

Decision Support System for Determining the Best School Extracurricular Activities by Combining the ROC and MAUT Methods

Jahril^{1,*}, Abdul Karim², Erlin Windia Ambarsari³, Agus Perdana Windarto⁴

¹Faculty of Computer Science and Information Technology, Informatics Engineering, Budi Darma University, Medan, Indonesia

²Informatics Engineering, Labuhanbatu University, Medan, Indonesia

³Faculty of Engineering and Computer Science, Informatics Engineering, Universitas Indraprasta PGRI, Jakarta, Indonesia

⁴Information System, STIKOM Tunas Bangsa, Pematang Siantar, Indonesia

Email: ^{1,*}jahrilmanik15@gmail.com, ²abdkarim6@gmail.com, ³erlinunindra@gmail.com, ⁴agus.perdana@amiktunasbangsa.ac.id

Correspondence Author Email: jahrilmanik15@gmail.com

Abstract—The various extracurricular activities at school make students confused and difficult to choose which extracurricular activities are more suitable for participation. However, sometimes there are also students choosing extracurricular activities based on many of their friends. Therefore, determining the best school extracurricular activities is the best solution for students as a reference to find which is the best extracurricular activity. The criteria used in this study in choosing the best extracurricular activities are Regional Event Activities, Allocation, Creativity and Talent Channeling. By utilizing SPK, decision makers can make more systematic decisions, based on a deeper understanding of the various alternatives available and relevant criteria. SPK or decision support system is a technique that has the ability to determine a decision using a technical design based on alternatives and predetermined criteria. SPK or decision support system is a technique that has the ability to determine a decision using a technical design based on alternatives and predetermined criteria. In the context of extracurricular school selection, combining the ROC (Rank Order Centroid) and MAUT (Multi-Attribute Utility Theory) methods in a Decision Support System is an interesting approach. The ROC method is used to cluster and rank schools based on certain criteria, while MAUT helps in the calculation of appropriate weights for these criteria. By integrating these two methods, the SPK can provide a more structured guideline in the selection of extracurricular activities that suit students' interests and needs. The research results obtained show that the Futsal alternative is the first recommendation as the best extracurricular with a final value of 0.655086.

Keywords: DSS; ROC; MAUT; Extracurricular

1. INTRODUCTION

Education plays a major role in shaping an individual's character and potential and is the foundation for a bright future. Aside from the academic program, student development is also strengthened through participation in extracurricular activities. Extracurricular activities include a wide array of activities outside of the regular class schedule, such as clubs, sports activities, arts, and social activities. Engaging in extracurricular activities helps students develop diverse skills, pursue personal interests, and channel their talents, all while contributing to holistic personal development. However, choosing the most suitable extracurricular activities is often a dilemma for students, parents, and school authorities. School is a place for learning and teaching to gain knowledge in the form of education. Schools are a place of character-building for students, which greatly affects their cognitive and affective development. In every level of education, schools usually have extracurricular activities that every student can participate in.

Extracurricular activities aim to enable students to develop their interests and talents and show their abilities, with a positive goal for the progress of the students themselves. With the many kinds of extracurricular activities available at school, it makes students confused and difficult to choose which extracurricular activities are more suitable for participation[1]. However, sometimes there are also students who choose extracurricular activities based on the opinions of many of their friends. Therefore, determining the best school extracurricular activities is the best solution for students as a reference to find the best extracurricular activities. The selection of appropriate extracurricular activities is a decision that has a significant impact on the educational experience and personal development of students. In making this decision, students must consider various factors such as personal interests, aptitudes, time availability, personal development goals, and other considerations. Each student has unique preferences, so there is no universally applicable approach. The criteria used in this study in selecting the best extracurricular activities are regional event activities, allocation, creativity, and talent channeling. Therefore, the decision-making process related to extracurricular activities is often a complex one.

In an age where information technology is advancing, there is a great opportunity to utilize technology to improve the quality of smarter, data-driven decision-making. The concept of decision support systems (DSS) emerges as a promising solution in this context. A CBMS is a system created with the aim of assisting decision-makers by integrating data, information, and analysis methods. By utilizing SPK, decision-makers can make more systematic decisions based on a deeper understanding of the various alternatives available and the relevant criteria. SPK, or decision support system, is a technique that has the ability to determine a decision using a technical design based on alternatives and criteria that have been determined[2][3][4]. In the context of extracurricular school selection, combining the ROC (Rank Order Centroid) and MAUT (Multi-Attribute Utility Theory) methods in a decision support system is an interesting approach. The ROC method is used to cluster and rank schools based on certain criteria, while MAUT helps in the calculation of appropriate weights for these criteria. By integrating these two methods, the SDM can provide a more structured guideline for the selection of extracurricular activities that suit the interests and needs of students.

In the use of the combination of ROC and MAUT, it has been widely used as an option to determine or solve problems efficiently that have a complex and structured nature. Based on previous research, such as research conducted

by Ade Ayunda Kusuma, Zaza Pearl, Uswatun, and Mesran in 2021, determining the location of millennial coffee shops in the new normal era by combining the roc and maut methods With the criteria of strategic location, land area, accessibility, crowd, rental price, number of competitors, and length of lease, so as to produce the highest alternative value contained in alternative A1, namely Jalan Sisingan Mangaraja, the final result is 0.8054[5]. Research conducted by Agung Tria Yudi, Jumba Dorisman Raja Gukguk, and Mesran in 2022 determined the priority of regionally superior products by combining the roc and death methods. With the criteria of turnover, labor, target market, origin of raw materials, and quantity of raw materials Producing the highest alternative value is in alternative A3, namely coffee products; the final result is 0.000635[6]. Research conducted by Zaza Pearl Arini, Devi Januarti Sitanggang, Muhammad Ali, and Soeb Aripin in 2022 determined the best facial wash for oily skin by combining the roc and death methods. With the criteria of composition, fragrance, packaging, marketing, number of consumers, price, and side effects resulting in the highest alternative value found in alternative A2 ponds, the final result is 0.7775[7]. Research conducted by Mei Mariana Boangmanalu, Mesran, and Bister Purba in 2022 determined the selection of retail marketing candidates by combining the roc and death methods. With the criteria of education, experience, public speaking, appearance, and age, Produces the highest alternative value contained in alternative A6, namely friska larisna; the final result is 0.575[8]. Research conducted by Jumba Dorisman Rajagukguk, Mesran, and Bisterpurba in 2022 in determining candidates for UKT assistance at Budi Darma University by combining roc and death methods With the criteria of GPA, achievement, parents' income, and semester, the highest alternative value is found in alternative A2, namely the Mangaraja side road; the final result is 0.707[9]. Research conducted by Rmadani, Prizwanto, and Yasir Hasan in 2022 determined the selection of teachers at Madrasah Ibtidaiyah by combining the roc and death methods. With the criteria of the Koran reading test, broad insight, communication, personality, and experience Producing the highest alternative value is in alternative A5, and the final result is 0.832[10]. Research was conducted in 2022 to determine the eligibility of migrant workers by combining the ROC and death methods. With the criteria of education, work experience, age, knowledge, skills, and ethics, the highest alternative value is found in alternative A5, namely boby, with a final value of 0.9748[11].

The purpose of this research is to develop a decision support system that utilizes the ROC and MAUT methods to determine the best school for extracurricular activities. Through this approach, it is expected that the extracurricular selection process can run more efficiently, objectively, and based on strong information. To provide a more in-depth understanding of the background issues motivating this research, the context of the research will be explained more comprehensively.

2. RESEARCH METHODOLOGY

2.1 Decision Support System

Decision Support System (DSS) is a system or software created with the aim of providing assistance to individuals or groups in the decision-making process. SPK utilizes data, information, and various analytical methods to provide structured and fact-based support when facing complex decisions. The main focus of SDM is to assist decision makers in understanding the situation at hand, evaluating available alternatives, and identifying the best option based on predetermined criteria or objectives[12][13][14][15][16].

2.2 Extracurricular

Extracurricular refers to educational activities or programs that are held outside of regular class hours at schools or educational institutions. The main mission of these activities is to provide learners with additional experiences, which include the development of skills, interests, and knowledge outside the scope of the academic curriculum. The main purpose of extracurricular activities is to provide opportunities for students to develop themselves outside the classroom environment, explore their interests and talents, expand their knowledge, and acquire social and leadership skills. Generally, extracurricular activities are directed and managed by teachers or instructors who have expertise in the field, and students are given the freedom to choose activities that suit their interests and abilities[17][18][19][20][21].

2.3 ROC Method

ROC is a method that focuses on the priority of the first criterion, which is the main criterion. In this method, criteria are weighted according to their importance by assigning weights to each criterion according to a ranking based on priority evaluation. In this case, the first criterion is more important than the second criterion, the second criterion is more important than the third criterion, and so on until the nth criterion. The importance of each criterion is as follows[22][23][24][25][26]:

$$C_1 > C_2 > C_3 > C_m \quad (1)$$

To calculate the weight value, use the formula:

$$W_m = \frac{1}{m} \sum_{i=1}^m \left(\frac{1}{i} \right) \quad (2)$$

2.4 MAUT Method

MAUT is an analytical method applied in SPK for decision-making processes involving multiple criteria or attributes. The Multi-Attribute Utility Theory (MAUT) method is used to convert a number of levels of importance into numerical values in the 0–1 scale range[27]. On this scale, 0 represents the lowest or worst option, while 1 indicates the highest or best option. The MAUT method is one of the frameworks for the final evaluation of each object, where the object can be said to be the weight that is summed to a relevant valueThe following are the calculation steps in the MAUT method[28][29][30][31][32][33].

1. Creating a Decision Matrix

$$X_{ij} = \begin{bmatrix} r_{11} & \dots & r_{1j} & \dots & r_{1n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{i1} & \dots & r_{ij} & \dots & r_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ r_{m1} & \dots & r_{mj} & \dots & r_{mn} \end{bmatrix} \tag{3}$$

2. Calculating the Normalized Matrix

$$(r_{ij}^*) = \frac{r_{ij} - \min(r_{ij})}{\max(r_{ij}) - \min(r_{ij})} \text{ (For Benefit)} \tag{4}$$

$$(r_{ij}^*) = 1 + \left(\frac{\min(r_{ij}) - r_{ij}}{\max(r_{ij}) - \min(r_{ij})} \right) \text{ (For Cost)} \tag{5}$$

3. Finding the Marginal Utility Value (U_{ij})

$$U_{ij} = \frac{e^{(r_{ij}^*)^2} - 1}{1.71} \tag{6}$$

4. Finding the Final Utility Value (U_i)

$$U_i = \sum_j^n = 1 u_{ij} \cdot w_j \tag{7}$$

2.5 Research Stages

In this study, the authors took several steps to collect data as shown in the following figure:

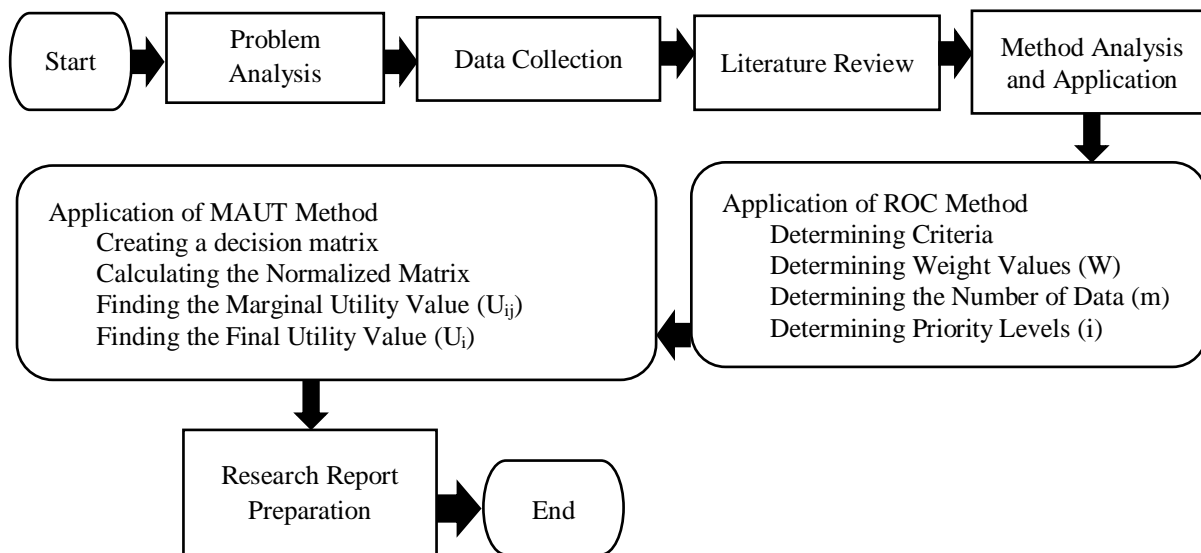


Figure 1. Research Framework

In this study, the authors took several steps to collect data as shown in Figure 1 and the following explanation:

1. Analyzing the Problem
In conducting a study, we first analyze a problem so that it can be used as a subject matter in a study.
2. Data Collection
Collecting data in a study is very necessary so that the data can be used as a reference in the study.
3. Literature Study
In conducting a research, we must understand the object and look for several references in the library or on google scholar so that it makes it easier for us to do research.
4. Analysis of Method Application

At this stage we analyze the problem in selecting the best chat application, starting from determining the weight value, criteria and alternatives using the ROC and MAUT methods.

5. Conclusion

In this stage the author makes conclusions from all the processes of this study to ensure that the results of this study are as expected.

3. RESULT AND DISCUSSION

3.1 Alternatives

In producing decisions in determining outstanding students, some alternative data, criteria and weights are needed. Here are 5 alternative data such as Table 1.

Table 1. Alternative Data

Alternative	Extracurricular
A1	Pmr
A2	Pramuka
A3	Drum band
A4	Paskibra
A5	Futsal
A6	Dance and rhythm

3.2 Criteria

This calculation also requires criteria because the criteria are materials for consideration.

Table 2. Criteria Data

Criteria	Description	Type
C1	Regional Event Activity	Benefit
C2	Allocation	Benefit
C3	Creativity	Benefit
C4	Talent Distribution	Benefit

3.3 Application of the ROC method

In determining the best chat application, there are several criteria that must be met, and the weighting for this study uses the ROC method. Weighting the value according to the ROC method based on the criteria above, the calculation is as follows:

$$W1 = \frac{1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}}{4} = 0,521$$

$$W2 = \frac{0 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4}}{4} = 0,271$$

$$W3 = \frac{0 + 0 + \frac{1}{3} + \frac{1}{4}}{4} = 0,146$$

$$W4 = \frac{0 + 0 + 0 + \frac{1}{4}}{4} = 0,062$$

Then the weight for $C_1 = 0,521$, $C_2 = 0,271$, $C_3 = 0,146$, dan $C_4 = 0,062$. The following are alternatives and criteria that have been weighted:

Table 3. Alternative and Weight Data

Criteria	Description	Weight	Type
C1	Regional Event Activity	0,521	Benefit
C2	Allocation	0,271	Benefit
C3	Creativity	0,146	Benefit
C4	Talent Distribution	0,062	Benefit

The following is extracurricular data that will be considered in this study as an alternative to finding the best extracurricular activities:

Table 4. Alternative Data and Criteria

Alternative	C1	C2	C3	C4
Pmr	Good	Very Good	Good	Good
Pramuka	Very Good	Good	Good	Good
Drum band	Good	Good	Very Good	Good
Paskibra	Good	Very Good	Fair	Very Good
Futsal	Very Good	Good	Good	Very Good
Dance and rhythm	Very Good	Cukuk Good	Good	Fair

Table 4 above requires data on the weighting value of all criteria; the following weighting value data is needed in this study.

Table 5. Data Nilai Pembobotan C2, C3, dan C4

Keterangan	Nilai
Very Good	5
Good	4
Fair	3
Poor	2
Very Poor	1

The following is the match rating data obtained after matching the alternative criteria data with the weighting value data.

Table 6. Match Rating Data

Alternative	C1	C2	C3	C4
A1	4	5	4	4
A2	5	4	4	4
A3	4	4	5	4
A4	4	5	3	5
A5	5	4	4	5
A6	5	3	4	3

3.4 Application of MAUT Method

After finding the number value that has been changed based on the value of each alternative, the next step is the calculation of the MAUT method:

1. Preparing the Decision Matrix

$$X_{ij} = \begin{bmatrix} 4 & 5 & 4 & 4 \\ 5 & 4 & 4 & 4 \\ 4 & 4 & 5 & 4 \\ 4 & 5 & 3 & 5 \\ 5 & 4 & 4 & 5 \\ 5 & 3 & 4 & 3 \end{bmatrix}$$

2. Calculating the Normalized Matrix C1

$$r_{11}^* = \frac{4-4}{5-4} = 0$$

$$r_{21}^* = \frac{5-4}{5-4} = 1$$

$$r_{31}^* = \frac{4-4}{5-4} = 0$$

$$r_{41}^* = \frac{4-4}{5-4} = 0$$

$$r_{51}^* = \frac{5-4}{5-4} = 1$$

$$r_{61}^* = \frac{5-4}{5-4} = 1$$

C2

$$r_{12}^* = \frac{5-3}{5-3} = 1$$

$$r_{22}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{32}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{42}^* = \frac{5-3}{5-3} = 1$$

$$r_{52}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{62}^* = \frac{3-3}{5-3} = 0$$

C3

$$r_{13}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{23}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{33}^* = \frac{5-3}{5-3} = 1$$

$$r_{43}^* = \frac{3-3}{5-3} = 0$$

$$r_{53}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{63}^* = \frac{4-3}{5-3} = 0,5$$

C4

$$r_{14}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{24}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{34}^* = \frac{4-3}{5-3} = 0,5$$

$$r_{44}^* = \frac{5-3}{5-3} = 1$$

$$r_{54}^* = \frac{5-3}{5-3} = 1$$

$$r_{64}^* = \frac{3-3}{5-3} = 0$$

The following results can be obtained from normalization calculations:

Table 7. Normalized Matrix Data

Alternative	C1	C2	C3	C4
A1	0	1	0,5	0,5
A2	1	0,5	0,5	0,5
A3	0	0,5	1	0,5
A4	0	1	0	1
A5	1	0,5	0,5	1
A6	1	0	0,5	0

3. Finding the Marginal Utility Value (U_{ij})

C1

$$U_{11} = \frac{e^{(1)^2}-1}{1.71} = 0$$

$$U_{21} = \frac{e^{(1)^2}-1}{1.71} = 1,0048432$$

$$U_{31} = \frac{e^{(0)^2}-1}{1.71} = 0$$

$$U41 = \frac{e^{(1)^2} - 1}{1.71} = 0$$

$$U = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

C2

$$U12 = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U22 = \frac{e^{(-1)^2} - 1}{1.71} = 0,1660967$$

$$U32 = \frac{e^{(1)^2} - 1}{1.71} = 0,1660967$$

$$U42 = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U52 = \frac{e^{(0)^2} - 1}{1.71} = 0,1660967$$

$$U62 = \frac{e^{(-1)^2} - 1}{1.71} = 0$$

C3

$$U13 = \frac{e^{(1)^2} - 1}{1.71} = 0,1660967$$

$$U23 = \frac{e^{(0,5)^2} - 1}{1.71} = 0,1660967$$

$$U33 = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U43 = \frac{e^{(0)^2} - 1}{1.71} = 0$$

$$U53 = \frac{e^{(0,5)^2} - 1}{1.71} = 0,1660967$$

$$U63 = \frac{e^{(0,5)^2} - 1}{1.71} = 0,1660967$$

C4

$$U14 = \frac{e^{(0,5)^2} - 1}{1.71} = 0,1660967$$

$$U24 = \frac{e^{(0,5)^2} - 1}{1.71} = 0,1660967$$

$$U34 = \frac{e^{(1)^2} - 1}{1.71} = 0,1660967$$

$$U44 = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U54 = \frac{e^{(1)^2} - 1}{1.71} = 1,0048432$$

$$U64 = \frac{e^{(0)^2} - 1}{1.71} = 0$$

From the calculation, the following data is obtained:

Table 8. U_{ij} Calculation Result Data

Alternative	C1	C2	C3	C4
A1	0	1,0048432	0,1660967	0,1660967
A2	1,0048432	0,1660967	0,1660967	0,1660967
A3	0	0,1660967	1,0048432	0,1660967

Alternative	C1	C2	C3	C4
A4	0	1,0048432	0	1,0048432
A5	1,0048432	0,1660967	0,1660967	1,0048432
A6	1,0048432	0	0,1660967	0

4. Finding the Final Utility Value (U_i)

$$U_1 = (0,521 * 0) + (0,271 * 1,0048432) + (0,146 * 0,1660967) + (0,062 * 0,1660967) \\ = 0,306861$$

$$U_2 = (0,521 * 1,0048432) + (0,271 * 0,1660967) + (0,146 * 0,1660967) + (0,062 * 0,1660967) \\ = 0,603084$$

$$U_3 = (0,521 * 0) + (0,271 * 0,1660967) + (0,146 * 1,0048432) + (0,062 * 0,1660967) \\ = 0,202017$$

$$U_4 = (0,521 * 0) + (0,271 * 1,0048432) + (0,146 * 0) + (0,062 * 1,0048432) \\ = 0,334613$$

$$U_5 = (0,521 * 1,0048432) + (0,271 * 0,1660967) + (0,146 * 0,1660967) + (0,062 * 1,0048432) \\ = 0,655086$$

$$U_6 = (0,521 * 1,0048432) + (0,271 * 0) + (0,146 * 0,1660967) + (0,062 * 0) \\ = 0,547773$$

After calculating the last stage, the following ranking data can be generated:

Table 9. Ranking Data

Alternative	Extracurricular	Value	Rangking
A1	Pmr	0,306861	5
A2	Pramuka	0,603084	2
A3	Drum band	0,202017	6
A4	Paskibra	0,334613	4
A5	Futsal	0,655086	1
A6	Dance and rhythm	0,547773	3

The combination of ROC and MAUT methods can solve the problem of determining the best extracurricular school with satisfactory results. Futsal extracurricular is the first recommendation as a good extracurricular, with a final value of 0.655086.

4. CONCLUSION

The application of the Rank Order Centroid (ROC) method as a determination of weight values and Multi Attribute Utility Theory (MAUT) as a case resolution solution can be used as a solution in solving cases in evaluating the determination of extracurricular schools based on the weight of criteria and alternatives. The process of making a decision in determining the extracurricular school is clearer and more accurate; therefore, it is easier for students to choose extracurricular activities according to their interests. The combination of the ROC and MAUT methods can solve the problem of determining the best school extracurricular activities with satisfactory results. Futsal extracurricular is the first recommendation as a good extracurricular, with a final value of 0.655086.

REFERENCES

- [1] K. Shilviana and T. Hamami, "Pengembangan Kegiatan Kokurikuler dan Ekstrakurikuler," *Palapa*, vol. 8, no. 1, pp. 159–177, 2020, doi: <https://doi.org/10.36088/palapa.v8i1.705>.
- [2] H. Ekawati and Y. Yunita, "Penerapan Metode MOOSRA dalam Rekomendasi Platform Investasi Emas Online Terbaik dengan Pembobotan ROC," *JURNAL MEDIA INFORMATIKA BUDIDARMA*, vol. 7, no. 2, pp. 778–786, 2023, doi: [10.30865/mib.v7i2.6063](https://doi.org/10.30865/mib.v7i2.6063).
- [3] K. Kraugusteeliana, A. Subagiyo, and F. Setyawan, "Pemilihan Jenis Obat Terbaik Untuk Gejala Batuk Remaja dengan Menggunakan Metode AHP dan ARAS," *JURIKOM (Jurnal Riset Komputer)*, vol. 9, no. 6, pp. 2172–2182, 2022.
- [4] A. Iskandar, "Penerapan Multi-Objective Optimization by Ratio Analysis (MOORA) Dalam Penyeleksian Kelayakan Nasabah Penerima Kredit," *Journal of Computer System and Informatics (JoSYC)*, vol. 4, no. 1, pp. 7–14, 2022, doi: [10.47065/josyc.v4i1.2499](https://doi.org/10.47065/josyc.v4i1.2499).

- [5] A. A. Kusuma, Z. M. Arini, U. Hasanah, and M. Mesran, M.Kom, “Analisa Penerapan Metode Multi Attribute Utility Theory (MAUT) dengan Pembobotan Rank Order Centroid (ROC) Dalam Pemilihan Lokasi Strategis Coffeshop Milenial di Era New Normal,” *Jurnal Sistem Komputer dan Informatika (JSON)*, vol. 3, no. 2, p. 51, 2021, doi: 10.30865/json.v3i2.3575.
- [6] A. Triayudi, J. D. Rajagukguk, and M. Mesran, “Implementasi Metode MAUT Dalam Menentukan Prioritas Produk Unggulan Daerah Dengan Menerapkan Pembobotan ROC,” *Journal of Computer System and Informatics (JoSYC)*, vol. 3, no. 4, pp. 452–460, 2022, doi: 10.47065/josyc.v3i4.2216.
- [7] Z. M. Arini, D. J. Sitanggang, M. Ali, and S. Aripin, “Sistem Pendukung Keputusan Penentuan Facial Wash Terbaik yang digunakan pada kulit berminyak dengan menggunakan Metode Multi Attribute Utility Theory (MAUT) dan Pembobotan Rank Order Centroid (ROC),” pp. 317–324, 2022.
- [8] M. M. Boangmanalu, M. Mesran, and B. Purba, “Implementasi Metode MAUT Dalam Seleksi Calon Marketing Retail dengan menerapkan pembobotan ROC,” *Jurnal Ilmiah Media Sisfo*, vol. 16, no. 2, pp. 81–91, 2022, doi: 10.33998/mediasisfo.2022.16.2.1264.
- [9] J. D. Rajagukguk, M. Mesran, and B. Purba, “Penerapan Kombinasi Metode ROC Dan MAUT Dalam Penentuan Calon Penerima Bantuan UKT Pada Universitas Budi Darma,” *J-SAKTI (Jurnal Sains Komputer dan Informatika)*, vol. 6, no. 2, pp. 1193–1206, 2022, doi: 10.30645/j-sakti.v6i2.473.
- [10] I. I. Ramadani, P. Pristiwanto, and Y. Hasan, “Kombinasi Metode ROC dan Metode MAUT dalam Pemilihan Guru pada Madrasah Ibtidaiyah,” *Bulletin of Data Science*, vol. 2, no. 1, pp. 1–7, 2022.
- [11] D. H. Ramadan, M. R. Siregar, and S. R. Siregar, “Penerapan Metode MAUT Dalam Penentuan Kelayakan TKI dengan Pembobotan ROC,” *JURNAL MEDIA INFORMATIKA BUDIDARMA*, vol. 6, no. 3, pp. 1789–1795, 2022, doi: 10.30865/mib.v6i3.4441.
- [12] H. M. Valentine, S. Ramos, F. Nugroho, and M. Mesran, “Penerapan Metode ROC-TOPSIS dalam Keputusan Penerima Program Keluarga Harapan,” *Journal of Computer System and Informatics (JoSYC)*, vol. 4, no. 1, pp. 203–211, 2022, doi: 10.47065/josyc.v4i1.2541.
- [13] D. P. Indini, M. Mesran, and A. Triayudi, “Penerapan Sistem Pendukung Keputusan dalam Penentuan Alat Bantu Media Pembelajaran Fisika Terbaik Menggunakan Metode PSI,” *Journal of Computer System and Informatics (JoSYC)*, vol. 4, no. 4, pp. 861–871, 2023, doi: 10.47065/josyc.v4i4.3466.
- [14] S. Hutagalung, D. S. Gea, and D. P. Indini, “Penerapan Metode MOORA Dalam Pemilihan Bimbingan Belajar Terbaik,” *Journal of Informatics Management and Information Technology*, vol. 3, no. 1, pp. 1–7, 2023, doi: 10.47065/jimat.v3i1.226.
- [15] A. Iskandar, “Penyeleksian Penerimaan Teleservice Representative dengan Penerapan Metode ARAS dan Pembobotan ROC,” *JURIKOM (Jurnal Riset Komputer)*, vol. 10, no. 2, pp. 548–557, 2023, doi: 10.30865/jurikom.v10i2.6069.
- [16] M. A. Abdullah and R. T. Aldisa, “Implementasi Metode MAUT dalam Sistem Pendukung Keputusan Seleksi Penerimaan Stock Keeper Restoran dengan Pembobotan Rank Order Centroid,” *Building of Informatics, Technology and Science (BITS)*, vol. 4, no. 3, pp. 1422–1430, 2022, doi: 10.47065/bits.v4i3.2656.
- [17] S. Supiana, A. H. Hermawan, and A. Wahyuni, “Manajemen Peningkatan Karakter Disiplin Peserta Didik Melalui Kegiatan Ekstrakurikuler,” *Jurnal Isema: Islamic Educational Management*, vol. 4, no. 2, pp. 193–208, 2019, doi: 10.15575/isema.v4i2.5526.
- [18] A. M. Abidin, “Penerapan pendidikan karakter pada kegiatan ekstrakurikuler melalui metode pembiasaan,” *Didaktika: Jurnal Kependidikan*, vol. 12, no. 2, pp. 183–196, 2019, doi: 10.30863/didaktika.v12i2.185.
- [19] A. Sundari, “Manajemen Kegiatan Ekstrakurikuler Dalam Meningkatkan Prestasi Non Akademik Siswa,” *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, vol. 2, no. 1, pp. 1–8, 2021, doi: 10.31538/munaddhomah.v2i1.45.
- [20] S. Supiani, D. Muryati, and A. Saefulloh, “Pelaksanaan Kegiatan Ekstrakurikuler Keagamaan Di Man Kota Palangkaraya Secara Daring,” *ENGGANG: Jurnal Pendidikan, Bahasa, Sastra, Seni, Dan Budaya*, vol. 1, no. 1, pp. 30–39, 2020, doi: 10.37304/enggang.v1i1.2351.
- [21] S. Sasmito, “Optimalisasi ekstrakurikuler: sebuah praktik baik,” *Indonesian Journal of Educational Development (IJED)*, vol. 2, no. 3, pp. 524–533, 2021, doi: 10.5281/zenodo.5681650.
- [22] R. T. Aldisa, “Penerapan Metode TOPSIS dengan Pembobotan ROC dalam Seleksi Penerimaan Auditor Internal Perusahaan,” *Jurnal Media Informatika Budidarma*, vol. 7, no. 2, pp. 828–836, 2023, doi: 10.30865/mib.v7i2.5899.
- [23] D. P. Indini, K. Khairunnisa, N. D. Puspa, T. A. Siregar, M. Mesran, and M. Kom, “Penerapan Metode OCRA dalam Menentukan Media Pembelajaran Online Terbaik di Masa Pandemi Covid-19 dengan Pembobotan ROC,” *Jurnal Sistem Komputer dan Informatika (JSON)*, vol. 3, no. 2, pp. 60–66, 2021, doi: 10.30865/json.v3i2.3576.
- [24] M. Mesran and D. P. Indini, “Analisis Dalam Pendukung Keputusan Seleksi Content Creator Mahasiswa Terbaik Menerapkan Metode EDAS dan ROC,” *Journal of Computer System and Informatics (JoSYC)*, vol. 4, no. 4, pp. 912–921, 2023, doi: 10.47065/josyc.v4i4.4093.
- [25] B. Anwar, W. Simatupang, M. Muskhair, D. Irfan, and A. H. Nasyuha, “Kombinasi Penerapan Metode WASPAS dan Rank Order Centroid (ROC) dalam Keputusan Pemilihan Teknologi Kamera Ponsel Terbaik,” *Building of Informatics, Technology and Science (BITS)*, vol. 4, no. 3, pp. 1431–1437, 2022, doi: 10.47065/bits.v4i3.2655.
- [26] F. Mahdi and D. P. Indini, “Penerapan Metode WASPAS dan ROC (Rank Order Centroid) dalam Pengangkatan Karyawan Kontrak,” *Bulletin of Computer Science Research*, vol. 3, no. 2, pp. 197–202, 2023, doi: 10.47065/bulletincsr.v3i2.232.
- [27] D. Aldo, “Sistem Pendukung Keputusan Penilaian Kinerja Dosen Dengan Menggunakan Metode Multi Attribute Utility Theory (Maut),” *Jursima*, vol. 7, no. 2, p. 76, 2019, doi: 10.47024/js.v7i2.180.
- [28] R. T. Aldisa, S. Sanwani, D. M. Simanjuntak, S. Laia, and M. Mesran, “Penerapan Metode Metode Multy Attribute Utility Theory (MAUT) dalam Pemilihan Asisten Laboratorium Komputer,” *JURNAL MEDIA INFORMATIKA BUDIDARMA*, vol. 6, no. 3, pp. 1782–1788, 2022, doi: 10.30865/mib.v6i3.4171.
- [29] D. N. Sholihaningtias, “Rekomendasi Kelayakan Penerima Kredit Menggunakan Metode TOPSIS dengan Pembobotan ROC,” *Jurnal Saintekom: Sains, Teknologi, Komputer dan Manajemen*, vol. 13, no. 1, pp. 88–99, 2023, doi: 10.33020/saintekom.v13i1.376.
- [30] J. Faran and R. T. Aldisa, “Implementasi Metode MAUT dengan Menerapkan Pembobotan ROC Dalam Pemilihan Ketua Himpunan Mahasiswa,” *JURNAL MEDIA INFORMATIKA BUDIDARMA*, vol. 7, no. 3, pp. 1315–1322, 2023, doi: 10.30865/mib.v7i3.6471.

- [31] K. Suhada, S. Saludin, A. Sadikin, I. K. Dewi, and F. Nugroho, “Penerapan Metode Multi-Attribute Utility Theory (MAUT) pada Pemilihan Broadcasting Terbaik,” *Jurnal Media Informatika Budidarma*, vol. 7, no. 2, pp. 641–649, 2023, doi: 10.30865/mib.v7i2.5937.
- [32] D. W. T. Putra, I. S. Oktavia, G. Y. Swara, and E. Yulianti, “Perancangan Sistem Pendukung Keputusan Menggunakan Metode Multi-Attribute Utility Theory (MAUT) Dalam Seleksi Pengangkatan Karyawan Tetap pada Dinas Pekerjaan Umum Kota Sawahlunto,” *Jurnal Ilmiah ILKOMINFO-Ilmu Komputer & Informatika*, vol. 5, no. 2, pp. 53–59, 2022, doi: 10.47324/ilkominfo.v5i2.147.
- [33] I. Saputra and R. N. Siregar, “Sistem Pendukung Keputusan Pemilihan Karyawan Terbaik CV. Aurelia Weida Prima Medan Dengan Metode Maut,” *KLIK: Kajian Ilmiah Informatika dan Komputer*, vol. 3, no. 1, pp. 9–16, 2022, doi: 10.30865/klik.v3i1.377.