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Implementation of Mamdani Method *Fuzzy* System in Determining Final Semester Grades of UIN Walisongo Semarang Students

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Abstract. Final semester grades are an important component for students to obtain a pass in completing a course. The program for determining final semester grades using fuzzy Mamdani can be used to facilitate the calculation of final semester grades. This research aims to determine the results of applying the Mamdani fuzzy system method in determining the final semester grades of students at UIN Walisongo Semarang. The Mamdani fuzzy system method was chosen as the method for calculating final semester grades along with MAPE (Mean Absolute Percentage Error) calculations. In accordance with the lecture contract for the computational mathematics course, several input variables were found to be used in the research, namely structured assignment grades (20%), independent assignment grades (30%), mid-semester exam grades (25%), and final semester exam scores (25%). The data is processed in several steps, namely creating fuzzy membership sets and functions, creating fuzzy rules, fuzzification, and defuzzification. After calculating with the Mamdani method fuzzy system, the next step is to calculate the MAPE value and display the results. The MAPE value obtained from research with 46 data was 2.074; This means that according to the MAPE criteria it produces accurate data. This proves that the Mamdani fuzzy system method can be applied to calculate students' final semester grades.

Keywords: *fuzzy; membership sets; fuzzy system; mamdani method; mean absolute percentage error.*

1 Introduction

Mathematics is a branch of human inquiry that involves the study of numbers, quantity, data, shape and space and their relationships, especially generalization and abstraction and their application to situations in the real world [1]. Mathematical topics, especially in computing, there is a discussion of *fuzzy* sets, namely how to define a set whose members are still unclear or vague into a range of values between 0 and 1, where 1 is a full member of the set, while 0 is not a member of the set [2].

The final semester grade is an important component for students to obtain graduation in completing a course. The final semester grade at the State Islamic University (UIN) Walisongo Semarang has several levels from a value range of 0 to 4 with the lowest value of E to the highest value of A [3] . The existence of several different assessment variables for the final semester grade and the results of various grades are possible to use *fuzzy* logic. The existence of various assessment variables can be used *fuzzy* systems, namely the way of each *fuzzy* component to solve various problems in the real world [4].

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Calculation of final semester grades using conventional calculations carried out so far uses *crisp* numbers or firm numbers, whereas if processed with *fuzzy* calculations, it is calculated based on the rules and steps according to the *fuzzy* system. There are several kinds of methods in *fuzzy*, namely Mamdani *fuzzy*, Sugeno fuzzy, and Tsukamoto *fuzzy* [5]. The research conducted focuses on using Mamdani fuzzy or *the Min-Max* method with the advantage that it is easier to calculate and is known to make reasoning systems that resemble human intuition, so it can be used to represent guesses [6].

Research on *fuzzy* in the scope of education has been carried out, for example making expert system applications to make it easier for teachers to categorize smart students, less intelligent students, and unintelligent students [5]. There is similar research in the same year, namely on a decision support system that can be used to help analyze and measure the ability of students during lectures [6]. There are previous research and seminars on the application of the Mamdani *fuzzy* method used to determine whether lecturers are successful or not in teaching [7]. Furthermore, in 2017, relevant research was found, namely research with the aim of knowing the results of students learning mathematics using the Mamdani method [8].

Regarding research on the Mamdani *fuzzy* method in 2020, research was found that contained research on recommending teachers in giving grades to students [9]. The following year, research was found that aimed to create a scholarship program that was right on target, right amount and right on time to improve academic achievement [10]. Some previous research on *fuzzy* from the assessment of learning outcomes to determining the success of teaching lecturers found that there are still many objects and methods that have not been done. The difference between this research and previous research is the number of *input* variables, *fuzzy* sets, and *fuzzy* rules that are loaded more. The variables supporting the final semester grades at the university level are different, therefore UIN Walisongo Semarang was chosen as a research destination and student grade data collection. Based on the review of previous research, research will be conducted to determine the application of the Mamdani method *fuzzy* system in determining the final semester grades of UIN Walisongo Semarang students.

2 Learning Assessment

Learning assessment standards are known as minimum criteria regarding the assessment of the process and student learning outcomes in order to fulfill a series of graduate learning outcomes [3]. The assessment reporting table for Diploma and Bachelor program students is as follows [3].

Table 1 Value Reporting

Letter	Weight
A	**4,00**

B +	$\mathbf{3,50-3,99}$
B	$\mathbf{3,00-3,49}$
C +	$\mathbf{2,50-2,99}$
C	$\mathbf{2,00-2,49}$
D +	$\mathbf{1,50-1,99}$
D	$\mathbf{1,00-1,49}$
E +	$\mathbf{0,05-0,99}$
E	$\mathbf{0,00}$

Table 1 is used to report the assessment on a scale of 0 to 4 or equivalents with grades E to A. There are also other assessments used on a scale from 0 to 100 such as the following table [3].

Table 2 Value Reporting Equivalencies

Figures	Letter	Weight
≥80	A	4,0
79	$B+$	3,9
⋮	⋮	⋮
50	D	1,0
≤49	E	0,0

3 Fuzzy

In general, *fuzzy* logic is a method of counting with linguistic variables, as a substitute for counting with numbers [11]. The value of the membership function is called the degree of membership of a set element or called a *fuzzy* set, so that each element has a certain degree of membership in the set [2] . The degree of membership is expressed in a closed interval [0,1] on a real number.

3.1 Membership Function

The membership function of the *fuzzy* set $\tilde{A}$ in the universe U is a mapping $\mu_{\tilde{A}(x)}$ of U on the interval $[0,1]$, namely

$$\mu_{\tilde{A}(x)}: U \rightarrow [0,1] \quad (1)$$

The function value $\mu_{\tilde{A}(x)}$ is the degree of membership of the element $x \in U$ in the *fuzzy* set $\tilde{A}$. A function value equal to 0 states that it does not belong to the *fuzzy* set, while a value of 1 states full membership [2]. The following *fuzzy* set membership function is used in Figure 1

The triangular membership function is a function consisting of ascending and descending linear functions, the *fuzzy* set has three limits, namely$a, b, c \in R$ where$a < b < c$, and is expressed by a triangle (x; a, b, c) with conditions in Equation (2).

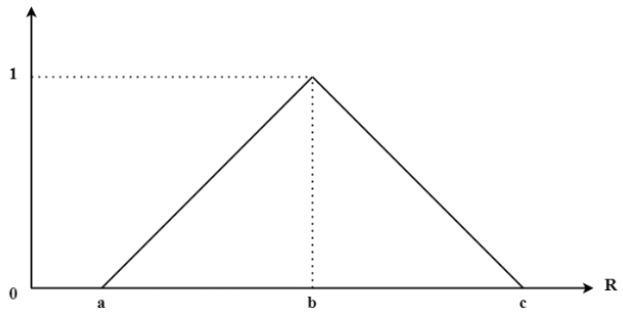

Figure 1 Triangular Membership Function (Source: [2])

$$\text{Triangle}\ (x; a, b, c) = \begin{cases} \frac{x-a}{b-a}; \text{for}\ a\ \leq x\ \leq b \\ \frac{c-x}{c-b}; \text{for}\ b\ \leq x\ \leq c \\ 0; otherwise. \end{cases} \quad (2)$$

where:
$x\ \in R, a, b, c =$ domain, $0 =$ membership degree [2].

3.2 Fuzzy System

Fuzzy systems are real-world problem solving using each *fuzzy* part in the form of fuzzification, fuzzy rules, and defuzzification. *Fuzzy* systems are one of the applications of computational artificial intelligence, the difference with ordinary computational is seen from the technique [4].

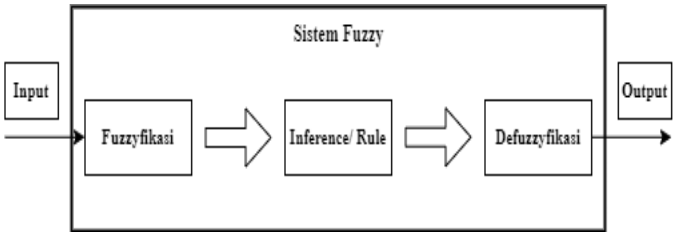

Figure 2 Fuzzy Systems (Source: [4])

3.2.1 Fuzzification

Fuzzification is a way of converting a crisp set into a *fuzzy* set [4]. Crisp numbers are entered and mapped into fuzzy numbers with fuzzification [12]. Broadly speaking, the definition of fuzzification is the conversion of firm values into *fuzzy* values in the input process.

3.2.2 Fuzzy Inference Rules

The process of mapping the truth value of the input to determine the truth value of the output as desired or *fuzzy* rules are used to determine the output based on the value of the input variable [4]. *Fuzzy* rules indicate how a system works, as generally written in the form of implications (If..., then...) [13].

3.2.3 Defuzzification

Defuzzification is a mapping of *fuzzy* sets to classical sets, so that the value obtained is a real number [4]. Centroid method is to find a solution in classical value by taking the center point of the *fuzzy* region. The Centroid method for discrete domains is formulated as follows:

$$Z = \frac{\sum_{i=1}^{n} d_i . U_{A_i}(d_i)}{\sum_{i=1}^{n} U_{A_i}(d_i)} \quad (3)$$

where:

Z	=	defuzzification value,
d_i	=	output value at rule- ,i
U_{A_i}	=	the degree of membership of the output value at rule- ,i
n	=	many rules.

4 Mamdani Method

The Mamdani *fuzzy* method refers to IF-THEN rules that are displayed with a *fuzzy* set where the membership function is monotonous, so that the output results are given classically or *crisp*. Using a weighted average to get the final result [14]. The Mamdani rule is described in Figure 3.

The inference engine uses the Min implication function and the composition between rules uses the Max function, resulting in a new *fuzzy* set. The *fuzzy* set $\tilde{A}$ and the *fuzzy* set $\tilde{B}$ are called the intersection (conjunction) where the *fuzzy* set $\tilde{A} \cap \tilde{B}$ with the following membership function in Equation (4).

$$\mu_{\tilde{A}\cap\tilde{B}}(x) = \min\{\mu_{\tilde{A}}(x), \mu_{\tilde{B}}(x)\} \quad (4)$$

for every $x \in U$. The *fuzzy* set $\tilde{A}$ and the *fuzzy* set $\tilde{B}$ are called a combination (disjunction) where the *fuzzy* set $\tilde{A} \cup \tilde{B}$ with the following membership function in Equation (5).

$$\mu_{\tilde{A}\cup\tilde{B}}(x) = \max\{\mu_{\tilde{A}}(x), \mu_{\tilde{B}}(x)\} \quad (5)$$

for each $x \in U$ [2] .

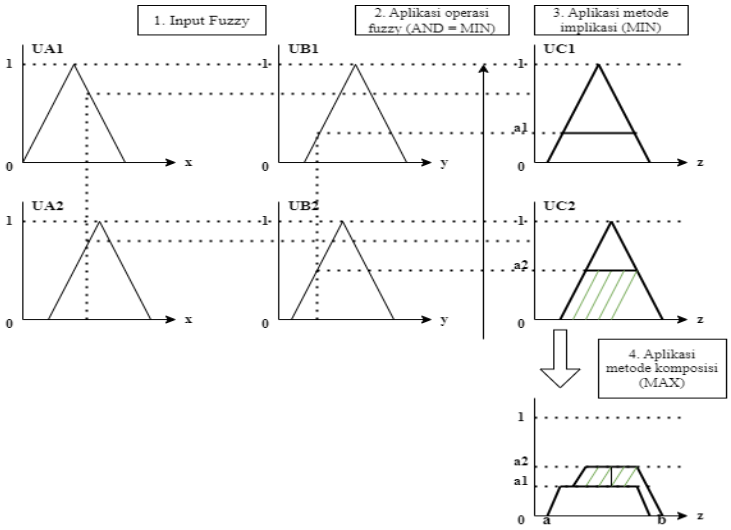

Figure 3 Two-Rule Mamdani Method (Source: **[14]**)

5 MAPE

Mean Absolute Percentage Error (MAPE) is the average absolute percentage error of the forecast. The error is defined as the actual or observed value minus the forecast value. The percentage errors are summed regardless of sign to calculate MAPE [15] in Equation (6).

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left[\frac{(X_t - F_t)}{X_t}\right] \times 100 \quad (6)$$

where:

n = sample size,
X_t = the actual value for time period t,
F_t = forecast for period t [15].

The following are the criteria for the MAPE value obtained:

Table 3 MAPE Criteria [16]

MAPE	Forecast Power
$< 10\%$	Highly accurate forecasts
$10\% - 20\%$	Good forecast
$20\% - 50\%$	Reasonable forecast
$> 50\%$	Weak and inaccurate forecasts

6 Research Methods

The following is the flow of research conducted in this study:

a. Collecting value data supporting the final semester grades, the data is secondary data from those collected from student grades.
b. Define fuzzy sets and membership functions.
c. Create fuzzy rules based on the appropriate assessment weights in related courses.
d. Perform calculations based on fuzzy systems using the Mamdani method.
e. Perform MAPE calculation to see the average error.
f. Display results and make conclusions from data processing.

7 Results and Discussion

The data used in the study in Table 4 include data on independent assignment grades, structured assignment grades, midterm exam grades (UTS), and final semester grades (UAS) in the 2021 computational mathematics course. The sample taken randomly is 5 out of 46 students, according to the following table taken from the Appendix.

Table 4 Sample Values

Sample	No.	Tasks Independent	Value Tasks Structured	UTS	UAS	Total
1	20	75	80	75	75	76,25
2	24	85	80	80	80	80,5
3	32	70	80	75	70	73,75
4	43	80	80	75	85	80,75
5	46	75	80	75	70	74,25

7.1 Determining Fuzzy Sets and Membership Functions

There are 4 *input* variables, namely independent assignment grades, structured assignment grades, UTS grades, and UAS grades. The *output* variable is the final semester grade. The input and output variables obtained to adjust the computational mathematics course can be seen in the Appendix. The *fuzzy* set (*input*) consists of very low, low, medium, high, and very high in Table 5. The *fuzzy* set (*output*) is the value of E, D, C, B, and A. The *fuzzy* set (*input*) used refers to [9] , while the output part adjusts to Table 2 in [3] with more concise values.

Table 5 Fuzzy Variables and Sets

Input	Independent Assignment Grades, Structured	Very low	[0-100]	[0 45 55]
		Low	[0-100]	[45 55 65]
		Medium	[0-100]	[55 65 75]

	Assignment Grades, UTS Grades, and UAS Grades.	High	[0-100]	[65 75 85]
		Very high	[0-100]	[75 85 100]
Output	End of Semester Grade	E	[0-100]	[0 45 55]
		D	[0-100]	[45 55 65]
		C	[0-100]	[55 65 75]
		B	[0-100]	[65 75 85]
		A	[0-100]	[75 85 100]

Next, the membership function for each variable of independent assignment value, structured assignment value, UTS value, UAS value, and final semester value is determined in Figure 4.

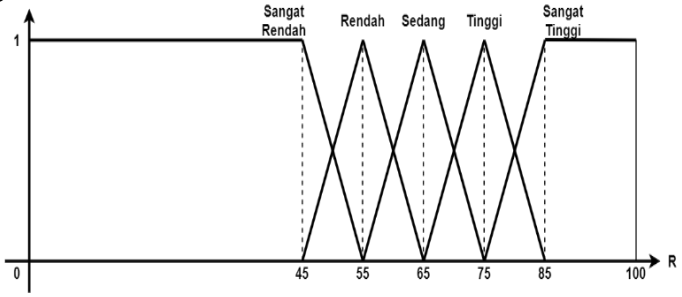

Figure 4 Membership Function Graph of Structured Assignment Value, Independent Assignment, UTS and UAS

The membership function of the independent assignment value is loaded by 5 conditions namely very low, low, medium, high, and very high referring to [9], defined in Equation (7)-(11). The *input* value is calculated by Equation 2 by looking at Figure 5.

$$Very\ Low = \begin{cases} 1;\ x\ \leq 45 \\ \frac{55-x}{55-45}; 45\ \leq x\ \leq 55 \\ 0; x \geq 55 \end{cases} \quad (7)$$

$$Low = \begin{cases} \frac{x-45}{55-45}; 45\ \leq x\ \leq 55 \\ \frac{65-x}{65-55}; 55\ \leq x\ \leq 65 \\ 0; x \geq 65\ \vee x \leq 45 \end{cases} \quad (8)$$

$$Medium = \begin{cases} \frac{x-55}{65-55}; 55\ \leq x\ \leq 65 \\ \frac{75-x}{75-65}; 65\ \leq x\ \leq 75 \\ 0; x \geq 75\ \vee x \leq 55 \end{cases} \quad (9)$$

$$High = \begin{cases} \frac{x-65}{75-65}; 65 \leq x \leq 75 \\ \frac{85-x}{85-75}; 75 \leq x \leq 85 \\ 0; x \geq 85 \vee x \leq 65 \end{cases} \quad (10)$$

$$Very\ High = \begin{cases} 1; x \geq 85 \\ \frac{x-75}{85-75}; 75 \leq x \leq 85 \\ 0; x \leq 75 \end{cases} \quad (11)$$

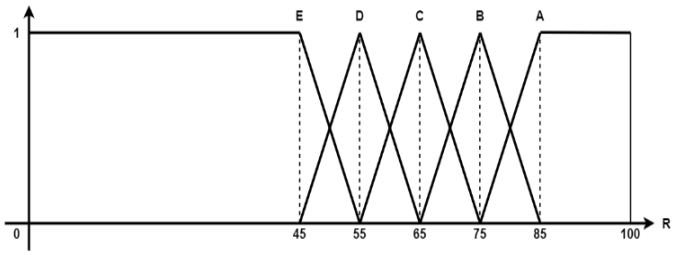

Figure 5 Membership Function Graph of Semester Final Grade

The membership function of the final semester grade is loaded in 5 conditions namely E, D, C, B, and A referring to [9] and Table 5. The calculation of the output value is done according to equation 2 and see Figure 6.

$$E = \begin{cases} 1; x \leq 45 \\ \frac{55-x}{55-45}; 45 \leq x \leq 55 \\ 0; x \geq 55 \end{cases} \quad (12)$$

$$D = \begin{cases} \frac{x-45}{55-45}; 45 \leq x \leq 55 \\ \frac{65-x}{65-55}; 55 \leq x \leq 65 \\ 0; x \geq 65 \vee x \leq 45 \end{cases} \quad (13)$$

$$C = \begin{cases} \frac{x-55}{65-55}; 55 \leq x \leq 65 \\ \frac{75-x}{75-65}; 65 \leq x \leq 75 \\ 0; x \geq 75 \vee x \leq 55 \end{cases} \quad (14)$$

$$B = \begin{cases} \frac{x-65}{75-65}; 65 \leq x \leq 75 \\ \frac{85-x}{85-75}; 75 \leq x \leq 85 \\ 0; x \geq 85 \vee x \leq 65 \end{cases} \quad (15)$$

$$A = \begin{cases} 1; x \geq 85 \\ \frac{x-75}{85-75}; 75 \leq x \leq 85 \\ 0; x \leq 75 \end{cases} \quad (16)$$

7.2 Fuzzy Rules

The *fuzzy* rules created are based on the lecture contract of the computational mathematics course. Rules are obtained based on structured assignments 20%, independent assignments 30%, midterm 25%, and final semester 25%. Based on 4 *input* variables accompanied by 5 conditions on each variable, 625 *fuzzy* rules are obtained.

Rule 1: *IF the* independent assignment score is very low *AND* the structured assignment score is very low *AND* the mid-semester exam score is very low *AND* the final semester exam score is very low *THEN* the final semester grade is *E*.

Rule 2: *IF the* independent assignment score is very low *AND* the structured assignment score is very low *AND* the mid-semester exam score is very low *AND* the final semester exam score is low *THEN* the final semester grade is *E*.

⋮

Rule 625: *IF the* independent grade is very high *AND* the structured assignment grade is very high *AND* the midterm exam grade is very high *AND* the final semester exam grade is very high *THEN* the final semester grade *is A*.

7.3 Calculations and Results

The first sample is used for calculation examples. The first sample obtained an independent assignment value of 75, a structured assignment value of 80, a UTS value of 75, and a UAS value of 75. Based on equation 2.8, the following calculation is obtained: First, part of the independent task value of 75 is obtained in the high linguistic variable. Then the calculation is applied using equation 11.

$$\mu_{tinggi}[75] = \frac{x-65}{75-65} = \frac{75-65}{75-65} = \frac{10}{10} = 1.$$

Secondly, the 80 structured task value part is obtained between the high (equation 11) and very high (equation 12) linguistic variables.

$$\mu_{tinggi}[80] = \frac{85-x}{85-75} = \frac{85-80}{85-75} = \frac{5}{10} = 0{,}5.$$

$$\mu_{sangat\ tinggi}[80] = \frac{x-75}{85-75} = \frac{80-75}{85-75} = \frac{5}{10} = 0{,}5.$$

Third, part of the UTS score of 75 is obtained in the high linguistic variable. Then the calculation is applied using equation 11.

$$\mu_{tinggi}[75] = \frac{x-65}{75-65} = \frac{75-65}{75-65} = \frac{10}{10} = 1.$$

Finally, the UAS score part of 75 is obtained in the high linguistic variable. Then the calculation is applied using equation 11.

$$\mu_{tinggi}[75] = \frac{x-65}{75-65} = \frac{75-65}{75-65} = \frac{10}{10} = 1.$$

Next, a table is created to determine the *fuzzy* rules to look for.

Table 6 Fuzzy Rules Sample 1

Independent Assignment	Structured Assignment	UTS	UAS
High	High Very high	High	High

After calculating each value in each variable, two rules were found from 625 rules associated with each calculated linguistic variable. The rules obtained are as follows:

469th Rule: *IF the* independent assignment score is high *AND* the structured assignment score is high *AND* the mid-semester exam score is high *AND* the final semester exam score is high *THEN* the final semester grade is B.

444th Rule: *IF* independent assignment score is high *AND* structured assignment score is very high *AND* mid-semester exam score is high *AND* final semester exam score is high *THEN* final semester grade is B.

After finding 2 rules, the conjunction process continues, namely calculating the minimum value of each rule based on equation 4.

469th Rule

$\alpha(469) = \mu_{nilai\ TM}tinggi\ \cap\ \mu_{nilai\ TT}tinggi\ \cap\ \mu_{nilai\ UTS}tinggi\ \cap\ \mu_{nilai\ UAS}tinggi$

$\alpha(469) = \min(1; 0{,}5; 1; 0{,}5)$

$\alpha(469) = 0{,}5.$

494th Rule

$\alpha(494) = \mu_{nilai\ TM}tinggi \cap \mu_{nilai\ TT}sangat\ tinggi \cap \mu_{nilai\ UTS}tinggi \cap \mu_{nilai\ UAS}tinggi$

$\alpha(494) = \min(1; 0{,}5; 1; 0{,}5)$

$\alpha(494) = 0{,}5.$

After calculating the minimum value of each rule, proceed with the disjunction process at each level based on equation 5.

$nilai\ B = \max(\alpha(469) \cup \alpha(494))$

$nilai\ B = \max(0{,}5; 0{,}5)$

$nilai\ B = 0{,}5.$

Furthermore, a table is made to facilitate the identification of the defuzzification value.

Table 7 Defuzzification

	E	D	C	B	A
Mid value	45	55	65	75	85
Fuzzy value	0	0	0	0,5	0

The defuzzification value is calculated based on Equation 3, then obtained as follows:

$$Z = \frac{\sum_{i=1}^{n} d_i . U_{A_i}(d_i)}{\sum_{i=1}^{n} U_{A_i}(d_i)}$$

$$Z = \frac{B(75)}{B}$$
$$Z = \frac{0{,}5(75)}{0{,}5}$$
$$Z = 75.$$

The final grade obtained is 75, which is included in the B grade

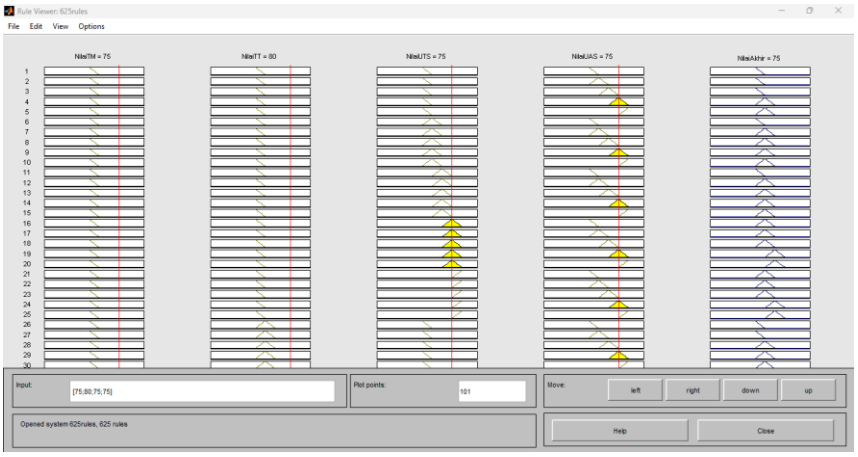

Figure 6 Fuzzy Inference System calculation results in Matlab

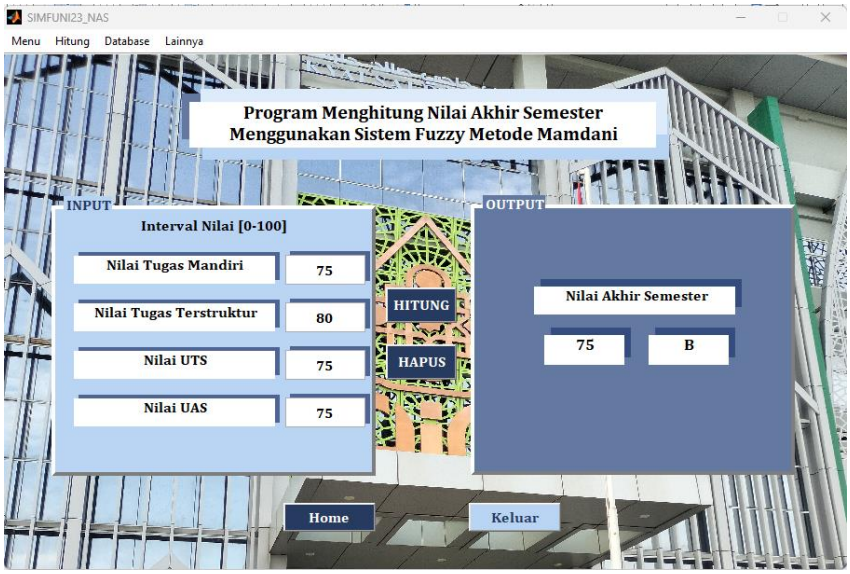

Figure7 Matlab GUI View Calculating Final Grades Semester

The results of the 5 sample calculations are shown in the Table 8.

Table 8 Final Grade of Semester 5 Sample

Sample	No.	Final Semester Grade Results	
		Conventional	Fuzzy Mamdani
1	20	76,25	75
2	24	80,5	80
3	32	73,75	75
4	43	80,75	80
5	46	74,25	75

The calculation of the MAPE value is based on Equation 6.

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left[\frac{(X_t - F_t)}{X_t}\right] \times 100$$

where:

$n = 5$

$X_t = \{80{,}75; 74{,}25; 73{,}75; 80{,}5; 76{,}25\}$

$F_t = \{80, 75, 70, 80, 75\}$.

To facilitate the calculation, Table 9 shows the MAPE value calculation.

Table 9 MAPE Value Calculation

Sample	X_t	F_t	$\lvert X_t - F_t \rvert$	$\left\lvert\frac{X_t - F_t}{X_t}\right\rvert$
1	76,25	75	1,25	0,016
2	80,5	80	0,5	0,006
3	73,75	70	3,75	0,051
4	80,75	80	0,75	0,009
5	74,25	75	0,75	0,01
Total			7	0,092

Based on Table 9, the calculation results are as follows.

$$MAPE = \frac{1}{5}\sum_{t=1}^{5}\left[\frac{(X_t - F_t)}{X_t}\right] \times 100$$

$$MAPE = \frac{1}{5} \times 0{,}092 \times 100$$

$$MAPE = 1{,}84.$$

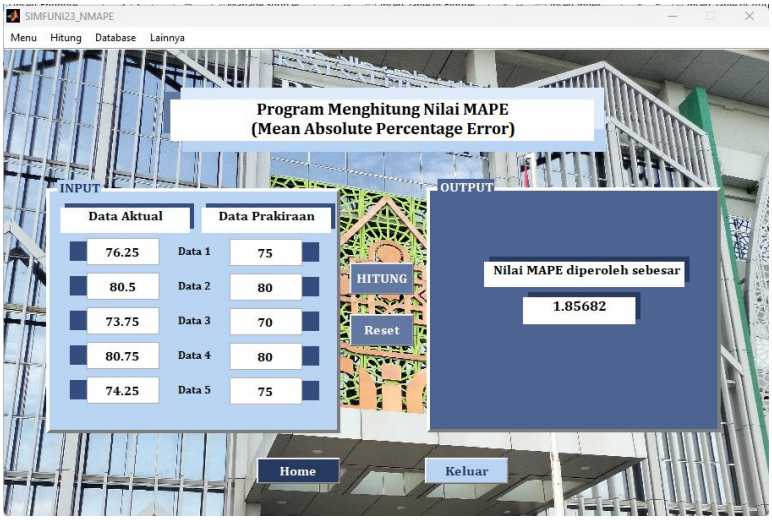

Figure 8 GUI View of Matlab Program Calculating MAPE Value

The MAPE value of 5 samples was obtained at 1.84 while the calculation in the MATLAB program was obtained at 1.857. The MAPE value of 1.84 indicates that the final semester grades calculated using conventional calculations with the Mamdani method *fuzzy* system are very accurate according to Table 3.

Calculations for all data are carried out in accordance with the previous steps, namely using the Mamdani method *fuzzy* system with Centroid defuzzification. The MAPE value is calculated based on Equation 6.

$$MAPE = \frac{1}{46}\sum_{t=1}^{46}\left[\frac{(X_t - F_t)}{X_t}\right] \times 100$$

$$MAPE = \frac{1}{46} \times 0{,}954 \times 100$$

$$MAPE = 2{,}07391304 = 2{,}074.$$

After 46 data were calculated using manual methods and Mamdani *fuzzy*, a MAPE value of 2.074 was obtained, meaning that the calculation of the final semester grades based on the Mamdani method *fuzzy* system produced accurate values.

8 Conclusion

The conclusion obtained from this research is that each *input* variable (structured assignment value, independent assignment value, UTS value, and UAS value) and *output* (final semester grade) has 5 conditions, resulting in 625 *fuzzy* rules. The final semester grade calculated using the Mamdani method *fuzzy* system and Centroid method defuzzification produces reliable values. The MAPE value obtained from 46 data is 2.074,

meaning that the final semester grade data gets accurate results. The Mamdani method *fuzzy* system can be applied to calculate the final semester grades of UIN Walisongo Semarang students.

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Appendix

The following grade data was taken in the mathematics department by mathematics lecturers at Walisongo State Islamic University Semarang in 2021.

Table10 List of computational math course grades

No.	NIM	Value				Final Grade Semester
		Tasks Independent	Tasks Structured	UTS	UAS	
1	1708046009	80	80	75	75	76,75
2	1908046014	80	80	78	85	81,5
3	1908046015	80	80	75	76	77,15
4	1908046017	80	80	75	75	76,75
5	1908046023	80	80	75	85	80,75
6	1908046026	80	80	75	70	74,75
7	1908046002	75	80	75	70	74,25
8	1908046003	80	80	75	78	77,95
9	1908046004	76	80	75	75	76,35
10	1908046005	76	80	75	75	76,35
11	1908046007	77	80	75	75	76,45
12	1908046008	77	80	75	75	76,45
13	1908046009	80	80	75	76	77,15
14	1908046010	80	80	75	80	78,75
15	1908046011	80	80	75	80	78,75
16	1908046012	85	80	75	78	78,45
17	1908046013	70	80	75	75	75,75
18	1908046018	80	80	75	78	77,95
19	1908046019	80	80	75	77	77,55
20	1908046021	75	80	75	75	76,25
21	1908046022	75	80	75	75	76,25
22	1908046024	90	80	75	81	80,15
23	1908046027	85	80	75	75	77,25

24	1908046028	85	80	80	80	80,5
25	1908046029	80	80	75	80	78,75
26	1908046030	80	80	75	77	77,55
27	1908046032	70	80	75	70	73,75
28	1908046033	80	80	75	84	80,35
29	1908046034	80	80	75	85	80,75
30	1908046035	75	80	75	75	76,25
31	1908046036	80	80	75	80	78,75
32	1908046037	70	80	75	70	73,75
33	1908046038	90	80	75	81	80,15
34	1908046040	80	80	75	85	80,75
35	1908046041	90	80	75	90	83,75
36	1908046043	80	80	75	80	78,75
37	1908046044	70	80	75	75	75,75
38	1908046045	75	80	75	75	76,25
39	1908046046	76	80	75	75	76,35
40	1908046047	75	80	75	75	76,25
41	1908046048	85	80	75	85	81,25
42	1908046049	75	80	75	70	74,25
43	1908046051	80	80	75	85	80,75
44	1908046052	75	80	75	70	74,25
45	1908046054	78	80	75	77	77,35
46	1908046055	75	80	75	70	74,25

Semarang, 28 Desember 2023
Mengetahui,
Dosen Pengampu

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