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Application of Tahani Fuzzy Logic in Participant Selection for ONMIPA PT: A Case Study at Institut Teknologi Del

Asido Saragih[1*], Jaya Santoso[2], Ana Muliyana[3]

[1] Electrical Engineering, Faculty of Informatics and Electrical Engineering, Institut Teknologi Del
[2]Informatics, Faculty of Informatics and Electrical Engineering, Institut Teknologi Del
[3]Software Engineering Technology, Faculty of Vocational, Institut Teknologi Del
e-mail: ***asido.saragih@del.ac.id**,

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Abstract
This study investigates the preparation of students for the National Olympiad of Mathematics and Natural Sciences for Higher Education (ONMIPA PT), focusing on the selection process at Institut Teknologi Del (IT Del). The research applies the Tahani fuzzy logic method to select students who demonstrate potential across various mathematical disciplines such as Linear Algebra, Abstract Algebra, Real Analysis, Complex Analysis, and Combinatorics. By using fuzzy logic, students' performances are categorized into three levels: less, adequate, and good. The goal is to ensure a well-rounded selection of participants who can excel in all tested areas, rather than choosing those with the highest scores in individual topics. The results demonstrate that fuzzy logic improves decision-making in selecting participants for the competition. Additionally, the study highlights the broader implications of ONMIPA PT in enhancing educational quality and fostering scientific excellence. This research contributes to the development of selection methods for academic competitions, offering insights into the application of fuzzy logic in multi-stage decision-making processes.

Keywords: Fuzzy Logic, Tahani, Olympiad, Mathematical

1. Introduction

The National Olympiad of Mathematics and Natural Sciences for Higher Education (ONMIPA PT) is a prestigious academic competition held annually in Indonesia. It aims to nurture and recognize the talents of university students in the fields of Mathematics, Physics, Chemistry, and Biology. This competition serves as a platform for students from various universities across the country to showcase their problem-solving skills, critical thinking, and deep understanding of scientific concepts (Pusat Prestasi Nasional, 2024). By participating in ONMIPA PT, students not only enhance their knowledge but also contribute to the advancement of science and technology in Indonesia. The Olympiad fosters a spirit of academic excellence and encourages collaboration among future scientists, thereby playing a crucial role in shaping the next generation of innovators and leaders in the scientific community.

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As the prestigious academic competition, The National Olympiad of Mathematics and Natural Sciences for Higher Education (ONMIPA PT) is a long-awaited event in the Indonesia's academic landscape. Recognizing the high level of competition and the honour associated with excelling in this Olympiad, universities across the country dedicate significant resources and efforts to prepare their students. Faculty members often organize intensive training sessions, workshops, and mock exams to ensure that their participants are well-equipped with the necessary knowledge and skills. The aim is not only to achieve individual success but also to bring pride to the institution by demonstrating excellence on a national stage. This rigorous preparation reflects the importance placed on ONMIPA PT as a platform for showcasing academic talent and fostering the next generation of scientific leaders. Preparing students to face the competition not only the institution needs, but also as the one of many ways to improve the education's quality. Pattipeilohy specifically mentioned that The National Science Olympiad has an impact to improve the quality of education by developing the curriculum, improving the education policy and many other items of education that can help the nations to improve their education standards (Pattipeilohy et al., 2024).

To achieve all things above, the stakeholders of the ONMIPA PT competition such as some of faculty members and trainers, creating their own way to achieve their goals. Understanding the high stakes of the competition, many trainers go beyond traditional teaching methods by closely analyzing the specific challenges that students face when answering complex problems (Annisa Amalia et al., 2020). This analysis allows trainers to identify common areas of difficulty and tailor their training programs to address these weaknesses effectively. By focusing on these targeted areas, they can better equip students with the skills and confidence needed to excel in the competition. This strategic preparation underscores the significance of ONMIPA PT, where success not only brings individual recognition but also elevates the reputation of the institution. This is the reason of why all of stakeholders prepare their students very well. Preparation is the main key for all of participants of the competition. When preparing for the ONMIPA PT Olympiad, there are many factors that need to be carefully considered. In addition to the guidance provided by faculty mentors, the selection of student participants is crucial. Students who demonstrate stronger potential compared to their peers are easier to equip with the necessary knowledge and skills to face the competition. This careful selection ensures that the most capable students are given the opportunity to refine their abilities and maximize their chances of success in the Olympiad.

Institut Teknologi Del (IT Del), as an institution that participates in sending its students to the ONMIPA PT Olympiad, prepares its students meticulously. The preparation involves not only equipping students with the competition material but also thoroughly selecting all students who register as participants through a joint examination. Specifically, in the field of mathematics, 24 student applicants are carefully screened. During the internal selection, the mathematics faculty team at IT Del tests students on topics such as Linear Algebra, Abstract Algebra or Algebraic Structures, Real Analysis, Complex Analysis, and Combinatorics. The mathematics faculty team at IT Del strives to conduct a high-quality selection process to ensure that only the best candidates are chosen for further training. After the training, the mathematics faculty team selects the five students with the highest scores to participate in the regional selection for LLDIKTI I.

However, in practice, directly recruiting the five students with the highest scores may overlook participants with well-rounded abilities across all the mathematical fields being tested. For

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example, a student who scores a high 80 points might achieve maximum scores in four of the tested mathematics fields but receive no score in one of them. On the other hand, an ideal participant would have at least moderate proficiency across all the tested fields, making them easier to train and more adaptable in the competition. This is why the mathematics faculty team at IT Del uses fuzzy logic when selecting participants.

In the initial selection stage, the mathematics faculty team at IT Del uses the fuzzy logic method to choose participants for further training. This method is typically employed to classify scores that are distributed under ambiguous or uncertain conditions (Cahyaningrum, 2023). By applying fuzzy logic, the team can make more nuanced decisions in selecting students, ensuring that those with the most potential are identified, even when their performance might not be easily categorized using traditional methods. In this study, the abilities of students participating in the initial selection for every topic of the test are categorized into three groups: less, adequate, and good. Students who fall into the considered and recommended categories in the query fuzzification function will be proceed to further training, after which the five students with the highest scores are selected to advance to the next stage of the competition.

Categorization, as applied in this study, requires a clear conceptual framework to define category boundaries, which aids in decision-making. In other studies, such as those referenced in studies for example: home purchase decision support system using fuzzy method (Kurnialensya, 2024), teacher recruitment (Setiawan, 2020), selection of the best employee (Putri Astari et al., 2018), determining laptop purchase recommendations (Murdianingsih & Isbahatunnisa, 2020), car purchase recommendations using fuzzy method (Kurnialensya et al., 2024), fuzzy logic methods on fertilizer selection (Indahingwati et al., 2018) and choosing the best packaged milk for optimizing nutrition (Nisa et al., 2020), fuzzy logic has been employed to support decision-making processes. Fuzzy logic is commonly used in contexts like determining production levels and needs assessment (Vinodh, S., & Balaji, S. R., 2010) and decision support systems (Wu & Xu, 2020).

The specific fuzzy logic method used in this study is the Tahani fuzzy method. Some of the reasons we use Tahani fuzzy method are simplicity and effectiveness in data processing, ability to categorize diverse data, relevance for multi-criteria contexts, balanced results for further training, and compatibility with digital systems. The degree of membership in the Tahani fuzzy logic membership function is used in this study utilizing the interval [0, 1]. A triangular-shaped curve approach is employed to maintain the precision of membership and the effectiveness of data processing (Sofia & Juhari, 2021). In addition, previous research has demonstrated that Fuzzy Tahani can provide recommendations based on the ranking of fire strength values from the variables selected by the user (Prasetyo et al., 2019). Sahir, on their research also used Tahani fuzzy method as the tools' decisions to select computers tablet (Sahir et al., 2018). That research successfully provided decision support for tablet recommendations through a computer, based on criteria such as price, size, memory capacity, and RAM. A decision support system capable of recommending laptop choices based on fuzzy criteria such as price, LCD, hard drive, memory, processor, and warranty on online shop was also researched by previous studies using the Tahani fuzzy logic (Syahroni & Rachmatullah, 2018). The same idea to select the best lecturer by using Tahani Fuzzy method also used in study (Fadilatul Ilmiyah & Cintya Resti, 2023), and determining the quality of service of some expedition companies in Jabodetabek (Pamuji, 2016). The implementation of the idea of Tahani fuzzy logic also applied

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to determine the best farmer village in Deli Serdang, Indonesia (Ervina & Darma Nasution, 2020).

In general, previous research applied the concept of Tahani fuzzy logic to single-stage selection, where the selected object is immediately considered as the desired outcome. Syahroni and Rahmatullah in (Prasetio et al., 2022) outlined several stages in the application of the Tahani fuzzy method, including:

1. Describing the Membership Function
   The membership function is represented by a curve with values in the range [0, 1]. The types of curves used are triangular or trapezoidal shapes, as well as shoulder shapes at constant values.
2. Fuzzification
   This process converts crisp values into fuzzy values.
3. Fuzzification of the Query
   In this stage, data from the defined research variables are processed, commonly known as Database Management System (DBMS). This process provides a data overview that aids in drawing conclusions or in making decisions.
4. Fuzzy Set Operations
   This stage involves performing fuzzy set operations, which modify and combine fuzzy sets. The membership values resulting from two fuzzy sets are known as Fire strength or α-predicate. This stage also employs operators such as AND and OR.

Typically, fuzzy membership is represented as a membership graph; a curve that maps data input points to their membership values (also known as degrees of membership) within a range from 0 to 1 (Yulia & Ainul Mardiah, 2018). In this study, however, the focus is on using Tahani fuzzy logic for the initial selection stage. The objects, in this case, are the student participants, who will still need to undergo further selection in subsequent stages. This means that in this research, the fuzzy logic concept serves as a filter to identify student participants who are likely to have potential in mathematics. The filtered results are then re-evaluated to select the five participants with the highest scores.
The novelty of this study lies in the application of the Tahani fuzzy logic concept to the tiered selection of competition participants. Specifically, after being screened using the Tahani fuzzy logic, participants must still undergo further selection in the subsequent stages of the competition. The final step of fuzzification query in this study gives us the recommendation to choose some student as the Olympiad preparation participants. Hence, the final fuzzification query in this study still give us the fuzzy logic function as a main tool to choose the participants.

2. Methods

Several branches of mathematics are used as variables categorized into fuzzy sets in this study, including Linear Algebra, Abstract Algebra or Algebraic Structures, Real Analysis, Complex Analysis, and Combinatorics. The variables of data, indicators, and score weight contribution is represented in the following table.

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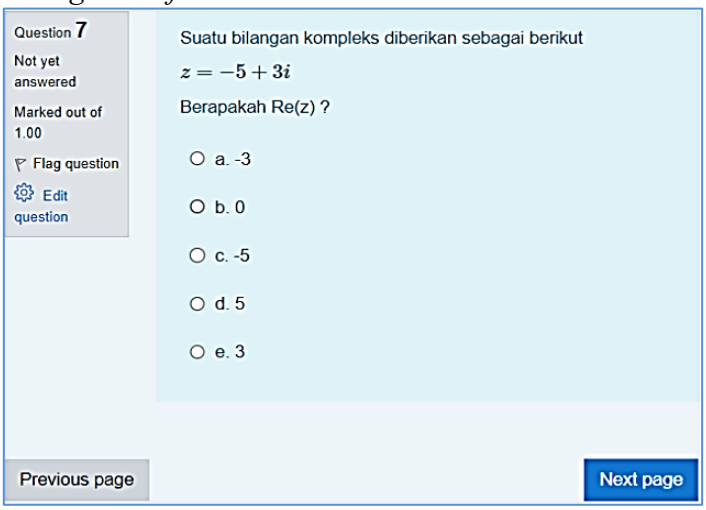
Table 1
Variables of Data, Indicators, and Score Weight Contribution

Assesment Variables	Indicator	Score weight contribution
Linear Algebra (Var A)	Solving the test questions	20%
Abstract Algebra (Var B)	Solving the test questions	20%
Real Analysis (Var C)	Solving the test questions	20%
Complex Analysis (Var D)	Solving the test questions	20%
Combinatorics (Var E)	Solving the test questions	20%

Data for each variable is obtained through tests specifically designed to assess each of these mathematical disciplines. Data collection was conducted through IT Del's e-course web platform, a web-based learning support system that enables students and lecturers to conduct exams and submit assignments. The interface displaying the questions that appear on the IT Del e-course web page during the student selection exam is shown in the following image.

Figure 1
IT Del E-Course Web Page Interface



The exam consists of 10 multiple-choice questions, each with a weight of 10 points. The scores obtained from the e-course platform are displayed in a Microsoft Excel file after converting to table are shown in **Table 3** in the next section. For each data point obtained for the variables shown in **Table 3**, data analysis is performed using fuzzy logic. The fuzzy sets for students' evaluation for each variable are shown in the following table.

Table 2
Fuzzy Set for Every Variable

Variables	Score Range	Fuzzy Set

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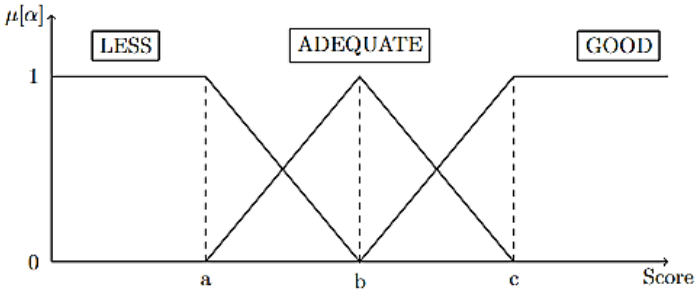
Linear Algebra (Var A)	[0,20]	Less, Adequate, Good
Abstract Algebra (Var B)	[0,20]	Less, Adequate, Good
Real Analysis (Var C)	[0,20]	Less, Adequate, Good
Complex Analysis (Var D)	[0,20]	Less, Adequate, Good
Combinatorics (Var E)	[0,20]	Less, Adequate, Good

Since the score range for each variable is the same, the membership function curves of the fuzzy sets for each variable are illustrated in the following curve.

Figure 2
The Membership Function for Every Variable Curve Design



For each fuzzy variable $\boldsymbol{\alpha} =$ {Linear Algebra, Abstract Algebra or Algebraic Structures, Real Analysis, Complex Analysis, Combinatorics}, the membership function values are formulated using the following equation.

$$\boldsymbol{\mu}\ \text{Less}\ [\boldsymbol{\alpha}] = \begin{cases} \mathbf{1}\ ; & \boldsymbol{\alpha} \leq \boldsymbol{a} \\ \frac{\boldsymbol{b}-\boldsymbol{\alpha}}{\boldsymbol{b}-\boldsymbol{a}}; & \boldsymbol{a} \leq \boldsymbol{\alpha} \leq \boldsymbol{b} \\ \mathbf{0}\ ; & \boldsymbol{\alpha} \geq \boldsymbol{b} \end{cases} \tag{1}$$

$$\boldsymbol{\mu}\ \text{Adequate}\ [\boldsymbol{\alpha}] = \begin{cases} \mathbf{0}\ ; & \boldsymbol{\alpha} \leq \boldsymbol{a}\ \ \textbf{or}\ \ \boldsymbol{\alpha} \geq \boldsymbol{c} \\ \frac{\boldsymbol{\alpha}-\boldsymbol{a}}{\boldsymbol{b}-\boldsymbol{a}}; & \boldsymbol{a} \leq \boldsymbol{\alpha} \leq \boldsymbol{b} \\ \frac{\boldsymbol{c}-\boldsymbol{\alpha}}{\boldsymbol{c}-\boldsymbol{b}}; & \boldsymbol{b} \leq \boldsymbol{\alpha} \leq \boldsymbol{c} \end{cases} \tag{2}$$

$$\boldsymbol{\mu}\ \text{Good}\ [\boldsymbol{\alpha}] = \begin{cases} \mathbf{0}\ ; & \boldsymbol{\alpha} \leq \boldsymbol{b} \\ \frac{\boldsymbol{\alpha}-\boldsymbol{b}}{\boldsymbol{c}-\boldsymbol{b}}; & \boldsymbol{b} \leq \boldsymbol{\alpha} \leq \boldsymbol{c} \\ \mathbf{1}\ ; & \boldsymbol{\alpha} \geq \boldsymbol{c} \end{cases} \tag{3}$$

The fuzzy membership function values obtained for each variable are then subjected to query fuzzification. There are no specific rules for determining the membership function to be used in the fuzzification process, as each system may have different levels of suitability (Hidayat et al., 2015). As mentioned in the previous subsection, this study provides opportunities for every participant with potential to be maximized through training. Therefore, this study does not

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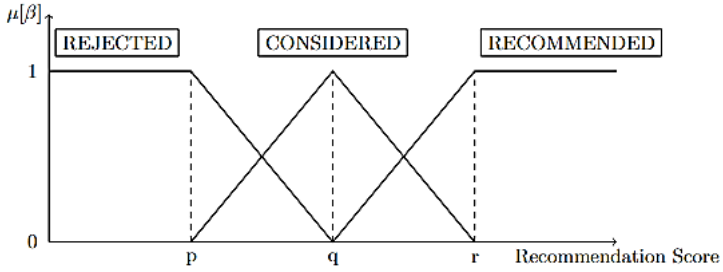
select just the highest-scoring individual as a competition participant, but rather chooses all participants who meet the query criteria after registering for the selection process.
Participants who have recommendation score fall into the "considered" and "recommended" categories will be selected for the Olympiad training program. The membership of query fuzzification function is represented as the following curve.

Figure 3
The Membership Function of Query Fuzzification



Recommendation score for every participant is obtained using Structure Query Language (SQL) for every adequate or good membership functions' value in each variable, with the following formula that counting by Microsoft excel.

$$\text{Recommendation score} = \frac{\sum_{i=A}^{E} (Adequate + Good)Var-i}{n(Variables)} \quad (4)$$

Hence, following the membership function of query fuzzification, the participants who pass the requirements joining the Olympiad preparation are the participants who have the recommendation score greater or equals to q following curve in **Figure 3**.
Based on the method described above, the data obtained was analyzed using the Tahani fuzzy logic method. The results of the data processing in this study will be presented in the following section.

3. Result and Discussion

Data acquisition was carried out by holding multiple choice exams on Linear Algebra, Abstract Algebra or Algebraic Structures, Real Analysis, Complex Analysis, and Combinatorics. Each topic has two questions, so the total number of questions tested is 10. Each question answered correctly will be given a score of 10. The minimum score for each topic is 0, and the maximum score is 20. The exam is carried out using the IT Del e-course platform and calculates the score obtained with a display given in table form after being exported as an MS Excel, shown in the following table.

Table 3
Obtained Score from IT Del E-Course Web Page

Name of participants	Score									
	Linear Algebra	Total	Abstract Algebra	Total	Real Analysis	Total	Complex Analysis	Total	Combi-natorics	Total

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	Q 1	Q2		Q 1	Q 2		Q 1	Q 2		Q 1	Q 2		Q1	Q 2	
Yizreel Schwartz. S	10	10	**20**	10	0	**10**	0	10	**10**	10	10	**20**	10	10	**20**
Ridho Alexander. P	10	0	**10**	10	10	**20**	0	10	**10**	10	0	**10**	10	10	**20**
Febri Sihotang	10	0	**10**	10	0	**10**	10	10	**20**	10	10	**20**	10	10	**20**
Wesly Fery. W. A	10	0	**10**	10	0	**10**	10	10	**20**	10	0	**10**	10	10	**20**
Firman Bintang. H	10	0	**10**	10	0	**10**	10	10	**20**	0	0	**0**	10	10	**20**
Bunga Rhiza. S	10	0	**10**	10	0	**10**	10	10	**20**	10	10	**20**	10	0	**10**
Jeremy. A. R. S	10	0	**10**	10	10	**20**	0	0	**0**	10	0	**10**	10	10	**20**
Trinita Gloria. S	10	10	**20**	0	0	**0**	10	10	**20**	10	0	**10**	10	0	**10**
Rully Cesarlin. L	0	0	**0**	10	0	**10**	0	10	**10**	10	10	**20**	10	10	**20**
Andrew Howard. N	10	0	**10**	0	0	**0**	0	0	**0**	0	10	**10**	10	10	**20**
Gabriele Patricia. S	0	0	**0**	10	0	**10**	0	10	**10**	0	0	**0**	10	0	**10**
Obenhard. A. P	0	0	**0**	0	0	**0**	0	0	**0**	10	10	**20**	10	10	**20**
Meilyna Silvia. A. H	0	0	**0**	0	10	**10**	0	0	**0**	0	10	**10**	10	0	**10**
Chesya Pelita. S	0	0	**0**	0	0	**0**	0	10	**10**	10	10	**20**	10	0	**10**
Arika Dinda. S. P. S	0	0	**0**	10	0	**10**	0	10	**10**	10	0	**10**	10	0	**10**
Aisah Sipahutar	0	10	**10**	0	0	**0**	10	0	**10**	0	0	**0**	10	0	**10**
Yoga Fransisco. P	0	0	**0**	0	0	**0**	10	0	**10**	10	0	**10**	0	10	**10**
Dewi Sekar. A. B	0	0	**0**	0	0	**0**	0	10	**10**	10	0	**10**	10	0	**10**
Ony Jesika. H	10	0	**10**	0	0	**0**	0	0	**0**	0	0	**0**	10	0	**10**
Yan Mart. O. P	10	0	**10**	0	0	**0**	0	0	**0**	10	0	**10**	0	0	**0**
Cinthya Monica. M	10	0	**10**	0	0	**0**	0	0	**0**	0	0	**0**	0	0	**0**
Rosa Paramitha. G	0	0	**0**	0	0	**0**	0	10	**10**	10	0	**10**	0	0	**0**
Prans Daniel. S	0	0	**0**	0	0	**0**	0	0	**0**	10	10	**20**	0	0	**0**

Note. Q: Question

Based on obtained data, the researchers designed the membership function values following **Equations (1)**, **(2)**, and **(3)** as the following equations.

$$\mu \text{ Less } [\alpha] = \begin{cases} 1 \ ; & \alpha \leq 5 \\ \frac{10-\alpha}{10-5}; & 5 \leq \alpha \leq 10 \\ 0 \ ; & \alpha \geq 10 \end{cases} \quad (5)$$

$$\mu \text{ Adequate } [\alpha] = \begin{cases} 0 \ ; & \alpha \leq 5 \ \text{ or } \ \alpha \geq 15 \\ \frac{\alpha-5}{10-\alpha}; & 5 \leq \alpha \leq 10 \\ \frac{15-\alpha}{15-10}; & 10 \leq \alpha \leq 15 \end{cases} \quad (6)$$

$$\mu \text{ Good } [\alpha] = \begin{cases} 0 \ ; & \alpha \leq 10 \\ \frac{\alpha-10}{15-10}; & 10 \leq \alpha \leq 15 \\ 1 \ ; & \alpha \geq 15 \end{cases} \quad (7)$$

and the fuzzy sets for each variable are illustrated in the following curve.

Figure 4
The Membership Function for Every Variable

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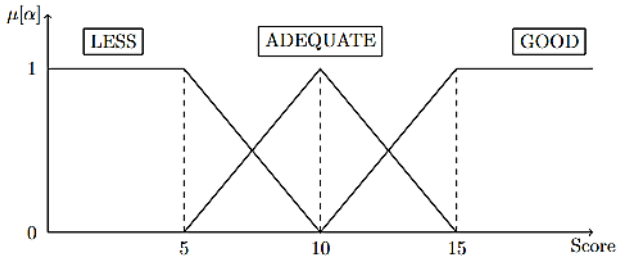

The score for each variable ranges from 0 at the minimum to 20 at the maximum. Therefore, the midpoint score of 10 is placed at the peak of the "adequate" fuzzy set, with scores of 5 and 15 serving as the boundaries for the "less" and "good" fuzzy sets, respectively as well as shown in **Figure 4**.

Using the **Equations (5)**, **(6)**, and **(7)**, the membership fuzzy function values are obtained as shown in the following table.

Table 4
The Membership Fuzzy Function Values

Name of participants	Membership Fuzzy Function Values														
	Linear Algebra (Var A)			Abstract Algebra (Var B)			Real Analysis (Var C)			Complex Analysis (Var D)			Combinatorics (Var E)		
	L	A	G	L	A	G	L	A	G	L	A	G	L	A	G
Yizreel Schwartz. S	0	0	1	0	1	0	0	1	0	0	0	1	0	0	1
Ridho Alexander. P	0	1	0	0	0	1	0	1	0	0	1	0	0	0	1
Febri Sihotang	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1
Wesly Fery Wanda. A	0	1	0	0	1	0	0	0	1	0	1	0	0	0	1
⋮	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Prans Daniel. S	1	0	0	1	0	0	1	0	0	0	0	1	1	0	0

Note. ***L:*** *Less,* ***A:*** *Adequate,* ***G:*** *Good*

After calculating the membership fuzzy function values in **Table 4**, the researcher performed query fuzzification to determine the recommendation score. The query fuzzification calculation involves dividing the total number of "adequate" or "good" scores for each variable by the total number of variables, as formulated in **Equations (4)**. The table of fuzzy membership function values for the "adequate" and "good" fuzzy sets with their recommendation score using **Equations (4)** is shown in the table below.

Table 5
The Adequate and Good Membership Fuzzy Function Values with Their Recommendation Score

Name of participants	Membership Fuzzy Function Values					Recommendation Score
	Linear Algebra	Abstract Algebra	Real Analysis	Complex Analysis	Combin-atorics	

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	(Var A)		(Var B)		(Var C)		(Var D)		(Var E)		
	A	**G**	**A**	**G**	**A**	**G**	**A**	**G**	**A**	**G**	
Yizreel Schwartz. S	0	1	1	0	1	0	0	1	0	1	1
Ridho Alexander. P	1	0	0	1	1	0	1	0	0	1	1
Febri Sihotang	1	0	1	0	0	1	0	1	0	1	1
Wesly Fery Wanda. A	1	0	1	0	0	1	1	0	0	1	1
⋮	…	…	…	…	…	…	…	…	…	…	
Prans Daniel. S	0	0	0	0	0	0	0	1	0	0	0,2

Note. ***A:*** *Adequate,* ***G:*** *Good*

After calculating the recommendation scores from the accumulated "adequate" and "good" fuzzy sets using Equation (4), 17 students were found to have scores greater than or equal to 0.6, while the remaining 6 students scored below 0.6. Therefore, this calculation recommends that 17 students participate in the Olympiad training program to prepare for the next selection stage of the competition.

4. Conclusion

The implementation of Tahani fuzzy logic in this study provided a more comprehensive approach to selecting participants for the mathematics competition. Instead of selecting only those with the highest scores, the method allowed for the identification of students with balanced abilities across multiple mathematical disciplines. This approach ensured that participants with potential in all relevant areas were included in the training program. Ultimately, 17 students were recommended for further preparation, highlighting the advantage of using fuzzy logic in making informed and equitable selection decisions.

The research was conducted at a single institution, Institut Teknologi Del, limiting the generalizability of the findings to other contexts. The relatively small sample size also means that the results may vary with a larger population. When compared to previous studies, the results of this research align with earlier findings that fuzzy logic enhances decision-making accuracy in multi-criteria contexts, such as the studies by Prasetyo et al. (2019). However, this study differs from prior research that applied fuzzy logic primarily for single-stage selection processes, as seen in Murdianingsih et al., (2020). By adopting a multi-stage approach, this research demonstrates additional value in the application of the Tahani fuzzy logic method.

The findings of this study have both theoretical and practical implications. Theoretically, it contributes to the growing body of literature on the application of fuzzy logic, particularly in decision support systems for educational contexts. Practically, it offers an alternative selection method for educational institutions to achieve a fairer and more balanced participant selection, especially in academic competitions.

Future research could explore the use of the Tahani fuzzy logic method in later selection stages to assess its consistency and effectiveness. Moreover, integrating additional variables, such as

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non-academic abilities or participants' motivation, could provide a more comprehensive selection process.

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6. References

Annisa Amalia, N., Pujiastuti Pendidikan Matematika, H., & Sultan Ageng Tirtayasa, U. (2020). Analisis Kesulitan Mahasiswa dalam Menyelesaikan Soal ON MIPA Matematika. In *JudulAnalisisis Kesulitan Mahasiswa dalam Menyelesaikan Soal ON MIPA Matematika. JPMR* (Vol. 05, Issue 02). https://ejournal.unib.ac.id/index.php/jpmr

Cahyaningrum, Y. C. (2023). Penerapan Artificial Intelligence Menggunakan Fuzzy Logic dalam Dunia Pendidikan. *JURNAL AMPLIFIER : JURNAL ILMIAH BIDANG TEKNIK ELEKTRO DAN KOMPUTER*, *13*(2), 62–68. https://doi.org/10.33369/jamplifier.v13i2.30757

Ervina, N., & Darma Nasution, S. (2020). Sistem Pendukung Keputusan Pemilihan Desa Petani Terbaik Menggunakan Metode Fuzzy Model Tahani. *Terapan Informatika Nusantara*, *1*(2), 64–73.

Fadilatul Ilmiyah, N., & Cintya Resti, N. (n.d.). *SELECTION OF THE BEST LECTURER USING FUZZY TAHANI*.

Hidayat, E. N., Gernowo, R., Teknik, J., Pelayaran, A., Indonesia, N., & Fisika, J. (2015). Implementasi Fuzzy Model Tahani Untuk Perancangan Sistem Pendukung Keputusan Penerimaan Taruna Baru. In *Jurnal Sistem Informasi Bisnis* (Vol. 01).

Indahingwati, A., Barid Nizarudin Wajdi, M., Ermayanti Susilo, D., Kurniasih, N., & Rahim, R. (2018). Comparison Analysis of TOPSIS and Fuzzy Logic Methods On Fertilizer Selection. *International Journal of Engineering & Technology*, *7*(2.3), 109. https://doi.org/10.14419/ijet.v7i2.3.12630

Kurnialensya, T. (2024). *Sistem Pendukung Keputusan Pembelian Rumah Menggunakan Metode Fuzzy dan Metode Simple Multi Attribute Rating Technique (Smart)*. 212–227. https://doi.org/10.61132/mars.v2i3.338

Kurnialensya, T., Wijanarko, T., Putra, A., & Hartono, B. (2024). *REKOMENDASI PEMBELIAN MOBIL MENGGUNAKAN METODE FUZZY DAN METODE SIMPLE MULTI ATTRIBUTE RATING TECHNIQUE (SMART) ARTICLE INFO*. *15*(2), 315–327. http://ejurnal.provisi.ac.id/index.php/JTIKP

Mardiah, A. (n.d.). *Fuzzy Logic Untuk Menentukan Kepuasan Siswa Terhadap Sarana Dan Prasarana Sekolah Dengan Menggunakan Metode Sugeno*.

Murdianingsih, Y., & Isbahatunnisa, I. (2020). IMPLEMENTASI METODE FUZZY TAHANI DALAM MENENTUKAN REKOMENDASI PEMBELIAN LAPTOP (Studi kasus di

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Toko Mega Alvindo Kalijati Subang). In *STMIK Subang* (Vol. 15, Issue 1).

Nisa, A. K., Abdy, M., & Zaki, A. (2020). Penerapan Fuzzy Logic untuk Menentukan Minuman Susu Kemasan Terbaik dalam Pengoptimalan Gizi. *Journal of Mathematics Computations and Statistics*, *3*(1), 51. https://doi.org/10.35580/jmathcos.v3i1.19902

Pamuji, A. (2016). Assessment The Method of Fuzzy Logic to Determine The Quality of Service Expedition in Jabodetabek Area. *Scientific Journal of Informatics*, *3*(2), 109–118. https://doi.org/10.15294/sji.v3i2.7906

Pattipeilohy, P., Akyuwen, F., Cindy, A. H., & Pattiasina, J. (2024). The National Science Olympiad and Its Impact on Improving the Quality of Education. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, *5*(2), 43–54. https://doi.org/10.62775/edukasia.v5i2.821

Prasetio, W. D., Zahrroh, A., Khudri, A., Rizki, B., Izzati, A. R., Brantadikara, D., & Kz Oktoeberza, W. (n.d.). IMPLEMENTASI FUZZY TAHANI DALAM SISTEM REKOMENDASI PEMILIHAN SMARTPHONE BERBASIS WEB. *Jurnal TEKNOSIA*, *16*(2), 41–54. https://ejournal.unib.ac.id/index.php/teknosia

Prasetyo, C. T., Hermawati, F. A., & Ronando, E. (2019). SISTEM REKOMENDASI PEMILIHAN SMARTPHONE BERDASARKAN KARAKTERISTIK SOSIO-DEMOGRAFIS PENGGUNA MENGGUNAKAN METODE FUZZY TAHANI. *KONVERGENSI*, *14*(1). https://doi.org/10.30996/konv.v14i1.2769

Putri Astari, A., Komarudin, R., Informasi, S., Nusa Mandiri Jakarta, S., Damai No, J., & Jati Barat Jakarta Selatan, W. (2018). *Sistem Pendukung Keputusan Pemilihan Karyawan Terbaik Dengan Metode Fuzzy Tahani* (Vol. 6, Issue 2).

Sahir, S. H., Rahim, R., Tinggi, S., & Rosmawati, R. (2018). Fuzzy model tahani as a decision support system for selection computer tablet. In *International Journal of Engineering & Technology* (Vol. 7, Issue 2). https://www.researchgate.net/publication/325626093

Setiawan, Y. E. (2020). *BAREKENG: Jurnal Ilmu Matematika dan Terapan SISTEM PENDUKUNG PENGAMBILAN KEPUTUSAN REKRUTMEN GURU MENGGUNAKAN LOGIKA FUZZY TAHANI Supporting System of Decision Making of Teacher Recruitment Using Tahani Fuzzy Logic*. *14*(2). https://doi.org/10.30598/barekengvol14iss2pp253-266

Sofia, W. A., & Juhari, J. (2021). Prosedur Fuzzy Tahani Menggunakan Fungsi Representatif Kurva Segitiga dan Trapesium. *Jurnal Riset Mahasiswa Matematika*, *1*(1), 40–50. https://doi.org/10.18860/jrmm.v1i1.13819

Syahroni, A. W., & Rachmatullah, S. (2018). Sistem Pendukung Keputusan Pemilihan Laptop pada Toko Online dengan Metode Fuzzy Tahani. *Jurnal & Penelitian Teknik Informatika*, *3*(1).

Vinodh, S., & Balaji, S. R. (2010). Fuzzy logic based leanness assessment and its decision support system. *International Journal of Production Research*, *49*(13), 4027–4041. https://doi.org/10.1080/00207543.2010.492408

Wu, H., & Xu, Z. (2021). Fuzzy logic in decision support: Methods, applications and future trends. *International Journal of Computers Communications & Control*, 16(1), 4044. https://doi.org/10.15837/ijccc.2021.1.4044

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