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Machine Learning on Opinion Mining of Netizen's Hate Speech

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Abstract

Netizen comments written in an online news portal through social media platforms, one of which is Instagram, can be used as material in the sentiment analysis process, which can be classified into positive, negative, or neutral sentiments. Sentiment analysis is part of the study of text mining, the science of discovering unknown knowledge by automatically extracting information from large volumes of unstructured text into useful information. The resulting information is in the form of sentiment towards a topic, whether it tends to be positive, negative, or neutral. The classification method used in this research is Support Vector Machine (SVM) and TF-IDF data weighting to classify text. Stages to perform data analysis are pre-processing to clean data, word weighting, labeling data into positive, negative, or neutral classes, and classifying and visualizing data with graphs. Accuracy tests using 70:30 split data showed that the accuracy reached 98%. Tests with 80:20 and 90:10 split data also showed high accuracy of 98% and 99%.

A. Introduction

Based on the survey results of the Indonesian Internet Service Providers Association (APJII), internet users in Indonesia have reached 210 million people, with an internet penetration rate of 77.02%. This marks a significant increase compared to previous years, with a penetration rate of 64.80% in 2018 and 73.70% in 2019-2020. The rapid development of Internet technology has now given rise to many types of social media. Social media is a medium used by its users to exchange information and network via the internet. There are so many benefits of social media, some of the uses of social media are knowing sports information, business, tourism, and also for political affairs (Mahawardana, Imawati, and Dika 2022) (Iskandar Mulyana and Lutfianti 2023). This is also supported by developments in mobile phone technology so social media has become very popular because of its ease of communication (Putri Nur Lyrawati 2023)(Kowsari et al. 2019). Currently, the development of social media has entered the world of journalism where many online news portals have emerged. An online news portal is one of the press media that presents news, articles and features online (Anam et al. 2021). The development of online news portals in Indonesia is directly proportional to the development of audience development in the search for information sources (Arifin 2013).

Online news portals present news not only through websites and apps but also through social media platforms. These social media sites include Instagram, Facebook, Twitter, and YouTube. The current form of journalism also follows this trend to attract a wider audience. Digital platforms on online news portals enable audience involvement in the journalistic process. (Woro Harkandi Kencana, 2022). One of the social media applications that is widely used by the public is the Instagram application(Hashida, Tamura, and Sakai 2018). The Instagram application is often used as an efficient and effective means of campaigning, promoting, and socializing policies. In Instagram social media posts, there are many comments given by readers, so that they can generate public opinion in the form of both positive and negative comments (Fahlevvi 2022).

Based on the comments sent, a picture of public opinion can be seen, and then it will be extracted into structured information data to find out the polarity of an opinion and whether it is included in the positive, neutral, or negative classification (Wandani, Fauziah, and Andrianingsih 2021) (Darwis, Pratiwi, and Pasaribu 2020). The method that can be used for data to become structured information is the use of sentiment analysis, which is part of text mining (Alkaff et al. 2023). Text Mining is the process of discovering unknown knowledge through automatic extraction of information from large volumes of unstructured text (Sodik Pamungkas and Kharisudin 2021). Sentiment analysis also uses Natural Language Processing (NLP) to detect subjective information present in documents (Arsi and Waluyo 2021)(Idris, Mustofa, and Salihi 2023). The information used will be analyzed in several processes, starting with extracting data and then cleaning the data. The data-cleaning process is called pre-processing. After cleaning, the data is processed with the method that will be used. One of the methods used to classify sentiment analysis is Support Vector Machine (SVM) (Adhitya Karel Maulaya and Junadhi 2022) (Rahmaddeni et al. 2022).

Research on Sentiment Analysis on the use of the Shopee application using the Support Vector Machine (SVM) algorithm conducted (Dedi Darwis, Nery Siskawati, and Zaenal Abidin 2020). From the experimental results of his research, it produces quite good performance with an accuracy of 98% and an f1-score of 0.98 or 98%. Another study on the Application of the Support Vector Machine Method for Twitter User Sentiment Analysis was conducted in which the results of his research experiments resulted in SVM performance with an accuracy of 93% (Amin and Rainarli 2019). Likewise, in research on Sentiment Analysis of Online News Media Application Reviews on Google Play using the Support Vector Machines (SVM) and Naive Bayes Algorithm Methods and knowing the tendency of public opinion on Google Play about online news media applications where subjects were taken using scraping as many as 5615 opinions resulted in the conclusion that the accuracy of SVM (Support Vector Machines) was 88%, outperforming Naive Bayes by only 87% (Ibrohim and Budi 2023).

Based on this, this research was conducted to determine the performance of the SVM method in classifying positive, neutral, and negative sentiments on infosumbar Instagram social media. By doing this research, it is hoped that it can provide an overview of how netizens react to each upload topic regarding positive, neutral, and negative comments on the account.

B. Research Method

In this section, the methods and techniques used for the classification of reviews on public opinion spaces and the steps taken during the experiments are classified. Figure 1 illustrates the stages of this research starting from the online review dataset until each review is classified into positive, negative, and neutral.

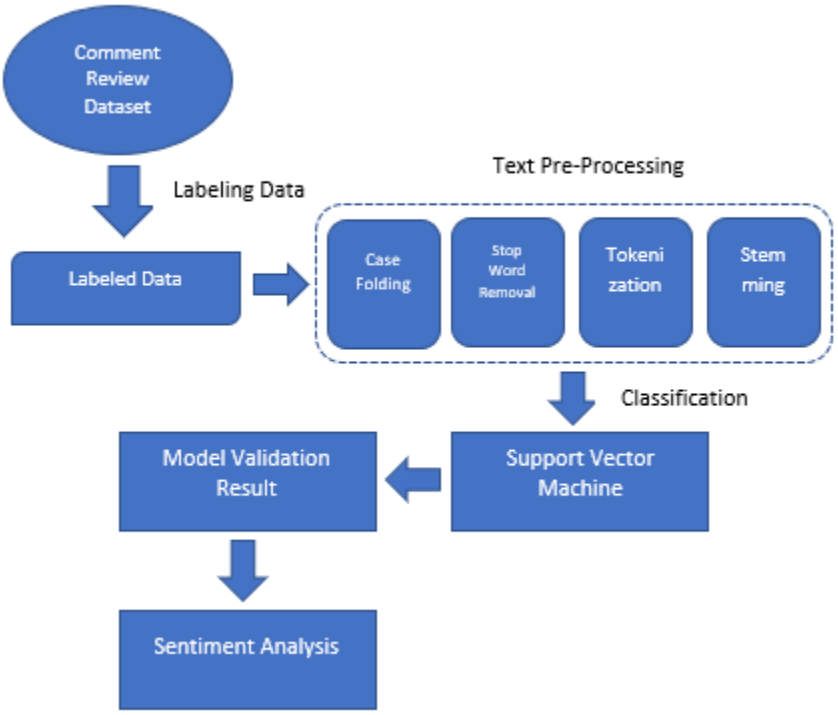

Fig.1. Research Framework

This research involves several stages to analyze public opinion reviews. The first stage is to conduct data collection to obtain a dataset of netizen comments related to city government policies. The dataset is then labeled with positive, negative, and neutral sentiments in the second stage. The labeled dataset is then processed by performing case-folding, stopword removal, tokenization, and stemming in the preprocessing stage. After preprocessing, TF-IDF analysis is performed to measure the importance of words in a document or text corpus. The next stage is text classification using the SVM method and model validation.

a. Dataset

Indonesian dataset that will be used in this research. The amount of data obtained is a data sample from the scraping results of 1050 data and the amount is preprocessed to produce data selection. The following is the dataset taken using the scraping technique:

Table 1. Dataset

	No	Comment	Author
0	1	Baguslah tidak bikin berantakan	van.mwessi
1	2	Sebenarnya lebih baik direlokasi, karena panta...	af_rina3
2	3	makanan yang layak dong yang dijual	dhiocwb
		Taplau ini memang harus dirapikan, selain tata…	pasar_seafood_online
		Mau tempat yang luas? Pindah ke by pass	verifirdaus
...	...	...	...
1048	1049	Kebiasaan lama yang tidak bisa dirobah… Bisa…	ju_liar_di
1049	1050	Tetapkan menggunakan Pergub,, sehingga ada dasa…	dwi_ab_xv

b. Labeling

This study first conducted an initial data selection to select data that fit the comment categories related to netizen comments on city government policies. After the selection process, comment data was obtained that could be classified as positive, negative, or neutral. Some examples of data selection results can be found in Table 2.

Table 2. Data Labeling

	No	Comment	Author	Sentiment
0	1	Baguslah tidak bikin berantakan	van.mwessi	negative
1	2	Sebenarnya lebih baik direlokasi, karena panta...	af_rina3	possitive
2	3	makanan yang layak dong yang dijual	dhiocwb	negative
		Taplau ini memang harus dirapikan, selain tata…	pasar_seafood_online	possitive
		Mau tempat yang luas? Pindah ke by pass	verifirdaus	negative
...	...	...	...	...
1048	1049	Kebiasaan lama yang tidak bisa	ju_liar_di	neutral

1049	1050	dirobah… Bisa… Tetapkan menggunakan Pergub,, sehingga ada dasa…	dwi_ab_xv	neutral

After the data labeling process, a comparison of the number of negative, positive, and neutral sentiments on the dataset can be seen in Figure 2.

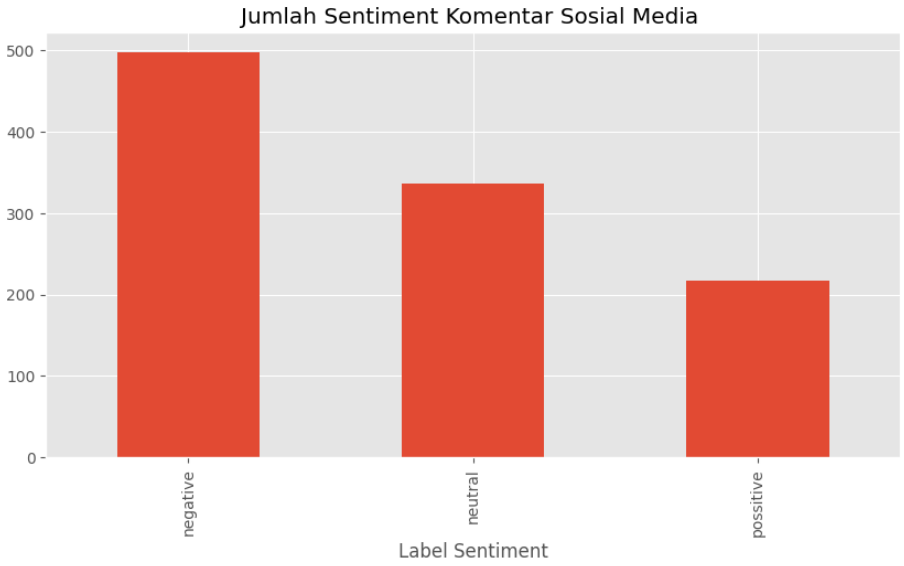

Fig. 2. Dataset distribution

C. Result and Discussion

This research is conducted in several stages, the first stage is data collection, the data collected is review data from social media and online news portals. The data used to test this research is Indonesian-language public opinion review data regarding city government policies. The dataset used in this research is 1050 reviews. In this research, we do pre-processing and then do TF IDF feature extraction. Then we classify the review text to find sentiment analysis with the ML model. Preprocessing the dataset needs to be done before the classification process, to eliminate words that are not suitable for research, equalize the shape of words or letters (lowercase), and reduce the number of words. By preprocessing the data, it can be ensured that the data used for training is better, cleaner, and more suitable for use in SVM analysis. After text preprocessing, it is necessary to weigh the words. Some examples of results from the text preprocessing process can be presented in Table 3.

Table 3. Data Pre-Processing (Cleaning)

No	Text	Result
1	Baguslah tidak bikin berantakan…	Baguslah tidak bikin berantakan
2	Sebenarnya lebih baik direlokasi, karena pantai ini kan fasilitas umum siapa saja boleh menikmati.....sementara kalau ada pedangang dan kita tidak membeli dagangannya kita nggak boleh duduk atau parkir disana	Sebenarnya lebih baik direlokasi karena pantai ini kan fasilitas umum siapa saja boleh menikmati sementara kalau ada pedangang dan kita tidak membeli dagangannya kita nggak boleh duduk atau parkir disana
3	makanan yang layak dong yang dijual	makanan yang layak dong yang dijual

Table 4. Data Pre-Processing (Case Folding)

No	Text	Result
1	Baguslah tidak bikin berantakan…	baguslah tidak bikin berantakan
2	Sebenarnya lebih baik direlokasi, karena pantai ini kan fasilitas umum siapa saja boleh menikmati.....sementara kalau ada pedangang dan kita tidak membeli dagangannya kita nggak boleh duduk atau parkir disana	sebenarnya lebih baik direlokasi karena pantai ini kan fasilitas umum siapa saja boleh menikmati sementara kalau ada pedangang dan kita tidak membeli dagangannya kita nggak boleh duduk atau parkir disana
3	makanan yang layak dong yang dijual	makanan yang layak dong yang dijual

	No	Comment	Author	Sentiment
0	1	bagus bikin beranta	van.mwessi	0
1	2	relokasi pantai fasilitas menikmatisementara p...	af_rina3	2
2	3	makan layak jual	dhiocwb	0
3	4	taplau rapi tata letak yg beranta sdm edukasi ...	pasar_seafood_online	2
4	5	luaspindah by pass	verifirdaus	0
...	...	...	...	...
1045	1046	amen preman sana tertib bikin unjung	mhdsyafiq08_	1
1046	1047	bikinkn menara pantau pakuntuk pantau unjung y...	muhammadfikrii12	1
1047	1048	bahas muncul area dagang baru buat bijak siste...	donny.aswin	1
1048	1049	biasa dirobah pantai padang sepi unjung ulah d...	ju_liar_di	1
1049	1050	tetap pergubsehingga dasar kuat menindakbagi y...	dwi_ab_xv	1

1050 rows × 4 columns

Fig. 3. Labeling Result

After going through the preprocessing process, a cleaned dataset is generated. To perform sentiment analysis, the cleaned data is converted into vectors by applying the TF-IDF method. Each model in the algorithm is evaluated in terms of accuracy. In the experiments conducted on the three Machine Learning algorithms using "TF-IDF" feature extraction, it was found that SVM provided the best training accuracy model with good classification. The following is a comparison of accuracy with three different ratios of training and testing data. The following is a comparison of the accuracy value of the SVM model

Table 5. Accuracy Split Data 70:30

	precision	recall	f1-score	support
0	1.00	1.00	1.00	143
1	1.00	0.93	0.96	102
2	0.91	1.00	0.95	70
accuracy			0.98	315

macro avg	0.97	0.98	0.97	315
weighted avg	0.98	0.98	0.98	315

The results of this accuracy are presented in Figure 4 confusion matrix of SVM.

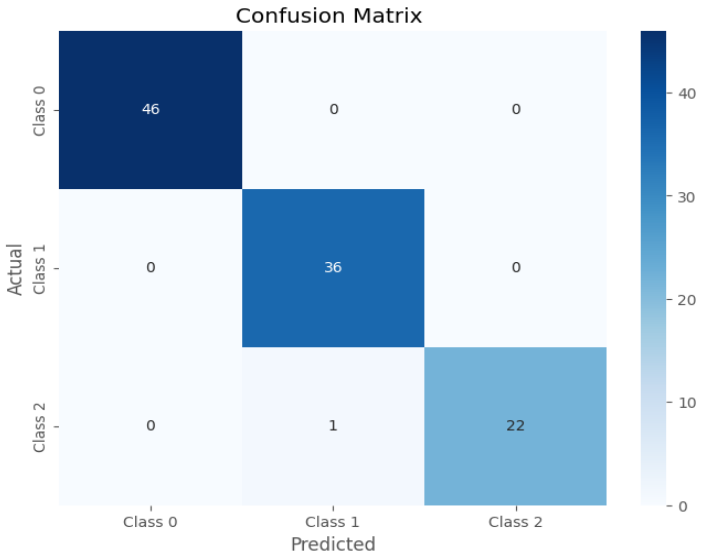

Fig. 4. Confusion Matrix Split Data 70:30

Table 6. Accuracy Split Data 80:20

	precision	recall	f1-score	support
0	1.00	1.00	1.00	90
1	0.97	0.97	0.97	66
2	0.96	0.96	0.96	54
accuracy			0.98	210
macro avg	0.98	0.98	0.98	210
weighted avg	0.98	0.98	0.98	210

The results of this accuracy are presented in Figure 5 confusion matrix of SVM split data 80:20

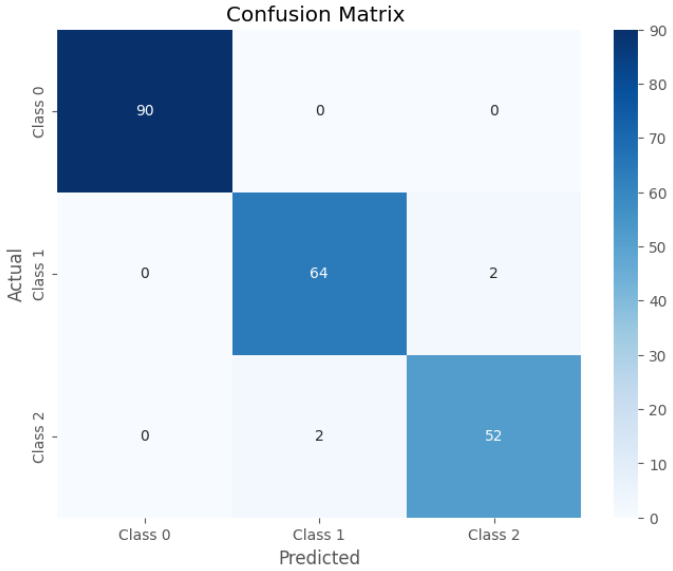

Fig. 5. Confusion Matrix Split Data 80:20

Table. 7. Accuracy Score Split Data 90:10

	precision	recall	f1-score	support
0	1.00	1.00	1.00	46
1	0.97	1.00	0.99	36
2	1.00	0.96	0.98	23
accuracy			0.99	105
macro avg	0.99	0.99	0.99	105
weighted avg	0.99	0.99	0.99	105

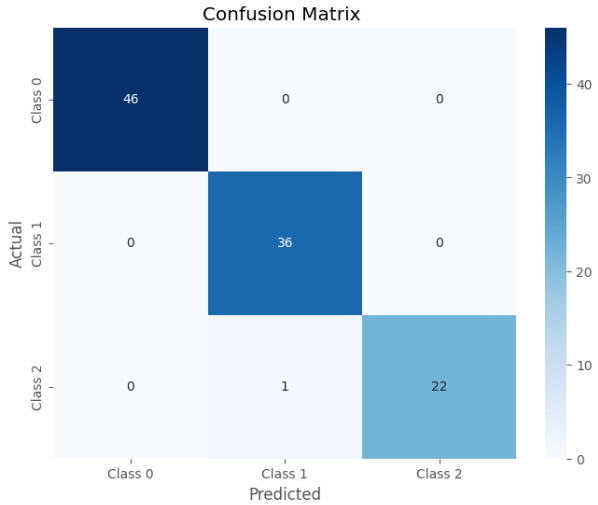

Fig. 6. Confusion Matrix Split Data 90:10

D. Conclusion

This research uses the SVM method and TF-IDF data weighting to classify text. Through accuracy testing using 70:30 split data, it was found that the accuracy reached 98%. Tests with 80:20 and 90:10 split data also resulted in high accuracy of 98% and 99% respectively. In this research, it is important to define technical

abbreviations to ensure clear understanding. The text uses objective, neutral language, and is free from embellishment. A formal structure was followed and argumentation was balanced, avoiding bias. Appropriate vocabulary selection was made, and grammar and formatting were consistent. However, there were differences between testing directly on the model and testing using the comparison chart. This offers opportunities for future research using other Machine Learning algorithms and methods, as well as expanding the number of datasets. In carrying out intent sentiment analysis, the number and variety of datasets can be increased.

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