



Prediction of the Number of New Student Unregistration Based on Mamdani

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Abstract

One of the annual routine events carried out by a private university is the admission of new students (PMB). From a number of prospective students who register, there are usually a number of students who unregister or cancel registration. Several factors for unregistration of new students are (1) acceptance of state universities, the interest of prospective students to study at state universities is still high, (2) there are doubts about the study program chosen by students, (3) Inadequate ability to pay. Some of the above factors must be taken seriously so that there is no decrease in the number of registrations. The mamdani method is one of the calculation methods that can be used to predict the number of new student registrations, with 4 main stages, namely creating fuzzy sets, implementing implication functions, applying rules and regulations, and affirming. Prediction of unregistration using the Mamdani method will make it easier for academics, in this case the academic bureau, to find solutions to reduce the number of unregistration itself.

Keywords: Prediction, Unregistration, Mamdani

1. Introduction

Admission of new students (PMB) is an annual activity in a tertiary institution, PMB is held between January and August. Registration and selection can be done directly at the location or online, as well as registration. Of the number of prospective students who register, there are usually a number of students who unregister or cancel their registration.

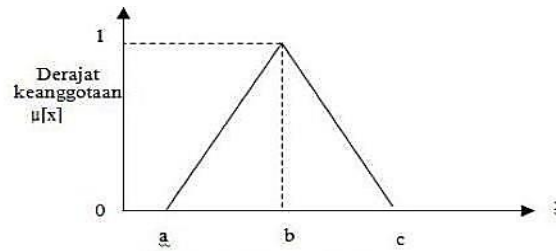
Several factors for unregistering new students are (1) acceptance at state universities, prospective students' interest in studying at state universities is still high, (2) there are doubts about the study program chosen by students, (3) inadequate ability to pay. Several factors above must be taken seriously so that there is no decline in registration numbers. An initial prediction is needed to determine the number of unregistrations for each admission.

This prediction is useful for taking steps to reduce the number of prospective students who register, such as providing a better understanding of the vision and mission of each study program when the promotion team visits the school or through guidance from career teachers. as a student career center at school, for example creating payment patterns with stages that enlighten prospective students, or placing more emphasis on information on facilities and infrastructure that have the potential to influence student interest and no less important is improving services to students which will strengthen confidence in joining the university.

The mamdani method is a calculation method that can be used to predict the number of new student unregistrations, with 4 main stages, namely creating fuzzy sets, implementing support functions, applying regulatory rules, and confirmation [1]. Several studies that support the mamdani method to be used as an appropriate prediction function include (1) the Fuzzy Mamdani Model for Assessing the Level of Satisfaction with Public Complaint Services, written by Martin, in 2018, concluding that the mamdani method is able to predict the level of service satisfaction as a basis decision support in efforts to improve services based on public complaints [2]. (2) Application of Fuzzy Mamdani for a Decision Support System for Cellular Telephone Selection, written by Wira Buana, concluding that fuzzy Mamdani can be used as an alternative for technical decision making in cellular telephone selection problems [3]. Several previous studies can provide confirmation that the Mamdani method is very easy and suitable for predictive calculation methods.

2. Research methods

Another name for the mamdani method is the max-min method [4]. The curve representation in mamdani is as follows:



Gambar 2.3 Kurva Segitiga.

Fungsi Keanggotaan

$$\mu(x; a, b, c) = \begin{cases} 0 & x < a \\ \frac{x-a}{b-a} & a \leq x \leq b \\ \frac{c-x}{c-b} & b < x \leq c \\ 1 & x > c \end{cases}$$

Fig. 1: Mamdani Curve

The output from predictions using mamdani can be obtained in 4 stages [5]

1. Create a fuzzy set
input variables and output variables are divided into one or more fuzzy sets
2. Implementation of the implication function
The implication function used is the Mamdani method, which is min
3. Regulatory rules
The Mamdani method uses Max (Maximum) fuzzy system inference. In general it can be written [6]:
 $\mu_{sf}[X_i] = \max(\mu_{sf}[X_i] \cdot \mu_{kf}[X_i])$
Information:
 $\mu_{sf}[X_i]$ = membership value of the fuzzy solution up to the *i*th rule
 $\mu_{kf}[X_i]$ = fuzzy sequential membership value of rule *i*
4. Confirmation (defuzzy) Defuzzyfication of the Mamdani method using the centroid method. Where in this method, a crisp solution is obtained by taking the center point of the fuzzy area [7].

$$\mu(x) = \frac{\int_a^b x \mu(x) dx}{\int_a^b \mu(x) dx}$$

atau

$$\mu(x) = \frac{\sum_{i=1}^n x_i \mu(x_i)}{\sum_{i=1}^n \mu(x_i)}$$

3. Result And Discussion

3.1. Dataset provision

The initial stage of implementation to Mamdani is providing a dataset. The existing data set was taken during each new student admission season, namely March to August, with a range from 2017 to 2022.

Table 1: Dataset Unregistration

Period	Date	Pendaftaran	Registration	Unregistration
2017-2021	Mar 2017	130	130	3
	Apr 2017	135	134	2
	Mey 2017	140	133	5
	Jun 2017	121	121	6
	Jul 2017	300	287	10
	Aug 2017	302	297	5
	Mar 2018	135	130	10
	Apr 2018	140	120	6
	Mey 2018	160	157	3
	Jun 2018	145	145	2
	Jul 2018	255	254	7
	Aug 2018	300	287	15

Mar 2019	150	145	5
Apr 2019	155	150	4
Mey 2019	160	160	9
Jun 2019	170	154	8
Jul 2019	290	290	5
Aug 2019	234	230	8
Mar 2020	210	210	7
Apr 2020	190	189	6
Mey 2020	140	132	15
Jun 2020	129	128	17
Jul 2020	310	305	32
Aug 2020	304	300	14
Mar 2021	300	290	15
Apr 2021	267	267	2
Mey 2021	321	320	16
Jun 2021	400	389	34
Jul 2021	305	302	32
Aug 2021	432	423	12
Mar 2020	210	210	7
Apr 2020	190	189	6
Mey 2020	140	132	15
Jun 2020	129	128	17
Jul 2020	310	305	32
Aug 2020	304	300	14
Mar 2021	300	290	15
Apr 2021	267	267	2
Mey 2021	321	320	16
Jun 2021	400	389	34
Jul 2021	305	302	32
Aug 2021	432	423	12
Mar 2022	300	290	?

From the table above, the following analysis can be seen:

Pendaftaran Max =432, Pendaftaran Min = 121

Registration Max =423, Registration Min = 120

Unregistration Max =34, Unregistration Min = 2

Next, the determination of purchasing goods in March 2022 will be determined using the mamdani method

3.2. Mamdani Processing

Processing in the Mamdani method includes determining fuzzy sets, determining fuzzy rules, applying fuzzy rules, defuzzification

1. Stage I, Fuzzy Set

Application of the formula above

- a. Registration, consisting of 2 fuzzy sets: MIN and MAX

$$\mu_{\text{Pendaftaran MAX}}[x] = \begin{cases} 1, & x \leq 121 \\ \frac{432-x}{432-121}, & 121 \leq x \leq 432 \\ 0, & x \geq 432 \end{cases}$$

$$\mu_{\text{Pendaftaran MIX}}[x] = \begin{cases} 0, & x \leq 121 \\ \frac{x-121}{432-121}, & 121 \leq x \leq 432 \\ 1, & x \geq 432 \end{cases}$$

Membership Value:

$$\begin{aligned} \mu_{\text{Pendaftaran MAX}}[300] &= (432 - 300)/(432-121) \\ &= 132/311 \\ &= 0.42 \end{aligned}$$

$$\begin{aligned} \mu_{\text{Pendaftaran MIN}}[300] &= (300 - 121)/(432-121) \\ &= 179 / 311 \\ &= 0.58 \end{aligned}$$

b. Registration, consists of 2 fuzzy sets: MAX and MIN

$$\mu_{\text{Registration MAX}}[y] = \begin{cases} 1, & y \leq 120 \\ \frac{432 - y}{432 - 121}, & 120 \leq y \leq 432 \\ 0, & y \geq 432 \end{cases}$$

$$\mu_{\text{Registration MIN}}[x] = \begin{cases} 0, & y \leq 120 \\ \frac{y - 121}{432 - 121}, & 121 \leq y \leq 432 \\ 1, & y \geq 432 \end{cases}$$

Membership Value:

$$\begin{aligned} \mu_{\text{Registration MAX}}[290] &= (423 - 290) / (423 - 120) \\ &= 133 / 303 \\ &= 0.44 \\ \mu_{\text{Registration MIN}}[300] &= (290 - 120) / (423 - 120) \\ &= 170 / 303 \\ &= 0.56 \end{aligned}$$

c. Unregistration, consists of 2 fuzzy sets: MAX and MIN

$$\mu_{\text{Unregistration MAX}}[z] = \begin{cases} z \leq 80 \\ \frac{150 - z}{150 - 80}, & 80 \leq z \leq 150 \\ 0, & z \geq 150 \end{cases}$$

$$\mu_{\text{Unregistration MIN}}[z] = \begin{cases} 0, & z \leq 80 \\ \frac{z - 80}{150 - 80}, & 80 \leq z \leq 150 \\ 1, & z \geq 150 \end{cases}$$

2. Determination of fuzzy rules

Table 2: Fuzzy Rule Table

Code	Rule	Konsekuensi
R1	If Pendaftaran Max AND Registration Max Then	Unregistration Min
R2	If Pendaftaran Max AND Registration Min Then	Unregistration Min

3. Application of stage 3 to fuzzy rules

- a. [R1] If Pendaftaran MAX AND Registration MAX Then Unregistration MIN
 - α - Predikat1 = $\mu_{\text{pendaftaran Max}} \cap \mu_{\text{registration Max}}$
 - = $\min(\mu_{\text{pendaftaran}}[300] \cap \mu_{\text{registration}}[423])$
 - = $\min(0,42;0,44)$
 - = 0.42

See set Unregistration MIN

$$\begin{aligned} (Z1 - 2) / (34 - 2) &= 0,42 \\ (Z1 - 2) / 32 &= 0,15 \\ Z1 - 2 &= 4,8 \\ Z1 &= 6,8 \end{aligned}$$

b. [R2] If Pendaftaran MAX AND Registration MIN Then Unregistration MIN

$$\begin{aligned} \alpha\text{- Predikat2} &= \text{Pendaftaran MAX} \cap \mu \text{ Registration MIN} \\ &= \min(\mu \text{ Pendaftaran [432]} \cap \mu \text{ Registration [120]}) \\ &= \min(0.42; 0.56) \\ &= 0.42 \end{aligned}$$

See set Unregistration MIN

$$\begin{aligned} (Z1 - 2) / (34 - 2) &= 0,42 \\ (Z1 - 2) / 32 &= 0,15 \\ Z1 - 2 &= 4,8 \\ Z1 &= 6,8 \end{aligned}$$

4. Determining predictions (defuzzification)

$$Z = \frac{\text{apred1} * z1 + \text{apred2} * z2}{\text{apred1} + \text{apred2}}$$

$$\begin{aligned} Z &= \frac{0.42 * 6.8 + 0.42 * 6.8}{0.42 + 0.42} \\ Z &= 6.8 \end{aligned}$$

So the prediction for unregistration in March 2022 is 6.8

4. Conclusion

The Mamdani method has a pattern of looking for the largest and smallest values for each variable. In this discussion, the variables that exist are the number of registrations, the number of registrations and the number of unregistrations. Next, look for the lowest and highest values and create regulations. The final result is a calculation according to previously determined regulations. Predicting unregistration using the Mamdani method will make it easier for academic parties, in this case academic bureaus, to find solutions to reduce the number of unregistrations themselves.

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