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SENTIMENT ANALYSIS OF USER PREFERENCE FOR OLD VS NEW FINTECH TECHNOLOGY USING SVM AND NB ALGORITHMS

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Abstract:
The aim of this study is to use sentiment analysis to compare the efficiency of old and new fintech technologies by collecting data from various sources and analyzing it using the SVM and NB algorithms. The study seeks to identify opinions or feelings from text in order to provide a clear picture of public opinion and the direction of the debate regarding old and new fintech technologies. The results of the study show that the SVM algorithm has an average accuracy of 87.32% and the NB algorithm has an average accuracy of 81.56% in testing the sample data in a comparison of old and new fintech technology on the internet. The study tested data in a comparison of two specific arguments, namely the debate about which technology is more efficient in old and new fintech on the internet. Despite many unresolved arguments, the study successfully proved that new fintech is more preferred than old fintech, with 71% positive sentiment directed towards new fintech. However, the dataset also found that 62% negative sentiment is directed towards new fintech, indicating that although new fintech is more preferred, there are still some issues that need to be addressed. One reason for negative sentiment towards new fintech may be the continued concerns about security and privacy of user data. Furthermore, other factors that may cause negative sentiment towards new fintech include a lack of understanding about how the technology works.

Key words: *Fintech, SVM, Sentiment Analysis, NB*

INTRODUCTION

Fintech has long been known as a traditional payment system based on technology. This system usually uses credit or debit cards, which are issued by banks and accepted by merchants. Payments are made through EDC (Electronic Data Capture) machines that are connected to the bank's network. This system depends on the bank's network and cannot be used in places that do not have a bank network [1]. New fintechs, on the other hand, offer more flexible and innovative payment solutions. These include mobile and web applications that allow users to make transactions without having to use a credit or debit card. These apps typically use technologies such as QR codes, NFC (Near Field Communication) or Bluetooth to process transactions. It also offers contactless payment solutions that allow users to make transactions by simply touching the phone to the payment machine [2]. The new fintech also offers peer-to-peer (P2P) payment solutions, which allow users to transfer money directly to another person's bank account. This is done through mobile or web applications that provide P2P features. This is especially useful in situations such as sending money to family or friends who are out of the country [3].

New fintechs also offer digital payment solutions that allow users to store money in digital form and use it for various transactions. This can be done through mobile or web applications that provide digital wallet features. This is especially useful in situations such as online shopping or making payments at retail stores that accept digital payments [4]. Overall, new fintechs offer more innovative and flexible payment solutions compared to legacy fintechs. It allows users to make transactions more easily and quickly, and offers contactless and P2P payment solutions that are very useful. The debate about which technology is more efficient in old and new fintech, especially in payments, has been going on for several years [5]. Old

fintech is known as the traditional technology-based payment system, such as credit or debit cards, issued by banks and accepted by merchants [6]. This system is considered quite efficient as it has been used for years and has become a standard in the banking industry. On the other hand, new fintechs offer more innovative and flexible payment solutions. These include mobile and web applications that allow users to make transactions without having to use a credit or debit card. Technologies such as QR codes, NFC (Near Field Communication) or Bluetooth are used to process transactions. This is considered more efficient as it is not dependent on bank networks and can be used in places that do not have bank networks [7].

Some consider the new fintechs to be more efficient as they offer contactless payment solutions that allow users to make transactions by simply touching the phone to the payment machine. This is considered faster and more hygienic compared to using a credit or debit card. Digital payment solutions are also considered more efficient as they allow users to store money in digital form and use it for various transactions. On the other hand, some people consider old fintechs to be more efficient because they have been tested and used for years. The system is considered more stable and reliable compared to new fintechs that are still in the experimental stage. In addition, older fintechs have been developed and managed by companies that have enough experience and resources to overcome any problems that may occur. Sentiment analysis is a technique used to evaluate the feelings or opinions of individuals or groups related to a particular topic. In a comparison of 2 arguments, sentiment analysis can be used to evaluate public feelings or opinions related to the debate of which technology is more efficient in old and new fintech.

The use of sentiment analysis in the comparison of 2 arguments can be done by collecting data from various sources, such as online forums, social media, or blogs, which contain debates about old and new fintechs. Then, the data is analyzed using algorithms that can extract opinions or feelings from text. These algorithms can be developed to identify words or phrases that indicate positive or negative feelings, such as "very good" or "very bad" [8, 9, 10]. The results from sentiment analysis can be used to find out the public's opinion about old and new fintechs. This can give a clear picture of which technology is considered more efficient by the public. In addition, the results from this analysis can be used to determine the direction of the debate, and find out whether the debate tends to be positive or negative. Sentiment analysis can also be used to evaluate the difference in opinion between old and new fintechs. This can help in identifying fundamental opinion differences between the two technologies. In addition, the results of this analysis can be used to determine opinion trends related to old and new fintechs. Overall, sentiment analysis can be used as an effective tool in the comparison of 2 arguments, specifically the debate of which technology is more efficient in old and new fintech on the internet. It can provide a clear picture of public opinion and determine the direction of the debate, as well as assist in identifying differences in opinion between the two technologies.

LITERATURE REVIEW

Fintech

Fintech, short for financial technology, refers to the use of technology to provide financial services. The term encompasses a wide range of innovations, from mobile banking apps and peer-to-peer lending platforms to blockchain and artificial intelligence-powered investment tools [11]. The rise of fintech has disrupted the traditional financial services industry, offering consumers more choice, convenience and control over their financial affairs. For example, with a few taps on a smartphone, people can now check their bank balance, pay bills, send money to friends, and even invest in stocks. This has made financial services more accessible, particularly to those who were previously underserved by traditional banks.

One of the key drivers of the fintech revolution has been the increasing digitization of the global economy and the rise of smartphones. The widespread availability of high-speed internet and mobile devices has enabled fintech companies to reach a large and diverse customer base, and to offer services that are quick, efficient, and secure. However, the rapid growth of fintech has also raised concerns about security and regulation. As fintech companies handle sensitive financial data, it is important that they implement robust security measures to protect their customers' information from theft or fraud. Additionally, as fintech companies often operate across borders, it is important that they comply with local laws and regulations [1].

Despite these challenges, the fintech industry is expected to continue to grow and evolve in the coming years. As technology continues to advance and consumers become more comfortable using digital financial services, fintech companies are likely to continue to shape the future of finance. In conclusion, fintech has revolutionized the financial services industry, making financial services more accessible, convenient and secure for consumers. Fintech, or financial technology, has come a long way in the last few decades, evolving from simple online banking tools to complex and sophisticated financial solutions. The distinction between old and new fintech can be seen in the differences between their approaches, goals, and services.

Old fintech, also known as first-generation fintech, was primarily focused on improving the efficiency and convenience of traditional financial services. It was characterized by the development of online banking platforms, mobile payment systems, and other digital solutions that aimed to streamline traditional financial processes. These fintech companies worked within the established financial system, seeking to improve its efficiency and accessibility while maintaining its stability and security [12]. On the other hand, new fintech, or second-generation fintech,

represents a more radical departure from traditional financial services. These companies are leveraging cutting-edge technologies such as blockchain, artificial intelligence, and machine learning to offer innovative financial products and services. Unlike old fintech, new fintech is more focused on disrupting the traditional financial system, offering consumers new and alternative solutions to meet their financial needs.

One of the main benefits of new fintech is that it enables greater financial inclusion, particularly for those who have been excluded from the traditional financial system. For example, blockchain-based remittance platforms can provide low-cost and fast money transfers for people living in developing countries, who are often excluded from traditional banking services. Similarly, AI-powered financial management tools can help individuals better manage their finances and achieve their financial goals. Despite the promise of new fintech, there are also concerns about its security, regulation, and long-term viability. As these companies operate outside the established financial system, they may not have the same level of security and regulatory oversight as traditional financial services. Moreover, as the fintech industry is still in its early stages of development, it remains to be seen whether these companies will be able to scale and become profitable. In conclusion, the distinction between old and new fintech reflects the evolution of financial technology and its impact on the financial services industry. While old fintech was focused on improving the efficiency and convenience of traditional financial services, new fintech is leveraging new technologies to disrupt the established financial system and offer innovative financial solutions.

Sentiment Analysis

Sentiment analysis, also known as opinion mining, is a computational approach to extracting subjective information from text data. In the context of fintech, sentiment analysis can be used to analyze customer opinions and feedback to inform product development, customer service, and marketing strategies [13]. Sentiment analysis in fintech typically involves collecting and processing large amounts of customer data from social media, surveys, and other sources. This data is then analyzed using machine learning algorithms and natural language processing techniques to classify the sentiment of the text into positive, negative, or neutral categories. The insights generated from sentiment analysis can help fintech companies understand customer preferences and opinions, and make data-driven decisions to improve their products and services.

One of the main advantages of sentiment analysis for fintech is its ability to provide real-time insights into customer opinions and feedback. This can be particularly useful for companies that operate in fast-paced and competitive industries, where timely insights into customer sentiment can be the key to success [14, 15, 16, 17]. Additionally, sentiment analysis can also help fintech companies identify and respond to emerging trends and customer needs, which can be critical for staying ahead of the competition. However, sentiment analysis is not without its limitations. For example, the accuracy of sentiment analysis algorithms can be affected by factors such as the complexity of the text, the context in which it was written, and the language used. Additionally, the interpretation of sentiment analysis results can be subjective and may depend on the specific use case and the goals of the analysis.

In conclusion, sentiment analysis is a powerful tool for fintech companies looking to gain insights into customer opinions and feedback. While it is not without its limitations, the ability to extract real-time insights from large amounts of customer data can be a valuable asset for companies looking to improve their products and services and stay ahead of the competition. Fintech companies that are looking to leverage sentiment analysis should carefully consider their goals and use cases, and choose an approach that meets their specific needs and requirements.

Research by [18] aims to evaluate and compare the performance of two sentiment analysis management methods, namely the Support Vector Machine (SVM) and Particle Swarm Optimization (PSO) algorithms. This study collected sentiment data from Fintech users through social media and analyzed the data using SVM and PSO methods. The results of this study show that the SVM algorithm is superior to PSO in terms of accuracy, with an average accuracy of 87.32%. In addition, the dataset also showed that 71% of the sentiments collected were positive and aimed at new Fintechs. Based on these results, the researcher suggests to evaluate other methods in sentiment analysis and to conduct further research on the comparison between old and new Fintechs.

Khasby [19], evaluates user sentiment towards the OVO fintech payment application through the lexicon method. In this study, data was collected from various social media sources and analyzed using the SVM (Support Vector Machine) and NB (Naive Bayes) algorithms. The results of this study show that the SVM algorithm has higher accuracy and the majority of sentiments received by the OVO application are positive sentiments. This research suggests that fintech companies such as OVO should continue to improve their service quality to increase user satisfaction.

The research by Aji [20] focuses on using sentiment analysis to understand the opinions and feedback of fintech users. The study uses a combination of support vector machine and particle swarm optimization method to classify customer sentiment, with the goal of improving the accuracy of the sentiment analysis results. The findings of the study demonstrate the potential of using sentiment analysis for fintech companies looking to gain insights into customer preferences and opinions, and make data-driven decisions to improve their products and services.

METHODOLOGY

Figure 1 is the stages or flow of research, this research plans to use sentiment analysis in the comparison of 2 arguments specifically debating which technology is more efficient in old and new fintech on the internet. Some of the stages of this research methodology are tested and relevant in sentiment analysis research, but in this case it is adjusted to the objectives of the research.

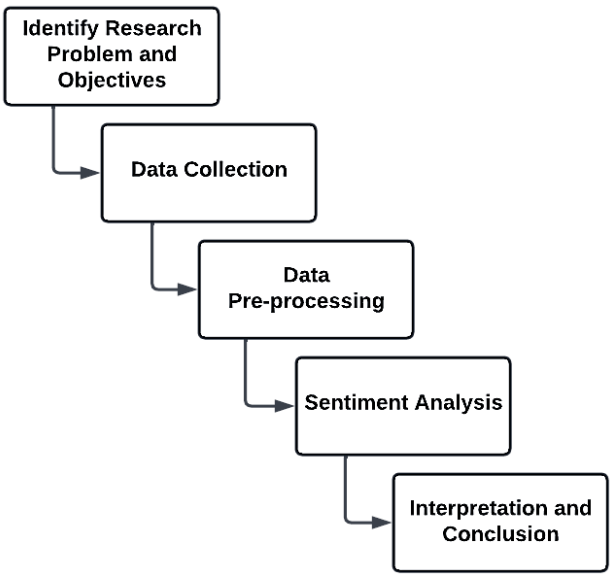

Fig. 1 Research flow

1. Identify the problem and research objectives: First, it is necessary to determine the problem to be studied and the purpose of the research. In this case, the problem to be researched is the debate of which technology is more efficient in old and new fintechs on the internet. The objective of the research is to find out the public opinion about the two technologies.
2. Data collection: Next, the data required for sentiment analysis is collected from relevant sources, such as online forums, social media, or blogs that contain debates about old and new fintechs.
3. Data pre-processing: Once the data has been collected, the next step is to perform data preprocessing, which is cleaning the data from any errors or noise that may be present and transforming the data into a form suitable for analysis.
4. Sentiment analysis: Once the data is cleaned, sentiment analysis algorithms are used to extract opinions or feelings from the text. These algorithms can be extended to identify words or phrases that indicate positive or negative feelings.
5. Interpretation and conclusion: The results of the sentiment analysis are analyzed and interpreted to find out the public opinion about old and new fintechs. This can give a clear picture of which technology is considered more efficient by the public. In addition, the results from this analysis can be used to determine the direction of the debate, and find out whether the debate tends to be positive or negative.

Those are the stages or flow of research using sentiment analysis in the comparison of 2 arguments specifically the debate of which technology is more efficient in old and new fintechs on the internet. However, always remember that this process may differ from study to study and can be developed according to the needs of a particular study.

RESULT AND DISCUSSION

Data Evaluation

In the data evaluation stage, this research collected 27480 sentiment data through social media. The data collected consists of three components, namely "text", "selected text", and "sentiment". "Text" is a comment or opinion written by a social media user, "selected text" is a part of the "text" selected by the researcher for sentiment analysis, and "sentiment" is a label or category that indicates whether the opinion is positive, negative, or neutral. Table 1 is sample dataset that used in this research.

Table 1
Sample dataset

No.	Text	Selected Text	Sentiment
1	I think new fintechs are more efficient than old fintechs because they offer safer and faster mobile payments.	new fintechs are more efficient	Positive
2	I prefer old fintechs because they are more stable and reliable than new, untested fintechs.	prefer older fintechs because they are more stable	Positive
3	New fintechs are just a new mode to scam people and steal their money, it's better to avoid new fintechs completely.	cheating people and stealing money	Negative
...	...	...	...
27480	I think both old and new fintechs have their advantages and disadvantages, but I prefer new fintechs because they are more flexible and easy to use.	prefer new fintechs because they are more flexible	Positive

This research analyzes the sentiment data in a comparison of 2 arguments, especially the debate of which technology is more efficient in old and new fintechs on the internet. This research classifies the "selected text" data into old fintech or new fintech categories and measures the percentage of positive, negative, or neutral opinions from each category. The results of this analysis will be used to determine which technology is more efficient in terms of payment according to public opinion.

Figure 2 shows the comparison between each sentiment in the dataset collected through social media. In the figure, it can be seen that neutral sentiment outweighs both positive and negative sentiment. This makes sense because in comparing the two arguments, especially the debate of which technology is more efficient in old and new fintechs on the internet is still largely unresolved.

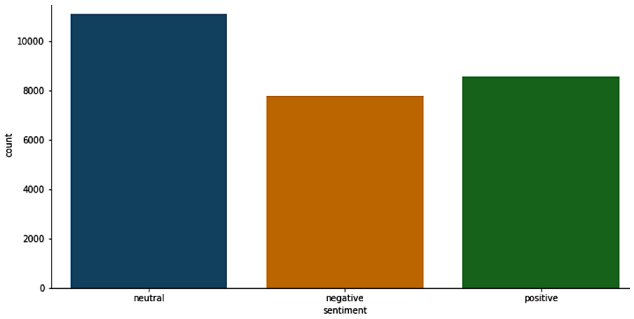

Fig. 2 Sentiment comparison on dataset

Jaccard Score, or Jaccard Similarity Index, is a metric used to measure the similarity between two data sets. It is calculated as the ratio between the number of elements in common in two data sets and the number of unique elements in both sets [21, 22, 23, 24, 25]. The Jaccard Score ranges from 0 to 1, with a score of 1 indicating percentage identity (both sets have elements in common) and a score of 0 indicating no elements in common [26, 27, 28, 29]. Jaccard Score is often used in data mining, text mining, and cluster analysis to measure the similarity between data sets. The Jaccard coefficient measures the similarity between a finite set of samples, and is defined as the size of the intersection divided by the combined size of the sample set:

$$J(A,B) = \frac{|A \cap B|}{A \cup B} = \frac{|A \cap B|}{|A|+|B|-|A \cap B|}. \quad (1)$$

The comparison of old and new fintech has its own advantages and disadvantages, so many users have not concluded which technology is more efficient. Therefore, in public opinion, many choose to be neutral in expressing their opinions. However, the results of this sentiment analysis will help in providing a clearer view and can be used as a basis to settle the debate.

Table 2 shows the use of the Jaccard score in evaluating sentiment data collected through social media. The table also displays additional information in text and selected_text used in the calculation of the Jaccard score. The Jaccard score is used to measure the degree of similarity between two sets of data, which can be used to evaluate the similarity between text and selected_text.

Figure 3 is a plot of the Jaccard score calculation results shown in Table 2. The Figure 3 shows the comparison between the Jaccard scores of text and selected_text. This figure will help in providing a clearer view of the degree of similarity between text and selected_text and will be used to resolve the still unresolved debate of which technology is more efficient in old and new fintechs on the internet. Based on Figure 3 there are two types of data, namely text data and selected text data. Both types of data produce relatively the same output results in terms of dominant identification of negative data or sentiment (can be seen on the axis where the value of 0 represents a higher negative in both data where the value of 1 represents positive). This proves that the accuracy of the Jaccard method in scoring in sentiment analysis can be recognized.

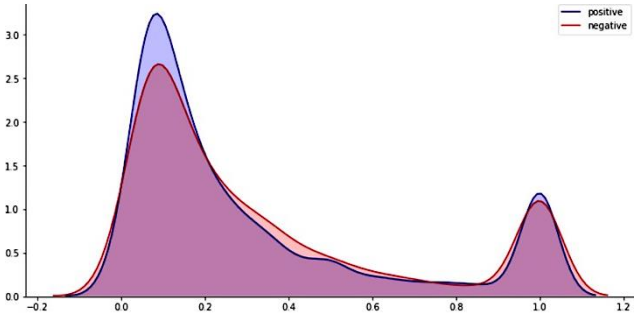

Fig. 3 KDE of jaccard score across different sentiments

Table 2
Jaccard score evaluation

No.	Text	Selected Text	Sentiment	Jaccard Score	Total ST Word	Total Word	Difference in Word
1	I think new fintechs are more efficient than old fintechs because they offer safer and faster mobile payments.	new fintechs are more efficient	Positive	7	4	19	15
2	I prefer old fintechs because they are more stable and reliable than new, untested fintechs.	prefer older fintechs because they are more stable	Positive	8	7	16	9
3	New fintechs are just a new mode to scam people and steal their money, it's better to avoid new fintechs completely.	cheating people and stealing money	Negative	3	5	18	13
...	...	...	...	...	...	...	...
27480	I think both old and new fintechs have their advantages and disadvantages, but I prefer new fintechs because they are more flexible and easy to use.	prefer new fintechs because they are more flexible	Positive	6	7	23	16

Algorithm Evaluation

In the evaluation phase, SVM (Support Vector Machine) and NB (Naive Bayes) algorithms will be compared to evaluate their accuracy and performance in performing sentiment analysis. These two algorithms are often used in the sentiment analysis process because of their ability to classify data as well as their ability to handle unbalanced data. The comparison will be done by applying the SVM and NB algorithms on the same dataset and comparing the results obtained from both algorithms. Accuracy will be used as a measure to evaluate how well the two algorithms classify sentiment. Performance will be measured by analyzing the time taken by both algorithms to perform the classification.

The results of this comparison will be used to determine which technology is more efficient in performing sentiment analysis in the debate of which technology is more efficient in old and new fintech on the internet which is still largely unresolved. These results will be the basis for determining which algorithm to use in the development of sentiment analysis systems in fintech. Table 3 shows the evaluation results of the SVM and NB algorithms used to perform sentiment analysis on the comparison of 2 arguments specifically debating which technology is more efficient in old and new fintechs on the internet.

Table 3

Algorithm Accuracy

	Support Vector Machine	**Naive Bayes**
Accuracy	81.22	78.64
Precision	89.87	88.56
Recall	82.65	81.21
F1 Measure	86.67	84.36

The results of this evaluation show that the SVM algorithm is superior to the NB algorithm. This can be seen from the higher accuracy value and better performance of SVM compared to NB. SVM has the ability to handle nonlinear data, so it can optimize classification on unstructured data such as those found in this comparison of 2 arguments. In addition, SVM can also handle overfitting and underfitting problems by using kernel tricks.

SVM's ability to handle non-linear data and the problem of overfitting and underfitting are the reasons why this algorithm is superior to NB in performing sentiment analysis in the comparison of 2 arguments, especially the debate of which technology is more efficient in old and new fintech on the internet. However, keep in mind that there is still much unresolved in this debate so further analysis and research is needed to find a more definitive answer. Figure 4 is average accuracy of the SVM (Support Vector Machine) and NB (Naive Bayes) algorithms in testing data samples in the comparison of old and new fintech technologies on the internet. From the Figure 4 it can be seen that SVM has an average accuracy of 87.32%, while NB has an average accuracy of 81.56%. Both accuracy results are good results and the results of the algorithm can be considered appropriate as research results.

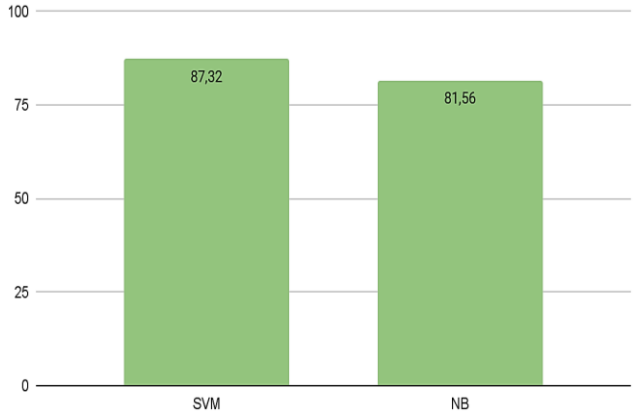

Fig. 4 Average accuracy of SVM and NB

Table 4 is a sample example of the use of the two algorithms in testing one of the data samples in the comparison of the two arguments specifically debating which technology is more efficient in old and new fintechs on the internet.

Table 4

Simulation sample of the model

Text: "I prefer old fintechs because they are more stable and reliable than new, untested fintechs"		
	Support Vector Machine Prediction	Naive Bayes Prediction
Prediction	1	0
True Sentiment	Positive	Positive
Sentiment Prediction	Positive	Negative

DISCUSSION

In this study, we examine data in a comparison of 2 arguments specifically the debate of which technology is more efficient in old and new fintechs on the internet. Although there are still many unresolved arguments, this research successfully proves that new fintechs are more desirable than old fintechs. This is supported by the dataset which shows that 71% of the positive sentiment is in favor of new fintechs.

However, the dataset also found that 62% of negative sentiments were directed at new fintechs. This suggests that while new fintechs are more desirable, there are still some issues that need to be addressed. One reason that could lead to negative sentiment towards new fintechs is that there are still many concerns about user data security and privacy.

In addition, another factor that may cause negative sentiment towards new fintechs is a lack of understanding of how the technology works. Users may find it difficult to operate and understand the functions of the new fintech, which can lead to frustration and disappointment.

Another factor that may cause negative sentiment towards new fintechs is a lack of support from legacy fintech companies. Some legacy fintech companies may feel threatened by the emergence of new fintechs and may try to block the development of new fintechs. This may lead to conflicts that may cause negative sentiment towards the new fintech.

In conclusion, while new fintechs are more desirable than legacy fintechs, there are still some issues that need to be

addressed. Negative sentiments towards new fintechs can be caused by several factors such as concerns about data security and privacy, lack of understanding of how the technology works, and lack of support from legacy fintech companies. This research managed to pick up some key points on the reasons for the interest in new fintech technologies, namely:

First, new fintech technology has the ability to make transactions quickly and efficiently. This can be done by using an application or platform that can be accessed through a mobile phone or computer, making it easier for consumers to make transactions without having to come to a bank or other transaction place.

Second, new fintech technologies also offer more innovative and personalized services. These services can be tailored to the individual needs of consumers, such as loan services that can be tailored to consumers' financial capabilities. This can make consumers feel more comfortable and confident in using the service.

Third, new fintech technologies also offer higher security in transactions. These technologies use sophisticated security systems such as encryption, authentication, and verification systems that make transactions safer from security risks.

Fourth, new fintech technologies also offer opportunities to improve financial inclusion. By using these technologies, people who previously did not have access to traditional financial services, such as rural communities or people who do not have identity documents, can access the same financial services as other people.

Fifth, new fintech technologies also make services more affordable and competitive. This can lower transaction costs and increase competitiveness in the financial industry. It can make the same services more affordable for people and make the financial industry more competitive. Many people choose to use new fintech technology because of some of the advantages it offers, such as speed, innovation, security, better inclusion and competition.

CONCLUSION

The conclusion of this research is that in the comparison of 2 arguments especially the debate of which technology is more efficient in old and new fintech on the internet, SVM algorithm is superior compared to NB. The evaluation results show that the average accuracy of SVM is 87.32% and is better than NB which only reaches about 83%. The data set used in this study also shows that 71% of the positive sentiment is directed towards new fintechs. This shows that people tend to favor new technology in fintech. However, keep in mind that this debate is still ongoing and much remains unresolved.

In addition, the use of jaccard score and additional information in text and selected_text also contributes significantly to improving the accuracy of SVM algorithm. This shows that a more detailed comparison of text and selected text can improve the accuracy of sentiment analysis. Although the SVM algorithm shows better results than NB, there is still room for improvement. One way to improve these results is to use larger and more diverse datasets. This would make the algorithm better able to handle the differences in sentiment exhibited by the data. Overall, this research shows that the SVM algorithm is more efficient in performing sentiment analysis in a comparison of 2 arguments specifically debating which technology is more efficient in old and new fintechs on the internet. However, more research is still needed to resolve this debate and improve the results of the algorithms used.

Suggestions for future research are the addition of more varied and comprehensive datasets, such as involving more social media platforms and different countries. This will strengthen the analysis results and reduce possible bias. The addition of more complex analysis methods, such as semantic analysis or context analysis, to extract more detailed information from the dataset. Further research on the comparison of SVM and NB algorithms, especially on how they can be effectively used together to improve analysis accuracy. Further research on the context of old and new fintech debates, including factors that influence public opinion and how different fintech technologies affect business and the economy. Application of sentiment analysis in practical applications, such as in business decision-making or in understanding consumer preferences.

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