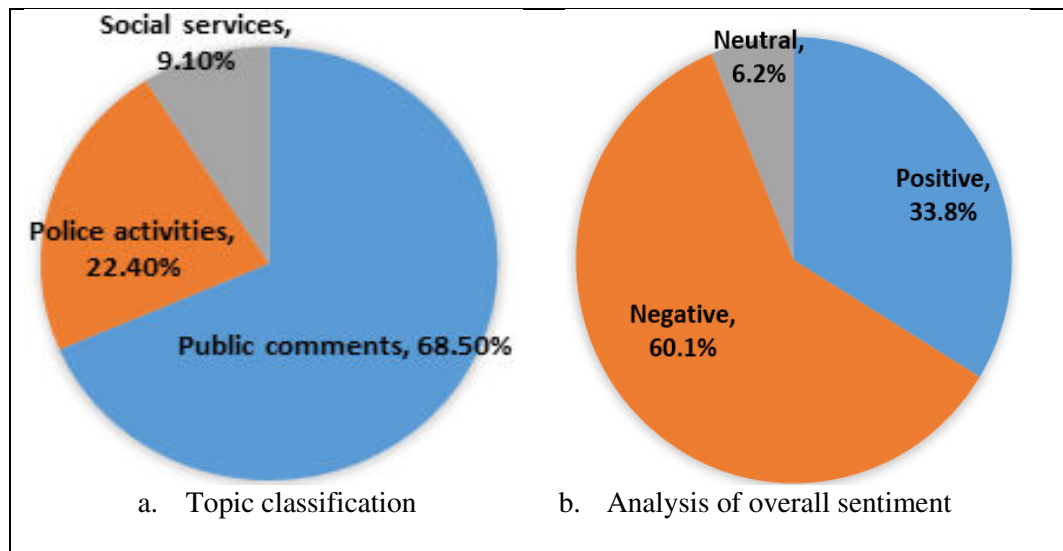


Fig.1. Results of topic classification and overall sentiment analysis

For the topic category results, there were 120 tweets for the topic of tweets related to police activities, the topic of public service was 49 tweets and 367 tweets for public comments. In other words, out of a total of 536 tweets, 68.5% were community comments, 22.4% were police activities and 9.1% were community services (Fig. 1.a). The level of accuracy obtained in the topic classification is 96%.

Fig. 1.b is the result of the visualization of the sentiment classification of the tweets analyzed as a whole, as much as 60.1% were negative sentiments, 33.8% were positive sentiments and 6.2% were neutral sentiments with an accuracy rate of 86%.

For the results of sentiment analysis in each topic, see Fig. 2.

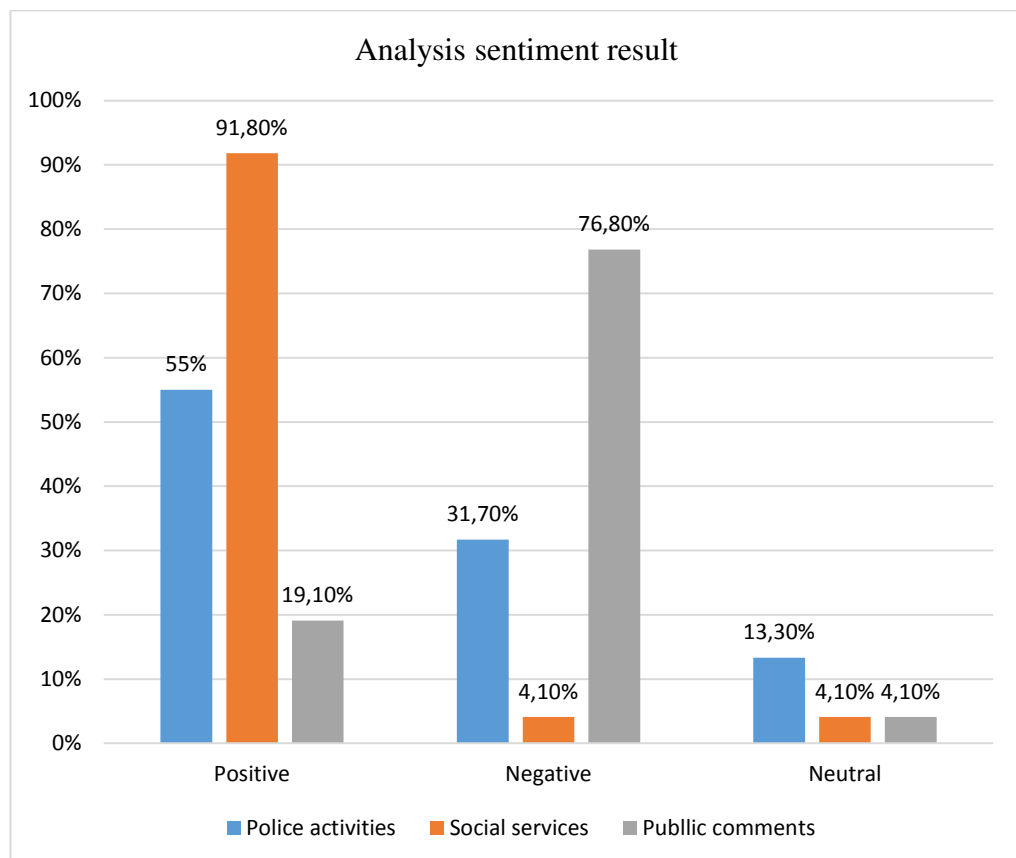


Fig. 2. Results of sentiment analysis for each topic

After tweets are classified by topic, sentiment analysis is carried out for each topic. Sentiments are classified into 3 groups: positive, negative and neutral. From figure 2, it can be seen that the topic of Police Activities received positive sentiment was 55.0%, neutral 13.3% and negative 31.7%. For example, tweets on the topic of Police Activities "the visit of the police chief to NTB" contained neutral sentiments. For positive sentiment, it can be exemplified "Regional Police and students reject intolerance". It can be seen that there are police activities that get negative sentiment because one of them is the tweets are true police activities but in the sentence there is negative sentiment.

From the analysis of sentiments for the topic of public comments obtained positive sentiments as much as 19.1%, neutral 4.1% and negative 76.8%. It can be seen that public comments that have negative sentiments are greater than others, so it can be concluded that there are still many people who are not satisfied with the police.

Community service is an advertisement that presents social messages that aim to arouse public concern for a number of problems they must face. From Fig. 2, we see the sentiment analysis of tweets on the topic of public services, which received positive sentiment of 91.8%, neutral 4.1% and negative 4.1%.

The classification calculation uses naive bayes classifier method based on the formula (1). Shown in Table 1 is an example of training data that will become a pattern for classification calculations.

Table 1. Examples of training data

Sentiment category	Original Tweets
positive	@HumasPoldaJatim: Kami Hadir Dan Dekat Dengan Masyarakat\n\n@DivHumas_Polri \n@PolriMultimedia \n@e100ss \n@beritajatimcom \n@jawapos \n@SINDOnew\ue2\x80\xa6
positive	@DivHumas_Polri: Hoax dan Ujaran Kebencian dapat mengancam persatuan \n\nLaporkan dan Janban Ikut Menyebarkan\n\n#PolriPromoter #PolriHumani\ue2\x80\xa6
positive	RT @richadmustova: @WajahMuslim17 @D1x174nX1 Tolong dong min @DivHumas_Polri , masa Polisi2 Muslim gx ada satu pun yg terpenggil hatiny utk\ue2\x80\xa6
neutral	@DivHumas_Polri: Jenazah Pilot Lion Air JT610 Berhasil Teridentifikasi\n\n#PolriPromoter #PolriHumanis #ThinkBeforePosting @PolriMultimedi\ue2\x80\xa6
neutral	@DivHumas_Polri: Tak Bayar Pajak Tahunan, Polisi Berwenang Tilang dan Sita Kendaraan \n\nSelengkapny \ue2\xac\x87\xef\xb8\x8f\nhttps://t.co/Pyp1GK8EPm\n\n#Korlant\ue2\x80\xa6
neutral	@DivHumas_Polri: 16 Jenazah Korban Lio Air JT610 Teridentifikasi\n\nBerikut identitas jenazah Lion Air JT610 yang baru teridentifikasi :\ue2\x80\xa6
negative	Ini penistaan agama sesungguhnya, mohon ditindak sesuai hukum yang berlaku yaaa\x0\x9f\x99\x8f\n@bareskrim2018 \n@BareskrimPolri\ue2\x80\xa6 https://t.co/7FTB3ZTfSk
negative	Demo jalan wanaherang (mercedes benz) gunung putri kab bogor. Bupati sama kepala desanya korupsi siap siap digantun\ue2\x80\xa6 https://t.co/LBk7NPBMGb
negative	@Dennysiregar7: Ah @DivHumas_Polri gimana sih ? Jangan menghancurkan angan2 mereka dong. Itu kayak dibanting rasanya.. https://t.co/jo0n\ue2\x80\xa6
?	dia melakukan penistaan

After processing data, data will be obtained as shown in Table 2.

Table 2. Data preprocessing results

Sentiment category	Results after preprocessing
positive	hadir dan masyakat
positive	hoax kebencian mengancam persatuan janban
positive	tolong min polisi2 muslim gx terpanggil hatinya
neutral	jenazah pilot lion air jt610 berhasil teridentifikasi
neutral	bayar pajak tahunan polisi berwenang tilang sita kendaraan
neutral	jenazah korban lio air jt610 identitas jenazah lion air jt610 teridentifikasi
negative	penistaan agama sesungguhnya mohon ditindak sesuai hukum berlaku
negative	demo jalan wanaherang gunung putri kab bogor bupati kepala desanya korupsi
negative	ah gimana sih menghancurkan angan2 kayak dibanting
?	penistaan

The 10th line in the data will be classified based on the previous lines.

By using Bayes Theorem to predict the probability that the given set of features belongs to a particular label. The formula used is as follows

$$P(\text{label} | \text{feature}) = P(\text{label}) * P(\text{feature} | \text{label}) / P(\text{feature})$$

$P(\text{label})$ is the probability of the label that will occur, which will be used to predict test data randomly with the possibility that the random feature set will have the same label. This is based on the number of examples of training with labels compared to the total number of training examples. For example, if the sample 3/100 training has a label, the probability of the label is 3 percent.

$P(\text{feature} | \text{label})$ is the previous probability of the given set of features classified as that label. This is based on which features have occurred with each label in the training data.

$P(\text{feature})$ is the previous probability of the given set of features that occur. This is the possibility of the random feature set being the same as the given feature set, and based on the set of features observed in the training data. For example, if the given feature set occurs twice in 100 training times, the previous probability is 2 percent.

$P(\text{label} | \text{feature})$ tells us the probability that the given feature must have that label. If this value is high, we can be pretty sure that the label is correct for the features provided.

From Table 2, the values for the calculation of naive bayes classifier are as follows:

$$P(\text{positive}) = 3/9$$

$$P(\text{negative}) = 3/9$$

$$P(\text{neutral}) = 3/9$$

By referring to equation 1, the probability value obtained is,

$$P(\text{blasphemy}|\text{positive}) = (0+1)/(15+67) = 0.0161$$

$$P(\text{blasphemy}|\text{negative}) = (1+1)/(26+67) = 0.0215$$

$$P(\text{blasphemy}|\text{neutral}) = (0+1)/(26+67) = 0.0107$$

$$P(\text{positive}|10\text{th data}) = 3/9 * 0.0161 = 0,005366667$$

$$P(\text{negative}|10\text{th data}) = 3/9 * 0.0215 = 0,00716595$$

$$P(\text{neutral}|10\text{th data}) = 3/9 * 0.0107 = 0,003566667$$

Based on the results of the calculation above, it can be seen that the data to -10 has a negative label because the value in the negative part is greater than the others.

CONCLUSION

From the results of the sentiment analysis, it can be concluded that most people support police activities and services, but most people are still dissatisfied with police performance.

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