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### Comparison of Feature Selection for Naive Bayes Classification Method in A Case Study of the Corona virus Lockdown

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#### Abstract

Classification in sentiment analysis often involves less relevant features for the modeling process. This causes the accuracy obtained to be not optimal. Therefore, a feature selection method is needed to sort out features that have high relevance to the dataset. This research aims to compare the accuracy between three different methods. They are Naive Bayes Classification without using any feature selection, using Information Gain, and using Chi-Square feature selection. The datasets used are sentiments related to the lockdown as a policy for the Coronavirus pandemic from Twitter. Feature

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# Comparison of Feature Selection for Naïve Bayes Classification Method in A Case Study of The Coronavirus Lockdown

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Abstract—Classification in sentiment analysis often involves less relevant features for the modeling process. This causes the accuracy obtained to be not optimal. Therefore, a feature selection method is needed to sort out features that have high relevance to the dataset. This research aims to compare the accuracy between three different methods. They are Naïve Bayes Classification without using any feature selection, using Information Gain, and using Chi-Square feature selection. The datasets used are sentiments related to the lockdown as a policy for the Coronavirus pandemic from Twitter. Feature selection methods affected the accuracy by filtering features and sorting the most relevant features based on its algorithm. The results showed that the average accuracy of Naïve Bayes without feature selection, using Information Gain, using Chi-Square based on both Indonesian and English datasets were 63.2%, 64.2%, and 65%, respectively.

### Keywords— sentiment analysis, naïve bayes classification, feature selection, information gain, chi-square

#### I. INTRODUCTION

Coronavirus disease (COVID-19) that began in December 2019 has become a global pandemic. By the middle of 2021, a surge of the third wave of COVID-19 was happening. There were 178,868,783 confirmed cases including 3,880,649 deaths per June 23rd 2021 [1]. In Indonesia, there were 15,308 new cases and 303 new deaths on June 23rd 2021.

As the impact of increased number of cases, the government has imposed an emergency restriction toward community activities policy to suppress the spread of virus. The terms of policy in limiting community activities vary, depending on each country and region. Some advocate social distancing, and some partially or totally limit community activities, which became known as the term lockdown. In Indonesia, terms of the restrictions are well known as Large-Scale Social Restrictions (LSSR/PSBB), Enforcement of Restrictions on Community Activities (ERCA/PPKM), and lockdown itself.

The policies reaped the pros and cons in various circles of society around the world. Public sentiments of pros and cons are expressed in various kinds of social media, especially Twitter as a popular text-based social media. Therefore, the diversity of opinions regarding the coronavirus lockdown can be used as a case study for this sentiment analysis research.

Sentiment analysis is a process of finding user opinions on certain topics or texts under consideration or commonly known as opinion mining. Sentiment analysis is carried out to classify whether an opinion is included in a negative or positive opinion [2]. In machine learning, the sentiment analysis process can be carried out with various classification methods.

In general, the classification uses all the features contained in the data to build a model, even though not all of these features are relevant to the classification results, thus feature selection needs to be added [3]. This is because of the amount of all features from a large dataset could degrades the classification accuracy of the built model [4]. In addition, adding feature selection to the classification process can affect the accuracy. Classification methods with feature selection will generally produce better accuracy [5] [6]. But it is also difficult to simultaneously reduce the number of features and maintain classification accuracy [7].

Based on the problems above, this study is conducted to examine how feature selection affects accuracy by comparing Naïve Bayes Classification without feature selection, using Information Gain and using Chi-Square feature selection. This aims to find out the best feature selection in making a sentiment classification related to the coronavirus lockdown. The best model that has been obtained is used to analyze sentiment towards the lockdown policy that occurred in Indonesia.

This paper divides into five sections. First section is introduction, second is literature review, third is research methodology, forth is results and discussion and fifth is conclusion.

#### II. LITERATURE REVIEW

This research is conducted based on several previous studies with related methods. Pratama, et al. (2018) examined the comparison of accuracy between Naïve Bayes with Chi-Square feature selection and Naïve Bayes without feature selection. In their research, the accuracy of Naïve Bayes with Chi-Square was higher than Naïve Bayes without feature selection [8].

Other than that, Sari (2016) examined sentiment analysis classification using Naïve Bayes without feature selection and Naïve Bayes with Information Gain. Her research showed that the implementation of feature selection techniques could increase the level of accuracy. It was because features that were not relevant to the classification target were reduced. The Information Gain feature selection technique completed by selecting ten features on the top ranking showed the best results in her study [9].



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I. Introduction Phishing is known as one of the old which started way back in the 1990s the most common and malicious att phishing messages, tactics, and tec Phishing techniques include email p phishing, and whaling. Phishing targ a trustworthy source. Typically, the Sign in to Cont believable real pe(son, or legitimate into supplying sensitive data which i and debit card numbers, passwords [1]. The data is then used to obtain a such as online accounts which pote or even identity fraud. Phishing can	est forms of cyberattacks, s, and it remains to be one of acks. Throughout the years, hniques have evolved. hishing scams, spear- jets the victims by posing as attacker poses as an actual, inue Reading agency to trick individuals ncludes bank data, credit, as well as private credentials access to sensitive accounts ntially result in financial loss also infect the victim devices	

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#### I. Introduction

With the continued increase in the average human lifespan, the number of old people has continued to increase, causing increases in healthcare-related costs and low patient-to-doctor ratio due to the ever-increasing demand for medical care [1]. Caregivers and healthcare providers have devised the remote monitoring method to cater to the increasing number of old persons and this has raised the interest in the use of WSNs in the healthcare sector [2]. Scientists and researchers have developed MWSN s as a network of wireless sensors consisting of several miniaturized sensors that can execute wireless transmission of data from their zones of deployment (connected or implanted) [3] [4]. Hence, physicians rely on these devices to remotely monitor the vital signs of their patients even when they

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