SENTIMENT ANALYSIS OF SHOPPING APPS USING RAPIDMINER

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ABSTRACT

An online marketplace site is a shopping place that is very popular nowadays with the community because it offers a variety of conveniences. Three of the marketplace apps are Shopee, Lazada, and Shein. Some people are satisfied with the service provided by the Shopee, Lazada, and Shein apps. However, some people complain about these applications. User-provided responses to Shopee, Lazada, and Shein apps in the comments at Google Play Store can be analyzed for negative, positive, or even neutral sentiments. This study aims to evaluate the best method to make sentiment analysis in terms of accuracy. Moreover, this study intends to identify the best shopping apps in the market based on the analysis of reviews so that customers can use the best apps easily and without any problems. As a result, Shopee, Lazada, and Shein businesses will be able to gain insight into how their customers feel about specific topics, and they will be able to identify pressing issues in real-time before they become overwhelming. The data for this study was obtained from 300 reviews we collected from the Google Play Store. After cleaning, the Naïve Bayes and SVM sentiment algorithms were used to assess the filtered summary phrases as positive or negative sentiments. According to these results, SVM is the best method because it provides significantly better accuracy than Naive Bayes for the three data pairs of Shopee, Lazada, and Shein, which are 76.00%, 78.50%, and 76.00%, respectively. It shows that SVM has outperformed Naive Bayes in terms of the accuracy of sentiment-based classification. Thus, we can conclude that Lazada is the best shopping app based on the highest accuracy achieved by SVM, which is 78.50%.

Keywords*: Accuracy, Naïve Bayes, Sentiment Analysis, Support Vector Machine (SVM),*

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1. Introduction

The online marketplace shopping site, often known as e-commerce, is rapidly growing and has become significantly important for people nowadays. In the twenty-first century, trade and commerce have been so diversified that multichannel has taken place and online shopping has increased significantly throughout the world (Johnson et al. 2001). Retail Research found that between 2014 and 2015, online sales in Western Europe grew by around 20%. Now a multi-billion-dollar industry, e-commerce is expected to grow and expand even more. Globally, e-commerce constituted about 2.29 trillion-dollar market (John, 2018) and expected to reach 4 trillion dollar by 2020 (eMarketer, 2016) due to the double-digit worldwide growth in sales (15%) and order (13%) (eMarketer, 2018) in all sorts of e-commerce such as business-to-business (B2B), business-to-consumer (B2C) (Zu-roni & Goh, 2012).

One of the reasons for the growth of the marketplace or e-commerce is the convenience and comfort of use, as well as the many benefits of being able to buy things without having to come to the shop, as well as the ability to buy anywhere without any limits and for 24 hours. Many shoppers find it easier to browse and search for what they need online. Alternatively, in other words, shopping on the Internet offers convenience and time-saving benefits to shoppers, as compared to shopping in traditional brick-and-mortar stores. Changing consumer lifestyles and lack of time may make it more difficult for consumers to shop at physical locations such as stores and shopping malls (Davies et al.1995). Not only that, online shopping also has lower search costs and better product selection. With online shopping, it offers a greater selection for shoppers as compared to physical retail storefronts. According to Sharma & Krishna (2002), the Internet store can provide a larger inventory of products and sizes and can virtually guarantee the availability of any type and size of merchandise. Another advantage of using the online marketplace is that there are several discounts, promotions, and even free shipping to the most popular shopping destination in the community.

There are various marketplace applications that give convenience and comfort to consumers, such as Shopee, Lazada, and Shein. However, it does not mean that consumers need to use and download all the shopping apps. The reason is that it can negatively affect consumers when they download all the available shopping apps. For example, the phone's storage will be full, and consumers will find it difficult to get points if they use all the shopping apps. Not only that, but this mode of purchase also has some significant drawbacks and certain flaws emerge. For instance, the items sold that do not match the picture, packing or goods damaged during delivery, the seller sending goods that are not acceptable for booking transactions, and even many scams and viruses resulting from the numerous market things or e-commerce. According to Zheng et al. (2018), transaction fraud is a common crime in online shopping. Bradbury (2008) warns that online shopping can expose consumers to malicious scripts and viruses. As a result, we must assist management in seeing the community's attitude, particularly Shopee, Lazada, and Shein app users. There must be an analysis method approach that can summarize the reviews, positive or negative.

Due to its drawback, it motivates us to conduct sentiment analysis on the shopping app by developing a few models: Naive Bayes and Support Vector Machine (SVM) using Rapidminer. In this study, we decided to go to Shopee, Lazada and Shein because Shopee and Lazada are on the list of 10 best online shopping platforms in Malaysia (FunEmpire, 2022). Meanwhile, for the Shein, we decided to use it because we wanted to compare. What if the apps that did not list in the ten best shopping apps are good compared to those listed? This study aims to identify the best shopping apps based on the review analysis so that it not only make customers a better choice but also helps good contents to gain popularity. As a result, consumers will use the best shopping apps, which can directly save their phone storage since they do not need to install all the shopping apps. Not only that, this can also help marketplace applications, particularly Shopee, Lazada, and Shein, find out what makes their customers unhappy and implement improvements that change this attitude. In the work of aspect-based sentiment analysis (ABSA), also named aspect-level sentiment analysis, (Akhtar et al., 2017) used to do sentiment analysis on reviews of hotels and restaurants. It helps identify the aspect with the most positive and negative reviews, which hotels can work on and improve.

Sentiment analysis is the study of feelings, emotions, attitudes, and beliefs. It is a systematic process determining whether a review is good or negative. Textual data is used to examine the notion of expressing sentiment and calculating insights to explore the business. This study will provide insight into how the consumer feels when using the apps, foresee the best performance, and detect the overall opinion on the apps. Various research works in sentiment analysis (Ligthart et al., 2021) published an overview of opinion mining in the earlier stage. Piryani et al. (2017) discuss the study topic from 2000 to 2015 and provides a framework for computationally processing unstructured data to extract views and identify their moods. Not

only that this research also will insight into the developer's app to improve the customer experience by upgrading the apps. The mining opinion disregards the topic of the text in favor of focusing on the expression stated in the opinion text. This decides the review of the shopping apps in the Google Play Store, which may include positive or negative thoughts.

Next, some limitations should be noted in this study. The limitations of this study involve many aspects. This study mainly focuses on reviewing the shopping apps that are being scrapped from the Google Play Store apps. Using Rapidminer version 9.10.11, an appropriate method for this study is determined using the Naive Bayes and Support Vector Machine (SVM) algorithms. This scope of the study involves the time and money spent, the materials and techniques used, and also the number of personnel needed for this study to be completed. It is because we must submit our research study more efficiently and follow the submission date. About a few weeks are needed for us as researchers to conduct this study. Second, sentiment analysis of human-to-machine and human-to-human interactions requires very similar datasets to those used for emotion recognition.

There are two kinds of method that can be used or two basic approaches for machine learning which are supervised and unsupervised learning. The supervised method can be implemented using a classifier such as a Support Vector Machine (SVM), Naïve Bayes, logistic regression, K-NN classifier, and others (Badresiya et al., 2014). Badresiya et al. (2014) analyzed spam detection. They used five different algorithms: Decision Tree, Naive Bayes, K-NN, SVM, and logistic regression. The results show that SVM is the best method as it gives the highest accuracy, 83.19%, followed by logistic regression, 82.39%. Meanwhile, the Decision Tree, Naive Bayes, and K-NN results were 51.00%, 66.44%, and 68.56%, respectively. Tripathi et al. (2015) have yielded results where the accuracy for the Naive Bayes was 63.33%, and the K-NN was 70%. They used data mining techniques for classification to perform the sentiment analysis based on English tweets on Twitter.

Many companies and organizations are using sentiment analysis to analyze public thoughts about their services or product. There were many articles and research done regarding this topic. Shoeb et al. (2017) used tweets for sentiment analysis. They performed sentiment analysis on people's opinions on Twitter using data mining techniques for classification. They applied three different classifiers to the data and then compared the results to see which one provided the best accuracy and results. In the research, Decision Tree, K-NN, and Naïve Bayes showed accuracy results of 84.66%, 50.72%, and 64.42%, respectively. Corresponding to the previous research, Bayhaqy et al. (2018) have put much effort into studying sentiment analysis from the views of E-Commerce customers who have been written on Twitter. By training them on the data, they built various classifiers, which are Decision Tree, K-NN, and Naive Bayes, then evaluated their accuracy and performance. Decision Tree shows the most excellent accuracy results (77%), followed by K-NN (78%), and Naive Bayes (77%). Thus, for both research, we can see that the Decision tree was the best method as it gives the best accuracy.

This study will examine various shopping app reviews, which are Shopee, Lazada, and Shein from the Google Play Store, to assess the accuracy of the sentiment analysis algorithm Naïve Bayes and Support Vector Machine (SVM) findings. Naïve Bayes and Support Vector Machine (SVM) were choosen as they are the simplest classifiers and easy to use throughout the process. The value of this research is that it will inform Shopee, Lazada, and Shein management about the positive and negative opinions of that application users, as well as provide empirical proof for associated ideas that may be utilized as a gift of thought to the development of later theories.

2. Methodology

Comments can usually be divided into two categories. A positive comment is hopeful and confident and thinks of an exemplary aspect of a situation instead of the bad ones. On the other hand, negative comments can be seen as expressing our meaning, refusing, or denying. As

shown in the table below, each of these comments will be run into the machine learning model: Naïve Bayes and Support Vector Machine and output whether there was a positive or negative connotation.

Due to its ease of use throughout the training and classification stages, the Naive Bayes text classifier has been commonly implemented (Ting, 2011). The job of assigning a label or text categorization category to a whole text or document is called text categorization. In this, we introduce the Naïve Bayes method to categorize text. According to Bayes' Theorem:

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)} \tag{1}$$

where, is the posterior probability, or the probability that a hypothesis A will hold true in the face of an occurrence B, is likelihood probability, or the probability that hypothesis A is true given the evidence, and is prior probability, or the likelihood of the hypothesis before looking at the evidence.

From (1), it will go through some processes to make sure that it is compatible with the sentiment analysis process:

$$c_{MAP} = \underset{c \in C}{argmax}\, P(c) \prod_{i \in index} P(x_i|c) \tag{2}$$

where MAP is the most likely class or in other words maximum a posterior, P(c) is the probability of prior class and P(xi|c) is the probability of each words that represent in the document with class c.

Support Vector Machine (SVM) is a supervised machine learning algorithm that can be used for classification or regression challenges. Since its introduction in the 1990s (Cortes and Vapnik 1995), SVM has been recognized for its skill in image and pattern classification (Zhan & Shen 2005, Karamizadeh et al. 2014) and as such is frequently used in remote sensing contexts (Mountrakis et al. 2011).

Support Vector Machine (SVM) classification is based on finding a hyperplane to divide a dataset into different classes. Support vectors are the data points of the dataset that are nearest to the hyperplane. To classify a new data correctly we use hyper which is obtained from a greatest possible margin.

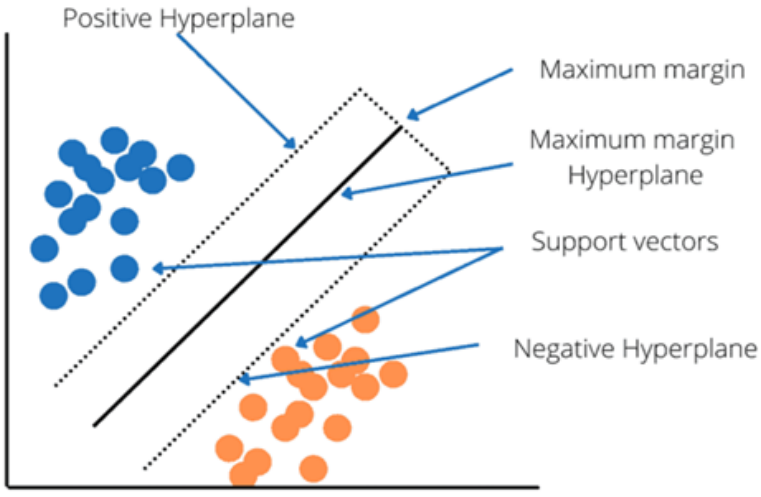

Figure 1 Support Vector Machine classifier

In Figure 1 as we can see there are two main terms that we have to take note of in these sections which are support vector and margin. Support Vectors are the points that are closest to

the hyperplane. Next, margin is the distance between the positive hyperplane and negative hyperplane. The observations closest to the hyperplane (support vectors). As we can see in diagram 2.2 there are separable positive and negative points. We can classify the particular points with a hyperplane (center line). When we want to create the positive and negative hyperplane, it must pass through one of the nearest positive points for the positive part and the same goes to the negative part which is it must pass through one of the nearest negative points. From there, it will create the particular hyperplane. That is the intuition behind Support Vector Machine (SVM).

There has math intuition that involves Support Vector Machine (SVM). The basic hyperplane equation is:

$$y = w^T + b \tag{3}$$

To classify a point as negative or positive we need to define a decision rule. We can define decision rule as:

$$w^T + b \geq 0$$

Hence:

$$y = \begin{cases} +1, if\ w^T + b \geq 0 \\ -1, if\ w^T + b < 0 \end{cases} \tag{4}$$

From the classification of decision rule above (4) we can define that if the data point is below the hyperplane, we will predict the new observation belongs to the negative classes. Meanwhile, if the data point is above the hyperplane, we will predict the observation belongs to the positive classes.

The Naive Bayes and Support Vector Machine (SVM) algorithms are used in Rapidminer version 9.10.11 to determine the best approach for this study.

3. Results and Discussions

We used two distinct models, namely Naive Bayes and Support Vector Machine, to evaluate the performance of each shopping apps (Shopee, Lazada, and Shein) and compare it to one another. Diagram 2 below shows the performance of each model based on the shopping apps:

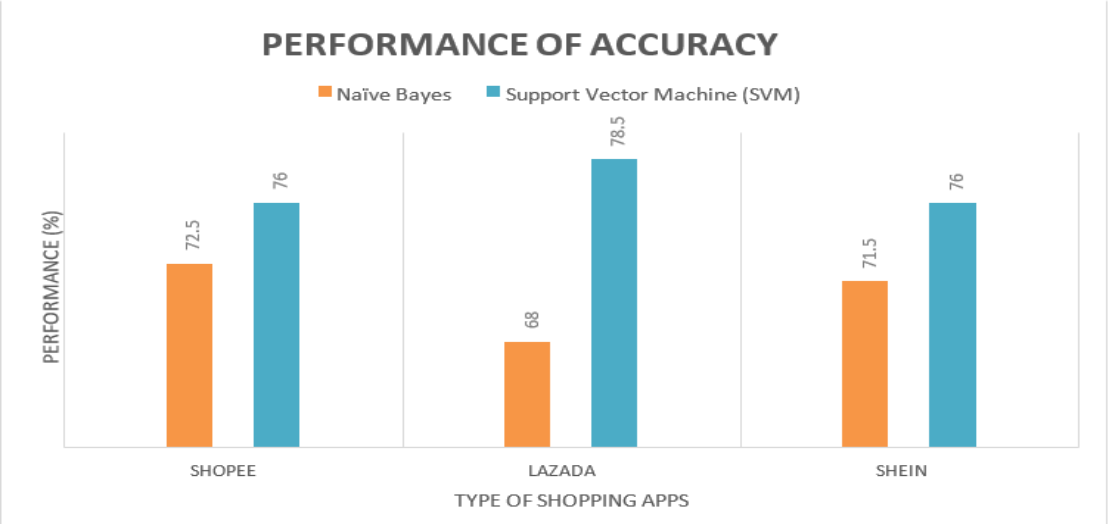

Figure 2 Performance of different models by accuracy

Figure 2 shows the accuracy of sentiment analysis for all three shopping apps by both models: Naive Bayes and Support Vector Machine (SVM). According to the SVM model, the accuracy for Shopee, Lazada, and Shein is 76.00%, 78.50%, and 76.00%, respectively. In the meanwhile, the Naive Bayes model yields 72.5%, 68.00%, and 71.50%. Based on the results, we can conclude that SVM gives the highest accuracy compared to naive Bayes for all three shopping apps. As an outcome of this, the Support Vector Machine (SVM) classifier is the best classifier model to use with these shopping application datasets since it provides predictions that are more accurate and exact.

To wrap things up, because of Lazada's performance is the most accurate out of the three shopping applications (Lazada, Shopee, and Shein), we may conclude that Lazada is the best shopping application. This is due to the fact that Lazada's accuracy percentage is the highest at 78.50%.

4. Conclusion and Recommendation

Many people are having a difficult situation in order to make decisions. For example, people having difficulty to use various application that have in our life. Having that, sentiment analysis is one of the computational method that provided to analyze, process and reveal people's feeling either the message is positive or negative so that it can let consumers to get know the best application they should use as it beneficial to them. Not only that, sentiment analysis assists businesses in managing their brand reputation by allowing them to make timely decisions on how to respond to negative brand mentions, thereby avoiding risks. For example, by configuring alerts on the sentiment analysis platform, they can be notified immediately of a negative mention on the platforms they are monitoring. As a result, the businesses can deal with a problem before it becomes a bigger problem. This also helps them attract better qualified applicants and consumers, expand their consumer base, and increase sales.

Having that, the study of sentiment analysis are provided in order to help the consumers to get know the best application they should use as it beneficial to them and indirectly can help businesses to improve their platform for better future. This paper describes sentiment analysis in detail, as well as various supervised machine learning algorithms used in sentiment analysis. Naïve Bayes and Support Vector Machine (SVM) are two algorithm and sentiment analysis techniques that we used in our study in order to perform the process in sentiment analysis so that it can help people to make their decisions.

In our work, with the help of data mining techniques, we attempt to classify sentiment analysis for the shopping apps Shopee, Lazada, and Shine. As mentioned in paragraph one, we use two different classifiers which are Naïve Bayes and Support Vector Machine (SVM). Both of the classifiers are function to predict the labels for our dataset. The result shows that the accuracy for the Shopee, Lazada and Shein based on the SVM model is 76.00%, 78.50% and 76.00%, respectively. Meanwhile, the accuracy result of Naïve Bayes for Shopee, Lazada and Shein is 72.50%, 68.00% and 71.50%. Therefore, based on the result we may conclude that Support Vector Machine (SVM) classifier is the best classifier model to be used with these shopping application datasets since it provides predictions that are more accurate and exact with highest accuracy compared to Naive Bayes for all three shopping apps. Hence, first objective in our study is which is to evaluate the best method to make sentiment analysis in term of accuracy is achieved. The second objective are also accomplished where preferred and the best shopping apps based on the review analysis are determined since the performance of Lazada is the most accurate out of the three shopping applications (Lazada, Shopee, and Shein). Therefore, we can conclude that Lazada is the best shopping application. This is because Lazada has the highest accuracy percentage at 78.50%.

This paper presents a comparison of various learning techniques used in sentiment analysis. Both of these techniques (Support Vector Machine (SVM) and Naive Bayes) are

compared for performance, but more future work is needed to improve the performance of such techniques. There is a great need in the industry for the application of sentiment analysis because every company wants to know how customers feel about their service or product.

In the future work, the recommendation for the study is include other languages and use special characters and non-letter characters. It would be beneficial to include emotions, as they are commonly used in social media to represent their expressions.

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