



Clustering for Motivating New Student Admissions in Study Program Selection: Systematic Literature Review

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Abstract

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This research aims to evaluate clustering in new student admissions in determining effective strategies, to help prospective students in choosing study programs that match the interests and potential of prospective new students. Clustering as a machine learning technique to group data that has similarities, is increasingly used in the field of education to support the decision-making process. This Systematic Literature Review (SLR) examines the application of clustering methods in new student admissions, especially in recommending the right study program. By analyzing 10 studies in applying clustering methods that are often used, to determine the main factors that influence the selection of courses, as well as their impact on student satisfaction in choosing courses and optimal academic results. The results of this study provide insight into strategies for the admissions team in optimizing marketing, so that there is a more effective alignment between student profiles and study program characteristics.

Keywords: *Clustering, New Student Admission, Study Program Selection, Machine Learning, Systematic Literature Review (SLR).*

Abstrak

Penelitian ini bertujuan untuk mengevaluasi clustering dalam penerimaan mahasiswa baru dalam menentukan strategi yang efektif, untuk membantu calon mahasiswa dalam memilih program studi yang sesuai dengan minat dan potensi calon mahasiswa baru. Clustering sebagai teknik machine learning untuk mengelompokkan data yang memiliki kesamaan, semakin banyak digunakan dalam bidang pendidikan guna mendukung proses pengambilan keputusan. Systematic Literatur Review (SLR) ini meneliti penerapan metode clustering dalam penerimaan mahasiswa baru, khususnya dalam merekomendasikan program studi yang tepat. Dengan cara menganalisis 10 penelitian dalam menerapkan metode clustering yang sering digunakan, untuk menentukan faktor-faktor utama yang mempengaruhi pemilihan program studi, serta dampaknya terhadap kepuasan mahasiswa memilih program studi dan hasil optimal pada akademik. Pada hasil penelitian ini memberikan wawasan terhadap strategi untuk tim admisi dalam mengoptimalkan pemasaran, sehingga terdapat keselarasan yang lebih efektif baik antara profil mahasiswa dan karakteristik program studi

Kata-kata kunci: *Clustering, Penerimaan Mahasiswa Baru, Pemilihan Program Studi, Machine Learning, Systematic Literature Review (SLR).*



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1. Introduction

One of the important stages in higher education management is the new student admission process, as this process directly affects the quality and quantity of students accepted by a higher education institution. To optimize this process, effective clustering is required to analyze prospective student data by grouping student data using clustering algorithms. This approach aims to identify patterns and characteristics that can improve the new student admission process. The results of the clustering are expected to provide deeper insights for the admission team, particularly in supporting decision-making during new student selection.

The new student admission process generates a large amount of data in the form of applicant profiles. From year to year, there has been an increase in the number of prospective students coming from various regions. By applying clustering methods, key variables can be optimized and identified to support promotion teams in determining suitable academic programs for prospective students based on their interests and fields. This approach has been applied in studies such as the implementation of K-Means clustering to determine promotion locations for new student admissions.

Along with technological advancements, data-driven approaches such as clustering have been widely used to group prospective students based on specific characteristics, including interests, academic performance, and career potential. Clustering is a machine learning technique that aims to group data into several clusters with similar characteristics. In the context of new student admissions, this method can provide more targeted recommendations for program selection, enabling prospective students to make more appropriate decisions when choosing their fields of study.

This study employs a Systematic Literature Review (SLR) approach to analyze various studies related to academic programs. Through a systematic review of relevant literature, this research identifies the most frequently used clustering algorithms, the key factors influencing program selection, and the benefits of clustering for optimizing admission and marketing teams in higher education. Through this review, the findings are expected to provide deeper insights for marketing and admission teams in optimizing new student admission strategies and improving the alignment between student profiles and selected academic programs.

2. Method

Systematic Literature Review (SLR) is a research method that aims to synthesize scientific evidence in a transparent and structured manner to address specific research questions. This method involves explicit steps, such as formulating research questions, searching for relevant literature, assessing the quality of studies, and synthesizing data, thereby minimizing bias and enhancing the validity of the results (Williams et al., 2021). According to Hariyati (2023), SLR enables researchers to understand key issues, develop a research framework, and identify gaps in existing literature. In addition, SLR is used to strengthen the knowledge base of a particular topic by compiling a comprehensive review of interrelated primary studies (Fisch & Block, 2018; Lame, 2019). Thus, SLR not only makes a significant contribution to the development of scientific knowledge but also serves as an important tool for evidence-based decision-making.

This study employs a Systematic Literature Review (SLR) approach to systematically and comprehensively examine the application of the Naive Bayes method in classification tasks. To ensure a structured and focused review process, several selection criteria were established for choosing the journals to be reviewed. First, the selected journals must be published in reputable journals to ensure the quality and credibility of the research. Second, the journals must be published within the period of 2019 to 2024 to ensure that the reviewed studies remain relevant to recent developments in the field of classification. Third, the journal themes must be related to classification, particularly in the context of text or opinion data classification, which is the main focus of this study. Finally, the primary method used in the studies must be Naive Bayes, although other methods may be included for comparison purposes. Based on these criteria, the reviewed studies are expected to provide a comprehensive and accurate overview of the application of Naive Bayes in classification.

The stages of the research are as follows:



Figure 1. Stages of Research

It begins with the formulation of the research theme and research questions that address the effectiveness of clustering usage. Next, a literature search is conducted using various trusted sources such as IEEE Xplore, SpringerLink, ScienceDirect, ACM Digital Library, and Google Scholar, with

keywords including “classification,” “Naive Bayes,” “Key Performance Indicators,” and “machine learning.” This process follows structured SLR guidelines to ensure the validity and reliability of the research findings.

3. Results and Discussion

No	Year	Title	Method	Contribution	Conclusion
1	2018	Analysis of New Student Selection using Clustering Algorithms [1]	<p>- This study employs clustering methods to process data from the National Selection for State Universities (SNMPTN) for new student admissions at Universitas Negeri Surabaya, aiming to efficiently handle the large volume of applicant data, which reached 29,779 applicants in 2016.</p> <p>Different clustering techniques were selected and evaluated as benchmarks to determine the most accurate and appropriate method for analyzing applicant data. Ultimately, this approach seeks to reduce processing costs and applicant waiting times while increasing the likelihood of admitting high-quality candidates.</p>	<p>- This study contributes to improving the efficiency of processing large volumes of new student data for the National Selection for State Universities (SNMPTN) at Universitas Negeri Surabaya by addressing the annual challenge of managing 29,779 applicants in 2016, thereby reducing the time required to determine selected candidates.</p> <p>By applying various clustering techniques, this research aims to enhance the accuracy of applicant selection, potentially lowering processing costs and minimizing applicant waiting times, while also increasing the likelihood of admitting high-quality candidates into their preferred study programs.</p>	<p>This study demonstrates that clustering methods can improve the efficiency of new student selection at Universitas Negeri Surabaya by reducing processing costs, accelerating selection time, and increasing the accuracy of identifying qualified candidates. The application of clustering techniques helps manage large volumes of data more effectively, resulting in a more optimal selection system. Future studies may explore more advanced algorithms to further enhance selection outcomes.</p>
2	2019	Marketing Strategy for New Student Enrollment Using Machine Learning-Based Clustering Techniques [2]	<p>- This study uses the K-Means clustering algorithm, which is a non-hierarchical clustering method that groups data based on similarity. This method was chosen due to its computational efficiency and simple processing steps, making it suitable for analyzing new student admission data.</p> <p>- To determine the optimal number of clusters, the Elbow method is employed. This method visually identifies the point at which increasing the number of clusters yields diminishing returns in terms of</p>	<p>- This study contributes to identifying and grouping prospective new students based on specific characteristics using Machine Learning techniques with a clustering approach, enabling universities to tailor their marketing strategies more effectively and efficiently according to the needs and preferences of each applicant group.</p> <p>The clustering results show that applicants can</p>	<p>This study shows that the K-Means algorithm is effective in clustering prospective new students based on specific characteristics, with three optimal clusters identified using the Elbow method. The clustering results provide valuable insights for universities to better adjust their marketing strategies, enhance the relevance of promotional campaigns, and optimize new student enrollment</p>

No	Year	Title	Method	Contribution	Conclusion
			explained variance, leading to the conclusion that three clusters are optimal for grouping prospective student applicants..	be divided into three distinct groups, namely cluster 1 (11%), cluster 2 (56%), and cluster 3 (33%). These findings provide valuable insights for universities in designing more targeted and relevant promotional campaigns for each group, thereby increasing new student enrollment rates.	Therefore, the application of clustering techniques in student selection supports more data-driven and efficient decision-making..
3	2023	Clustering analysis of admission of new students using k-Means and k-medoids algorithms to increase marketing potential [3]	This study employs clustering methods, specifically the K-Means and K-Medoids algorithms, to analyze new student admission data from the PMB recording dataset for the 2023 period, which consists of 86 data records. The analysis reveals two clusters: cluster 1 (C0) represents the passed category with varying results (60 for K-Medoids and 40 for K-Means), while cluster 2 (C1) indicates an undetermined status, with 26 results for K-Medoids and 46 for K-Means. These findings provide insights into the potential quality of new student admissions..	This study employs clustering methods, specifically the K-Means and K-Medoids algorithms, to analyze new student admission data, providing insights into the quality of potential admissions and supporting strategic decision-making for campus marketing. The results show the formation of two clusters, with K-Medoids identifying 60 potential admitted candidates and 26 undetermined candidates, while K-Means identifies 40 potential admitted candidates and 46 undetermined candidates. These findings highlight the effectiveness of these algorithms in categorizing admission data to support more effective marketing strategies.	This study demonstrates that the K-Means and K-Medoids algorithms are effective in clustering new student admission data, with two main clusters identified. The analysis results show that K-Medoids groups 60 potential admitted candidates and 26 undetermined candidates, while K-Means groups 40 potential admitted candidates and 46 undetermined candidates. These differences provide insights into the effectiveness of each algorithm in categorizing admission data. The findings can assist institutions in strategic decision-making, particularly in developing more targeted marketing strategies based on the identified quality of prospective students.

No	Year	Title	Method	Contribution	Conclusion
4	2024	A Decision Support Predictive Model using Clustering Analysis Incoming College Students [4]	This study uses clustering analysis to group incoming students based on their entrance examination scores, helping to identify patterns and characteristics within the student population. The dataset from the Central Philippines State University Admissions Office, including demographic data such as senior high school academic tracks and selected course programs, was analyzed to support decision-making regarding appropriate course enrollment for students.	The Predictive Decision Support Model using Clustering Analysis aims to enhance educational institutions' understanding of the needs and characteristics of incoming students, facilitating more accurate decisions regarding course enrollment based on students' entrance examination scores and demographic data. By applying clustering analysis, the model groups students according to their entrance exam results, which can lead to more accurate recommendations for suitable course programs, ultimately supporting the Central Philippines State University Admissions Office in optimizing the selection process for incoming students..	This study demonstrates that clustering analysis can help identify patterns and characteristics of new students based on their entrance examination scores and demographic data. The applied Predictive Decision Support Model enables institutions to make more accurate decisions regarding appropriate course enrollment for each student. Consequently, this approach supports the Central Philippines State University Admissions Office in optimizing the selection process and improving the accuracy of study program recommendations for incoming students.
5	2022	Multiple educational data mining approaches to discover patterns in university admissions program prediction [5]	This paper employs various relationships and clustering approaches within educational data mining to create a knowledge base for predicting ideal college program selection and enrollment estimates for incoming freshmen. The study analyzes two years of college admission data and final-year scholastic records of graduating students to achieve a significant level of accuracy in predicting suitable college programs for students.	This paper contributes to the field of educational data mining by utilizing various relationships and clustering techniques to create a knowledge base that enhances the prediction of ideal college program selection for incoming students, thereby improving the accuracy of the admissions process. Findings from predictive data mining methods can significantly benefit the admissions departments of educational institutions by optimizing course alignment, enhancing student guidance, and improving enrollment forecasting and registration readiness.	This study demonstrates that clustering techniques and educational data mining can improve the accuracy of predicting the most suitable university program for new students. By analyzing admission data and academic records, this method helps educational institutions optimize the selection process, enhance student guidance, and better forecast enrollment trends. The findings contribute to the development of a more data-driven and efficient student admission system.

No	Year	Title	Method	Contribution	Conclusion
6	2022	Implementation of the K-Means Clustering Method to Improve Student Recruitment [6]	<p>- This study uses the K-Means Clustering algorithm to group student data based on their city of origin, school background, and province of origin, which helps in developing strategic policies for student recruitment.</p> <p>Data mining applications, particularly Orange Data Mining and RapidMiner, are employed to implement the K-Means Clustering algorithm, ensuring consistent results in data grouping or clustering across both platforms..</p>	<p>- The application of the K-Means Clustering algorithm enables effective grouping of student data based on their city of origin, school background, and province of origin, which helps in identifying strategic policies for recruiting new students each year.</p> <p>By analyzing the clustered data, universities can formulate targeted recruitment strategies, focusing on areas with the highest potential to attract new students, as demonstrated by the identification of clusters with the largest membership and specific geographic origins. yang bervariasi.</p>	<p>This study shows that the application of the K-Means Clustering algorithm is effective in grouping student data based on their city of origin, school background, and province of origin. By using Orange Data Mining and RapidMiner, the clustering results can be optimized to support new student recruitment strategies. The resulting cluster analysis helps institutions design more targeted recruitment policies, focusing on regions with the highest potential to attract new students. This approach enables data-driven decision-making to improve the effectiveness of student admissions each year.</p>
7	2012	Efficient Clustering Technique for University Admission Data [7]	<p>This study uses the K-Means clustering algorithm, which organizes unlabeled input vectors into clusters by minimizing the distance within clusters and maximizing the distance between clusters. This algorithm is well known for its speed and effectiveness in producing good clustering results, although it can be sensitive to noise in the data.</p> <p>The clustering quality is evaluated using the internal DB measure, which serves as an</p>	<p>- This paper presents an efficient clustering technique using the K-Means algorithm, specifically applied to the admission data of King Abdulaziz University (KAU). It helps organize and analyze admission data to identify natural groupings among applicants based on various attributes.</p> <p>The findings from the</p>	<p>This study shows that the K-Means Clustering algorithm is effective in grouping student admission data at King Abdulaziz University (KAU) by minimizing distances within clusters and maximizing distances between clusters. Evaluation using the DB validity index ensures good clustering quality. The analysis results</p>

No	Year	Title	Method	Contribution	Conclusion
			internal clustering validity index. This measure helps assess the performance of the clustering algorithm and provides insights into the natural partitions formed within the admission data..	clustering analysis provide valuable insights for the KAU admission office, such as acceptance rates by region or city, enabling the university to tailor its advertising strategies to effectively target areas with lower acceptance rates.	provide important insights for the KAU admissions office in understanding admission patterns based on regions, which can be used to adjust marketing strategies to increase the number of applicants from areas with lower acceptance rates.
8	2023	Machine learning-based selection of phd admission [8]	This paper discusses the use of machine learning algorithms to predict students' chances of admission to doctoral programs, with a particular focus on methods such as Logistic Regression and K-Nearest Neighbors (KNN). The experimental results indicate that the KNN model demonstrates superior performance compared to the Logistic Regression model in predicting doctoral admission outcomes.	This paper introduces a new dataset called PhD_Admission_Dataset, which is used to evaluate various machine learning algorithms in predicting students' chances of admission to doctoral programs, thereby enhancing decision-making processes for educational institutions. By applying machine learning algorithms such as KNN and Logistic Regression, this study demonstrates that these methods can effectively manage large volumes of doctoral applications, while enabling students to predict their admission probabilities in advance.	This study demonstrates that machine learning algorithms, particularly K-Nearest Neighbors (KNN) and Logistic Regression, can be used to predict the probability of students being admitted to doctoral programs. The experimental results show that the KNN model outperforms Logistic Regression in making predictions. By introducing the PhD_Admission_Dataset, this research contributes to improving decision-making processes for educational institutions and helps prospective students estimate their chances of admission prior to applying.
9	2023	Analysis and Application of the K-Clustering Means Clustering Algorithm as a Promotion Strategy for New Student Admissions at Universitas Wirarajaschool [9]	This study applies the K-Means Clustering algorithm to analyze new student admission data at Universitas Wiraraja for the years 2021 and 2022. The dataset consists of 1,993 records with seven main attributes: gender, admission pathway, study program choice, sub-district, and regency. Prior to analysis, the data underwent a preprocessing stage that included data cleaning to remove missing values, duplicate removal to eliminate redundant	This study contributes to optimizing new student admission promotion strategies by applying a data mining approach. By utilizing K-Means Clustering, the study is able to identify regions with high and low student enrollment rates, allowing promotional strategies to be implemented in a more targeted and effective manner. Based on the	The results of this study indicate that the K-Means Clustering algorithm can be used to group new students at Universitas Wiraraja into two main clusters. Cluster 0 consists of 1,460 students (73%) originating from regions with high enrollment levels, while Cluster 1 consists of 551 students (23%) from regions with lower enrollment levels.

No	Year	Title	Method	Contribution	Conclusion
			<p>records, and data transformation into numerical form to facilitate analysis using K-Means Clustering.</p> <p>The determination of the optimal number of clusters was conducted using the Davies–Bouldin Index (DBI), where the best result was obtained with a DBI value of 0.878 at $k = 2$, resulting in the student data being divided into two main clusters. The analysis was implemented using RapidMiner, with key operators including Read Excel to load the dataset, the Clustering Algorithm operator to process the data using K-Means Clustering, and the Performance operator to evaluate the clustering results.</p>	<p>analysis results, it was found that promotional efforts should be focused on Sumenep Regency, particularly in the districts of Kota Sumenep, Kepulauan, Kalianget, and Saronggi, which show the highest student enrollment levels.</p> <p>In addition, the study identifies the schools of origin with the highest enrollment rates, namely public senior high schools (SMA Negeri), public vocational schools (SMK Negeri), private Islamic senior high schools (MA Swasta), and public Islamic senior high schools (SMA Negeri), public vocational schools (SMK Negeri), private Islamic senior high schools (MA Swasta), and public Islamic senior high schools (MA Negeri), as universities can develop more effective and efficient marketing strategies to attract prospective new students. Through a data-driven analysis, they have been shown to contribute the largest number of new students. Through a data mining-based approach, Universitas Wiraraja can design a more effective and efficient promotional strategies, thereby optimizing the increase in new student enrollment.</p>	<p>Based on these clustering results, the recommended promotional strategy is to focus and intensify promotion in Sumenep Regency, particularly in the districts of Kota Sumenep, Kepulauan, Kalianget, and Saronggi, as these areas show higher potential for new student enrollment.</p> <p>In addition, the schools that should be prioritized for promotional activities are public senior high schools (SMA Negeri), public vocational schools (SMK Negeri), private Islamic senior high schools (MA Swasta), and public Islamic senior high schools (SMA Negeri), public vocational schools (SMK Negeri), private Islamic senior high schools (MA Swasta), and public Islamic senior high schools (MA Negeri), as these areas show higher potential for new student enrollment.</p>

No	Year	Title	Method	Contribution	Conclusion
10	2024	Student Clustering Optimizing Student Admissions [10]	<p>DataThis study applies the K-Means Clustering algorithm to group Newstudent data from ITB Ahmad Dahlan with the aim of identifying specific patterns and characteristics to optimize new student admissions. The data were obtained from active students in the 2019–2022 academic years, with key variables including study program, GPA, city/regency, province, type of school, and class.</p> <p>The research stages consist of data collection, data transformation, implementation of the K-Means Clustering algorithm, and result visualization. Categorical data such as study program, school of origin, and regional origin were converted into numerical form to facilitate the analysis process. Furthermore, the number of clusters was set to three groups, with initial centroids selected randomly. The iterative process was conducted using Euclidean distance to determine cluster membership until stability was achieved (i.e., no data points changed clusters).</p> <p>The clustering results were evaluated using the Silhouette Score and Inertia to assess the quality of the clustering. Finally, the clustering outcomes were visualized using scatter plots to support further analysis.</p>	<p>This study contributes to optimizing new student admission strategies through a data-driven approach. By applying K-Means Clustering, universities can identify enrollment patterns based on study programs, school of origin, and regional origin. This enables institutions to adjust marketing and promotional strategies more effectively, particularly in allocating marketing resources to regions with high potential. In addition, this research helps reduce recruitment costs by focusing promotional efforts on more relevant groups of prospective students. Furthermore, this data-based analysis supports more measurable and objective decision-making, allowing universities to improve the quality of new student admissions in a more efficient manner. Beyond its benefits for ITB Ahmad Dahlan, the findings of this study may also serve as a reference for other universities in implementing clustering methods for student admission analysis.</p>	<p>The research results show that the K-Means Clustering algorithm is able to group ITB Ahmad Dahlan students into three main clusters, each with distinct characteristics. This clustering provides in-depth insights into differences in study program preferences, school of origin, average GPA, and students' regional backgrounds. With this information, the university can tailor new student admission strategies more precisely, both in terms of promotion and candidate selection. In addition, the application of clustering has been proven to improve institutional efficiency and effectiveness in managing student admissions, enabling the university to allocate resources more optimally. Therefore, the findings of this study are expected to serve as a foundation for policymakers in designing data-driven admission strategies to enhance the quality and quantity of new students in the future.</p>

The discussion presented in the table on clustering for new student admissions in motivating study program selection shows that the application of the K-Means clustering algorithm is effective in grouping student data based on city of origin, school of origin, and province of origin. By using Orange Data Mining and RapidMiner, the clustering results can be optimized to support new student recruitment strategies. The resulting cluster analysis assists institutions in designing more targeted recruitment policies by focusing on regions with the highest potential to attract prospective

students. This approach enables data-driven decision-making to improve the effectiveness of student admissions each year.

The K-Means algorithm is effective in grouping prospective students based on specific characteristics, with three optimal clusters identified using the Elbow method. The clustering results provide valuable insights for universities to better tailor their marketing strategies, enhance the relevance of promotional campaigns, and optimize new student enrollment rates. Therefore, the application of clustering techniques in student selection supports more efficient and targeted decision-making in new student admissions, particularly in optimizing study program selection. This data-driven approach contributes to the development of effective admission strategies aimed at improving both the quality and quantity of new students in the future.

4. Conclusion

Based on the table and the discussion above, it can be concluded that the K-Means Clustering method is effective in grouping prospective new students based on key demographic factors. By identifying three optimal clusters using the Elbow method, universities can gain deeper insights into student characteristics and adjust their marketing strategies more effectively. In addition, the application of simple linear regression enables the prediction of new student enrollment for future years. This supports universities in designing more targeted promotional strategies and optimizing admission policies through more structured data analysis.

Overall, the use of clustering techniques in new student selection can enhance decision-making efficiency, strengthen the relevance of promotional campaigns, and optimize new student enrollment rates by supporting more appropriate study program selection. Thus, the application of K-Means Clustering and predictive analysis in new student admissions not only helps in understanding enrollment patterns but also supports more targeted decision-making. Universities can optimize new student enrollment through more relevant strategies, enhance institutional competitiveness, and strengthen the positioning of study programs in attracting prospective students.

References

- [1] Suartana, I. M., & Hidayat, A. I. N. (2018). Analysis of New Student Selection using Clustering Algorithms. *IOP Conference Series: Materials Science and Engineering*, 288(1). <https://doi.org/10.1088/1757-899X/288/1/012079>.

- [2] Dana, R. D., Rohmat, C. L., & Rinaldi, A. R. (2019). Strategi Marketing Penerimaan Mahasiswa Baru Menggunakan Machine Learning dengan Teknik Clustering. *Jurnal Informatika: Jurnal Pengembangan IT*, 4(2-2), 201-204. <https://doi.org/10.30591/jpit.v4i2-2.1879>
- [3] Amin, H., & Utomo, W. H. (2023). *Clustering Analysis Of Admission Of New Students Using K-Means Clustering And K-Medoids Algorithms To Increase Campus Marketing Potential*. <http://bsti.ubd.ac.id/e-jurnal>
- [4] Alegre, G. E., Balladares, R. A. C., Tee, S. M. R., Adad, F. I. R., Cofino, C. L., & Cerna, P. D. (2024). *A Decision Support Predictive Model using Clustering Analysis for Incoming College Students*. 869-873. <https://doi.org/10.1109/icipcn63822.2024.00150>
- [5] Mamaril, J. C. O., & Ballera, M. A. (2022). Multiple educational data mining approaches to discover patterns in university admissions for program prediction. *International Journal of Informatics and Communication Technology (IJ-ICT)*, 11(1), 45. <https://doi.org/10.11591/ijict.v11i1.pp45-56>
- [6] Helmi, F. (2023). *Analisis dan Penerapan Algoritma K-Means Clustering Sebagai Strategi Promosi Penerimaan Mahasiswa Baru Pada Universitas Wiraraja*. 2(1), 1-11. <https://doi.org/10.35316/justify.v2i1.3205>
- [7] Fattah Mashat, A., Fouad, M. M., Yu, P. S., & Arabia Tarek Gharib, S. F. (2012). Efficient Clustering Technique for University Admission Data. In *International Journal of Computer Applications* (Vol. 45, Issue 23).
- [8] Deka, B. K., & Talukdar, C. (2022). Futuristic Trends in Artificial Intelligence Machine Learning-Based Selection Of Phd Admission Machine Learning-Based Selection Of Phd Admission Machine Learning-Based Selection Of Phd Admission. In *IIP Proceedings* (Vol. 2, Issue 16).
- [9] Muhammad Zulfadhilah, Mambang, & Septyan Eka Prastya. (2022). Implementasi Metode K-Means Clustering untuk Meningkatkan Penjaringan Mahasiswa. *TEMATIK*, 9(2), 152-160. <https://doi.org/10.38204/tematik.v9i2.1053>
- [10] Yusuf, D., Sestri, E., Razi, F., Teknologi dan Bisnis Ahmad Dahlan, I., Ir Juanda No, J. H., & Tangerang Selatan, K. (2024). JIKA | 484 Pengelompokan Data Mahasiswa Menggunakan Clustering Untuk Optimalisasi Penerimaan Mahasiswa Baru. In *Jurnal Informatika) Universitas Muhammadiyah Tangerang P* (Vol. 8, Issue 4).