

# Mining Indonesian Cyber Bullying Patterns in Social Networks

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## Abstract

Bullying in social media such as Twitter and Facebook has been recognised as a serious issue in Indonesia. Bullying in social media is a type of human rights violation that involves other people following an initial perpetrator in sending bullying messages repeatedly and intentionally in order to cause distress and risk to the victims. Moreover, some people use Twitter for different, more innocuous, but still unpleasant, purposes such as embarrassing someone.

Our research analyses Indonesian bullying words on Twitter so as to discover Indonesian bullying patterns. It also discusses how to mine Indonesian bullying words on Twitter by using text mining techniques. Analysing Indonesian bullying words is one of the challenges in this work.

Our research has successfully identified that “bangsat” and “anjing” terms are the trend of Indonesian bullying patterns on Twitter.

This work also compares Indonesian bullying patterns in Jakarta and Surabaya. The results are quite similar. The “bangsat” and “anjing” terms usually occur on Twitter located in both cities. Finally, our research discusses how text mining could provide a solution towards analysing Indonesian bullying words patterns in Twitter messages.

*Keywords:* Data Mining, Text Mining, Cyber bullying, social computing.

## 1 Introduction

With the rapid growth of the Information and Communication Technology, the number of people interacting using modern technologies such as the Internet has been increased significantly in Indonesia. Over the last decade, the Internet in Indonesia has developed rapidly to become a vital medium of communication in both personal and professional lives (Hui 2010). This is a new online concept and associated technologies will change our perspective on using Internet media to interact with each other in communities.

Telkom is one of the telecommunication companies in Indonesia providing internet services, Telkom states that

more than 40 million Indonesian people accessed the internet in 2011 and this will continue to increase rapidly to more than 70% in 2014 (Telkom 2012). Telkom also indicates that more than 63.1 million people used the internet for interaction in 2012, especially using social media such as Facebook and Twitter. Around 43.6 million Indonesian people used Facebook and 19.5 million used Twitter as media to communicate. This indicates that Indonesia has a potential growth of social media usage as media communication to share information..

Considering the fact that the internet and the number of social media users will grow rapidly in the next decade in Indonesia, social media is considered as a potential medium of cyber bullying. This is because social media, such as Twitter and Facebook provide some options for people to build their network, allowing them to chat or interact freely. At this point, everybody can express their ideas spontaneously to fulfil their need for existence, actualization, and socialization transferred in words, pictures and videos. Unfortunately, over time, the comfort of existence, actualization and socialization to build information and communication has been misused by people. They have used the social media to bully someone by sending offensive words, pictures or videos, which is called cyber bullying.

Cyber bullying is a kind of human rights violation to hurt or embarrass someone through ICT such as the Internet, mobile phone or other technology (Commission 2013) Furthermore, Hosking (2013) reported young Australians have been bullied at least fortnightly. The purpose of cyber bullying usually involves intimidating someone through sending text messages, emails, phone calls, chatting, and videos or pictures that are often seen as anonymous.

Bullying face-to-face is common in life. Bullying through the internet has increased in recent years and has become widespread in the world. When we look at the data from some surveys on the Internet, more than 77% students were bullied in 2012 (Graphs.net 2012). According to the Graphs.net’s survey, bullying on the Internet will grow significantly if the parents are not proactive in guiding their child when their child accesses social media on the Internet.

The Ipsos is an independent market research company, which conducted a survey to rank bullying in some countries (Gottfried 2012). They examined bullying among approximately 200,000 school-age children in 40 countries in the world in 2005-2006 and reported that Indonesia is one of the countries that has a high percentage of cyber bullying (Gottfried 2012). Ipsos reported that more than 91% of Indonesian citizens are

aware that their children were bullied on social media (Gottfried 2012). In Australia, it is about 87%, Poland is around 83%, Sweden is about 85%, the United States is about 82%, and Germany is around 81% (Gottfried 2012). Moreover, the majority of citizens in each of the 24 countries agreed that cyber bullying needs special attention from parents, particularly Japan (91%) and Indonesia (89%) (Gottfried 2012).

Kaman (2007) has conducted a survey about cyber bullying across 40 countries including Indonesia in 2005-2006. The result is that Indonesia took third place after Japan and South Korea. This indicates that cyber bullying in Indonesia is a major problem needing urgent attention.

Given the rapid growth of cyber bullying in Indonesia, identifying bullying patterns in social media is an important research task to understand what kind of bullying patterns occur. Hence, detecting Indonesian bullying patterns in Twitter should be analysed more deeply to know the strong relationship between Indonesian bullying words. This study will contribute to knowledge about human rights violations in social media in Indonesia.

Analysing Indonesian bullying words in Twitter is an interesting issue to explore. The Indonesian bullying words are unique compared to other countries, because they are always related to animals, psychology, disability, and attitude. For example, “*kamu gila, perilaku kamu seperti anjing, bangsat*” (“You are crazy, you act like a dog, you rascal”). Other than that, there are several bullying words combinations – “*bangsat, anjing, gila*” (rascal, dog, crazy). So, the perpetrator technically uses two or more words to bully.

Even though some previous research has been conducted on bullying studies, such as to explore the variety of characteristics of bullying in social media, e.g., (Campbell 2005), identifying the relationship between Indonesian bullying words using text mining technique has not been investigated as far as we know. Hence, this research has proposed to analyse Indonesian bullying words in social media. This research uses text mining techniques as a tool to extract the words and to mine data in databases.

Bullying in social media may influence people to commit harassment and violence, whether physical or psychological (Kowalski, Limber & Agatston 2008): for example, when the perpetrator arranges to meet with the victims and they possibly accomplish violence acts towards the victims. There have been a few cyber bullying cases in Indonesia that have influenced physical violence. These cases are located in Yogyakarta in which mostly young high school females are the victims. Bantul, Gunung Kidul, Kulonprogo, Sleman, Klaten, Magelang, and Purworejo in Central Java also have a similar cyber bullying phenomenon (Octaviany & Waskita 2012). The advantage of learning Indonesian bullying words is to recognise and to identify the words when they appear in social media. Then, we may be able to seek earlier help and prevent any violence from taking place.

In Indonesia, cyber bullying occurs continuously, which includes harassment, denigration, impersonation, invasion

of privacy, threats and exclusion - being excluded from the society. Besides, law enforcement in Indonesia is still weak. So, the victims rarely report such incidents to the authorities, such as the police or their parents.

This work uses Rapid Miner<sup>1</sup> software in order to analyse the Indonesian bullying words from Twitter. There are several processes before analysing the Indonesian bullying words: first, importing data from the repository in Rapid Miner; second, filtering words to clean up unstructure sentences; third, using FP-Growth and association rules techniques.

The data is collected using Twitter adder<sup>2</sup>. Moreover, in the process of filtering words, we created a stem Indonesian bullying dictionary to detect some bullying words in Indonesian Twitter posts. Jakarta and Surabaya are two big cities in Indonesia which have become objects in this research because some people who sent bullying messages in Twitter come from Jakarta and Surabaya. Our research has identified Indonesian bullying patterns in both cities. We found the trend of Indonesian bullying patterns in Jakarta and Surabaya to be quite similar.

Additionally, the results of this research are an important contribution to the Indonesian government, Non-Government Organizations and Indonesian society about human rights violations through the Internet.

This paper is organized as follows. Section 2 describes the related work of this paper. In section 3, we describe FP-Growth and Association Rule mining which will be used to analyse the research problem. In section 4, implementation of text mining, FP-Growth, and Association Rule to solve the research problems will be detailed. Analysing the relationship among words will discover new bullying patterns. The last section is the Conclusion section.

## 2 Related Work

Some previous research has discussed cyber bullying in social media. Chen et al. (2012) have conducted research to detect offensive language in social media. The technique that has been used to identify offensive language is the Lexical Syntactic Feature (LSF) approach. The LSF framework has been successful in detecting some offensive content in social media, which has achieved precision of 98.24%, and recall of 94.34% and also succeeds in detecting users who sent offensive messages, achieving precision of 77.9%, and recall of 77.8% (Chen et al. 2012). A similar technique to detect offensive content in social media is a lexicon-based approach which can block and filter the offensive words and sentences in social media (Popescu & Etzioni 2007; Taboada et al. 2011). The lexicon-based technique has been successful in detecting sentiment terms in social media.

Identifying context words in Twitter using the machine learning technique has been shown in previous research. Pak and Paroubek (2010) constructed a simple binary

<sup>1</sup> Rapid Miner software is available at <http://rapid-i.com/content/view/26/201/>

<sup>2</sup> Twitter adder is available at <http://www.tweetadder.com/download>

classifier using n-gram and POS (Part-of-Speech) features to classify tweets on the basis of positive, negative and neutral sentiment. Their approach has similar techniques to the unigram, bigrams and POS tags approach introduced by Go, Bhayani and Huang (2009). Go, Bhayani and Huang have analysed the distribution of certain POS tags between positive and negative posts.

Recently, Maynard, Bontcheva and Rout (2012) conducted research to detect negative opinions in social media using the rule-based approach. Their research has identified negative opinions, which contain sentiment sentences, with 86% precision and 71% recall, and also identified sentences where the accuracy of the polarity (positive or negative) was 66%.

Another approach to detecting cyber bullying is a language-based method introduced by Reynolds, Kontostathis and Edwards (2011). Their research has successfully identified 78.5% of message posts from “Form spring” which contain cyber bullying by recording the percentage of curse and insult word posts.

### 3 Collecting Indonesian Bullying Words from Indonesian Twitter Posts

The collected data are the important part in conducting research. Much of the work required to collect data from Twitter will be spent obtaining and preparing the data. Choosing the proper approach will depend on the ultimate purpose of the analysis. There is Twitter Adder software development which can capture text in social media. The reader should be aware that these examples of Indonesian bullying words may contain offensive and often abusive language.

#### 3.1 Data Collection from Indonesian Twitter

The first step in collecting data is download tweets text in Twitter using Twitter Adder. This step generally needs a key word to capture posting tweet text from Twitter automatically. The classification of Indonesian bullying words which were posted on Twitter will be represented in Table 1.

In our research, to collect data we used the Indonesian language because we would like to mine Indonesian bullying words which occur in Twitter. Furthermore, bullying on the Internet is also a part of human rights violations. To understand what Indonesian bullying words mean, we try to translate some Indonesian bullying words into English in Table 1.

We accessed Twitter’s public timeline to search tweets containing Indonesian bullying words to suit our interest. We removed all facts that did not express Indonesian bullying messages like news and objective phrases from collected data.

Bullying words	Indonesia	English
Bullying words related to animals	- Bangsat - Anjing - Babi - Monyet - Konyuk	- Rascal - Dog - Pig - Monkey - Monkey or stupid
Bullying words related to stupidity and Psychology	- Goblok - Idiot - Geblek - Gila - Tolol - Sarap - Udik - Kampungan	- Stupid - Idiot - Fool - Mental disorder - Stupid - Crazy - Rube - Hick
Bullying words related to disabled persons	- Buta - Budek - Jelek	- Blind - Deaf - Ugly
General Bullying words	- Setan - Iblis - Keparat - Gembel - Brengsek - Sompret - Bajingan	- Satan - Devil - Assh..* - Poor - Bastard - Jeepers - Scoundrel / Bastard
Bullying words related to attitude	- Bejad	- Depraved action

Table 1: The Classification of Indonesian Bullying Words

Overall, the total number of comments downloaded are around 14000 tweets, which specifically contain Indonesian bullying words, and the whole tweet messages that had been analysed. These data were recorded for about a week. The data are saved in Microsoft Excel format and will be recorded in Table 2.

After recording data in Table 2, the next step is preparation of data to be analysed using data mining techniques. This work will analyse posting messages on Twitter. From Table 2, the object to be analysed is the last tweet attribute.

Tweet ID	Location	Follower	Friend	Last Tweet	Last tweet date
36409 4716	Bandung	302	222	Avanya andaiy, avanya mohamad DFDM: <b>sarap</b> (crazy)!! addnan_ch: Oh <b>anjing (dog)</b> <b>goblog (Stupid)</b> fakyu siah <b>monyet</b> ( <b>monkey</b> ), <b>setan</b> ( <b>Satan</b> ), <b>babi (pig)</b> alas <b>bangsat (rascal)</b> shit damn aaaaahhhh an	4/06/20 13 14:35
50039 8381	Bekasi	148	179	baju lu beresin gak <b>anjing</b> lu, <b>bangsat, monyet</b> , ta i, sialan, gua bilangin mama. gini nihh lagi emosi, semua gua lempar ke ade	4/06/20 13 14:17

Table 2: Example Data in Excel Format

The data from Table 2 will be transformed into data repositories in Rapid Miner software. After transforming the data, we change the type of attribute of the last tweet into text because all attributes have been changed to be polynomial automatically in Rapid Miner.

### 3.2 Processing Data Using Rapid Miner

The next step is the preparation of the processing document. First, we design a processing document from the retrieved data to be numeric data. The purpose of designing the process document is to navigate processing data through connecting one process to other processes. The design process involves process document operator generating data from repositories using Rapid Miner Software. Rapid Miner has services for data manipulation, calculation and graphical display. Moreover, Rapid Miner also offers a broad range of statistical methods. Rapid Miner allows users to transform the text into a structured representation. Rapid Miner also has functions for managing text documents, manipulating documents and heterogeneous text format. Figure 1 shows the design of processing data from the retrieved data to be words matrix data.

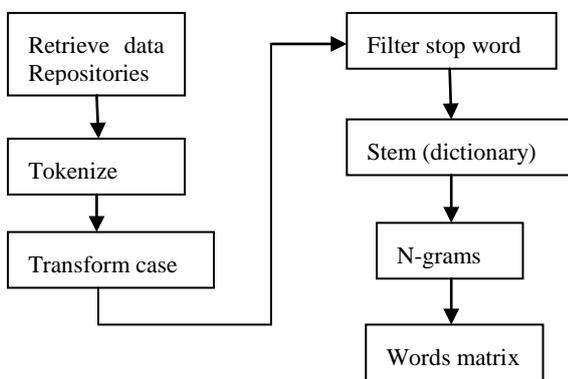


Figure 1. Processing data in Rapid Miner

We set the process document operator by creating word vectors and selecting attributes that will be analysed. We design some programs to filter the text. In this case, we create retrieving data, process document and numerical-to-binominal operators. Therefore, we need to convert all the numerical values to binominal values in order to be scanned at the next step. Every operator connects to each other.

Table 3 shows the example of a processing document using some filters such as tokenize, transform case, and stop word stem dictionary and n-grams. The function of n-grams is to detect two or more bullying words within a message. If a message consists of more than two bullying words, it is detected to be a bullying message. By selecting specific words within a message, the n-gram searches whether or not the event involves both users in applying offensive phrases in their message.

As we can see in table 3, the process cleans up some terms which do not have meaning.

The processing document operator involves some process that is as follows:

Operator	Before	After
Tokenize	Avanya andaiy, avanyaã™RT mohamadDFDM: "sarap!! addnan_ch: Oh anjing goblog fakyu siah monyet setan babi alas bangsat shit damn aaaaahhhh an. (What are you ã™RT mohamadDFDM crazy. Oh, He is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)	Avanya andaiy RT mohamad DFDM sarap addnan ch Oh anjing, goblog fakyu siah monyet, setan, babi alas bangsat shit damn (What are you RT mohamadDFDM addnan ch crazy. Oh, He is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)
Transforming Case	Avanya andaiy RT mohamad DFDM sarap addnan ch Oh anjing goblog fakyu siah monyet setan babi alas bangsat shit damn. (What are you RT mohamadDFDM addnan ch crazy. Oh, He is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)	Avanya andaiy RT mohamad DFDM sarap addnan ch Oh anjing goblog fakyu siah monyet setan babi alas bangsat shit damn (What are you rt mohamadDFDM addnan ch crazy. oh, he is a dog, stupid, fuc. *, monkey, satan, pig as rascal, shit.*)
Filter Stop Word	avanya andaiy rt mohamadDFDM sarap addnan ch oh anjing goblog fakyu siah monyet setan babi alas bangsat shit damn (What are you rt mohamadDFDM addnan ch crazy. Oh, he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)	avanya andaiy mohamad sarap addnan anjing goblog fakyu siah monyet setan babi alas bangsat shit damn (What are you mohamad addnan ch crazy. Oh, he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)
Stem Dictionary	avanya andaiy mohamad sarap addnan anjing goblog fakyu siah monyet setan babi alas bangsat shit damn (What are you mohamad addnan crazy. he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)	apa kamu apa mohamadDFDM sarap ada anjing goblok jancuk siah monyet setan babi ala bangsat shit damn (What are you mohamad crazy. he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)
n-Grams (terms)	apa kamu apa mohamadDFDM sarap ada anjing goblok fakyu siah monyet setan babi ala bangsat shit damn (What are you mohamad crazy. he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)	apa apa_kamu kamu kamu_apa apa apa_mohamadDFDM mohamadDFDM mohamadDFDM_sarap sarap_sarap_ada ada ada_anjing anjing anjing_goblok goblok goblok_jancuk jancuk jancuk_siah siah_siah monyet monyet monyet_setan setan setan_babi babi babi_ala ala ala_bangsat bangsat bangsat_shit shit shit_damn damn (What are you mohamad crazy. he is dog, stupid, fuc.*, monkey, satan, pig as rascal, shit.*)

Table 3: Example Filtering Document

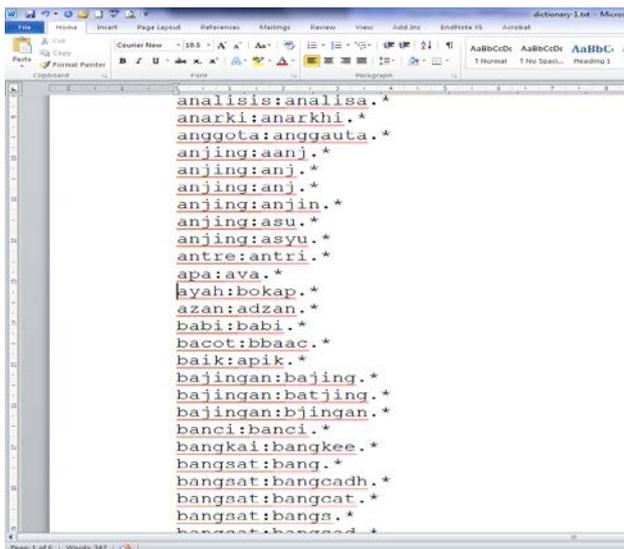
Table 3 illustrates the example of before and after cleaning up tweets and the result is that some unstructured Indonesian bullying words have been cleaned. The example of the clean message can be seen in table 3 in the column after the stem dictionary.

### 3.3 Stem Indonesian Bullying Dictionary

Figure 2 describes the stem dictionary that we developed to clean some Indonesian bullying terms when people sent tweets which may have the same meaning as other terms. For example: the bngt has the same terms and meaning as bangsat.

The stem Indonesian bullying dictionary has the purpose to filter some words which may have the same meaning as Indonesian bullying words. The stem Indonesian bullying dictionary process will transform some unstructured Indonesian bullying words into more structured words because people sent tweets by typing incomplete words. For example, bngt and anj will be replaced to become bangsat and anjing.

To replace some unstructured words in tweets, we create an Indonesian bullying dictionary by typing some Indonesian bullying words in Microsoft Word and save it in text format. For example: anjing:anj.\*; bangsat:bngt.\*. Typing anjing:anj.\* means that all words by typing anj or anji will be replaced to be anjing.



**Figure 2: Creating Stem Indonesian Bullying Dictionary**

Figure 2 shows the stem Indonesian bullying dictionary in text format. The stem dictionary has the function of replacing unstructured Indonesian bullying words with structured words. The resulting stems Indonesian bullying dictionary is shown in Table 3.

The result of the processing document operator is data matrix which is shown in Appendix 1. The data show some Indonesian bullying words which occur in some tweets. For example, “bangsat” (rascal) term occurs in tweets 1,2,3,...., etc.. The 0 means the word not appearing in the tweets, and 1,2,3 mean how many times the word appears in the tweets. Appendix 1 shows the data matrix after generating some operators in the processing document.

The next operator in the processing document is numerical-to-binomial. If the value of an attribute is between the specified minimal and maximal values, it is false, otherwise true. The result of generating this operator is shown in appendix 2.

Data from the matrix will be analysed using data FP-Growth and Association Rule. The data will change into letters representing the real data. The reason to change the real data to letters is that the computation of data mining will read data in letters or numbers. Table 3 describes representing the real data as letters or numbers.

### 3.4 Indonesian Bullying Words in Data Set

In association rule mining, the data which come from tweets will be represented as alphabet in the data set. The purpose of representing Indonesian bullying words in the alphabet is to calculate how often the words occur in the database and to compute how strong the relationship is between words. Representing data in a data set of association rules will be described below.

In association rule *TID* is a set of transactions. In this process, TID represents a set of all tweets posts in a database of Indonesian cyber bullying words.  $I = (a,b,d,c,d,e,\dots,z)$  is a set of items which contain Indonesian bullying words. Let  $A$  be a set of items of Indonesian bullying words. When  $A \subseteq T$ , an implication from  $A \Rightarrow B$  can be called an association rule, where  $A \subseteq I$ ,  $B \subseteq I$ , and  $A \cap B \neq \emptyset$ . In order to obtain a strong relationship between items in an association rule, all itemsets should satisfy the minimum support threshold and minimum confidence threshold as prerequisites in association rule mining. For calculating minimum support and minimum confidence, this work uses the formula given by Han et al. (2012).

$$\text{Support } (A \Rightarrow B) = P(A \cup B)$$

*Confidence*

$$(A \Rightarrow B) = P(B/A) = \frac{\text{support}(A \cup B)}{\text{support}(A)} = \frac{\text{support\_count}(A \cup B)}{\text{support\_count}(A)}$$

Table 4 shows an example of representing bullying words by letter.

Item	Represent
a	Bangsats (rascal)
b	Anjing (dog)
c	Babi (pig)
d	Monyet (monkey)
e	Kunyuks (monkey)
f	Bajingan (scoundrel/bastrad)

**Table 4: Illustrate Set of Item in Data Set**

Table 4 shows the illustrated Indonesian bullying words represented in an alphabet. For example: the letter a represents “bangsat”, b represents “anjing”, etc. The concept association rule is market basket analysis; hence all Indonesian words should be represented in the alphabet. The purpose of representing Indonesian bullying words with the alphabet is to get itemsets patterns in the Indonesian Bullying database.

Tweet ID	Last Tweet
1	a, b, c, d, g, n
2	a, b, d
3	a, b, k
4	a, b, c, d
5	a, b, m, t

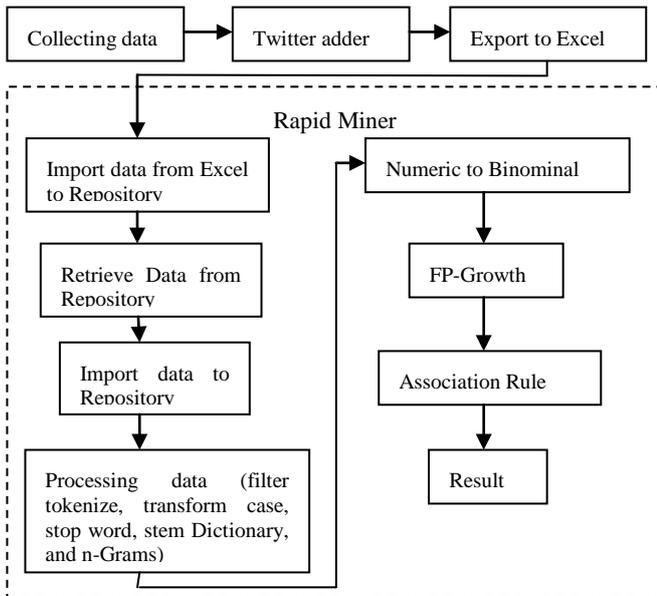
**Table 5: Example Data in Data Set**

Table 5 shows some example data recorded in the database. This means the itemsets that occur in transactional data are tweets which contain bangsat (a), anjing (b), babi (c), monyet (d), goblok (g), and sarap (n).

#### 4 Mining Indonesian Bullying Patterns on Indonesian Twitter Post

Data preparation, collection data from Twitter are the main work in this research. The purpose of analysing message from Twitter is to identify Indonesian bullying words patterns and trends. To achieve this aim, we will make an effort to identify pattern words using text mining technique.

The process of mining Indonesian bullying patterns in Twitter can be seen in figure 3.



**Figure 3. The process analysing Indonesian bullying words from Indonesian Twitter**

This research will use two steps to analyse bullying which occurs on Twitter.

1. First step, we will conduct analysis tweets using FP-growth, in terms of finding frequent patterns itemsets.
2. Second step, we use association rules mining to analyse the strong relationship between a pair of words.

In order to obtain a strong relationship between items, the minimum support threshold is 0.05 and the minimum confidence threshold is 0.95.

##### 4.1 Mining Indonesian Bullying Pattern Using FP-Growth in Rapid Miner

In this section, this work uses FP-Growth to analyse frequent patterns itemsets without generating candidate itemsets (Han, Kamber & Pei 2012). We believe this method to be more efficient compared to Apriori algorithm. The FP - Growth algorithm is an alternative algorithm in data mining used to find frequent itemsets. This approach uses FP-Tree algorithm which encodes the data set into a tree and then extracts the frequent itemsets from this tree.

The construction FP-Tree is divided into several steps.

1. To get support count for each item, scan the data set firstly to find frequent itemsets. Then, abandon the items which are not frequent and then sort the frequent items in decreasing order.
2. To create FP-Tree, scan every transaction from the data set. Every transaction will be read as follows:
  - a. Create a new path if the transaction is a unique transaction form and set the counter for each node to be 1
  - b. Add the common itemsets node counters if the transaction shares a common prefix itemsets then and create new nodes if needed.
3. Continue from first to second steps until each transaction has been mapped onto the tree.

Using the Rapid miner software, the data set will be generated and calculated automatically based on FP-Growth method. After being generated automatically, the frequent itemsets have been found, shown in table 6.

Support Count	Item1	Item 2	Item 3
0.330	bangsat (rascal)		
0.323	anjing (dog)		
0.070	anjing_bangsat		
0.267	bangsat	anjing	
0.054	bangsat	babi (pig)	
0.070	bangsat	anjing_bangsat	
0.081	anjing	babi	
0.070	anjing	anjing_bangsat	
0.052	bangsat	anjing	babi
0.070	bangsat	anjing	anjing_bangsat

**Table 6: The Result after generating FP-Growth in Rapid Miner**

Table 6 describes generated support count in FP-growth. There are frequent itemsets (Indonesian bullying words) which occurred in FP-growth: “bangsat” (rascal) and “anjing” (dog) were dominant in frequent itemsets. This means most Indonesian tweeters use both “bangsat” and “anjing” words to bully someone on Twitter. Moreover, another word such as “bangsat and babi” (pig) also has support count at around 0.054. It means that some Indonesian tweeters use “bangsat” and “babi” words to push other tweeters.

##### 4.2 Mining Indonesian Bullying Pattern Using Association Rule in Rapid Miner

The first method that will be applied in this research is association Rule which is based on market basket analysis. This method is usually applied in supermarkets, grocery stores, or book stores. The purpose of association Rule is to identify the trend items which tend to be purchased together in supermarkets, grocery stores, or book stores. The benefit when the shops have applied this method is receiving information on the kind of items that tend to be purchased together. Moreover, the shops can optimise the layout of items in the store which can potentially increase sales by cross-selling items. When

the association rule is applied to mine text, the text field would become the transaction and the words themselves would become the items.

Using the Rapid miner software, the transaction of itemsets is generated and calculated automatically and the result is shown in table 7. Table 7 shows that the frequent itemsets from transaction in database have been found. “Bangsat” and “anjing” are dominant in frequent itemsets. Meanwhile, “iblis” (devil) and “setan” (satan) have taken the second place after both “bangsat” and “anjing” words. “Bangsat” and “babi” have support count 0.052 and confidence 0.970 with imply “anjing” words. That means that “bangsat” and “babi” words have strong relation with “anjing” words. Furthermore, “iblis” word has support count 0.056 and confidence 0.986 to “setan” word. This means that “iblis” also a strong relation with “setan”.

Premises	Conclusion	Support Count	Confidence
bangsat (rascal), babi (pig)	Anjing (dog)	0.05	0.97
iblis (devil)	setan (satan)	0.05	0.98
anjing_bangsat	bangsat	0.07	1.0
anjing_bangsat	anjing	0.07	1.0
anjing_bangsat	bangsat, anjing	0.07	1.0
bangsat, anjing_bangsat	anjing	0.07	1.0
anjing, anjing_bangsat	bangsat	0.07	1.0

**Table 7: The Result after Generating Association Rule in Rapid Miner**

When we are looking at the result in table 7, it can take the point of view that most Indonesian tweeter use “bangsat (rascal)”, “ anjing (dog)”, “iblis (devil)”, and “setan (satan)” words to bully someone on social media especially on Twitter. The bullying occurs when people send tweets to others by sending two Indonesian bullying words such as “bangsat” and “anjing” or “iblis” and “setan”.

The reasons perpetrators were sending tweets using Indonesian bullying words on Twitter are follows:

1. They have expressed their emotion because the victims may have a bad attitude which may influence another person.
2. They have a purpose to harass or abuse someone by sending the bullying message.
3. They were following other tweeters in bullying someone.

Appendix 3 shows the relationship between Indonesian bullying words in a graph. “Bangsat and “anjing” words have strong relation with satisfying *support\_count* and *confidence*. Meanwhile, “iblis (devil)” and “setan (satan)” words also have satisfied the support count and confidence. Nevertheless, “bangsat” and “anjing” do not have relation with “iblis” and “setan” words.

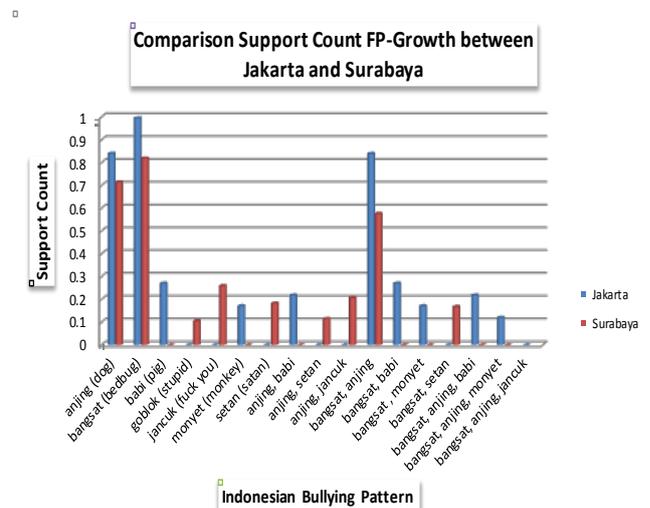
### 4.3 Comparison Indonesian Bullying Pattern between in Jakarta and Surabaya cities

Indonesia has many islands which spread from Sabang to West Papua Island, about 13.000 Islands (Maruli 2010).

Hence, this work will try a comparison between two regions in Indonesia which make a high percentage contribution to bullying in Indonesian Twitter. This work will analyse the cities of Jakarta and Surabaya because both cities are among the biggest cities of Indonesia. Many Indonesian people who come from rural areas move to Jakarta and Surabaya. Therefore, Jakarta and Surabaya have a lot of communities which tend to interact with each other.

To examine the Indonesian bullying pattern in Jakarta and Surabaya regions, both FP-Growth and Association Rule will be used. The purpose of this is to compare two locations which contribute Indonesian bullying words on Twitter. The comparison between Jakarta and Surabaya will be described clearly in this work.

The first technique to identify the Indonesian bullying pattern in Jakarta and Surabaya is FP-Growth. Using the rapid miner software, the result after generating FP-Growth algorithm is as follows:



**Figure 4: Comparison Support Count in FP-Growth between Jakarta and Surabaya**

Figure 4 shows the comparison support\_count in FP-Growth between Jakarta and Surabaya. We find the trend in Indonesian bullying patterns in Jakarta after generating it in FP-Growth. The “bangsat”, and “anjing” terms are the most popular bullying patterns which occur in Jakarta. This means most tweeters from Jakarta used “anjing ” and “bangsat” terms to bully someone on Twitter. Moreover, “bangsat” has a big support count at around 0.9 and “anjing” has support count at about 0.8. When we look at “bangsat” and “anjing, the support count is more than 0.8. This means that the frequency patterns in Jakarta are “bangsat” and “anjing”.

When we compare this to Surabaya in figure 4, we also find the trend of Indonesian bullying patterns in Surabaya after generating in FP-Growth. The “bangsat” and “anjing” are popular bullying terms in Surabaya. The frequent patterns of Indonesian bullying patterns in Surabaya are similar to Jakarta. The “bangsat” and “anjing” terms have a big support count. This means the tweeters in Surabaya use “bangsat” and “anjing” to bully someone on Twitter.

The differences in bullying patterns between tweeter in Jakarta and Surabaya are as follows:

1. There are other Indonesian bullying patterns in Jakarta such as “babi”, which has support count at around 0.25 and “monyet”, which has support count at about 0.15.
2. Others Indonesian bullying patterns in Surabaya are “goblok”, “jancuk”, and “setan”. “Goblok” has support count at about 0.1, “jancuk” has support count at around 0.25, and “setan” has support count at about 0.18.

Another technique that will be used is Association Rule. The Association rule technique will identify how strong the relationship is between Indonesian bullying words.

Premises	Conclusion	Jakarta		Surabaya	
		Support Count	Confidence	Support Count	Confidence
anjing (dog)	bangsat (rascal)	-	-	0.576	0.807
bajingan (scoundrel)	bangsat	-	-	0.102	0.922
bangsat	anjing	0.246	0.803	-	-
babi (pig)	anjing	0.218	0.808	-	-
setan (satan)	anjing	0.077	0.852	-	-
monyet	bangsat	0.171	1	-	-
setan	bangsat	0.090	1	0.168	0.926
babi	bangsat, anjing	0.218	0.808	-	-
bangsat, babi	anjing	0.218	0.808	-	-
setan	bangsat, anjing	0.077	0.852	-	-
bangsat, setan,	anjing	0.077	0.852	-	-
babi, monyet (monkey)	anjing	0.073	0.885	-	-
babi, monyet,	bangsat, anjing	0.073	0.885	-	-
anjing, babi,	bangsat	0.218	1	-	-
anjing, monyet,	bangsat	0.119	1	0.051	0.805
anjing, setan,	bangsat	-	-	0.113	0.991

**Table 8: Comparison between Jakarta and Surabaya after Generating Association Rule**

The results of the comparison after generating association rule between Jakarta and Surabaya are shown in table 8. In Jakarta, the combination two and three Indonesian bullying words that have great support count and confidence calculation are “monyet (monkey)” and “bangsat (rascal)”; “setan (satan)” and “bangsat”; “anjing (dog)”, “babi (pig)”, and “bangsat”; “anjing”, “monyet” and “bangsat”. This means that the strong rule of the Indonesian bullying words in Jakarta are “monyet” and “bangsat”; “setan” and “bangsat”; “anjing”, “babi”, and “bangsat”; “anjing”, “monyet” and “bangsat”.

When we compare this to Surabaya, the combination two and three Indonesian bullying words which have great support count and confidence calculation are “bajingan” and “bangsat”; “setan” and “bangsat”; “anjing”, “setan”

and”bangsat”. This means that the strong rule of the Indonesian bullying words in Surabaya is “bajingan” and “bangsat”; “setan” and “bangsat”; “anjing”, “setan” and”bangsat”.

Words with similar calculation support count and confidence for Indonesian bullying words between Jakarta and Surabaya after generating association rule are the “setan” “bangsat”; “anjing “, “monyet” and “bangsat” words. This means that the words have strong rule.

When we look at the result, the trend of Indonesian bullying words is “bangsat” and “anjing”. This trend illustrates that bullying through technology media has become a new phenomenon in modern life. People can send messages easily with anonymity to embarrass someone they do not like.

Moreover, all the trends of Indonesian bullying patterns both in Jakarta and Surabaya have important information for people who are interested in cyber bullying, especially in Indonesia. The trend of Indonesian bullying patterns also supports information for the Indonesian government to develop software for detecting offensive messages which contain Indonesian bullying words on Twitter. This result shows the real data Indonesian cyber bullying on Twitter, which can support the Indonesian government in enforcing Indonesian communication law.

Additionally, the trend of Indonesian bullying patterns on Twitter can be associated with social anxiety. Perpetrators send offensive messages on Twitter which can affect the victims whereby they feel unsafe, become unwell and anxious. In this situation, the victims are experiencing a social anxiety. The social anxiety is a potential cause of the victims feeling shyness, anxiety disorders, other emotional and temperamental factors. The victims feel discomfort and fear when they interact with other people in social media involving the perpetrators judging and evaluating them.

The social anxiety can be related to the self-esteem of the victims. The perpetrator will evaluate the victims based on the qualities they possess. The victims with low self-esteem tend to focus on their own weaknesses rather than focusing on their strengths. This will have a huge impact on their psychological well-being and their actions, thus leading to disorders like social anxiety.

The trend of Indonesian bullying patterns visualises that the perpetrators have a social attitude problem in which they always feel superior to the victims. They also invite their friends and other followers to be involved in the bullying.

## 5 Conclusion

In this study, we investigate the Indonesian bullying pattern which exists in Indonesian Twitter posts. Specifically, we propose the stem Indonesian dictionary to identify Indonesian bullying words in Twitter Posts, and further, to analyse the relationship between Indonesian bullying words. Our research has several contributions. First, we practically conceptualize the Indonesian lexicon bullying words and further detect Indonesian bullying word. Second, we analysed the Indonesian bullying words using Association Rule and FP-Growth to find trends and patterns of Indonesian

bullying words in Indonesian Twitter. Experimental results show that the stem Indonesian dictionary in Rapid Miner satisfies the identification of some Indonesian bullying words in Indonesian Twitter posts. Moreover, this research used Association Rule and FP-Growth techniques in Rapid Miner Software to find frequent Indonesian bullying patterns which were transformed into itemsets. The results after generating the data from repositories have shown that the trend in Indonesian bullying patterns which occurred in Indonesian Twitter posts after being generated were “bangsat”, “anjing”, “iblis”, and “setan”. Furthermore, the result of finding Indonesian bullying patterns in Jakarta and Surabaya is quite similar. Both “bangsat” and “anjing” terms are the most popular used by tweeters who live in Jakarta and Surabaya.

In addition, after generating data from the repository, both techniques, FP-Growth and Association Rule, has similar results. It means both techniques actually have powerful calculation able to find frequent itemsets which appeared in the database.

In conclusion, this research will mine deeply the Indonesian bullying words using clustering techniques to cluster and Naïve Bayes to classify some Indonesian bullying words. In the future, this research will be developed to detect and to predict what kind of Indonesian bullying patterns will occur on Twitter.

## 6 References

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Appendix 1  
Data Matrix

Result Overview WordList (Process Documents from Data) ExampleSet (Process Documents from Data)

Meta Data View **Data View** Plot View Advanced Charts Annotations

ExampleSet (14977 examples, 1 special attribute, 45049 regular attributes)

Row No.	text	a	a_bangsats	a_di	a_didagoan	a_dovei	a_ga	a_ka	a_kalah	a_ko
1	lasttweet	0	0	0	0	0	0	0	0	0
2	apa apa_kar	0	0	0	0	0	0	0	0	0
3	gila gila_gila	0	0	0	0	0	0	0	0	0
4	sarap sarap_	0	0	0	0	0	0	0	0	0
5	cageur cage	0	0	0	0	0	0	0	0	0
6	bangsat ban	0	0	0	0	0	0	0	0	0
7	baju baju_k	0	0	0	0	0	0	0	0	0
8	garyavg gar	0	0	0	0	0	0	0	0	0
9	sok sok_	0	0	0	0	0	0	0	0	0
10	rt rt_alvinfat	0	0	0	0	0	0	0	0	0

Appendix 2  
Numeric to Binominal

Result Overview ExampleSet (Numerical to Binominal)

Meta Data View **Data View** Plot View Advanced Charts Annotations

ExampleSet (14977 examples, 1 special attribute, 45049 regular attributes)

Row No.	text	a	a_bangsats	a_di	a_didagoan	a_dovei	a_ga	a_ka	a_kalah	a_ko
1	lasttweet	false	false	false	false	false	false	false	false	false
2	apa apa_kar	false	false	false	false	false	false	false	false	false
3	gila gila_gila	false	false	false	false	false	false	false	false	false
4	sarap sarap_	false	false	false	false	false	false	false	false	false
5	cageur cage	false	false	false	false	false	false	false	false	false
6	bangsat ban	false	false	false	false	false	false	false	false	false
7	baju baju_k	false	false	false	false	false	false	false	false	false
8	garyavg gar	false	false	false	false	false	false	false	false	false
9	sok sok_	false	false	false	false	false	false	false	false	false
10	rt rt_alvinfat	false	false	false	false	false	false	false	false	false

Appendix 3  
Association Rule in Graph

