

The Sentiment Analysis of Online Customer Review on Food and Beverages Delivery Services in the GOJEK Application Using K-Nearest Neighbors

Aal Fathrizqy Putra Mahardika

Student, Department of Industrial Engineering
Faculty of Engineering
Universitas Negeri Malang
Malang, Indonesia
aal.fathrizqy.1705166@students.um.ac.id

Aisyah Larasati*

Associate Professor, Department of Industrial Engineering
Faculty of Engineering
Universitas Negeri Malang
Malang, Indonesia

*Corresponding author: aisyah.larasati.ft@um.ac.id

Abdul Muid

Lecturer, Department of Industrial Engineering
Universitas Negeri Malang
Malang, Indonesia
abdul.muid.ft@um.ac.id

Abstract

The increasing of digitalization in developing an application of the public transportation service shows that the business is transforming rapidly and producing practicalities and innovation. For example, the use of the application has been advanced by adding delivery systems for the food and beverage businesses and many others. The massive number of users will give a massive amount of reviews about the applications. One of the companies that develop the application, such as Gojek, requires feedback from the user to improve its services for the future. The enormous reviews written by the users tend to be subjective, and difficult to interpret. By conducting analysis using the big data of reviews, Gojek can design the necessary strategies as a differentiator in attracting more customers to use its application. This study aims to further analyze the reviews based on a machine learning approach (K-Nearest Neighbors) and sentiment analysis to label each review as positive or negative. This study will use the best classification model determined by selecting the best accuracy and precision the model gives. The result gives that K-Nearest Neighbors get 83% accuracy on classified the reviews, and it tends to give a positive result with 35542 data. By analyzing the word frequency result, Gojek has succeeded in providing good application services and competent drivers.

Keywords

Transportation Technology, Sentiment Analysis, Text Mining, K-Nearest Neighbors, and CRM.

1. Introduction

The emergence of Industry 4.0 proves an important point that technology increased rapidly not just in the manufacturing industry, but also in the services industry even though it is associated with the complexity, capacity to innovate, and flexibility (Zahida & Sulistiyoningrum, 2018). The digitalization in the service industry such as public transport services shows that the business transforming fast and requires practicalities and innovation. It will be able

to change the social life of existing business practices, such as food and beverage delivery systems, public transport systems, and payment technology (Fitz-Gerald, 2018). Gojek is one of the pioneers in developing an application to solve the public transport problem in Indonesia. The application become so popular and used by every level of society and integrated with almost all services for community needs (Ulya, 2019). But the business competition is intense with other competitors such as Grab even though the services and the features they provide basically similar. To gain a lot of customers, the voices of the customer are important for the upcoming improvement of their application. In 2019, the result of a survey by IDN times in 6 different cities in Indonesia 74,8% market was dominated by Gojek for its feature Go-food (Wijayanto, 2019). Even though the survey results are promising, by conducting more analysis of the voices of the customer, Gojek can design the necessary strategies as a differentiator in attracting more customers to use its application (Chan et al., 2017). There are a lot of platforms that give the customer's voice, it can be in a form of reviews in Google Play Store, or App Store (IOS). The challenges are the number of reviews written is massive, it tends to be subjective, difficult to interpret, and sometimes it comes in a bad shape or blank. Electronic word of mouth should be easier to understand (Ardianti & Widiartanto, 2019). Nowadays text mining is famously used for analyzing text-based data like reviews. By using methods such as sentiment analysis, the analysis further with an approach from machine learning will provide the result as positive or negative and a better understanding of the data (Kurniawan et al., 2016).

This research uses text mining method that is able to process a large number of data and every shape it. The big data that come from the play store are all raw and need to be processed further. Since the platform that gives the most reviews written on the Gojek app is on Google Play Store, it will be used for scrapping the reviews data. In this study, the concept methodology is to be able to extract the information from the reviews and classified each review into each sentiment class. The model used K-Nearest Neighbors for its flexibility with the parameter of K value to find the closest class based on its K value (Sudira et al., 2019). The more training data used, will benefit the model because the algorithm doesn't have to build the model over and over again because K-Nearest Neighbors directly stored every training pattern that had been run (Nasution & Hayaty, 2019). The results are expected to provide information for Gojek based on word frequency distribution and its sentiment class given. It can give Gojek a better understanding of its customer wants about which features have many shortcomings, need improvement, and need to be followed up on bugs that often appear. Hopefully, this research will give a deep understanding of customers as a stakeholder to produce a fast response to market needs so that it will be able to increase company revenue (Wardani et al., 2020).

1.1 Objectives

This study aims to find valuable information from the customer reviews and understand on what the market needs to increase the company's revenue by conducting a sentiment analysis using K-Nearest Neighbors method. The methodology used with machine learning approach by building the most suitable model to classify each review on its sentiment classes. The classification model is built using the K-Nearest Neighbors algorithm and GridSearchCV to give the best model it could generate. The results should provide detailed information about customer need and want so that the company can design a strategy to attract more customers using its application.

2. Literature Review

Gojek is a startup company whose main focus is to create an easier way for Indonesian people to use motorcycle and taxi services through online applications. PT Aplikasi Karya Anak Bangsa is a startup company that oversees Gojek Indonesia. In the beginning, problems that often occur in the use of public transportation services in Indonesia among others are inadequate transportation facilities, distance from home to work and school, and traffic jams. Gojek answer the problems that arise from the transportation service sector. After developing rapidly, not only the transportation service sector was developed in the Gojek application, other services such as online payments, food orders, shopping, logistics, and business began to be entered (Appkey, 2021).

Food and beverage delivery systems is one of the famous features used by customers in Gojek Application. Nowadays people don't have to go to the restaurant to buy the food or to pick it up, Gojek provides a feature to let the customer choose the restaurant they want and buy the food from the application and let the Gojek Driver deliver it to the customer place. Sometimes problems are also created because of a simple matter like the late delivery, bad driver attitude, bad UI application, and bug in the application. The customer can give feedback on the column review available. That feedback is a form of electronic word of mouth and becomes an important factor that can determine

the new user's decision to use the application (Farki et al., 2016). With that many reviews can be collected; the text mining method is the most suitable way to analyze it further.

Text mining itself is a data exploration technique whose goal is to analyze large amounts of text data that is uncertain, not standardized, and also unstructured. Usually, this technique is used to extract information from product reviews, market predictions, social media analysis, and many things. With the increasing number of users of an application or product, of course, comments or user reviews are not spared, so text mining can be used to carry out further analysis (Sun et al., 2017). The process of stages carried out in text mining is no different from the data mining process in general starting from selecting data to selecting a method and providing an interpretation at the end, but the most important process lies in how well the method is chosen to provide information and interpret the results of mining these data (Fatmawati & Windarto, 2018). Sentiment analysis is used for classifying the information into three or two classes depending on the nature of the research. In general, in conducting sentiment analysis, there are two types of approaches used in conducting sentiment analysis, namely the machine learning approach and the Knowledge-based or lexicon-based approach. Most of the previous studies that still examine sentiment are based on existing dictionaries such as Microsoft NLP API and use these dictionaries to provide polarity and assess what class the sentiments of the analyzed dataset belong to (Pang et al., 2002; Xu et al., 2019).

K-Nearest Neighbors is a method that is known to be quite simple in machine learning algorithms in classifying objects based on the data closest to the object. this algorithm can easily represent, is strong in training the data and is effective for the grouping process the purpose of this algorithm is to classify new objects, attributes and examples of training data. By using the value of k as the main parameter to build the model. Basically, a high value of k will reduce the effect of noise on the classification, but the value of k can make the boundaries between each classification increasingly invisible. K-NN can also increase the efficiency of the model by finding delegates to provide an overview of trained data for the classification model (Sudira et al., 2019; Wisnu et al., 2020).

3. Methods

The methodology of this research consists of 4 steps by implementing the data mining method. The first one is Data Collection. It is to collect the data from the Google Play Store by scraping all the reviews in the review column. The data consist of Id, date, the content of the review, and rating. The second one is Data Preparation. Data preparation is a step of preparing the data by performing text preprocessing. It starts from data cleaning where text data will be adjusted to processed with the algorithm used. the preprocessing continue on tokenization of every data into a token, removing punctuation marks along with symbols or emoticons, performing stop words by removing words that are not needed, also performing the process of stemming or eliminating affixes by changing the words without affixes, and the last is eliminating duplicates or the same data or blank data (Lane et al., 2019; Masruroh & Wardhani, 2019).

The third one is modeling data. This step is built the model based on the prepared data and applies the K-Nearest Neighbors algorithm. The bootstrap technique is used to divide training and testing data because it can create a measure of bias and uncertainty in the data distribution (Monalisa, 2016). Feature extraction is used for giving weight to each word by looking at the frequency of occurrence of each word in the dataset, in this research using Count Vectorizer. The model then uses the K-Nearest Neighbors algorithm by implementing Grid Search CV and cross-validation to determine the best K value in the model built. it helps on minimize the time and risk of overfitting for the model built. The last step is to implement the results of the model built by analyzing the meaning of the accuracy and precision values, the confusion matrix shown, and the word frequency distribution table to provide managerial implications. Figure-1 shows the flowchart of this research. Figure-2 shows the flow process chart of the methodology. The entire method run using python programming.

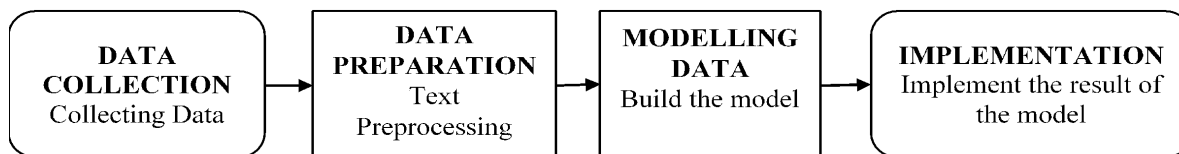


Figure 1. The Flowchart of the Research Methodology

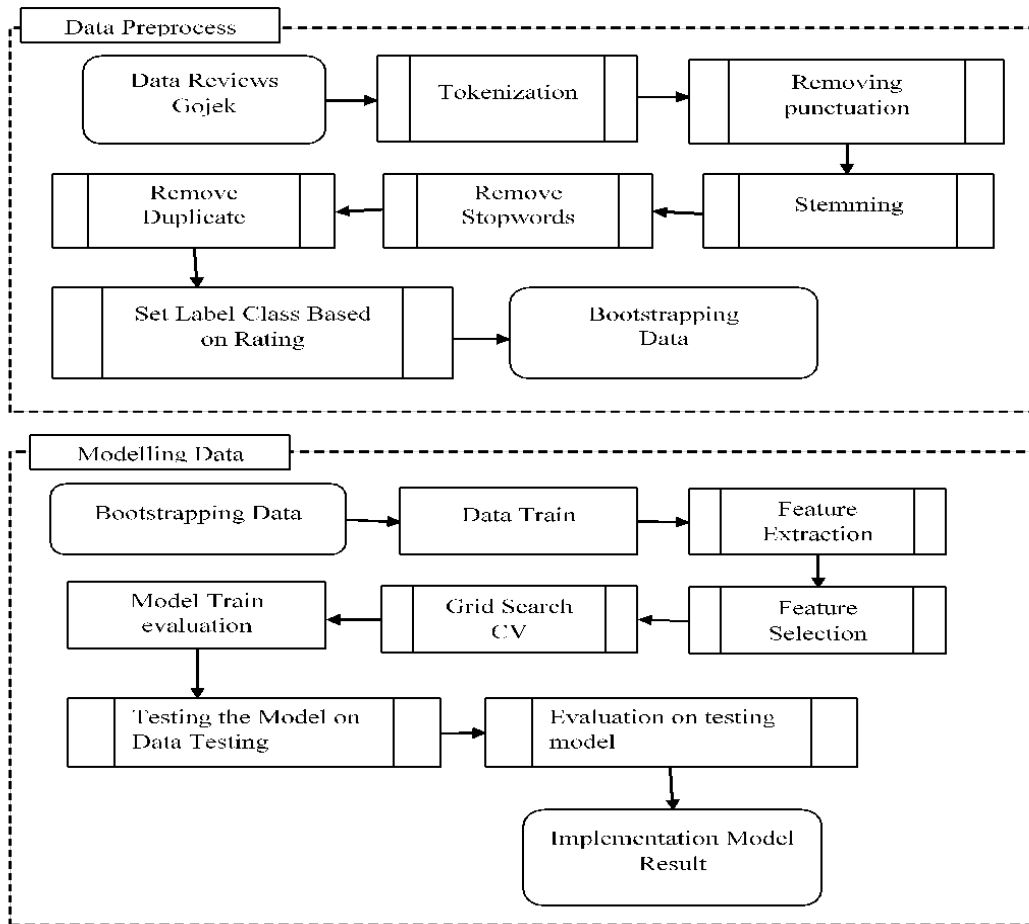


Figure 2. The Flow Process Chart of Methodology

4. Data Collection

This study use data from the Gojek application in the review column available on the Google Play Store. The data collection method is Google play scraper, a package in python programming for scraping data from the Google Play Store. The Google Play Store contains a lot of information such as the number of people who downloaded the application, the number of comments on the review column, suggested applications, and many others, this research only focus on collecting review content with a special format shown in Table 1. the amount of data collected is limited. on 360000 data because this study set a review year limitation from 2019 to 2021. Currently, the language displayed in the review is in Bahasa Indonesia.

Table 1. Data Scrap from Google Play Store

User ID	Date Written	Rating	Content Review
Nadia	20 April 2021	1/5	Makin update, makin ga jelas. Promo makin...
EVSU	21 April 2021	3/5	Udah 3 hari berturut-turut mau beli pulsa telkomsel bayar pakai paylater. Tapi....
Muchtar	21 April 2021	5/5	Saya pengguna gojek yg aktif...Cuma sekedar saran aja nih masalah go food.sekarang...

After the preprocessing step, the number of data collected is reduced into 189067 datasets. The data requires a label dataset for target variable thus on this research we made the label based on the rating value to create a complete train dataset for modeling phase. This data shown graphically in Figure-3 Sentiment Class Gojek.

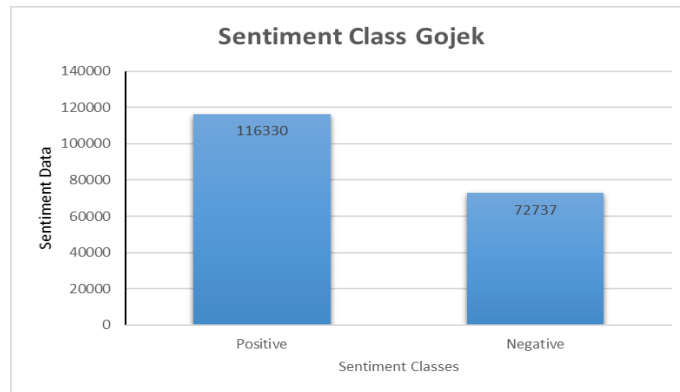


Figure 3 Data Sentiment Class Gojek

Figure-3 indicates the number of the positive class is more than negative class. This tends to create an imbalanced dataset. When building a model, it often finds data imbalances and it naturally doesn't match the number between classes resulting in an overfitting model (Tripathi, 2019). An overfitting model is a model that will create a perfectly good model on training dataset but won't do the same thing on new data set or testing dataset because it tends to memorize all of the information only on the training dataset rather than learning the pattern or more information on the training dataset (Ying, 2019). Thus, in this research bootstrapping requires doing another sampling on the required dataset before going further on the modeling phase, it will split the data into two datasets training and testing by implementing bootstrapping technique (Monalisa, 2016). The training dataset has 100000 datasets with a proportional number for each class. And the testing dataset is the rest of the actual dataset.

5. Results and Discussion

The results of this research show that the performance of the model is quite good by using the values of accuracy, precision, and recall as an evaluation of the model's performance. The results of the model evaluation are shown in Figure-4 normalized confusion matrix and Table 2 confusion matrix is below.

Table 2 Confusion Matrix

	Precision	Recall	F1-Score	Support
Negative	0.81	0.87	0.84	2526
Positive	0.85	0.79	0.82	2474
Accuracy			0.83	5000
Macro Avg	0.83	0.83	0.83	5000
Weighted Avg	0.83	0.83	0.83	5000

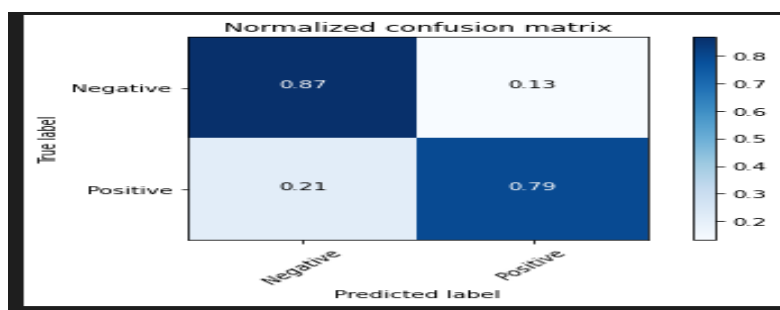


Figure 4 Normalized Confusion Matrix

Evaluating the model based on the accuracy score given in Table 2 is not enough, precision value for each class is important for not taking bias in implication. The precision on positive class is higher than the accuracy score, it indicates that the expected level of class accuracy with the predictions made by the model is very appropriate (Tharwat, 2018).

There are several factors that affect the performance of the built model. Among other things are the undersampling bootstrap technique, feature extraction with a count vectorizer, and finally the implementation of GridsearchCV with cross-validation to determine the best algorithm parameters. When building the model, feature extraction is needed for giving weight by seeing frequency words show up in each dataset to make it easier for the model to interpret text data. Count Vectorizer is used in this feature extraction with its capability on representing vectors from bag of words into a token to a numeric data form. After measuring the temporary model by adding one parameter from Count Vectorizer which is N-gram with a range from 1 to 4, the accuracy from this temporary model given is already 76% with 1-gram even before running the parameter algorithm K-Nearest Neighbors further. It shows in Figure-5 N-gram range result with the accuracy given.

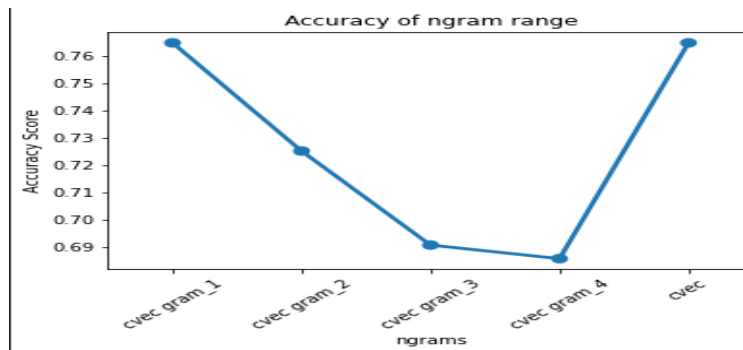


Figure 5 N-gram Range Accuracy Result

The implementation of GridsearchCV for finding the best parameter on K-Nearest Neighbors provides a fairly short time model which usually takes longer if other algorithms are used. the K value given is 1 for the best model. Based on the research (Gupta & Goel, 2020) Gupta & Goel (2020) developed that the higher the number K given on the model, the performance won't increase much higher. The model also gives ROC graphical shown in Figure-6 below.

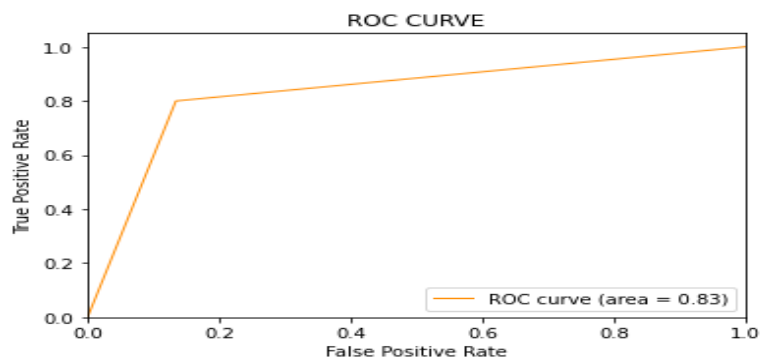


Figure 6 ROC Curve

The results of the ROC (Receiver Operating Characteristics) curve graph in figure-6 show to see the limit or threshold of the classification model built by the Gojek classification model. the ROC given value is 0.83. The True Positive Rate (TPR) or Recall value of 79.95%, and the False Positive Rate (FPR) of 13% implement that the threshold of the Gojek classification model is very good because the TPR>FPR value. With a higher threshold, the model will be able to accurately predict the sentiment class for the new data (Powers, 2020).

This research ends with the model to predict sentiment class on a new dataset using a testing dataset and the results show below.

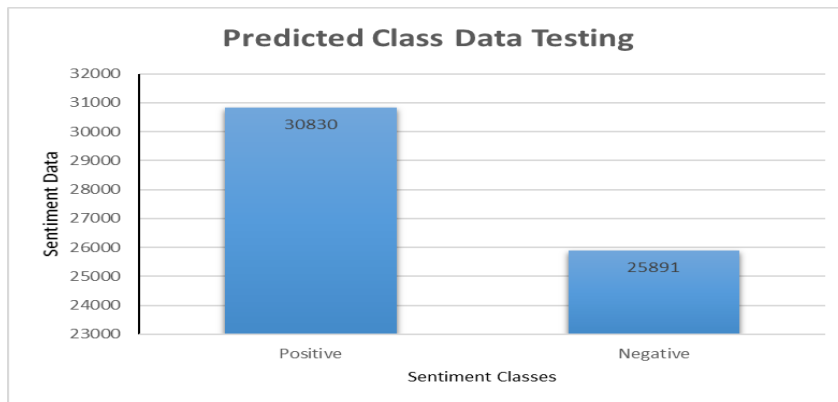


Figure 7 Predicted Class Testing Dataset

Figure-7 indicates that the number of positive classes on a new dataset is higher than the negative class. This proves that the model can predict the class to the unseen datasets. This research also provides a list of word frequency distribution from the model. Table 3 shows the word frequency distribution on the model.

Table 3 Word Frequency Distribution

Word	Aplikasi (application)	Driver	Bantu (help)	Gopay	Kasih (caring)	Pesan (order)	Mudah (easy)
Frequency	25296	16178	12957	12415	7613	6953	6454

Based on Table 3, the word “aplikasi” and “driver” has the highest frequency occurrence in this model. Interpreting the word “aplikasi” has a vast meaning if connected to Gojek app, it can be the UI of the Gojek app, the features, and many others. According to (Puspita & Aprilia, 2020), the quality of application and driver services is the most influential factor for customers to use Gojek app services. This means that customers review a lot about using the application in terms of the services provided and about drivers in terms of delivery and communication services. Corresponding to the histogram shown in figure-7 mostly the data have 54% positive sentiment, with the highest word occurrence “aplikasi”, Gojek can be concluded that its application performed very well as well as its features. Followed by the word “driver”, Gojek has given the best driver to serve its customer by performing the feature such as Goride, Gofood (food and beverage delivery systems).

There aren’t any words describe offers, deals, and discounts in Table 3. Offers or deals, and discounts are related to how the company gives reward to customer loyalty for using the app, like a promotion day using one of vouchers given, a discount and many more (Wardani et al., 2020). By doing this it will increase satisfaction and attract more customers to use the Gojek app more often.

5.1 Proposed Improvements

The model results still have a lot of room to give improvement. From the beginning of preprocessing step, the researcher suggests creating lemmatization with a complete dictionary so it will analyze the review text much better. Collecting much more data review on Google Play Store will help provide more information. Based on the results from table 3, word frequency distribution table, the words of “driver” means mostly the customer write a review focus on the quality of the driver. By increasing the quality of the driver will finish the problem that the customer has been write on the review. Good service quality can be created through the performance of its drivers this is because Gojek drivers are front stage employees who communicate directly with customers where front stage employees act as human attributes who are obliged to satisfy customer needs and desires (Nikin Hardati, 2021). Therefore, providing an excellent service is a priority (Mathodah, 2019). By doing a fast pick-up, being friendly to consumers and driving safely and comfortably. Increasing customer loyalty using promotion with more “Gopay Payday” program and a lot of discount voucher given to customer is one of strategy needed for gojek to fulfill customer needs.

6. Conclusion

It can be concluded that the model classification built with K-Nearest Neighbors can classify sentiment class with high accuracy and precision. The use of Grid search CV to find the best parameter works very well and should be doing for the future project to compare. Seeing the predicted sentiment class give 54% positive sentiment on review dataset and the word that most occur show in table 3 mean that most of the customer used Gojek app are satisfying with the performance of Gojek app and its feature such as Go Ride, Go food Delivery systems, Gopay and the services from the driver. Performance and quality services are an important elements of standards achievement that must be met, by achieving the standards that have been set mean that the company has performing well and vice versa (Kasmir, 2016). Improving the quality services cannot be separated from 5 dimension of service quality to achieve customer loyalty. The driver from gojek doing good communication relationships and sincere attention to customers, gain trust, and provide responsive service is a form of 5 dimension of service quality (Lee & Moghavvemi, 2015). Meanwhile from Gojek app giving discount and offer on its feature, doing a lot of promotion strategy to attract more consumers, and provide a stability performance from its application will create a strong relationship between consumers and the company, where consumers or the users will be commit to using the services again for the future (Jayanti, 2016; Nikin Hardati, 2021).

Acknowledgments

The authors would like to acknowledge financial support through UM Research Grant 2022 from Universitas Negeri Malang (UM) under grant number 19.5.1124/UN32.20.1/LT/2022.

References

- Ardianti, A. N., & Widiartanto, M. A., Pengaruh Online Customer Review dan Online Customer Rating terhadap Keputusan Pembelian melalui Marketplace Shopee. *Jurnal Ilmu Administrasi Bisnis*, 1–11, 2019.
- Chan, A., Maharani, M., & Tresna, P. W., Perbandingan Pengalaman Pengguna Pada Aplikasi Mobile Go-Jek Dan Grab (Studi Pada Konsumen Pt Go-Jek Dan Pt Grab Indonesia Di Dki Jakarta). *AdBispreneur*, 2(2), Available: <https://doi.org/10.24198/adbispreneur.v2i2.13183>, 2017.
- Farki, A., Baihaqi, I., & Wibawa, M., Pengaruh online customer review rating terhadap kepercayaan place di indonesia. 5(2), 2016.
- Fatmawati, K., & Windarto, A. P., Data Mining: Penerapan Rapidminer Dengan K-Means Cluster Pada Daerah Terjangkit Demam Berdarah Dengue (Dbd) Berdasarkan Provinsi. *Computer Engineering, Science and System Journal*, 3(2), 173. Available: <https://doi.org/10.24114/cess.v3i2.9661>, 2018.
- Fitz-Gerald, S., Management information systems: managing the digital firm, 15th Edition. In *International Journal of Information Management* Vol. 24, Issue 2, Available: <https://doi.org/10.1016/j.ijinfomgt.2003.12.006>, 2018.
- Gupta, S. C., & Goel, N., Performance enhancement of diabetes prediction by finding optimum K for KNN classifier with feature selection method. *Proceedings of the 3rd International Conference on Smart Systems and Inventive Technology, ICSSIT 2020, Icssit*, 980–986, Available: <https://doi.org/10.1109/ICSSIT48917.2020.9214129>, 2020.
- Jayanti, N. D., Kualitas Pelayanan (Reliability, Responsiveness, Assurance, Emphaty, Tangibles) Di Legend Premium Coffee Yogyakarta. Fakultas Teknik Universitas Negeri Yogyakarta Untuk, 1–97, 2016.
- Kasmir., Manajemen Sumber Daya Manusia (Teori dan Praktik) (1st ed.). Rajawali Pers, Available: <http://inlislite.uin-suska.ac.id/opac/detail-opac?id=11918>, 2016.
- Kurniawan, H. W., Rukmi, H. S., & Bakar, A. B. U., RANCANGAN STRATEGI PEMASARAN SEPATU MEREK “X” DENGAN MENGGUNAKAN METODE MULTIDIMENSIONAL SCALING. Vol 4(02), pp. 69–79, 2016.
- Lane, H., Howard, C., & Hapke, H. M., *Natural Language Processing in Action (Understanding, analyzing, and generating text with python)*, 2019.
- Lee, S. P., & Moghavvemi, S., The dimension of service quality and its impact on customer satisfaction, trust, and loyalty: A case of Malaysian banks. *Asian Journal of Business and Accounting*, 8(2), pp. 91–121, 2015.
- Masruroh, S. U., & Wardhani, L. K., Analisis kinerja algoritma naive bayes dan k-nearest neighbor pada sentimen analisis dengan pendekatan lexicon di media twitter [UIN Syarif Hidayatullah Jakarta]. In *Repository.Uinjkt.Ac.Id* (Issue Skripsi), Available: <http://repository.uinjkt.ac.id/dspace/handle/123456789/48565%0Ahttp://repository.uinjkt.ac.id/dspace/bitstream/123456789/48565/1/AZHAR-FST.pdf>, 2019.
- Methodah., Pengaruh kualitas pelayanan driver ojek online terhadap kepuasan konsumen pada gojek area tangerang selatan. *SCIENTIFIC JOURNAL OF REFLECTION: Economic, Accounting, Management and Business*,

- 2(3), pp. 1–10, Available: <https://doi.org/10.5281/zenodo.3269357>, 2019.
- Monalisa, A., *Penggunaan Metode Resampling Bootstrap Untuk Data Simulasi Time Series Model ARIMA*, Available: http://repository.unej.ac.id/bitstream/handle/123456789/76545/Andika_Monalisa-081810101016-1.pdf?sequence=1&isAllowed=y, 2016.
- Nasution, M. R. A., & Hayaty, M., Perbandingan Akurasi dan Waktu Proses Algoritma K-NN dan SVM dalam Analisis Sentimen Twitter. *Jurnal Informatika*, Vol. 6(2), pp. 226–235, Available: <https://doi.org/10.31311/ji.v6i2.5129>, 2019.
- Nikin Hardati, R., PENGARUH KINERJA DRIVER DAN FASILITAS APLIKASI TERHADAP LOYALITAS MELALUI KEPUASAN PELANGGAN (Studi Kasus Gojek Kota Malang). *Profit : Jurnal Administrasi Bisnis*, Vol. 15(01), pp. 74–83, Available: <https://doi.org/10.21776/ub.profit.2021.015.01.8>, 2021.
- Pang, B., Lee, L., & Shivakumar Vaithyanathan. Sentiment Classification using Machine Learning Techniques. *Proceedings of the 2002 Conference on Empirical Methods in Natural Language Processing (EMNLP 2002)*, pp. 79–86, Available: <https://doi.org/10.3115/1118693.1118704>, 2002.
- Powers, D. M. W., *Evaluation: from precision, recall and F-measure to ROC, informedness, markedness and correlation*. January 2011, Available: <https://doi.org/10.9735/2229-3981>, 2020.
- Puspita, M., & Aprilia, A., Faktor-Faktor Pendorong Konsumen Surabaya Membeli Makanan Dan Minuman Melalui Aplikasi Gofood Dan Grabfood. *Jurnal Manajemen Perhotelan*, Vol. 6(2), pp. 88–98. <https://doi.org/10.9744/jmp.6.2.88-98>, 2020.
- Sudira, H., Diar, A. L., & Ruldeviyani, Y., Instagram Sentiment Analysis with Naive Bayes and KNN: Exploring Customer Satisfaction of Digital Payment Services in Indonesia. *2019 International Workshop on Big Data and Information Security, IWBI 2019*, pp. 21–26, Available: <https://doi.org/10.1109/IWBI.2019.8935700>, 2019.
- Sun, S., Luo, C., & Chen, J., A review of natural language processing techniques for opinion mining systems. *Information Fusion*, Vol. 36, pp. 10–25, Available: <https://doi.org/10.1016/j.inffus.2016.10.004>, 2017.
- Tharwat, A., Classification assessment methods. *Applied Computing and Informatics*, Vol. 17(1), pp. 168–192, Available: <https://doi.org/10.1016/j.aci.2018.08.003>, 2018.
- Tripathi, H., *What Is Balanced And Imbalanced Dataset?*, Available: <https://medium.com/analytics-vidhya/what-is-balance-and-imbalance-dataset-89e8d7f46bc5>, 2019.
- Ulya, Fika Nurul., *Nielsen: Go-Food dan Grabfood Juara Layanan Pesan Antar di Indonesia*. Kompas.Com, Available: <https://money.kompas.com/read/2019/10/10/093000926/nielsen--go-food-dan-grabfood-juarai-layanan-pesan-antar-di-indonesia?page=all>, 2019.
- Wardani, V. E., Komalawati, E., & Alfirahmi, A., Pengaruh Program Gopay Payday Sebagai Customer Relationship Management Terhadap Brand Equity Gojek (PT. Aplikasi Karya Anak Bangsa). *LUGAS Jurnal Komunikasi*, Vol. 4(1), pp. 27–34, Available: <https://doi.org/10.31334/lugas.v4i1.938>, 2020.
- Wijayanto, N., *Survei: Tingkat Pemesanan GO-FOOD Ungguli GrabFood*. Sindo News, Available: <https://ekbis.sindonews.com/berita/1380049/34/survei-tingkat-pemesanan-go-food-ungguli-grabfood>, 2019.
- Wisnu, H., Afif, M., & Ruldevyani, Y., Sentiment analysis on customer satisfaction of digital payment in Indonesia: A comparative study using KNN and Naïve Bayes. *Journal of Physics: Conference Series*, Vol 1444(1), Available: <https://doi.org/10.1088/1742-6596/1444/1/012034>, 2020.
- Xu, G., Meng, Y., Qiu, X., Yu, Z., & Wu, X., Sentiment analysis of comment texts based on BiLSTM. *IEEE Access*, Vol. 7, pp. 51522–51532, Available: <https://doi.org/10.1109/ACCESS.2019.2909919>, 2019.
- Ying, X., An Overview of Overfitting and its Solutions. *Journal of Physics: Conference Series*, Vol. 1168(2). <https://doi.org/10.1088/1742-6596/1168/2/022022>, 2019.
- Zahida, Q., & Sulistiyoningrum, C. E., Analisis Penilaian Konsumen Terhadap Kinerja Layanan Transportasi Online Dalam Peningkatan Daya Saing Di Era Digital. *Seminar Nasional IENACO, ISSN 2337-*, pp. 274–281, 2018.

Biography

Aal Fathrizqy is a senior-year student at Department of Industrial Engineering, Faculty of Engineering, Universitas Negeri Malang.

Aisyah Larasati is an associate professor in Department of Industrial Engineering, Faculty of Engineering, Universitas Negeri Malang. Her research interests are data analytics, statistics and service quality as well as quality management.

Abdul Muid is a lecturer in Department of Industrial Engineering, Faculty of Engineering, Universitas Negeri Malang. His research interests are supply management, quality management and statistics.