UNIVERSITI TEKNOLOGI MARA

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM 2024

PROCEEDINGS OF JOHOR INTERNATIONAL INNOVATION INVENTION COMPETITION AND SYMPOSIUM 2024 (JIIICaS 2024)

"Flourish and Nurturing Sustainable Innovation for a Prosperous Nation"

JOHOR INTERNATIONAL INNOVATION, INVENTION COMPETITION AND SYMPOSIUM

Editorial Board

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Preface

In the name of Allah, the Almighty who gives us the enlightenment, the truth, the knowledge and with regards to Prophet Muhammad (peace be upon him) for guiding us to the straight path. We thank to Allah for giving us guidance and strength to write this e-book.

This e-book compiles the extended abstracts that submitted to Johor International Innovation Invention Competition and Symposium 2024 (JIIICaS2024), where JIIICaS2024 is a virtual platform for all creative minds to share and present their invention and innovation. Each abstract gives a brief background on the innovation or project.

We hope that this e-book will help the readers to get to know the innovation done by the students and get some ideas to develop future innovation products.

Foreword Rector

Assalamualaikum warahmatullahi Wabarakatuh, Salam Sejahtera, Salam Malaysia MADANI and Salam UiTM Dihatiku.

In the name of Allah, the Most Gracious, the Most Merciful.

It is a great honor to welcome you to the Johor International Innovation, Invention, Competition, and Symposium 2024 (JIIICaS 2024). This event connects various disciplines, focusing on education and engaging educators, students, researchers, and innovators from all walks of life.

Innovation is not just about ideas; it demands perseverance, creativity, and determination to turn those ideas into reality. The remarkable projects showcased today highlight the dedication and spirit of all participants. Initiatives like this not only explore new technologies but also cultivate skills and leadership among our youth. At Universiti Teknologi MARA (UiTM) Johor Branch, we are fully committed to fostering a dynamic culture of innovation, promoting the commercialization of new products, and encouraging meaningful collaborations with industry and society.

As we celebrate this event, I would like to extend my heartfelt gratitude to all sponsors, judges, the College of Computing, Informatics and Mathematics, UiTM Pasir Gudang Campus as the event organizer, as well as to the researchers and participants for their hard work in making this event a success. Let us continue striving for innovation and excellence. May the ideas presented today inspire us and lay the groundwork for future achievements.

Thank you.

Associate Professor Dr. Saunah Zainon
Rector
Universiti Teknologi MARA (UiTM)
Johor Branch

(A-ST038) FACTORS IMPACTING THE MENTAL HEALTH OF MATHEMATICS STUDENTS IN UITM, SHAH ALAM BASED ON AREA DOMINANCE METHOD

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ABSTRACT

Individuals are unable to efficiently handle their daily responsibilities and achieve their maximum capabilities unless they possess mental health. Recent research indicates a growing prevalence of mental health issues among Malaysian university students, significantly impacting their academic performance. This study centres on the mental health of mathematics students at UiTM Shah Alam, aiming to ascertain and prioritize the factors that influence their mental health states by employing fuzzy set theory and the Area Dominance Method. A thorough questionnaire was administered to ten mathematics students to evaluate different factors related to academic pressure, financial circumstances, lifestyle, social environment, and family dynamics. A comprehensive analysis of existing literature was performed to identify the key factors. The gathered data was examined using the area dominance approach to address the inherent uncertainty and complexity involved in evaluating mental health. The analysis indicated that academic pressure exerted the most significant influence on students' mental health, followed by family, financial, lifestyle, and social environment. These findings underscore the importance of focused interventions to mitigate these sources of stress and create a favourable learning atmosphere. This study makes a significant contribution to the wider discussion on student well-being by promoting a comprehensive approach to dealing with mental health problems in academic environments. The study uses advanced fuzzy analysis to provide practical insights for developing efficient support strategies and a deeper understanding of the factors that impact student mental health.

Keywords: mental health, university students, fuzzy set theory, area dominance method

1.0 INTRODUCTION

Mental health is crucial for overall well-being and quality of life, significantly impacting individuals' potential, stress management, and contributions to society. In Malaysia, mental health challenges are rising, particularly among university students, leading to academic underachievement (Isa et al., 2022). This study focuses on mathematics students at UiTM, Shah Alam, to identify factors affecting their mental health, including family, financial, lifestyle, social environment, and academic pressure. By employing fuzzy set theory and the Area Dominance Method, the research aims to prioritize these factors and develop targeted interventions to foster a supportive educational environment.

2.0 OBJECTIVE

i. To identify factors that contribute to the Mental health of mathematics students at UiTM, Shah Alam.

ii. To collect data on factors that contribute to the Mental health of mathematics students at UiTM, Shah Alam.

iii. To analyze by ranking the collected data on Mental health concerns among mathematics students based on area dominance method.

3.0 METHODOLOGY

Area Dominance Method Analysis

The main methodology for prioritizing fuzzy numbers is predominantly based on the concept of area dominance. This concept considers the direction of dominance, which occurs when one fuzzy number dominates another. The directions of dominance can be classified into two distinct categories. Tseng and Klein are the individuals who introduced the area dominance method, and (Mohd Hanif et al., 2013) extended this method to be applied in implementation.

Category 1: Non-Overlapping Fuzzy Number

The first category is for non-overlapping case between fuzzy numbers $\tilde{A}$ and $\tilde{B}$. $\tilde{A}$ is said to dominate $\tilde{B}$ if $\tilde{A}$ is on the right-hand side of $\tilde{B}$ and vice versa. $\tilde{A}$ domination of $\tilde{B}$ can be illustrated in the following Figure 1.

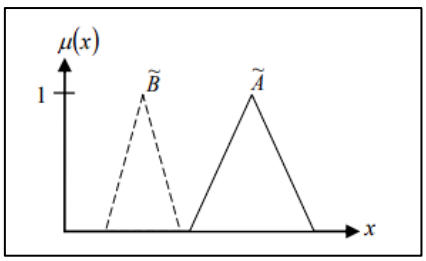

Figure 1. Non-Overlapping Fuzzy Numbers

Category 2: Overlapping Fuzzy Number

The second category is for overlapping case between fuzzy numbers $\tilde{A}$ and $\tilde{B}$. The overlapping area of $\tilde{A}$ and $\tilde{B}$ is defined as the indifferent or intersection area between $\tilde{A}$ and $\tilde{B}$. Suppose that there exists an overlapping area between $\tilde{A}$ and $\tilde{B}$. Thus, $\mu_{\tilde{A}\cap\tilde{B}} \neq 0$ where $x \in X$. The direction of domination for overlapping case between two fuzzy numbers is defined as followed:

(a) $\tilde{A}$ dominates $\tilde{B}$ if;

i. the non-overlapping area belongs to $\tilde{A}$ and is on the right-hand side of the overlapping area, or

ii. the non-overlapping area belongs to $\tilde{B}$ and is on the left-hand side of the overlapping area, or
iii. the non-overlapping area belongs to $\tilde{A}$ and is at the upper dominance of the overlapping area.

(b) $\tilde{B}$ dominates $\tilde{A}$ if;

i. the non-overlapping area belongs to $\tilde{A}$ and is on the left-hand side of the overlapping area, or
ii. the non-overlapping area belongs to $\tilde{B}$ and is on the right-hand side of the overlapping area, or
iii. the non-overlapping area belongs to $\tilde{B}$ and is at the upper dominance of the overlapping area.

Figure 2 (a) to (c) shows the illustration of some cases in Category 2.

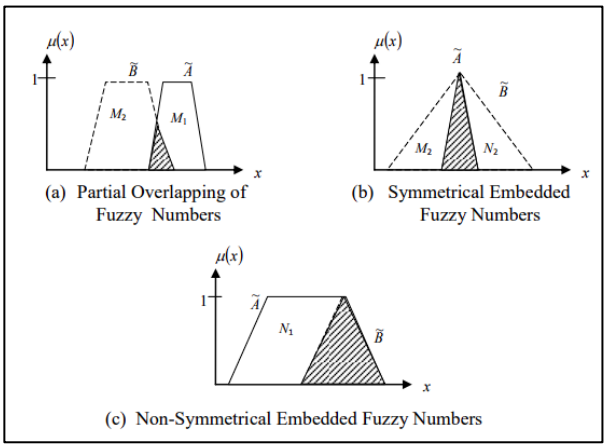

Figure 2. Some Possible Situations of Overlapping Fuzzy Numbers

The Proposed Algorithm for Ranking Fuzzy Numbers. (Mohd Hanif et al., 2013)

The proposed algorithm for ranking fuzzy number is by incorporating the upper dominance concept and inclusion of the spread factor are presented as followed.

Step 1. Find the area where $\tilde{A}$ and $\tilde{B}$ are indifferent (shaded region).

$$\text{Indifferent Area} = \text{Area of Shaded Region}$$
$$= \frac{1}{2} \times Base \times Height$$

Step 2. Find the area where $\tilde{A}$ dominates $\tilde{B}$ based on category 1 or 2.
Step 3. Find the area where $\tilde{B}$ dominates $\tilde{A}$ based on category 1 or 2.
Step 4. Find the area of $\tilde{A}$ and the area of $\tilde{B}$.

$$Area\ \tilde{A}\ and\ \tilde{B} = \frac{1}{2} \times Base \times Height$$

Step 5. Compute $R^*(\tilde{A},\tilde{B}) and\ R^*(\tilde{B},\tilde{A})$

The formulation for calculating the degree of dominancy between $\tilde{A}$ and $\tilde{B}$ is defined as followed.

$$R(\tilde{A},\tilde{B}) = \frac{(areas\ where\ \tilde{A}\ dominates\ \tilde{B}) + (area\ where\ \tilde{A}\ and\ \tilde{B}\ are\ indifferent)}{(area\ of\ \tilde{A}) + (area\ of\ \tilde{B})}$$

$$R(\tilde{B},\tilde{A}) = \frac{(areas\ where\ \tilde{B}\ dominates\ \tilde{A}) + (area\ where\ \tilde{A}\ and\ \tilde{B}\ are\ indifferent)}{(area\ of\ \tilde{A}) + (area\ of\ \tilde{B})}$$

$$R(\tilde{A},\tilde{B}) + R(\tilde{B},\tilde{A}) = 1,$$

where $R(\tilde{A},\tilde{B})$ is interpreted as the degree to which $\tilde{A}$ is preferred to, or indifferent to $\tilde{B}$, and $R(\tilde{B},\tilde{A})$ is defined as the degree to which $\tilde{B}$ is preferred to, or indifferent to $\tilde{A}$.

Fuzzy numbers $\tilde{A}$ and $\tilde{B}$ are ranked based on the following conditions:

If $R(\tilde{A},\tilde{B}) > 0.5$, then $\tilde{A} > \tilde{B}$.

If $R(\tilde{A},\tilde{B}) = 0.5$, then $\tilde{A} = \tilde{B}$.

If $R(\tilde{A},\tilde{B}) < 0.5$, then $\tilde{B} > \tilde{A}$.

4.0 RESULTS

The comparison of dominant criteria from implementation results and calculations from implementation section is presented in Table 1.

Table 1. Comparison of dominant criteria

No	Pairing Criteria	More influencing Criteria	Criteria dominates
1	Family and Financial	Family >Financial	Family
2	Family and Lifestyle	Family > Lifestyle	Family
3	Family and Social environment	Family > Social environment	Family
4	Family and Academic pressure	Family < Academic pressure	Academic pressure
5	Financial and Lifestyle	Financial > Lifestyle	Financial
6	Financial and Social environment	Financial > Social environment	Financial
7	Financial and Academic pressure	Financial < Academic pressure	Academic pressure
8	Lifestyle and Social environment	Lifestyle > Social environment	Lifestyle
9	Lifestyle and Academic pressure	Lifestyle < Academic pressure	Academic pressure

10	Social environment and Academic pressure	Social environment < Academic pressure	Academic pressure

After receiving the results, UiTM Shah Alam mathematics students' mental health was thoroughly examined. Academic pressure is the biggest factor, followed by family, financial, lifestyle, and social environment. China's largest college student population faces rising academic pressure, which affects their health (Zhang & Zheng, 2017). Personal and group academic stress were linked to negative emotions (Zhang & Zheng, 2017). This study found that men's and women's mental health are not affected by their close friend count inside and outside social housing (Liu et al., 2018). According to this supported literature review, academic pressure is the biggest issue facing high school and college students, and some people's mental health is unaffected by their environment.

Table 2 shows the results for this study:

Table 2. Results for ranking factors that influence Mental health

Ranking	Criteria
1	Academic pressure
2	Family
3	Financial
4	Lifestyle
5	Social environment

5.0 CONCLUSION

This project assessed and prioritized factors that affect the mental health of mathematics students at UiTM Shah Alam, focusing on family, financial, lifestyle, social, and academic pressures. Using the area dominance approach, the study analysed data from ten students, finding that academic pressure, family dynamics, financial stress, lifestyle choices, and social environment significantly impact mental health. Academic stress and family dynamics were the most influential. The study highlights the need for a holistic approach to supporting students, considering academic, familial, economic, lifestyle, and social factors. The findings will guide the development of targeted interventions to improve student well-being.

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