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Identification of Social Media Addiction Levels on "TikTok" Among Students Using Mamdani Fuzzy Logic

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Abstract—According to data from the Global Web Index in their early 2023 survey, advertising sources published by Byte Dance indicate that TikTok has 109.9 million users aged 18 and above in Indonesia alone. This highlights the inevitable trend of teenagers becoming addicted to social media, particularly the TikTok app. Related parties are starting to notice this addiction issue, along with a noticeable decline in academic performance, possibly as a result of students neglecting their time by spending it on social media (TikTok). Analyzing variables such as usage duration, productivity impact, and neglect of social interactions aims to measure TikTok addiction among students using the Mamdani fuzzy logic method. Of the 75 respondents surveyed, 17.33% were identified as "Not Addicted", 72% were identified as "Addicted", and the remaining 10.67% were identified as "Highly Addicted". The results show that most students are already identified as addicted to TikTok. The Mamdani fuzzy logic method is considered effective in handling uncertainties in human behaviour. By utilizing MATLAB's Fuzzy Logic Toolbox, this research models and evaluates addiction levels, providing insights to reduce excessive TikTok usage. This study also provides a strong foundation for future research exploring social media addiction on other platforms or among different populations. It encourages using technologies like MATLAB's Fuzzy Logic Toolbox in educational contexts to address other complex problems.

Keywords—Social Media Addiction; TikTok; Fuzzy Mamdani Method; Mamdani Fuzzy Logic; MATLAB.

I. INTRODUCTION

Social media has become integral to daily life in this digital era. Platforms like Facebook, Twitter, Instagram, LinkedIn, and TikTok allow users to communicate, share information, and form communities virtually. The development of internet technology and mobile devices has accelerated the adoption of social media worldwide. According to data from Global Web Index in their early 2023 survey, figures published by ByteDance's advertising source show that TikTok has 109.9 million users aged 18 and above in Indonesia, with a percentage of 66.1 percent of TikTok ad viewers in Indonesia being female, while the remaining 33.9 percent are male. This data indicates that TikTok is quite influential as one of the most favored social media platforms by the public in Indonesia.

Social media is a communication tool that allows individuals to interact with others. Social media's expansive and adaptable nature makes it possible to access communication at any time and from any location. Furthermore, social media platforms constantly update their features, making it difficult for users to quit accessing them. This might result in addiction to social media platforms [1]. Social media addiction behavior is characterized by a lack of control in using social media, resulting in decreased concentration in studying, staying up late, and reduced Interaction with the surrounding environment [2].

People addicted to social media use specific facilities or applications to fulfill their emotional needs, even when their usage tends to be high. According to research [3], addiction to TikTok can result in deficits in the user's ability to accept or consume content with longer durations. Longer content durations require longer focus. TikTok videos themselves typically range from 15 to 60 seconds. Being accustomed to short video durations, especially to the point of addiction, can make it harder for people to concentrate when presented with longer videos [3].

The study [4] used the Mamdani fuzzy method to identify student addiction to online games. The defuzzification calculation process can provide accurate results in identifying the level of addiction to online gaming among students.

Another study [5] also proved that Mamdani fuzzy logic can determine the level of gadget addiction in children. Mamdani Fuzzy Logic is a measurement algorithm that utilizes an approach allowing more complex measurements of addiction levels than other methods. This method is also commonly known as the MIN-MAX method. Therefore, using the Mamdani fuzzy method for determining addiction levels is quite effective in resolving this issue.

This study offers a novel approach to identifying the level of TikTok addiction among students by employing a comprehensive Mamdani fuzzy logic method. The study integrates variables such as usage duration, productivity impact, and neglect of social interactions but also utilizes MATLAB's Fuzzy Logic Toolbox to model and evaluate addiction levels more accurately and in detail. This significantly contributes to understanding the dynamics of social media addiction, particularly TikTok, among students and provides a strong foundation for more effective educational interventions in addressing social media addiction issues.

II. LITERATURE STUDY

In this study, the identification of TikTok addiction levels among students using the Mamdani fuzzy logic method. This

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method is chosen because it can handle vague or uncertain values, making it suitable for identifying addiction levels accurately.

A. *Mamdani Fuzzy Logic*

Mamdani Fuzzy Logic is one of the methods used in fuzzy logic to address problems involving uncertainty and ambiguity. Fuzzy logic is a system that allows computers to work with vague or uncertain concepts, similar to how humans think and make decisions. Fuzzy logic is a science that studies uncertainty. Fuzzy logic is considered capable of mapping an input to an output without disregarding existing factors. Fuzzy logic is believed to be highly flexible and tolerant of available data [6][7].

Fuzzy logic was introduced by Prof. Lotfi Zadeh, an Iranian national who became a professor at the University of California at Berkeley in 1965 [8]. In the Oxford dictionary, "fuzzy" is defined as blurred, imprecisely defined, or confused. The term "fuzzy system" is not intended to refer to a system that is unclear in its definition, operation, or description. A fuzzy system is built with clear definitions, operations, and descriptions based on fuzzy logic theory [8]. Fuzzy logic is a set of mathematical principles for representing knowledge based on the degree of membership [9].

The Mamdani method is often known as the Max-Min method. Ebrahim Mamdani introduced this method in 1975 [10]. Fuzzy logic may be somewhat unfamiliar in translation. Fuzzy means blurry, and logic means reasoning. Therefore, when combined into a sentence, it means fuzzy reasoning [10][11]. Fuzzy Mamdani has two main parts covering the input and output process.

In the input section, namely. Fuzzification and Inference. In the fuzzification part, parts of the input changer become fuzzy values. The input will be given a fuzzy value with membership functions. These membership functions describe how far an input value enters each fuzzy set. This ensures that the system deals with the uncertainty of the received data. Inference involves decision-making based on predetermined fuzzy rules. These rules will be connected with input conditions and actions the system processes. This process involves merging each fuzzy rule's contribution based on the input conditions' fuzzy values.

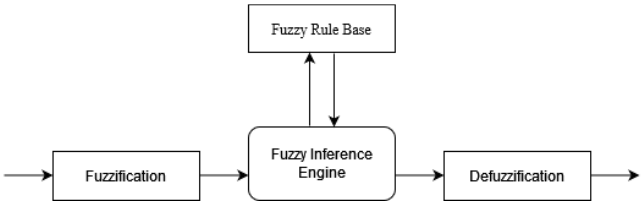

Figure 1 Fuzzy Rule Base

In the output part, namely: Defuzzification (Defuzification). In this part, the process of converting fuzzy values into definite values. The defuzzification method takes the fuzzy values generated from inference. It converts them into definite values that can be used as decision actions or final results in the form of decision values. For more detail, see Figure 1.

B. *Identification*

According to research [12], identification is recognizing and placing an object or individual into a class based on certain characteristics.

In computer science, identification is recognizing an object or entity by comparing its characteristics with previously known ones. Identification can be performed on various objects, such as text, images, and sounds. Identification is often used in various applications, such as facial, voice, and handwriting recognition [13].

C. *Social Media Addiction*

Addiction is a condition that causes a person to lose control over something. It usually refers to an excessive liking and is driven by a strong desire or fondness for something. A person experiencing addiction typically has no control over what they do, consume, or use. Addiction is a condition that can result in an individual being unable to control themselves and the negative impacts caused by their habits [14]. The modern world is mediated by technology and socialization. A fundamental human need is fulfilled mainly by it. Being "online" has become the new normal since so many young people say they sleep with their phones next to them, seldom turn them off, and constantly check them throughout the day [15].

Addiction in a person occurs in three stages. The initial or experimental stage begins when someone starts experimenting with a certain substance or behaviour [16]. At first, this usage may feel enjoyable or provide satisfaction, but it is often not considered a serious problem. The increasing or dependence stage follows if the usage continues, where the individual may start to experience tolerance, needing larger doses or greater intensity to achieve the same effect. Dependence also develops at this stage, where the usage of the substance or behaviour becomes more frequent and difficult to control. The crisis or despair stage is the final stage, occurring when the addiction reaches a point where its negative impacts significantly affect the individual's overall life. Physical, psychological, and social symptoms become apparent, including serious mental health issues, relationship problems, financial difficulties, and legal issues. Addiction is a condition of dependency on something that becomes a habit. Dependency has a negative connotation because it can have many adverse effects on an individual. It has been proven that many people lose focus on their work, education, and social lives [17].

Social media, also known as social networking sites, facilitates users' Interaction with others and the formation of social bonds virtually. Additionally, it allows users to present themselves excessively, leading to a tendency to use social media [18] continuously.

D. *MATLAB*

Matrix Laboratory (MATLAB) is a software designed to utilize matrices as the basis of its operations. The matrices used in MATLAB are designed with simplicity so that they are easy for users from various backgrounds to use [19].

MATLAB is software used for matrix-based programming, analysis, engineering, and mathematical computations.

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Additionally, MATLAB includes Simulink, which is used to prove theories through the simulation of dynamic systems, with results displayed in graphical form [20].

III. Research Methodology

In this section, the author will undertake several stages in designing a model to identify TikTok addiction levels among students using Mamdani fuzzy logic. These stages are carried out to ensure the research can proceed smoothly and achieve accurate results. Figure 2 is a research framework that outlines the sequence of steps to be undertaken in the study.

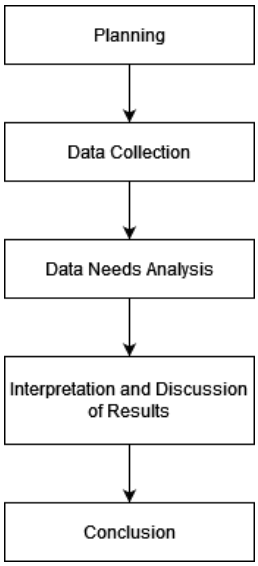

Figure 2 Research Framework

A. Planning

In a research study, planning is essential to design the stages that will be undertaken. Planning is a crucial process in organizing the steps that will be taken in research. This planning can help researchers ensure that the study is conducted systematically, effectively, and efficiently. Researchers determine the problem's formulation, identify variables, and make appropriate measurements. With thorough planning, it is expected to be able to identify addiction levels with the desired outcomes.

B. Data Collection

The researcher will conduct online observations on the research subjects by distributing questionnaires. The survey will be randomly conducted on 75 Islamic State University of North Sumatra students. Data collection through the survey research process is crucial for obtaining the necessary information aligned with the research objectives [21].

The author utilizes duration, productivity, and social Interaction in this study. With these variables, it is expected to facilitate the identification of TikTok addiction levels among students.

The use of spending time and social interaction variables refers to a study on the effect of social media use on learning, social interactions, and sleep duration among university students. This study was conducted on 300 female students at Prince Sattam bin Abdul Aziz University in Wadi Ad-dawasir. The study explains that 57% (*n=173*) are more inclined to use the technology for fun and to pass the time rather than for learning purposes. This habit substantially affects academic performance, learning, and knowledge acquisition, with 66% (n = 198) of them feeling more interested in spending time on social media than studying. Additionally, 59% (*n=176*) of students reported that excessive social media use had negatively impacted their relationships with family members and friends, making face-to-face communication more challenging. Research has also shown that social media use is associated with mental disorders, including depression and anxiety [22].

The use of productivity variables refers to a study [23] conducted on employees working in renowned IT/ITES companies in India using the Interpretative Phenomenological Analysis (IPA) procedure. The research identified three impacts of social media addiction on work productivity: not meeting deadlines, compromising work quality, and distraction from work. Some participants viewed that excessive use of social media led to losing productive time and kept them engaged in non-work-related activities. As a result, they sometimes fail to meet the deadlines given by their superiors to complete a task or request extensions for the given deadlines [23].

C. Data Needs Analysis

There are three input variables as follows. Spending Time: the amount of time students spends on the social media platform TikTok. Social Interaction: tendency to neglect social interactions when using TikTok or using TikTok more often during social gatherings. Productivity and decreased productivity due to negligence in time management, prioritizing social media over productive activities. There is one output variable as follows. Based on Table I, Addiction Level—the degree of student addiction to the TikHub social media platform.

Table I
Variable, Fuzzy Set and Domain

Function	Variable	Fuzzy Set	Universe of Discourse	Domain
Input	Duration	Low	0-12	[0 3 6]
		Medium		[3 6 9]
		High		[6 9 12]
	Productivity	Low	0-12	[0 3 6]
		Medium		[3 6 9]
		High		[6 9 12]
	Social Interaction	Low	0-12	[0 3 6]
		Medium		[3 6 9]
		High		[6 9 12]
Output	Addiction	Not Addicted	0-36	[0 9 18]
		Addicted		[9 18 27
		Highly Addicted		[18 27 36]

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After the variables, fuzzy sets and domains are determined. The next step is to define the set domain's membership functions and the category's values or degrees of membership for each variable.

1) Duration Variable: A diagram for the duration variable that provides boundary values for the membership set, along with the details in Figure 3.

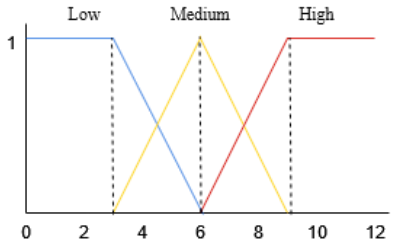

Figure 3 Duration Variable

The membership function of the duration variable is formulated as follows:

a) The membership degree set for the duration variable in the low category is defined as Equation 1.

$$\mu_{(\text{duration})}\text{low} = \begin{cases} 1; & x \leq 3 \\ \frac{6-x}{6-3}; & 3 \leq x \leq 6 \\ 0; & x \leq 6 \end{cases} \quad (1)$$

b) The membership degree set for the duration variable in the medium category is defined as Equation 2.

$$\mu_{(\text{duration})}\text{medium} = \begin{cases} 0; & x \leq 3 \text{ or } x \geq 9 \\ \frac{x-3}{6-3}; & 3 \leq x \leq 6 \\ \frac{9-x}{9-6}; & 6 \leq x \leq 9 \end{cases} \quad (2)$$

c) The membership degree set for the duration variable in the high category is defined as Equation 3.

$$\mu_{(\text{duration})}\text{high} = \begin{cases} 0; & x \leq 6 \\ \frac{x-6}{9-6}; & x \leq 9 \\ 1; & 9 \leq x \leq 12 \end{cases} \quad (3)$$

2) Productivity Variable: A diagram for the productivity variable that provides boundary values for the membership set, along with the details in Figure 4.

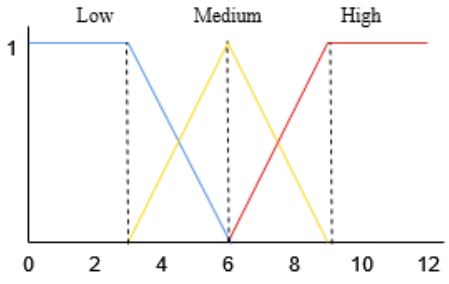

Figure 4 Productivity Variable

The membership function of the productivity variable is formulated as follows:

a) The membership degree set for the productivity variable in the low category is defined as Equation 4.

$$\mu_{(\text{productivity})}\text{low} = \begin{cases} 1; & x \leq 3 \\ \frac{6-x}{6-3}; & 3 \leq x \leq 6 \\ 0; & x \leq 6 \end{cases} \quad (4)$$

b) The membership degree set for the productivity variable in the medium category is defined as Equation 5.

$$\mu_{(\text{productivity})}\text{medium} = \begin{cases} 0; & x \leq 3 \text{ or } x \geq 9 \\ \frac{x-3}{6-3}; & 3 \leq x \leq 6 \\ \frac{9-x}{9-6}; & 6 \leq x \leq 9 \end{cases} \quad (5)$$

c) The membership degree set for the productivity variable in the high category is defined as Equation 6.

$$\mu_{(\text{productivity})}\text{high} = \begin{cases} 0; & x \leq 6 \\ \frac{x-6}{9-6}; & x \leq 9 \\ 1; & 9 \leq x \leq 12 \end{cases} \quad (6)$$

3) Social Interaction Variable: A diagram for the social interaction variable that provides boundary values for the membership set, along with the details in Figure 5.

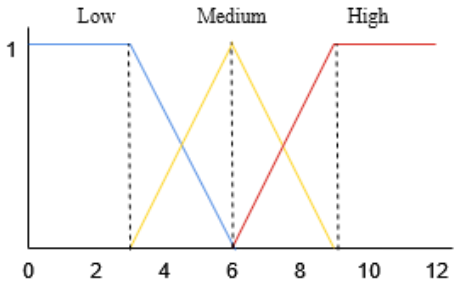

Figure 5 Social Interaction Variable

The membership function of the social interaction variable is formulated as follows:

a) The membership degree set for the social interaction variable in the low category is defined as Equation 7.

$$\mu_{(\text{social interaction})}\text{low} = \begin{cases} 1; & x \leq 3 \\ \frac{6-x}{6-3}; & 3 \leq x \leq 6 \\ 0; & x \leq 6 \end{cases} \quad (7)$$

b) The membership degree set for the social interaction variable in the medium category is defined as Equation 8.

$$\mu_{(\text{social interaction})}\text{medium} = \begin{cases} 0; & x \leq 3 \text{ or } x \geq 9 \\ \frac{x-3}{6-3}; & 3 \leq x \leq 6 \\ \frac{9-x}{9-6}; & 6 \leq x \leq 9 \end{cases} \quad (8)$$

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c) The membership degree set for the social interaction variable in the high category is defined as Equation 9.

$$\mu_{\text{(social interaction)}}\text{high}=\begin{cases}0; & x\le 6\\ \frac{x-6}{9-6}; & x\le 9\\ 1; & 9\le x\le 12\end{cases} \quad (9)$$

4) Addiction Variable: The following is a diagram for the output variable in the form of addiction levels, providing boundary values for the membership set along with the details in Figure 6.

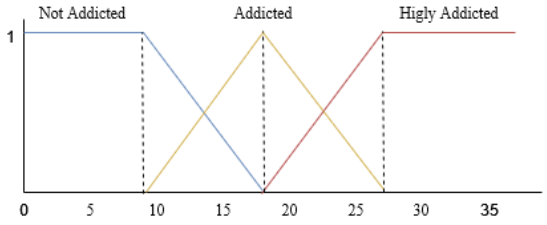

Figure 6 Addiction Variable

The membership function of the addiction variable is formulated as follows:

a) The membership functions for the addiction variable or output variable in the "Not Addicted" category from Figure 6. The function is defined as Equation 10.

$$\mu_{(addiction)}\text{not addicted} = \begin{cases}1; & x\le 9\\ \frac{18-x}{18-9}; & 9\le x\le 18\\ 0; & x\le 18\end{cases} \quad (10)$$

b) The membership functions for the addiction variable or output variable in the "Addicted" category from Figure 6. The function is defined as Equation 11.

$$\mu_{(addiction)}\text{addicted} = \begin{cases}0; & x\le 9 \text{ or } x\ge 27\\ \frac{x-9}{18-9}; & 9\le x\le 18\\ \frac{27-x}{27-18}; & 18\le x\le 27\end{cases} \quad (11)$$

c) The membership functions for the addiction variable or output variable in the "Highly Addicted" category from Figure 6. The function is defined as Equation 12.

$$\mu_{(addiction)}\text{higly addicted}=\begin{cases}0; & x\le 18\\ \frac{x-18}{27-18}; & x\le 27\\ 1; & 27\le x\le 36\end{cases} \quad (12)$$

Membership values for the addiction level fuzzy sets are determined using fuzzy set membership functions based on data. Fuzzy rules will be derived from the three input variables and one output variable. Designing a system that utilizes fuzzy logic involves several processes to generate decisions in the form of outputs that align with fuzzy calculation processes.

D. Interpretation and Discussion Result

After collecting data through questionnaires distributed to students, the data were processed using the Mamdani fuzzy logic method. The variables used in this study are usage duration, productivity, and social Interaction. The data from each variable were converted into linguistic variables and calculated using fuzzy membership functions.

1) Duration: Students who spend more than 1 hour daily using TikTok tend to fall into the "Highly Addicted" category. Those who use TikTok for 30-60 minutes per day fall into the "Addicted" category, while those who use it for less than 1 hour fall into the "Not Addicted" category.

2) Productivity: Students who report significant disruptions in productivity due to TikTok usage fall into the "Highly Addicted" category. Moderate disruptions fall into the "Addicted" category, and minimal or no disruptions fall into the "Not Addicted" category.

3) Social Interaction: Students who frequently neglect social interactions due to TikTok usage are likelier to be in the "Highly Addicted" category. Those who sometimes neglect social interactions fall into the "Addicted" category, and those who never neglect them fall into the "Not Addicted" category.

4) Discussion: The study results indicate that students with high TikTok usage duration tend to experience significant disruptions in productivity and social interactions. This suggests that TikTok addiction affects the time spent and other aspects of students' lives.

E. Conclusion

This study successfully identified the level of TikTok addiction among students using the Mamdani fuzzy logic method. By understanding these addiction levels, preventive and intervention measures can be taken to help students manage their social media use better and maintain a balance between digital life and real-life activities. Further research is needed to explore other factors influencing social media addiction and to develop effective strategies to address this issue.

IV. Result and Discussion

In this section, the questionnaire data representation based on the variables from the membership functions is used to obtain the membership values for each respondent. Calculations are carried out randomly for students.

1) Determination of Fuzzy Set: This section tests a random sample of respondents to verify the results of the calculations designed earlier.

a) The determination of fuzzy sets for membership values is based on the total values of the variables from Table II and those that meet the criteria for each category in the duration variable. The membership value of the respondent variable with *μlow*.

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$$\mu_{(\text{duration})}\text{low}=\begin{cases}1; & x \le 3\\ \frac{6-x}{6-3}; & 3 \le x \le 6\\ 0; & x \ge 6\end{cases}$$

Res6 = $\mu_{(10)}$low = 0

The membership value of the respondent variable with *μmedium.*

$$\mu_{(\text{duration})}\text{medium} = \begin{cases}0; & x \le 3 \text{ or } x \ge 9\\ \frac{x-3}{6-3}; & 3 \le x \le 6\\ \frac{9-x}{9-6}; & 6 \le x \le 9\end{cases}$$

Res6 = $\mu_{(10)}$medium = 0

The membership value of the respondent variable with *μhigh*.

$$\mu_{(\text{duration})}\text{high} = \begin{cases}0; & x \le 6\\ \frac{x-6}{9-6}; & x \le 9\\ 1; & 9 \le x \le 12\end{cases}$$

Res6 = $\mu_{(10)}$high = 1

The membership values for the duration variable can be seen in Table II.

TABLE II
MEMBERSHIP VALUE OF DURATION

No	A1	A2	A3	A4	Total	*μlow*	*μmedium*	*μhigh*
Res6	3	3	2	2	10	0	0	1

b) The determination of fuzzy sets for membership values is based on the total values of the variables from Table III and those that meet the criteria for each category in the productivity variable. The membership value of the respondent variable with *μlow*.

$$\mu_{(\text{productivity})}\text{low}=\begin{cases}1; & x \le 3\\ \frac{6-x}{6-3}; & 3 \le x \le 6\\ 0; & x \ge 6\end{cases}$$

Res6 = $\mu_{(10)}$low = 0

The membership value of the respondent variable with *μmedium*.

$$\mu_{(\text{productivity})}\text{medium} = \begin{cases}0; & x \le 3 \text{ or } x \ge 9\\ \frac{x-3}{6-3}; & 3 \le x \le 6\\ \frac{9-x}{9-6}; & 6 \le x \le 9\end{cases}$$

Res6 = $\mu_{(10)}$medium = 0

The membership value of the respondent variable with *μhigh*.

$$\mu_{(\text{productivity})}\text{high} = \begin{cases}0; & x \le 6\\ \frac{x-6}{9-6}; & x \le 9\\ 1; & 9 \le x \le 12\end{cases}$$

Res6 = $\mu_{(10)}$high = 1

The membership values for the productivity variable can be seen in Table III.

TABLE III
MEMBERSHIP VALUE OF PRODUCTIVITY

No	B1	B2	B3	B4	Total	*μlow*	*μmedium*	*μhigh*
Res6	3	3	3	3	12	0	0	1

c) The determination of fuzzy sets for membership values is based on the total values of the variables from Table IV and those that meet the criteria for each category in the social interaction variable. The membership value of the respondent variable with *μlow*.

$$\mu_{(\text{social interaction})}\text{low}=\begin{cases}1; & x \le 3\\ \frac{6-x}{6-3}; & 3 \le x \le 6\\ 0; & x \ge 6\end{cases}$$

Res6 = $\mu_{(10)}$low = 0

The membership value of the respondent variable with *μmedium*.

$$\mu_{(\text{social interaction})}\text{medium} = \begin{cases}0; & x \le 3 \text{ or } x \ge 9\\ \frac{x-3}{6-3}; & 3 \le x \le 6\\ \frac{9-x}{9-6}; & 6 \le x \le 9\end{cases}$$

Res6 = $\mu_{(10)}$medium = 0

The membership value of the respondent variable with *μhigh*.

$$\mu_{(\text{social interaction})}\text{high} = \begin{cases}0; & x \le 6\\ \frac{x-6}{9-6}; & x \le 9\\ 1; & 9 \le x \le 12\end{cases}$$

Res6 = $\mu_{(10)}$high = 1

The membership values for the duration variable can be seen in Table IV.

TABLE IV
MEMBERSHIP VALUE OF SOCIAL INTERACTION

No	C1	C2	C3	C4	Total	*μlow*	*μmedium*	*μhigh*
Res6	3	2	3	2	10	0	0	1

2) Function implication: The implication function in the Mamdani fuzzy method is the MIN function and the AND operator, which means taking the smallest membership value from the input variables as the output result. Based on the determined sets of variables earlier, the rules obtained are as follows:

α – predicate1:
$= \mu HighDuration \cap \mu HighProdictivity \cap HighSocialInteraction \text{ then } Addicted$
$= min\,(\mu HighDuration(1), \mu HighProdictivity\,(1), HighSocialInteraction(1))$
$= min\,(1,1,1) = 1$

3) Defuzzification: The defuzzification process, where the centroid method is used for the output "Addicted". For the "Addicted" output centroid defuzzification using Equation (13).

$$z = \frac{\int \mu(z)\cdot z\, dz}{\int \mu(z)\, dz} \quad (13)$$

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For "Addicted" with α=1:
Interval z = [9,27]

$$\mu Addiction(z) = \begin{cases} \frac{z-9}{18-9}; & 9 \le z \le 18 \\ \frac{27-z}{27-18}; & 18 \le z \le 27 \end{cases}$$

To calculate the centroid:

$$z = \frac{\int_9^{18} \frac{z-9}{9}\, z\, dz + \int_{18}^{27} \frac{27-z}{9}\, z\, dz}{\int_9^{18} \frac{z-9}{9}\, dz + \int_{18}^{27} \frac{27-z}{9}\, dz}$$

$$z = \frac{67.5+94.5}{4.5+4.5} = \frac{162}{9} = 18$$

Therefore, the resulting output value indicating the addiction level to TikTok for the sampled student is 18. This output value falls within the "Addicted" range, indicating that the student is identified in the "Addicted" category towards TikTok.

4) Implementation of System Model: This model utilizes the MATLAB (Matrix Laboratory) application, specifically designed using the Fuzzy Logic Toolbox. Figure 7 is the initial design in modeling Mamdani fuzzy logic. There are three input variables (duration, productivity, and social Interaction) and one output variable (Addiction).

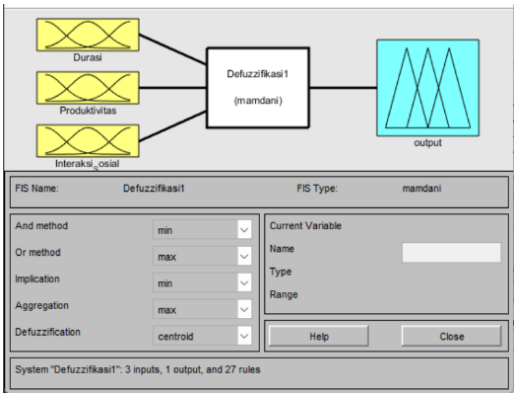

Figure 7 Fuzzy Logic Designer

Figure 8 is a fuzzy set formed consisting of variables that will be used to measure addiction levels. For specific details, please refer to Figure 3.

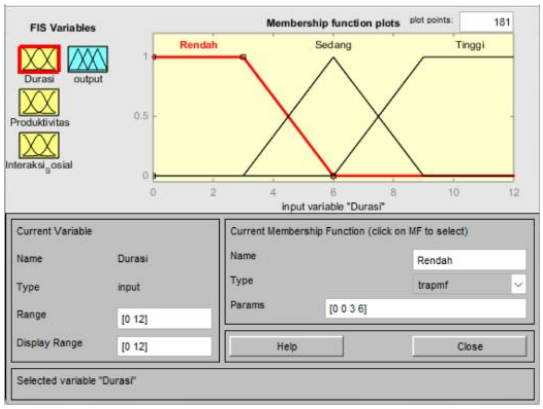

Figure 8 Membership Function

In Figure 9, all rules are inputted for processing to the next stage. This page represents the output of the level of addiction among students, which has been determined in such a way using the fuzzy sets and rules previously established.

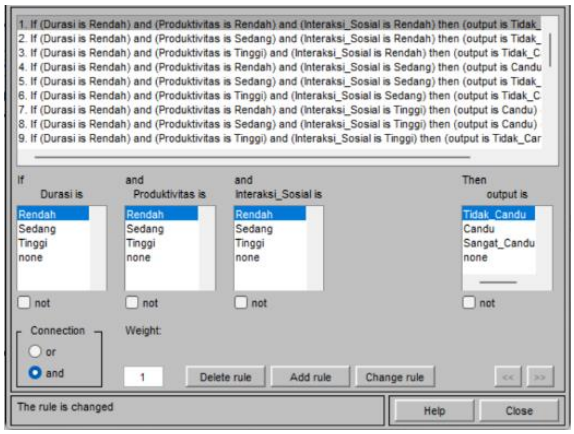

Figure 9 Rule Editor

Figure 10 represents the MATLAB modeling that illustrates the results of implementing fuzzy set determination to obtain the output values.

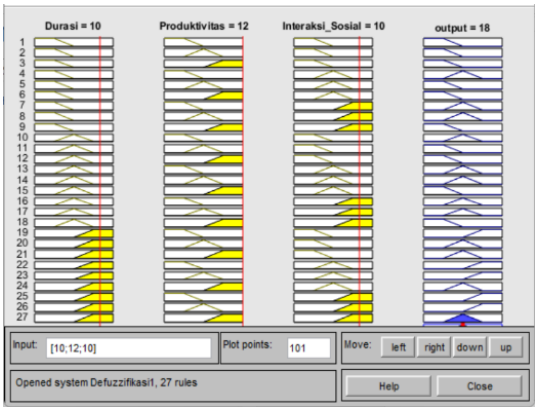

Figure 10 Results of Model Implementation

Based on the implementation of this study. The results show the level of TikTok addiction among 75 students. Out of all respondents, it was found that 17.33% of students were identified as "Not Addicted", 72% as "Addicted", and the remaining 10.67% as "Highly Addicted". These results indicate that the majority of students have shown signs of addiction to TikTok. It is hoped that in the future, they will be more mindful of using social media to avoid negative consequences, including addiction itself.

A previous study [4] demonstrated that Mamdani fuzzy logic is capable of accurately identifying the level of addiction to online games. This study also used input variables such as duration of use and impact on productivity, similar to our research. However, our study is more specific to using the TikTok application, which has characteristics different from those of online games. For example, the short and repetitive duration of TikTok content can affect addiction patterns

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differently than online games, which typically require longer playing times.

In research [5], it was found that Mamdani fuzzy logic is effective in determining the level of gadget addiction in children. This study focused more on the general impact of gadgets without specifying particular platforms like TikTok. Our study shows that although there are similarities in the approach using Mamdani fuzzy logic, the variability in applications (TikTok vs. general gadgets) and populations (students vs. children) provides different dynamics in addiction results. This research adds a dimension to understanding more specific social media addiction.

V. CONCLUSION

Based on the developed addiction level identification system, here are the advantages and disadvantages of the Effectiveness in Handling Uncertain Data model. Fuzzy logic Mamdani is effective in dealing with uncertain or ambiguous data. Respondents provide answers using linguistic variables and fuzzy logic in the context of modeling TikTok addiction levels among students. Mamdani can process this information effectively. If-Then Rule Approach Similar to Human Thinking. This approach makes designing and modifying models easier, according to expert knowledge. The "If-Then" rule structure mimics human decision-making, enhancing the model's adaptability—comprehensive Modeling of Input Variables. Various input variables such as duration, productivity, and social Interaction can be integrated using fuzzy logic Mamdani. This allows for a more comprehensive and accurate modeling approach, considering all factors simultaneously.

The challenge in defining membership functions. One of the challenges in fuzzy logic is determining the appropriate membership functions for each variable. Errors in defining these functions can reduce the model's accuracy. Complexity in rule design. Although the "If-Then" rule approach is intuitive, designing many rules can be complex and time-consuming. Crafting rules requires expert knowledge in the field to ensure optimal results. These points outline the strengths and weaknesses of using the Mamdani fuzzy logic method for modeling TikTok addiction levels among students. The designed system can be used to calculate the level of TikTok addiction among students using predefined variables and sets through MATLAB as the modeling tool.

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