
Decision Support System for Choosing the Best Doctor at Sari Mutiara Hospital Using the Fuzzy Tsukamoto Method

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Abstract

Doctors are medical personnel who are allowed to practice medical without having to have a specific specialty, and in the hospital there are several specialist doctors, one of which is an obstetrician who is an obstetrician and midwife who has an official title of Sp.OG. So far, the decision making on the selection of the best doctor carried out by the assessment team often faces problems in determining the best doctor candidate where the results obtained are ineffective in determining the best doctor which is decided by means of deliberation meetings. So of the many best doctor candidates who have met the criteria, not all will be the recipients of the best doctor candidates. This is because there is no objective method to make a quick choice based on the doctor's data which is correct according to the results of the deliberation meeting. By referring to the solution provided by Fuzzy Tsukamoto in helping to make a decision, an assessment team can quickly make a decision on the best doctor candidate as desired by comparing all the existing criteria. A decision support system is generally defined as a system that is capable of producing solutions and handling problems. Decision support systems are not intended to replace the role of decision makers, but rather to assist and support decision makers. This Fuzzy Tsukamoto method can determine the preference value of each alternative,

Keywords: Selection of Doctors, Fuzzy Tsukamoto, Decision Support Systems.

1. Introduction

Sari Mutiara Hospital is a private company owned by the Sari Mutiara Medan foundation which is located on Jalan Medan No. 17 Lubuk Pakam, Deli Serdang Regency, which is about 25 km from the city of Medan, North Sumatra Province and was established in 1988. Human resources at Sari Mutiara Hospital are adequate to improve the quality of service to the community. In providing services to patients, doctors and nurses work with sincerity and love, and as an appreciation for the services that have been provided, the Sari Mutiara Hospital usually gives rewards to employees, doctors, and nurses who are selected manually, namely, by bringing the results of the assessment into deliberation meetings that are considered less effective.

Doctors are medical personnel who are allowed to practice medical without having specific specialties, and at Sari Mutiara Hospital there are several specialist doctors, one of which is an obstetrician who is an obstetrician and obstetrician who has an official title of Sp.OG. In choosing the best doctor, nowadays it is not difficult anymore with the development of technology and information. Employees and patients in a hospital can choose their ideal specialist doctor well. Patients and the best doctor assessment team, generally have considerations or factors before making a decision, for example the

medical code of ethics, education, service system and working period. For that we need a computerized system that can assist the assessment team in deciding the best doctor.

In carrying out the process of selecting the best doctor, the assessment team often faces problems in determining the best doctor where the results obtained are ineffective in determining the best doctor which is decided by means of deliberation meetings.. So of the many best doctors who have met the criteria, not all will be the recipients of the best doctors. So that in determining the best doctor, a Decision Support System (DSS) system is needed. Decision Support System (DSS) is part of a computer-based information system (including a knowledge-based system (knowledge management)) that is used to support decision making in an organization or company (Melwin Syafrizal, 2010).

The method used in the decision-making system for selecting the best doctor at Sari Mutiara Hospital is the Tsukamoto fuzzy, which is an extension of monotonous reasoning. In the Tsukamoto method, every consequence of the rule in the form of IF-THEN must be represented by a fuzzy set with a monotonic membership function, as a result the inference output of each rule is given explicitly (crisp) based on the predicate (fire strength),

The final result is obtained using a weighted average (Rizky Amelia, 2013). With this best doctor selection program, it is hoped that it can help patients, employees, and the assessment team within the Sari Mutiara Hospital in determining the best doctors honestly, fairly, and prosperously so that they get satisfaction in actual results.

2. Methodology

In the decision support system in selecting the best doctor using the Tsukamoto fuzzy method, variables and score classifications are needed for each fuzzy set of each variable so that the best alternative will be obtained.

1. Defining the Problem and Desired Goal

The problem that arises is how to choose the best doctor according to the variable requirements set by the hospital. The desired goal is to speed up and minimize the assessment time and as a basis for awarding the best doctors.

2. Grouping Criteria into a Hierarchy

The variables that influence the decision making are grouped into 4 variables, including the implementation of the code of ethics, education, tenure and service. The variables used for fuzzy calculations in the system are symbolized as follows:

- a. Value of Implementation of the Code of Ethics = Code of Ethics
- b. Education = Education
- c. Years of Service = Terms of Service
- d. Service Value = Service



3. Results

3.1. Model Characteristics

The stage of defining the characteristics of the model is to determine the fuzzy set and define some of the fuzzy used in this system. The system for determining the best doctor selection is built based on 5 variable assessment criteria. These variables consist of 4 input variables and 1 output variable. The benchmarks for the assessment are 4 variables, namely the Implementation of the Medical Code of Ethics (Code of Ethics), Doctor's Education Level (Education), Doctor's Work Period (Employment Period), and the Value of Doctor's Services to Patients (Services). And the output variable consists of Evaluation Evaluation. All criteria are classified as fuzzy, because the data are not absolute but subjective. The following is a table of assessment criteria for selecting the best doctor:

Table 1.

Assessment Criteria Table	
Variable	Information
Code of Ethics	Value of Implementing Medical Ethics Code
Education	Doctor Education Level
Years of service	Doctor Working Period
Service	The Value of Doctor's Services to Patients

The classification of fuzzy set scores for all variables is 0 to 10. The following table shows the classification of fuzzy set scores for all variables.

Table 2.

Score Classification				
Variable		Membership Degree	Range	
Input	Code of Ethics	1. Very good	1. 6-10	
		2. Quite good	2. 3-7	
		3. Not good	3. 0-4	
	Education	1. Very high	1. 7-10	
		2. Tall	2. 5-8	
		3. High enough	3. 3-6	
		4. Standard	4. 0-4	
	Years of service	of	1. > 10 Years	1. 6-10
			2. $5 > X < 10$ Years	2. 3-7
			3. < 5 Years	3. 0-4
	Service		1. Very good	1. 6-10
			2. Quite good	2. 3-7
		3. Not good	3. 0-4	
Output	Evaluation result	Fuzzy Value Evaluation		

Based on the table above, the linguistic value of the Code of Ethics input variable shows the value of Very Good, Fairly Good and Less Good, the Education input variable shows the value of Very High, High, Fairly High, Standard. The working period input variable shows values > 10 years, $5 > X < 10$ years and < 5 years. And the service input variable shows the value of Very Good, Fairly Good and Less Good. While the linguistic value of

the output variable (Evaluation Results), the author uses the words Good Value for High value, Bad Value for low value and sorted by the highest value.

3.2. Variable Decomposition with Fuzzy Set (Fuzzyfication)

The fuzzy set based on the decomposition results of each variable can be seen as follows:

1. Code of Ethics Variables

The Code of Ethics variable has 3 fuzzy sets, namely: Very Good, Fairly Good and Less Good. The Less Good set uses a linear membership function approach down the left shoulder, the Very Good set uses a linear membership function approach up the right shoulder, while the Fairly Good set uses a triangular membership function approach.

Membership Functions with Variable Code of Ethics are as follows:

1. Code of EthicsNot Good[x] $\begin{cases} 1, & x \leq 0 \\ (4 - x)/(4 - 0), & 0 \leq x \leq 4 \\ 0, & x \geq 4 \end{cases}$
2. Code of EthicsPrettyGood[x] $\begin{cases} 0, & x \leq 3 \text{ atau } x \geq 7 \\ (x - 3)/(5 - 3), & 3 \leq x \leq 5 \\ (7 - x)/(7 - 5), & 5 \leq x \leq 7 \end{cases}$
3. Excellent Code of Conduct[x] $\begin{cases} 0, & x \leq 6 \\ (x - 6)/(10 - 6), & 6 \leq x \leq 10 \\ 1, & x \geq 10 \end{cases}$

2. Education Variable

The Education variable has 4 fuzzy sets, namely: Very High, High, Fairly High, Standard. The Standard Set uses a linear membership function approach down the left shoulder, the Very High set uses a linear membership function approach goes up the right shoulder, while the High and Fairly High set uses a triangular membership function approach. The membership function of the Education variable can be seen as follows:

Membership Function with Education Variable are as follows:

1. Standard Education[x] $\begin{cases} 1, & x \leq 0 \\ (4 - x)/(4 - 0), & 0 \leq x \leq 4 \\ 0, & x \geq 4 \end{cases}$
2. Sufficiently High Education[x] $\begin{cases} 0, & x \leq 3 \text{ atau } x \geq 6 \\ (x - 3)/(4 - 3), & 3 \leq x \leq 4 \\ (6 - x)/(6 - 4), & 4 \leq x \leq 6 \end{cases}$
3. HIGH EDUCATION[x] $\begin{cases} 0, & x \leq 5 \text{ atau } x \geq 8 \\ (x - 5)/(6 - 5), & 5 \leq x \leq 6 \\ (8 - x)/(8 - 6), & 6 \leq x \leq 8 \end{cases}$
4. VERY HIGH EDUCATION[x] $\begin{cases} 0, & x \leq 7 \\ (x - 7)/(8 - 7), & 7 \leq x \leq 8 \\ (10 - x)/(10 - 8), & 8 \leq x \leq 10 \end{cases}$

3. Variable Working Period

The working period variable has 3 fuzzy sets, namely: > 10 years, 5 > X < 10 years and < 5 years. The set <5 Years old uses a linear membership function approach down the left shoulder, the set > 10 Years uses a linear membership function approach up the right shoulder, while the set 5 > X <10 Years uses a triangular membership function approach.



Membership Function with Variable Period of Service is as follows:

1. Term of Service < 5 years [x] $\begin{cases} 1, & x \leq 0 \\ (4 - x)/(4 - 0), & 0 \leq x \leq 4 \\ 0, & x \geq 4 \end{cases}$
2. Employee 5 > X < 10 Years [x] $\begin{cases} 0, & x \leq 3 \text{ atau } x \geq 7 \\ (x - 3)/(5 - 3), & 3 \leq x \leq 5 \\ (7 - x)/(7 - 5), & 5 \leq x \leq 7 \end{cases}$
3. Term of Service > 10 Years [x] $\begin{cases} 0, & x \leq 6 \\ (x - 6)/(10 - 6), & 6 \leq x \leq 10 \\ 1, & x \geq 10 \end{cases}$

4. Service Variables

Service variable has 3 fuzzy sets, namely: Very Good, Fairly Good and Less Good. The Less Good set uses a linear membership function approach down the left shoulder, the Very Good set uses a linear membership function approach up the right shoulder, while the Fairly Good set uses a triangular membership function approach. The service variable membership function can be seen as shown below:

Membership Functions with Service Variables are as follows:

1. Service Not Good [x] $\begin{cases} 1, & x \leq 0 \\ (4 - x)/(4 - 0), & 0 \leq x \leq 4 \\ 0, & x \geq 4 \end{cases}$
2. Pretty Good Service [x] $\begin{cases} 0, & x \leq 3 \text{ atau } x \geq 7 \\ (x - 3)/(5 - 3), & 3 \leq x \leq 5 \\ (7 - x)/(7 - 5), & 5 \leq x \leq 7 \end{cases}$
3. Excellent Service [x] $\begin{cases} 0, & x \leq 6 \\ (x - 6)/(10 - 6), & 6 \leq x \leq 10 \\ 1, & x \geq 10 \end{cases}$

5. Evaluation Evaluation Variables

Variable Evaluation Assessment has 2 fuzzy sets, namely: Achievement, and Less Achievement. The Underachievement set uses a linear membership function approach down the left shoulder, the Achievement set uses a right shoulder ascending linear membership function approach. The membership function of the Evaluation Evaluation variable can be seen as follows:

Membership Functions with Evaluation Evaluation Variables are as follows:

1. EvaluateReduceAchievement [z] $\begin{cases} 1, & z \leq 0 \\ (5 - z)/(5 - 0), & 0 \leq z \leq 5 \\ 0, & z \geq 5 \end{cases}$
- $$\text{Evaluate Achievement [z]} \begin{cases} 0, & z \leq 5 \\ (z - 5)/(10 - 5), & 5 \leq z \leq 10 \\ 1, & z \geq 10 \end{cases}$$

3.3. Membership Degree Calculation

The following is a calculation of the degree of membership for the input variables and output variables in the assessment of the selection of the best doctor.

Table 3.
 Doctor's Value

Code	Doctor's Name	Score			
		Code of Ethics	Education	Years of service	Service
D1	dr. Ronny Ajartha, SPOG, M.kes	9	8	6	8
D2	dr. Robert Simamora, SPOG	8	7	7	6
D3	dr. Jackson Lubis, SPOG	6	5	6	5
D4	dr. John Tambunan, SPOG	7	4	6	4

Calculation of membership degrees for each doctor:

1. Code of Conduct

$$\begin{aligned}
 D1 = \text{Code of Ethics is Not Good}[9] &= x \ 4 \\
 &= 9 \ 4 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Code of Ethics Pretty Good}[9] &= x \ 7 \\
 &= 9 \ 7 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Excellent Code of Conduct [9]} &= (x - 6)/(10 - 6) \\
 &= (9 - 6)/(10 - 6) \\
 &= 3/4 = 0.75
 \end{aligned}$$

$$\begin{aligned}
 D2 = \text{Code of Ethics is Not Good}[8] &= x \ 4 \\
 &= 8 \ 4 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Code of Ethics Pretty Good}[8] &= x \ 7 \\
 &= 8 \ 7 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Excellent Code of Conduct [8]} &= (x - 6)/(10 - 6) \\
 &= (8 - 6)/(10 - 6) \\
 &= 2/4 = 0.5
 \end{aligned}$$

$$\begin{aligned}
 D3 = \text{Code of Ethics Less Good}[6] &= x \ 4 \\
 &= 6 \ 4 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Code of Conduct Pretty Good}[6] &= (7 - x)/(7 - 5) \\
 &= (7 - 6)/(7 - 5) \\
 &= 1/2 = 0.5
 \end{aligned}$$

$$\begin{aligned}
 \text{Excellent Code of Conduct [6]} &= x \leq 6 \\
 &= 6 \leq 6 \\
 &= 0
 \end{aligned}$$

$$\begin{aligned}
 D4 = \text{Code of Ethics is Not Good}[7] &= x \ 4 \\
 &= 7 \ 4 \\
 &= 0
 \end{aligned}$$



$$\begin{aligned} \text{Code of Ethics Pretty Good [7]} &= x \geq 7 \\ &= 7 \geq 7 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Excellent Code of Conduct [7]} &= (x - 6)/(10 - 6) \\ &= (7 - 6)/(10 - 6) \\ &= 1/4 = 0.25 \end{aligned}$$

2. Education

$$\begin{aligned} \text{D1 = Standard Education [8]} &= x \leq 4 \\ &= 8 \leq 4 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Sufficiently High Education [8]} &= x \geq 6 \\ &= 8 \geq 6 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Higher Education [8]} &= x \leq 8 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Very High Education [8]} &= (10 - x)/(10 - 8) \\ &= (10 - 8)/(10 - 8) \\ &= 2/2 = 1 \end{aligned}$$

$$\begin{aligned} \text{D2 = Standard Education [7]} &= x \leq 4 \\ &= 7 \leq 4 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Sufficiently High Education [7]} &= x \geq 6 \\ &= 7 \geq 6 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Higher Education [7]} &= (8 - x)/(8 - 6) \\ &= (8 - 7)/(8 - 6) \\ &= 1/2 = 0.5 \end{aligned}$$

$$\begin{aligned} \text{Very High Education [7]} &= x \geq 7 \\ &= 7 \geq 7 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{D3 = Standard Education [5]} &= x \leq 4 \\ &= 5 \leq 4 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Sufficiently High Education [5]} &= (6 - x)/(6 - 4) \\ &= (6 - 5)/(6 - 4) \\ &= 1/2 = 0.5 \end{aligned}$$

$$\begin{aligned} \text{Higher Education [5]} &= x \leq 5 \\ &= x \leq 5 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{Very High Education [5]} &= x \leq 7 \\ &= 5 \leq 7 \\ &= 0 \end{aligned}$$

$$\begin{aligned} \text{D4 = Standard Education [4]} &= x \leq 4 \\ &= 4 \leq 4 \\ &= 0 \end{aligned}$$

$$\text{Sufficiently High Education}[4] = (x - 3)/(4 - 3)$$

$$= (4 - 3)/(4 - 3)$$

$$= 1 / 1 = 1$$

$$\text{Higher Education [4]} = x \leq 5$$

$$= 4 \leq 5$$

$$= 0$$

$$\text{Very High Education [4]} = x \leq 7$$

$$= 4 \leq 7$$

$$= 0$$

3. Working Period

$$D1 = \text{Time of Service} < 5 [6] = x 4$$

$$= 6 4$$

$$= 0$$

$$\text{Service Period } 5 > X < 10 [6] = (7 - x)/(7 - 5)$$

$$= (7 - 6)/(7 - 5)$$

$$= 1/2 = 0.5$$

$$\text{Terms of Service} > 10 [6] = (x - 6)/(10 - 6)$$

$$= (6 - 6)/(10 - 6)$$

$$= 0/4 = 0$$

$$D2 = \text{Time of Service} < 5 [7] = x 4$$

$$= 5 4$$

$$= 0$$

$$\text{Employee } 5 > X < 10 [7] = (7 - x)/(7 - 5)$$

$$= (7 - 7)/(7 - 5)$$

$$= 0$$

$$\text{Terms of Service} > 10 [7] = (x - 6)/(10 - 6)$$

$$= (7 - 6)/(10 - 6)$$

$$= 1/4 = 0.25$$

$$D3 = \text{Time of Service} < 5 [6] = x 4$$

$$= 6 4$$

$$= 0$$

$$\text{Service Period } 5 > X < 10 [6] = (7 - x)/(7 - 5)$$

$$= (7 - 6)/(7 - 5)$$

$$= 1/2 = 0.5$$

$$\text{Terms of Service} > 10 [6] = (x - 6)/(10 - 6)$$

$$= (6 - 6)/(10 - 6)$$

$$= 0/4 = 0$$

$$D4 = \text{Time of Service} < 5 [6] = x 4$$

$$= 6 4$$

$$= 0$$

$$\text{Service Period } 5 > X < 10 [6] = (7 - x)/(7 - 5)$$

$$= (7 - 6)/(7 - 5)$$

$$= 1/2 = 0.5$$

$$\text{Terms of Service} > 10 [6] = (x - 6)/(10 - 6)$$

$$= (6 - 6)/(10 - 6)$$



$$= 0/4 = 0$$

4. Service

D1 = μ Poor Service[8] = $x \ 4$
 $= 8 \ 4$
 $= 0$

Quite Good Service[8] = $x \ 7$
 $= 8 \ 7$
 $= 0$

Excellent Service[8] = $(x - 6)/(10 - 6)$
 $= (8 - 6)/(10 - 6)$
 $= 2 / 4 = 0.5$

D2 = Poor Service[6] = $x \ 4$
 $= 6 \ 4$
 $= 0$

Quite Good Service [6] = $(7 - x)/(7 - 5)$
 $= (7 - 6)/(7 - 5)$
 $= 1/2 = 0.5$

Excellent Service [6] = $(x - 6)/(10 - 6)$
 $= (6 - 6)/(10 - 6)$
 $= 0/4 = 0$

D3 = μ Poor Service[5] = $x \ 4$
 $= 5 \ 4$
 $= 0$

Pretty Good Service[5] = $(x - 3)/(5 - 3)$
 $= (5 - 3)/(5 - 3)$
 $= 2/2 = 1$

Excellent Service[5] = $(x \leq 6)$
 $= x \leq 6$
 $= 0$

D4 = μ Poor Service[4] = $x \ 4$
 $= 4 \ 4$
 $= 0$

Pretty Good Service[4] = $(x - 3)/(5 - 3)$
 $= (4 - 3)/(5 - 3)$
 $= 1/2 = 0.5$

Excellent Service[4] = $x \leq 6$
 $= 6 \leq 6$
 $= 0$

Table 4.
 Membership Degree Case Example

Code	Doctor's Name	Membership Variables and Degrees			
		Code of Ethics	Education	Years of service	Service
D1	dr. Ronny Ajartha, SPOG, M.kes	0.75 (Very good)	1 (Very high)	0.5 (5 > X < 10)	0.5 (Very good)

D2	dr. Robert Simamora, SPOG	0.5 (Very good)	0.5 (Tall)	0.25 (>10)	0.5 (Quite good)
D3	dr. Jackson Lubis, SPOG	0.5 (Very good)	0.5 (High enough)	0.5 (5 > X<10)	1 (Quite good)
D4	dr. John Tambunan, SPOG	0.25 (Very good)	1 (High enough)	0.5 (5 > X<10)	0.5 (Quite good)

3.4. Rule Design

Contains the rules that apply to all events (combinations). This process serves to find a fuzzy output value from fuzzy input. The process is as follows: a fuzzy input value that comes from the fuzzyfication process is then entered into a rule that has been created to become a fuzzy output. The following are the rules that will be used for fuzzy calculations:

Table 5.
Rule Design

NO	Input Variables				Output Variable
	Code of Ethics	Education	Years of service	Service	Rating Evaluation
1	Very good	Very high	>10	Very good	Achievers
2	Very good	Very high	>10	Quite good	Achievers
3	Very good	Very high	>10	Not good	Achievers
4	Very good	Very high	5 < x > 10	Very good	Achievers
5	Very good	Very high	5 < x > 10	Quite good	Achievers
6	Very good	Very high	5 < x > 10	Not good	Achievers
7	Very good	Very high	< 5	Very good	Achievers
8	Very good	Very high	< 5	Quite good	Underachievement
9	Very good	Very high	< 5	Not good	Underachievement
10	Very good	Tall	>10	Very good	Achievers
11	Very good	Tall	>10	Quite good	Achievers
12	Very good	Tall	>10	Not good	Achievers
13	Very good	Tall	5 < x > 10	Very good	Achievers
14	Very good	Tall	5 < x > 10	Quite good	Achievers
15	Very good	Tall	5 < x > 10	Not good	Achievers
16	Very good	Tall	< 5	Very good	Achievers
17	Very good	Tall	< 5	Quite good	Achievers
18	Very good	Tall	< 5	Not good	Underachievement
19	Very good	High enough	>10	Very good	Achievers
20	Very good	High enough	>10	Quite good	Underachievement
21	Very good	High enough	>10	Not good	Underachievement
22	Very good	High enough	5 < x > 10	Very good	Achievers
23	Very good	High enough	5 < x > 10	Quite good	Underachievement



24	Very good	High enough	5 < x > 10	Not good	Underachievement
25	Very good	High enough	< 5	Very good	Achievers
26	Very good	High enough	< 5	Quite good	Underachievement
27	Very good	High enough	< 5	Not good	Underachievement
28	Quite good	Standard	>10	Very good	Underachievement
29	Quite good	Standard	>10	Quite good	Underachievement
30	Quite good	Standard	>10	Not good	Underachievement
31	Quite good	Standard	5 < x > 10	Very good	Underachievement
32	Quite good	Standard	5 < x > 10	Quite good	Underachievement
33	Quite good	Standard	5 < x > 10	Not good	Underachievement
34	Quite good	Standard	< 5	Very good	Underachievement
35	Quite good	Standard	< 5	Quite good	Underachievement
36	Quite good	Standard	< 5	Not good	Underachievement

One example of using if – then for the first rule (R1) is as follows:

[R1]= IF Code of Conduct Very Good AND Education Very High AND Term of Service > 10 AND Service Very Good THEN Value Evaluation

3.5. Inference Engine

Inference engine is a process to process fuzzy input into fuzzy output by following the rules that have been set on the fuzzy knowledge base. The inference engine is a MIN implication function to get the -predicate value of each rule. Then each value will be used to calculate the output, the results of inference explicitly (crisp) each rule (z). Defuzzification

The function of defuzzification is to process the fuzzy output obtained from the inference engine into a firm value by using a membership function that is in accordance with the fuzzyfication that has been done. The output results are obtained from the results (Z) of the average weighting (Mean).

The following are the results of the overall defuzzification (Z) of the best doctor selection decision scoring system:

$$\begin{aligned}
 Z &= ((\alpha_1 * z_1) + (\alpha_2 * z_2) + (\alpha_3 * z_3) + (\alpha_4 * z_4)) / (\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4) \\
 &= ((0.5 * 7.5) + (0.25 * 6.25) + (0.5 * 7.25) + (0.25 * 6.15)) / (0.5 + 0.25 + 0.5 + 0.25) \\
 &= (3.75 + 1.5625 + 3.625 + 1.5375) / (1.4) \\
 &= 10.5625 / 1.4 \\
 &= 7.583 \Rightarrow 7
 \end{aligned}$$

Then the Fuzzy value from the calculation of the Evaluation Assessment is 7.5 with the name dr. Ronny Ajartha, SPOG, M.kes. Based on this value, the results of the evaluation of the best doctors can be seen as follows:

Table 6.
Defuzzification Table

Code	Doctor's Name	Evaluation			
		-Predicate	Z(R)	Z	Rating Evaluation
D1	dr. Ronny Ajartha, SPOG, M.kes	0.5	7.5		Achievers
D2	dr. Robert Simamora, SPOG	0.25	6.25	7	Underachievement
D3	dr. Jackson Lubis, SPOG	0.5	7.25		Achievers
D4	dr. John Tambunan, SPOG	0.25	6.15		Underachievement

4. Conclusion

Based on the discussion regarding the Selection of the Best Doctor at Sari Mutiara Hospital with the Fuzzy Tsukamoto Method, it can be concluded: The decision support system using the fuzzy logic method with the Tsukamoto inference system is able to analyze and determine the best doctor at Sari Mutiara Hospital.

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