ANALYSIS OF INTER-RELIGIOUS TOLERANCE SENTIMENTS IN INDONESIA ON CONVERSATIONS ON SOCIAL MEDIA TWITTER

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Abstract — *Conversations on social media Twitter related to tolerance among religious communities in Indonesia are fascinating. However, it is a sensitive issue. In reality, there is often a war of comments about the implementation of tolerance between religious people in carrying out their own beliefs. The community is not careful in issuing opinions that can result in social insecurity, insecurity, and national instability. This condition will significantly affect the state of the country's economy. In some cases, political problems can be a trigger for intolerance between religious communities. The purpose of this study is to compare the performance of classification accuracy on positive or negative sentiments from conversations that intersect with the problem of tolerance among religious communities during the past year. In this study, we compared the performance of the accuracy of the modeling of sentiment analysis classification on public conversations on social media Twitter related to tolerance between religious communities in Indonesia. Because the text that will be carried out modeling comes from the Indonesian language, to facilitate labeling, translation is carried out into English, then a performance comparison of the sentiment analysis classification modeling with SVM algorithm, Naïve Bayes, Decision Tree, and k-NN. Based on the experiments, it was concluded that the SVM algorithm has the highest performance for the classification of sentiment analysis categories up to 65.03% compared to the Naïve Bayes algorithm, which reached 59.92%, Decision Tree, which reached 63.52% and k-NN which reached 57 66%.*

Keywords: Twitter, Tolerance, Religion, Communities, Indonesia.

Abstrak — Percakapan pada media sosial twitter yang berkaitan dengan toleransi antar umat beragama di Indonesia menarik untuk diteliti, walau merupakan isu yang sensitif namun kenyataannya pada percakapan di media sosial sering terjadi perang komentar terkait pelaksanaan toleransi antar umat beragama dalam menjalankan keyakinannya masing-masing, padahal jika masyarakat tidak berhati-hati dalam mengeluarkan opini dapat berakibat terjadinya kerawanan sosial, ketidakamanan dan instabilitas nasional, jika hal tersebut sampai terjadi maka akan sangat berpengaruh terhadap kondisi perekonomian negara, pada beberapa kasus persoalan politik dapat menjadi pemicu terjadinya intoleransi antar umat beragama. Tujuan dari penelitian ini untuk membandingkan kinerja akurasi klasifikasi terhadap sentimen positif atau negatif dari percakapan yang yang bersinggungan dengan masalah toleransi antar umat beragama sepanjang satu tahun terakhir. Dalam penelitian ini kami membandingkan kinerja akurasi dari pemodelan klasifikasi analisis sentimen terhadap percakapan masyarakat pada media sosial twitter terkait toleransi antar umat beragama di Indonesia. Karena teks yang akan dilakukan pemodelan berasal dari bahasa Indonesia, untuk mempermudah pelabelan maka dilakukan penerjemahan kedalam bahasa inggris, kemudian dilakukan perbandingan kinerja pemodelan klasifikasi analisis sentimen dengan algortima SVM, Naïve Bayes, Decision Tree dan k-NN. Berdasarkan eksperiman yang dilakukan diambil kesimpulan bahwa algoritma SVM memiliki kinerja tertinggi untuk klasifikasi kategori sentiment analisis hingga mencapai 65,03% dibandingkan dengan algoritma Naïve Bayes yang mencapai 59,92%, Decision Tree yang mencapai 63,52% dan k-NN yang mencapai 57,66%.

Kata Kunci: Twitter, Toleransi, Umat, Beragama, Indonesia.

INTRODUCTION

As one of the pillars of upholding the Negara Kesatuan Republik Indonesia, tolerance among religious communities is a necessity in the life of the nation and state consisting of various ethnicities, religions, races and skin colors. In the last few years, in the era of social media, religious tolerance in Indonesia can be said to be in quite a poor condition (Irham, 2017).

The phenomenon of social media as a means of delivering opinions publicly in cyberspace contributes significant influence in the delivery of hoax news (Hoax), which has the potential to be a cause of intolerance between religious communities (Pakpahan, 2017). Suppose the community is not smart enough to utilize social media to deliver opinions on the public. In that case, it has the potential to cause information uncertainty and turmoil in the real world society (Budiman, 2017).

In this decade, the conversation of cyber society is carried out on social media, and one of the most popular and significant roles in political, economic, and social life is Twitter (Olofinlua, 2019). Twitter-based microblogging provides users with facilities to send a short message with a maximum of 140 characters (tweet). Tweets can consist of text and photo. Through tweets, Twitter users can share information and opinions related to information with other Twitter users. Tweets that contain opinions, emotions, and sentiments are data that can be analyzed and can be used as material for analyzing a particular topic or trend that occurs on Twitter. Every tweet from Twitter users is data that can be analyzed, one of which is sentiment analysis. Sentiment analysis is an approach used to measure perceptions computationally (Sarlan et al., 2015).

The purpose of this study is to compare the classification performance of positive and negative sentiments analysis of the chatter of cyber citizens associated with issues of tolerance between religious communities in Indonesia based on the Support Vector Machine (SVM) algorithm, Naïve Bayes, Decision Tree and K-Nearest Neighbor (k-NN)**.**

As a reference, (Song et al., 2017) sentiment analysis of novels can be done by calculating the weight of positive and negative words and eliminating words that are unimportant in selecting features. It can produce the highest accuracy using Multinomial Naïve Bayes (MNB) compared to Multivariate Bernoulli Naïve Bayes (BNB). Meanwhile, according to research. (Septian et al., 2017) simplifying text articles into essential words in each word with the Nazief-Andriani Stemming method with classification using Naïve Bayes is proven to produce high accuracy. While (Ipmawati et al., 2017) in his research compared the accuracy performance of the SVM classification algorithm, Naïve Bayesian and K-NN, using two different datasets, namely IMDb movie review and sentiment analysis on twitter, found that SVM obtained the best results with an accuracy of 78.55 %. Whereas (Muthia, 2018) the research on tour planning including tourism products and hotels to be selected, information from social media, blogs and websites, found that the best accuracy performance with the Decision Tree algorithm reached 96.94% and the highest compared to other classification algorithms such as Naïve Bayes, Support Vector Machine, Decision Tree (C4.5) and Naïve Bayes Method with Particle Swarm Optimization Feature Selection. Furthermore, (Hayuningtyas & Sari, 2019) who conducted research related to Taman Mini Indonesia Indah information found that the performance of the classification accuracy combination of Naïve Bayes and PSO achieved the highest accuracy performance reaching 94.02%. The result is higher than using the Naïve Bayes classification without PSO, which only reached an accuracy level of 70%.

Based on the literature that has been studied, it can be concluded that for sentiment classification modeling analysis with positive and negative (binomial) class attributes can use the SVM algorithm, Naïve Bayes, Decision Tree, and k-NN, while the level of accuracy depends on the pre-processing of data carried out.

MATERIALS AND METHODS

The following are the steps on data gathering:
1. Data Collection
   Data collection is done through web scrapping data from Twitter. Web scraping is a process used to extract data from the desired website by directly accessing the World Wide Web with the help of HTTP, or through a web browser (Jain et al., 2019). Web Scrapping is used to convert unstructured data on the web into structured data stored and analyzed in a database or spreadsheet (Sirisuriya, 2015).
2. Pre-Processed Text
   After the tweet has been successfully extracted, the following text processing steps are conducted as follows:
   a) Translate Text to English
   b) Eliminating common words that have no meaning or Stop-words (Fauzi et al., 2019)
   c) Remove the URL
   d) Tokenization: Regexp (the process of dividing text that can be in the form of sentences, paragraphs, or documents, into certain tokens/parts)
   e) Eliminate @ Annotation Text
   f) Stemming words (mapping and decomposing word to form the essential words)
   g) Erase repetitive lines of text
3. SVM Algorithm
   SVM is used to solve both linear and non-linear classification and regression problems. SVM has a better mathematical concept than other classification techniques (Ahmad et al., 2017).

4. Naïve Bayes Algorithm

   Naïve Bayes is used to solving classification problems with the probability and statistical methods proposed by the English scientist Thomas Bayes. Based on data that existed in the past, the Naive Bayes Algorithm can predict the opportunities or possibilities that will occur in the future (Buani, 2016).

5. Decision Tree Algorithm

   Decision Tree is used to solve classification problems by dividing data into subsets based on input variables. Decision Tree is a type of flow chart that helps in the decision-making process (Adnan et al., 2019).

6. Modeling with Algoritma k-NN Algorithm

   k-NN is used to solve the classification problem based on learning data that is the closest distance to the object. Learning data are projected into multi-dimensional space, where each dimension represents the features of the data(Dey et al., 2016).

7. Cross-validation

   Data Resampling 10 Fold Cross-validation is used to set parameters of the model and predict errors in modeling.

The experiment steps carried out during the study are described in Figure 1.
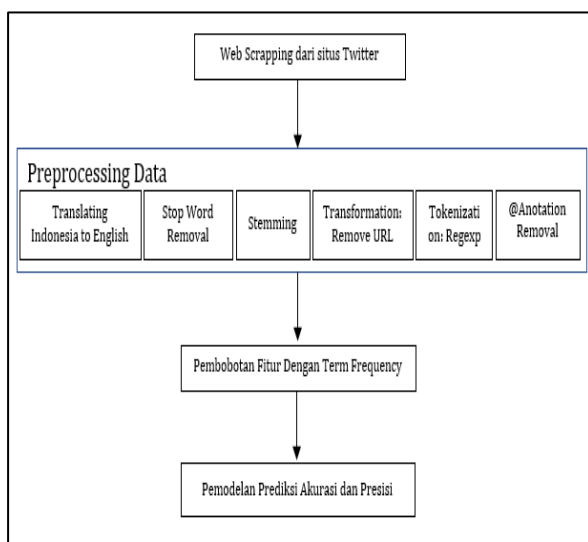
Source: (Pribadi et al., 2020)

Picture 1 The experiment steps

Figure 1 is an overview of the entire research process starting from data extraction, data pre-processing, to modeling.

RESULTS AND DISCUSSION

The process of collecting data through data extraction from January 1, 2019, to March 31, 2020, through Twitter scrapping for 1000 tweets with the output file type .csv using Python command is as follows:

twitter scraper "toleransi antar umat beragama" --output toleransi.csv --limit 1000 --begin date 2019-01-01 --end date 2020-04-30 –CSV.

After the tweet text is successfully obtained, the next step is to translate the entire Indonesian tweet text into English using the google trans library in Python, as shown in table 1.

Table 1. First 10 Data Result Twitter Scrapping and Translation

No	Teks
1	"Acquire Science Samai country to China" Maybe it is a picture of the importance of science to be mandatory for smua Muslims .. No matter until any away and never
2	"Helping God ??"
3	"I hope the whole world his good deeds accepted by Allah." This section rather not funny bapak.saya ndak know what is your religion, but the sacrifice of Jesus on the cross is not becandaan.ada can dijadiin joke but everything has its limits.
4	"If you want to master a fool, then wrap everything in vanity with the packaging of religion" pic.twitter.com/bls39R8kTC
5	"They" are in a race to be the truth at every stage berlebel religion. Ujungujungnya yes for looking at the political stage, alternating left and right silent, holy, pagan, bla..bla .. May 2020 destroyed that kind of person!
6	"When you see that everyone is looking for a rise of religions and water the earth began to flare up then get up, watch and understand with absolutely convinced that heavy rain from the sky has fallen, and there has been rain upon the hearts of one's inspiration" Filsafa
7	# Not Paying Workers Wage Workers will is the Enemy of God in the day of judgment a fair and beautiful religion also teaches us to fulfill the labor rights of workers and employees as soon as possible in accordance with the agreement fulfilled a Do ... https://www.facebook.com/ 100000638311229 / posts / 2231623510202238 /
8	#IjtimaUlamaDukungPrabowoDanSandi Honesty is the key to success .. @prabowo @sandiuno Time People united .. #IjtimaUlamaDukungPrabowoDanSandi
9	#rakyat intelligent # mngatakan #kitab Currently growled rocky sacred fiction ,, then mncul pngakuan himself #akalnya morbidly ill ,, aka The Muslim bg sngat mnyakit right ,, rhmt Allah (the Quran) which in the form of tips, warnings, dn history lesson dn mankind was the fact ,, ,, disbut Fiction
10	& Calendar + + ga dapet interfaith blessing = triple kill https://twitter.com/xxrensptr/status/11257695 47183607808

Source: (Pribadi et al., 2020)

Using the VADER library in Python, the tweet text that has been translated into English is labeled positive and negative. Like table 2 below.

Table 2. First 10 Data Result of Sentiment Labeling

No	Teks	Status
1	antum would let sound Muslims who are concerned with the dignity and nobility of his religion MUI allowed to evaporate Is there no figure better able to sit in the esteemed Majlis so that people like Naen should be allowed	Positive
2	cleric lectures continue mu mu and control people but if a fire in a neighboring rmh greater SDH will creep into our rmh we are forced to help extinguish that all ustat safe certainly understand is forgiveness from GOD almighty segala2nya not human	Positive
3	growing steadily converted before 25th	Positive
4	mbah life is still like nyebarin hoax the same embarrassment cloak and mouth hag shouted politicizing religion MUI how can you accept it	Positive
5	Not Paying Workers Wage Workers will is the Enemy of God in the day of judgment a fair and beautiful religion also teaches us to fulfill the labor rights of workers and employees as soon as possible in with the agreement fulfilled a Do	Positive
6	should not already held elections if you sided with the camp 01 Ngerugiin whole people is useless so the Commission but life's not fair at all, to be honest all the same ga membohongin Hopefully people can karma	Positive
7	This danger The religious life of a country depends on who its leader Do not let the religious scholars who ruler gini models can justify any means with Ayat2 duh	Negative
8	Acquire Science Samai country to China Maybe it is a picture of the importance of science to be mandatory for smua Muslims No matter until any away and never	Positive
9	Helping God	Positive
10	I hope the whole world his good deeds accepted by Allah This section rather not funny bapaksaya ndak know what is your religion but the sacrifice of Jesus on the cross is not becandaanada can dijadiin joke but everything has its limits	Positive

Source: (Pribadi et al., 2020)

The modeling steps taken are as follows:

1. Classification Modeling using RapidMiner.
   Figure 2 is a series of the whole process of classifying sentiment analysis of the tolerance dataset.
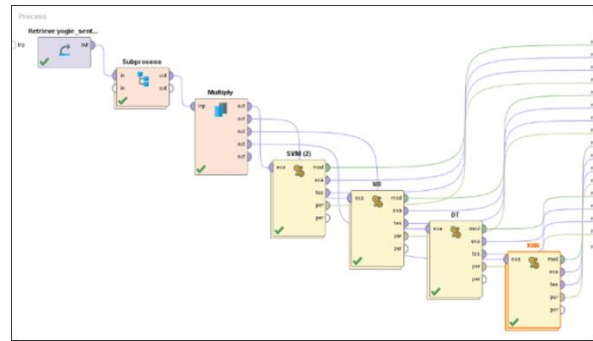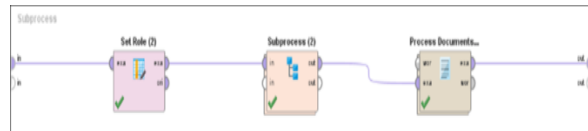

Source: (Pribadi et al., 2020)
Picture 2. Classification Modelling

2. Pre Data Processing
   Figure 3 is a subprocess of the classification process series from Figure 2, which contains pre data processing steps such as tokenization, stop word filtering and word stemming.

Source: (Pribadi et al., 2020)
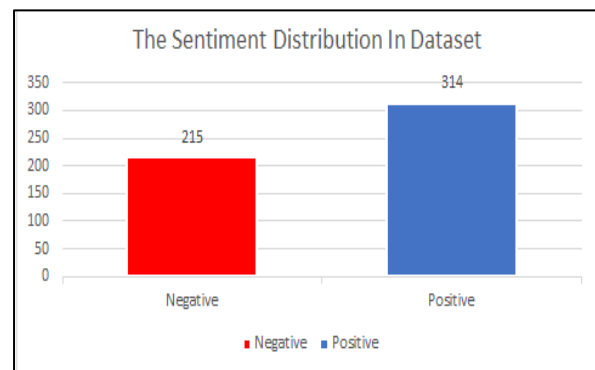Picture 3. Sub Process

Figure 4 is the pre-processing data step which is a detailed process of Figure 3.
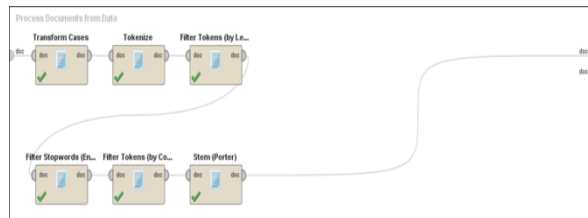
Source: (Pribadi et al., 2020)
Picture 4. Data Cleansing

After pre-processing the text then it is known that the sentiment distribution in the dataset can be seen in Figure 5.

Source: (Pribadi et al., 2020)
Picture 5. The Sentiment Distribution In Dataset
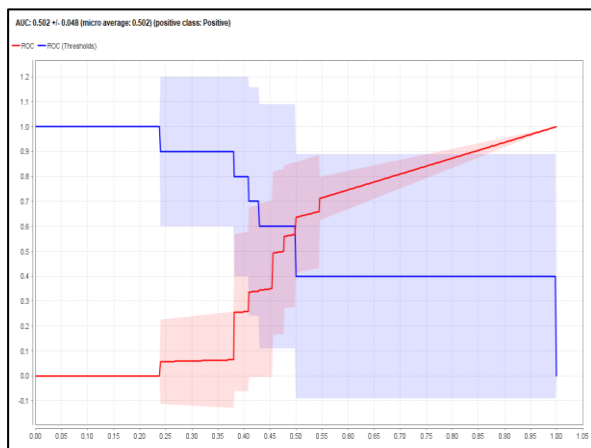
3. Modeling with Naïve Bayes Algorithm
    The results of classification modeling with the Naïve Bayes algorithm obtained the reports on the accuracy, precision, recall, and AUC, as shown in table 3.

Table 3 Naïve Bayes Algorithm Performance

Accuracy	59,92%
precision	67,96%
recall	61,46%
AUC	0,502

Source: (Pribadi et al., 2020)

The accuracy performance of the Naïve Bayes algorithm classification modeling reaches 0.502, as shown in Figure 6.

Source: (Pribadi et al., 2020)
Picture 6. AUC (accuracy performance) Naïve Bayes

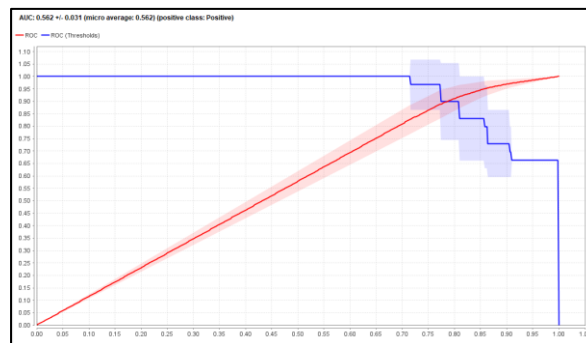4. Modeling with the Decision Tree Algorithm
    The results of classification modeling with the Decision Tree algorithm obtained the report on the accuracy, precision, recall, and AUC, as shown in table 4.

Table 4. Decision Tree Algorithm Performance

Accuracy	63,52%
precision	62,68%
recall	95,22%
AUC	0,562

Source: (Pribadi et al., 2020)

The accuracy performance of the Decision Tree classification modeling reaches 0.562, as shown in Figure 7.

Source: (Pribadi et al., 2020)
Picture 7. AUC (accuracy performance)Decision Tree
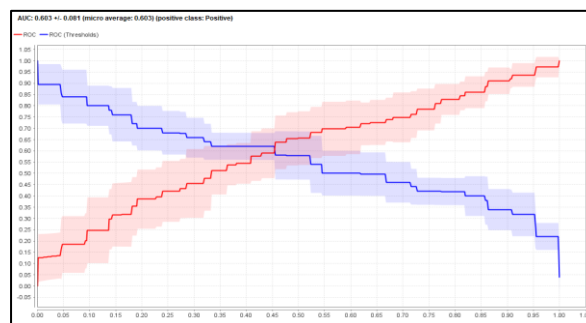
5. Modeling with k-NN Algorithm
    The results of classification modeling with the k-NN Algorithm obtained the report on the accuracy, precision, recall, and AUC, as shown in table 5.

Table 5 Performance k-NN Algorithm

Accuracy	57,66%
precision	62,93%
recall	69,75%
AUC	0,603

Source: (Pribadi et al., 2020)

The accuracy performance of the k-NN classification modeling reaches 0.603, as shown in Figure 8.

Source: (Pribadi et al., 2020)
Picture 8. AUC (accuracy performance) k-NN

6. Modeling with SVM Algorithm
    The results of classification modeling with the SVM algorithm obtained the reports on the accuracy, precision, recall, and AUC, as shown in table 6.

Table 6 SVM Algorithm Performance

Accuracy	65,03%
precision	63,30%
recall	97,77%
AUC	0,745

Source: (Pribadi et al., 2020)

The accuracy performance of the SVM classification modeling reaches 0.745 as shown in Figure 9.
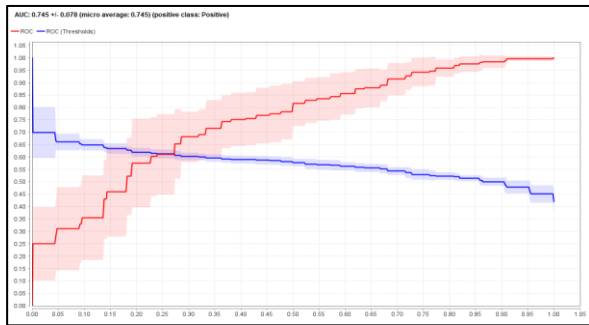
Source: (Pribadi et al., 2020)

Picture 9. AUC (accuracy performance) SVM

7. Area Under Curve (AUC)

AUC, as shown in Figures 6, 7, 8, and 9 is the effective value of the algorithm performance accuracy, an algorithm that has an AUC value above 0.6 can be considered to have a reasonably effective performance. Based on these hypotheses, the SVM algorithm provides the most effective performance accuracy compared to other algorithms with an average value of 0.745.

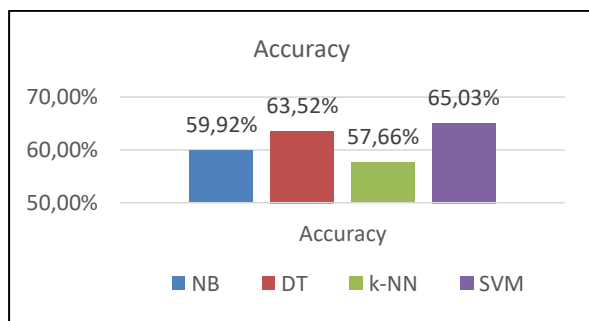8. Performance Comparison of Accuracy, Precision, and Recall

The results of classification modeling using the Naïve Bayes algorithm, Decision Tree, k-NN, and SVM, obtained a comparison of Accuracy, Precision, and Recall, as shown in table 7.

Table 7. Performance Comparison of Accuracy, Precision, and Recall on Each Algorithm

| Kinerja	NB	DT	k-NN	SVM
Accuracy	59,92%	63,52%	57,66%	65,03%
Precision	67,96%	62,68%	62,93%	63,30%
Recall	61,46%	95,22%	69,75%	97,77%

Source: (Pribadi et al., 2020)

The highest accuracy performance of the SVM algorithm is 65.03%, as shown in Figure 10.

Source: (Pribadi et al., 2020)

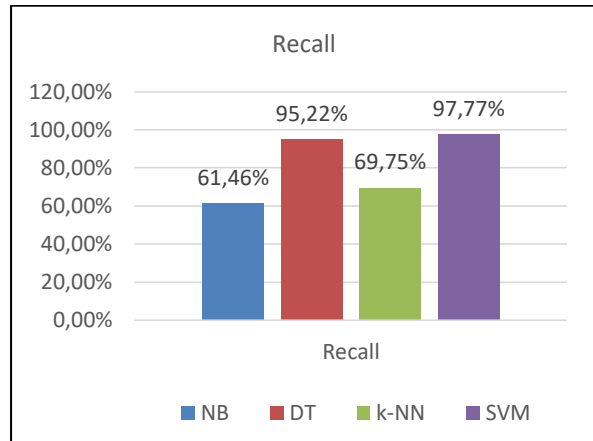Picture 10. Comparison of Accuracy Performance

The highest precision performance of the Naïve Bayes algorithm is 67.96%, as shown in Figure 11.
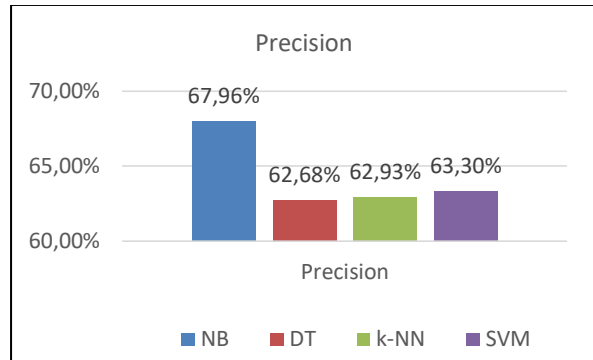
Source: (Pribadi et al., 2020)

Picture 11. Comparison of Precision Performance

The highest recall performance of the SVM algorithm is 97.77%, as shown in Figure 12.

Source: (Pribadi et al., 2020)

Picture 12. Comparison of Recall Performance

CONCLUSION

Based on research conducted using the dataset of tolerance among religious communities taken from tweets on Twitter from 2019 to 2020, it can be concluded that the SVM algorithm has a better performance compared to the Naïve Bayes algorithm, k-NN, and Decision Tree. The SVM algorithm is better in terms of accuracy, recall, and AUC values are 65.03%, 97.77%, and 0.745, respectively. Whereas in terms of precision performance metrics, the Naïve Bayes algorithm has a better performance compared to the SVM, k-NN, and Decision Tree algorithms with a precision value of 67.96%.

To improve algorithm performance, the data pre-processing step is the essential thing that needs to have further improvement.

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