



XIAMEN UNIVERSITY MALAYSIA
廈門大學 馬來西亞分校

News & Achievements



International Innovation ARSVOT Malaysia 2024

IAM2024 (27th – 28th July 2024)

Description: International Innovation ARSVOT Malaysia 2024 is an exhibition that highlights innovation in teaching and learning, innovative products, and a medium to share expertise in humanities. IAM2024 consists of two main events which are innovation competition and conference. We aspire the students, teachers, lecturers, researchers, and inventors to participate in this event to exchange new ideas and knowledge.

PROJECT 1: POSTER, ID: IAM239 (Nadira Hamidah Penton - DMT2009781): A GAMIFIED MULTI-MARKER AR APPLICATION TO ENHANCE ENGAGEMENTIN LEARNING SORTING ALGORITHMS



Student Testimonial (Nadira):

"Winning the Gold Award at IAM2024 is a humbling and exhilarating experience. It's incredibly rewarding to have my work on the gamified multi-marker AR application recognized at an international level. This project has been about more than just developing a technical solution—it's about enhancing the way we learn and making complex concepts, like sorting algorithms, more accessible and engaging. The IAM2024 competition provided a platform to share innovative ideas in education, and I'm proud that my work could contribute to this mission. I'm deeply grateful for the opportunity to collaborate with so many brilliant minds and to be part of an event that fosters creativity and innovation in teaching and learning."

PROJECT 2: AWARD CERTIFICATE for ID: IAM236 (Lim H'ng Ping - DMT2104048): N.INT: AN INTEREST-BASED SOCIAL MEDIA PLATFORM FOR REDUCING SOCIAL ANXIETY AND ENCOURAGE POSITIVE INTERACTIONS.



Poster:

N.INT: AN INTEREST-BASED SOCIAL MEDIA PLATFORM FOR REDUCING SOCIAL ANXIETY AND ENCOURAGE POSITIVE INTERACTIONS

INTRODUCTION

Social anxiety disorder (SAD) affects a significant portion of the population, leading to considerable challenges in social interactions and engagement, both offline and online. With the rise of social media as a primary mode of communication, it becomes crucial to design platforms that cater to the unique needs of socially anxious individuals. This project focuses on developing and evaluating an **interest-based social media platform** aimed at **reducing social anxiety** and **enhancing user interactions** by incorporating features specifically designed to support socially anxious users.

PROBLEM STATEMENT

Current social media platforms often **fail to address the specific needs** of socially anxious individuals, leading to **heightened anxiety and avoidance behaviors**. These platforms typically **lack features** that can **alleviate social anxiety**, such as supportive content sharing mechanisms, robust privacy controls, and environments that foster positive interactions. Consequently, socially anxious users may find it challenging to engage meaningfully, leading to a **reduced quality of social interactions** and overall dissatisfaction with social media experiences.

COMMERCIALISATION

The commercial potential of the interest-based social media platform lies in its unique focus on reducing social anxiety, a growing concern among social media users. By addressing niche market with tailored features that promote mental well-being and positive social interactions, the platform can attract a significant user base. Commercialization strategies include:

1. **Targeted Marketing Campaigns:**
 - o Emphasize the platform's unique benefits for socially anxious individuals.
 - o Collaborate with mental health organizations to reach potential users.
2. **Product Promotion:**
 - o Utilize the platform's ability to identify specific interest groups, making it easier for businesses to target their audience.
 - o Businesses can search for and join interest groups, promoting products to their target audience more effectively.
3. **Premium Features:**
 - o Offer enhanced features that improve user experience and interaction.
 - o Subscription models or one-time purchases for advanced functionalities.

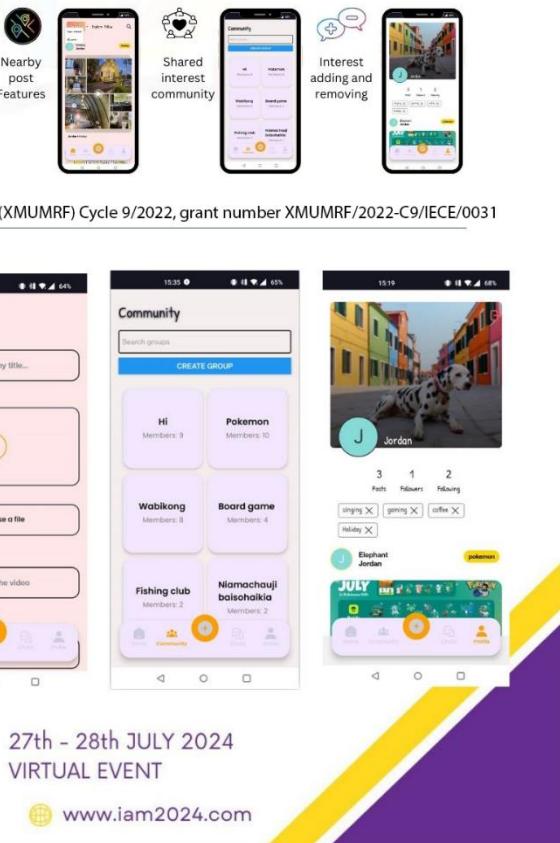
The platform's appeal to **both socially anxious and general users** broadens its market reach, increasing its commercial viability.

OBJECTIVE

- To **Identify** and Evaluate Features:
Determine key features and functionalities that support both socially anxious and non-socially anxious users through literature review and user feedback.
- To **Develop** the Platform:
Create an interest-based social media platform incorporating identified features using user-centered design and iterative development processes.
- To **Evaluate** Impact:
Assess the impact of the platform's usability, functionality, and its impact on user satisfaction, social interaction, and anxiety levels through pre- and post-usage surveys.

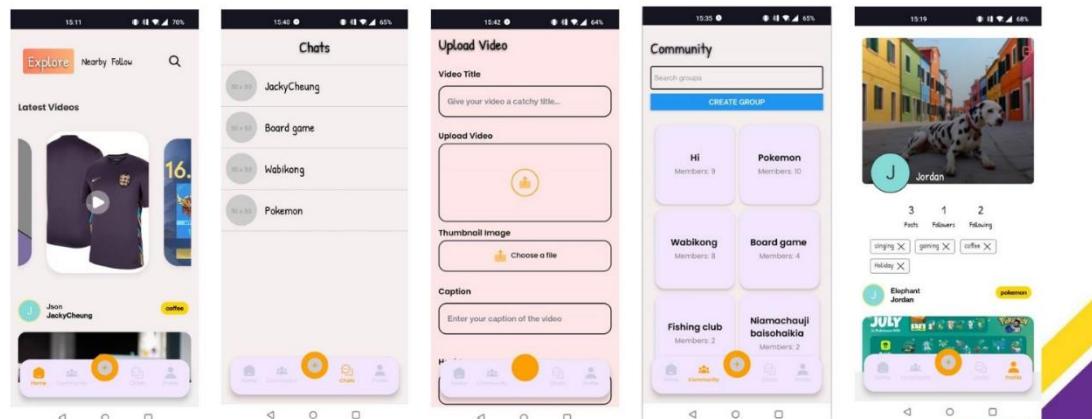
NOVELTY OF THE PRODUCT/PROTOTYPE

The novelty of this social media platform lies in its targeted approach to addressing social anxiety through **interest-based interactions**. Unlike existing platforms, this prototype integrates features specifically designed to reduce anxiety and enhance social support, such as **filters post based on user's interest and location**, **community with shared interest**, and **interest adding and removing**. By combining psychological insights with innovative technology, the platform offers a unique solution that not only meets the general needs of social media users but also provides substantial benefits for those struggling with social anxiety, setting it apart from traditional social media solutions.



This research was funded by Xiamen University Malaysia Research Fund (XMUMRF) Cycle 9/2022, grant number XMUMRF/2022-C9/IECE/0031

PRODUCT DESIGN



INTERNATIONAL INNOVATION ARSVOT
MALAYSIA 2024 (IAM2024)

+6011 - 2055 0840

admin@arsvot.org

27th - 28th JULY 2024
VIRTUAL EVENT

www.iam2024.com

Project Description: This project developed and evaluated an interest-based social media platform aimed at managing social anxiety and improving user interactions. Key features were identified and incorporated using an Iterative and Incremental Model, with continuous user feedback. Grounded in Self-Determination Theory (SDT), the platform enhanced user motivation and engagement. A pre- and post-usage survey measured anxiety levels and user satisfaction. Results showed reduced social

anxiety, improved interactions, and high satisfaction. The study emphasizes the importance of personalized, supportive features in social media to combat anxiety and enhance user experience, with recommendations for future innovation and inclusivity.

Student Testimonial: Receiving the Silver Award at IAM2024 is a moment of great pride and accomplishment. My project focused on developing an interest-based social media platform to help manage social anxiety and foster positive interactions. It was both challenging and exciting to design a platform that incorporates personalized features to support users in overcoming social anxiety. This recognition motivates me to continue refining the platform and explore new ways to make social media a more inclusive and supportive space. I'm incredibly thankful for the guidance from my supervisor: Dr. Ahmad Affandi Supli and the feedback from users that helped shape this project.

6th National Symposium on Human-Computer Interaction (FUSION2024)

FUSION 2024 aims to explore this vital intersection, bringing together professionals, researchers, educators, and students to delve into the ethical dimensions of HCI, UI/UX design, and sustainability. Attendees can look forward to a dynamic program featuring keynote speeches, paper and poster presentations, and student design challenge (SDC).

Group 1

Student Name: Nadira Hamidah Penton (DMT2009781)

Project Title: Development of a Gamified Multi-Marker Augmented Reality Application to Enhance Engagement in Learning Sorting Algorithms

Submission ID: SDC2024-14

Advisor: Dr. Ahmad Affandi Supli

Abstract:

Sorting algorithms are often difficult to comprehend. Visualization helps in understanding complex concepts, but its success relies on student engagement. Although existing studies have proposed various visualization tools, little attention has been given to the engagement aspect. This study aims to investigate how student engagement can be enhanced with visualization tools. The multi-marker AR method was identified as an innovative approach for increasing learning interactivity and participation. Combining gamification with visualization promotes effective and engaging learning. Thus, a gamified multi-marker AR application was developed using the Serious Game Development Model. Data were collected from 30 participants using the VisEngage questionnaire to assess participant engagement. Results indicate the application effectively engaged participants and positively impacted their understanding of sorting algorithms. This study offers a sustainable and innovative approach by

providing an adaptable solution for learning complex concepts, which can be implemented across various fields such as engineering, math, and AI.

Student Testimonial:

"I am incredibly honored to have received both the *BEST of THE BEST* and *SPECIAL AWARD* at the FUSION 2024 Student Design Challenge. Developing the gamified multi-marker AR application has been a rewarding journey, as it gave me the opportunity to explore how technology can make learning more interactive and engaging. Sorting algorithms are fundamental yet often challenging to grasp, and I aimed to make that process more intuitive and enjoyable through this project. The recognition of my work not only validates the effort I put into enhancing learning experiences but also motivates me to continue pushing the boundaries of educational technology. I am grateful for the support of my supervisor: Dr. Ahmad Affandi Supli and peers throughout this process and look forward to further innovations that can bridge the gap between complex concepts and engaging learning."



POSTER for presentation

DEVELOPMENT OF A GAMIFIED MULTI-MARKER AR APPLICATION TO ENHANCE ENGAGEMENT IN LEARNING SORTING ALGORITHMS

Dr. Ahmad Affandi Supli
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• Nadira Hamidah Fenton

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INTRODUCTION

Sorting algorithms are a fundamental concept in data structures and algorithms, which typically introduced at the beginning of undergraduate computing degrees. **Understanding these algorithms** is important as they form the foundation for solving more complex problems, provide a basis for understanding algorithm design and analysis, encourage critical thinking, and support efficient algorithm implementation.

Despite their importance, sorting algorithms are often viewed as a challenging subject due to their abstract nature and the involvement of programming elements, which can be difficult for some students to visualize, understand, and differentiate. Meanwhile, traditional teaching methods using textbooks and classroom materials can be time-consuming and less effective in conveying these concepts.

Visualization is a common strategy to solve problems in understanding complex and abstract concepts. However, relying solely on visualization may not be sufficient. The effectiveness of visualization depends on **student engagement** through active participation, making student engagement essential for successful learning with visualization technology. Currently, most existing studies that present visualization tool for learning sorting algorithm focus more on the effectiveness, meanwhile **little attention** has been given on the engagement aspect of these tools.

Gamification is a popular approach for enhancing student engagement in learning. Combining gamification with visualization technology can lead to better engagement and more effective learning outcomes. Moreover, advancements in technology have enabled the utilization of **Augmented Reality (AR)** to create interactive visualizations that can enhance students' spatial abilities and understanding of abstract concepts. Nevertheless, the use of AR, specifically the **multi-marker method**, has not yet been explored as a visualization tool for learning sorting algorithms.

Therefore, the goal of this study is to create a **gamified multi-marker AR application** to enhance engagement in learning sorting algorithms. This innovative approach aims to make the learning process more interactive, engaging, and fun.

Developed Using a Conceptual Framework Derived from Identified Elements in Literature Review

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graph TD
    CTM[Cognitive Theory of Multimedia Learning Strategies] --> GE[Gamification elements]
    GE --> ET[Engagement Taxonomy]
    EV[Engagement Visualisation Analytics] --> GE
    EV --> ET
    ET --> AE[Augmented Engagement]
    GE --> AE
    EV --> AE
    ET --> AE
    
```

- Gamification elements
- Attributes for creating engaging visualization
- Engagement taxonomy
- Cognitive Theory of Multimedia Learning Strategies

PROBLEM STATEMENT

- Traditional teaching methods can be **time-consuming and less effective** in providing a conceptual understanding of sorting algorithms.
- Most existing visualization tools for learning sorting algorithms focused primarily on their effectiveness. However, **little attention** has been given to the **engagement** aspect of these tools.
- At the moment, the utilization of AR, specifically the use of the **multi-marker method**, has not yet been explored. Meanwhile, this approach has the potential to improve student engagement in learning by increasing interactivity and promoting active participation through hands-on learning experiences.

NOVELTY

- **Integration of multi-marker AR method with gamification:** provides a unique approach for learning sorting algorithms using combination between gamification and multi-marker AR method.
- **Engagement-centric design:** developed based on conceptual framework to enhance engagement in learning.
- **Interactive hands-on learning experience:** designed to enhance student engagement through interactive learning experience.

OBJECTIVES

1. To identify elements that contribute to student engagement in learning sorting algorithms.
2. To develop a gamified multi-marker AR application based on the engagement elements.

PROTOTYPE: ARCARDIA

BENEFITS TO SOCIETY

- Enhance student engagement in learning sorting algorithm
- Encourage active participation in learning
- Improve student understanding of complex concept

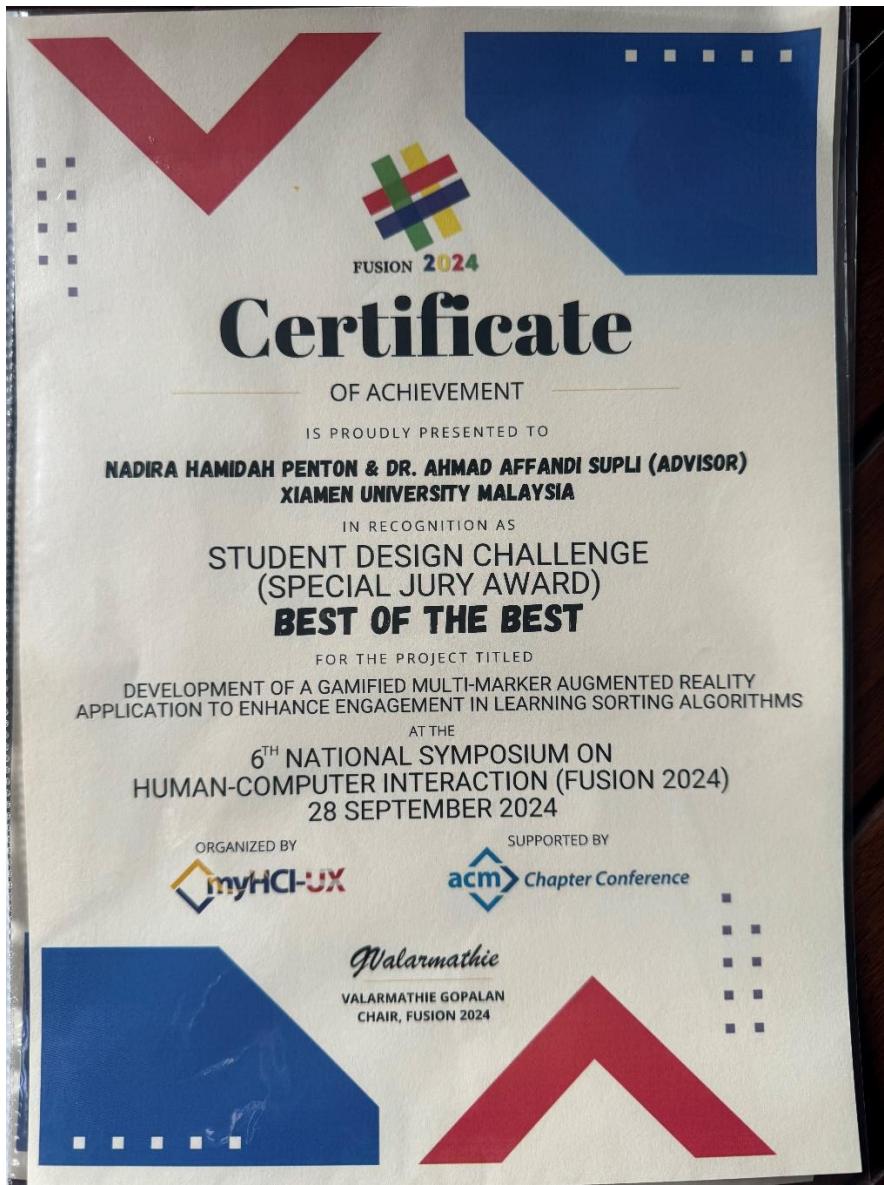
COMMERCIALIZATION POTENTIAL

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The student WON two awards (**BEST OF THE BEST** and **SPECIAL AWARD**) from this competition:





Group 2

Student Name: Kho Renjiro (DMT2209252), Lim Jia Zheng (DMT2209668)

Advisor Name: Dr. Ili Farhana Md Mahtar

Project Name: EcoMunch: A Gamified Solution to Food Waste and Sustainability

Abstract:

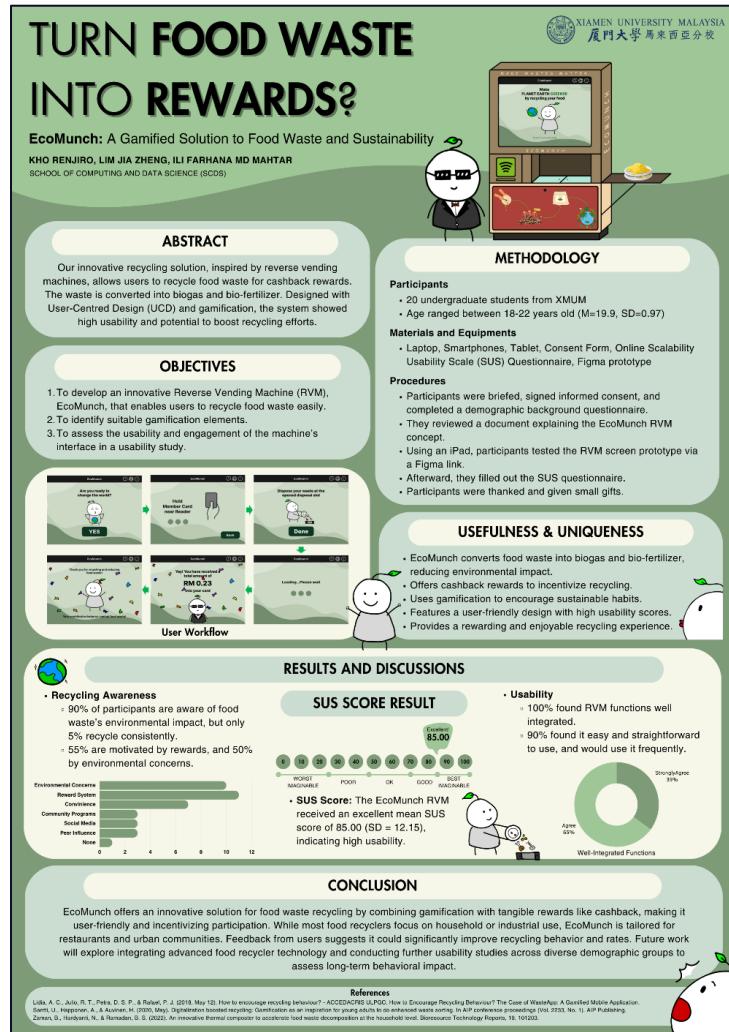
Food waste is a global issue that significantly impacts the environment, economy, and society, with millions of tons discarded annually. To tackle this issue, a food recycling solution inspired by reverse vending machines (RVM) was designed. The machine integrates gamification in its interface to increase recycling rates through cashback rewards. It facilitates easy food recycling, allowing customers to dispose of and transform them into compost. The concept and user interface of this machine were evaluated in a usability study involving university students. They were asked to complete a questionnaire regarding their recycling habits, complete user tasks and then provide ratings for its

usability. Most of the participants were aware of the food recycling impact despite of not participating in recycling. The result of the usability study shows high usability scores. It is anticipated that this machine will motivate customers to participate in recycling activities while providing a positive user experience.

Student Testimony:

"Taking part in the Fusion 2024 SDC competition was tough, but it was definitely a worthwhile experience. Even though we had difficulty with time management and poster design, the guidance from our advisor, Dr. Ili Farhana Md Mahtar, helped us overcome those challenges. We received Special Award for the 'Undergraduate: Ideas/Concept – Low Fidelity Prototype' category. While this competition improved our research and presentation skills, it also brought an enormous sense of satisfaction and personal growth."

Poster:





Extended Abstract Paper Submission:

EcoMunch: A Gamified Solution to Food Waste and Sustainability

Kho Rejiro¹, Lim Iu Zheng¹, Ili Farhana Md Mahtar¹
¹Xiamen University Malaysia, Malaysia

ABSTRACT

Food waste is a global issue that significantly impacts the environment, economy, and society, with millions of tons discarded annually. To tackle this issue, a food recycling solution inspired by reverse vending machines (RVM) was designed. The machine integrates gamification into its interface to increase recycling rates through cashback rewards. It facilitates easy food recycling, allowing customers to dispose of and transform them into compost. The concept and user interface of this machine were evaluated in a usability study involving university students. They were asked to complete a questionnaire regarding their recycling habits, complete user tasks and then provide ratings for its usability. Most of the participants were aware of the food recycling impact despite not participating in recycling. The result of the usability study shows high usability scores. It is anticipated that this machine will motivate customers to participate in recycling activities while providing a positive user experience.

Keywords: food waste recycling, reverse vending machines, user experience, gamification, usability

INTRODUCTION

Food waste is one of the most challenging issues worldwide, with severe impacts on the environment, economy, and society (Sobriani, 2020). What is even more worrying is the quantity of food that ends up in landfills that should otherwise have been consumed. Excessive food waste is responsible for a significant portion of greenhouse gas emissions, especially methane, which is highly responsible for climate change. The negative outcomes of food waste go beyond environmental impacts; they also create economic difficulties. The financial costs incurred through food waste are substantial and do not only include the lost food itself but also the resources used in production. Besides this, social issues are severe, with the glaring contradiction between the vast amount of wasted food and the ever-persistent problem of global hunger.

The food waste problem can be best tackled through inventive and functional ideas that could be easily blended into the already existing processes. One such idea is the recycling of food waste into useful end-products like biogas and bio-fertilizer which can be utilized for green energy and farming purposes, respectively (Sharma et al., 2023). Yet, the critical condition for making a sustainable change is to involve not only policy makers but also consumers and suppliers in the recycling process. Unfortunately, the low information on food waste recycling has become an obstacle to this. According to Lang et al., (2020), 62.67% of respondents have poor knowledge about the recycling of food waste. This shows that there is a need for creative ways that can motivate people to participate more.

On the household level, home-use food recycler machines like the Reencle and FoodCycler device provide a convenient way for people to participate in waste reduction. The household food recycler machine is a compact, user-friendly gadget that transforms food scraps into nutrient-rich compost through grinding, heating, and microbial decomposition. Within a day, organic waste is converted into compost suitable for gardening, making it easier for individuals to contribute to sustainable living practices. The success of this machine lies in its convenience and efficiency, which facilitates active participation in waste reduction at the household level. Zaman, Hardiyanti & Ramasan (2022) implemented a portable thermal composter in a household food recycler machine to speed up the process

of food decomposition. Based on the findings, the proposed food recycler can produce high-quality compost within a day from the food waste deposited.

According to Cojocan & Ozkirk (2020), literature reviews lack focus on understanding food waste behaviour at the restaurant level. Various reasons contribute to food wastage at the restaurant level such as overproduction by restaurants, plane waste from consumers and food spoilage. Daily, an average of 33.6 kilograms of food waste was recorded in six restaurants in Pakistan (Ammir et al., 2018).

In understanding recycling behaviour at university, Karmarker and Kundu (2024) investigated the issues of implementing RVM in university environments. According to their initial findings, students did not recycle even though recycling bins were provided at the university. They proposed an RVM by offering rewards to users when they deliver recycling materials to the machine which increased the rate of waste reduction and recycling participation. The design of their RVM features an easy-to-use interface and a compartment that automatically sorts the deposited items.

A study conducted by Lida et al. (2018) showed that recycling behaviour can be effectively changed by using game elements such as rewards, competition, and progress tracking to engage and motivate users. The inclusion of features such as leaderboards and point systems in the run-off recycling programs has proven to increase participation and motivate the youth to separate waste, thereby developing green habits properly. Furthermore, gamification, by making the process of recycling fun and competitive, not just boosts the number of recycled materials but creates behavioral change that is sustainable and makes recycling a more integral part of people's everyday life (Santi et al., 2020).

In this paper, the design of the solution to food wastage through a gamified Reverse Vending Machine (RVM) is explained. While similar technologies have been implemented in other recycling domains, such as plastic or aluminum, EcoMunch uniquely addresses food waste with an added incentive system. It integrates behavioral change techniques through rewards and competition to increase consumer participation in recycling food waste. In addition, this paper presents a study that measures the usability of the solution.

PROPOSED DESIGN

Using the UCD process, an RVM was designed known as EcoMunch. The RVM will accept food waste as an input and decompose the food waste into compost as the output. Figure 1 shows the design of the RVM. A touch screen display is placed on the RVM to allow users to interact with the RVM. Users can scan and retrieve their membership cards using the member card scanner and card output slot located below the screen. Conveniently located on the right side is a tray/plate holder where users may set their trays or plates while using the machine. After scanning their card, users can then dispose of their waste into the designated disposal slot. The material storage, where the recovered food waste is gathered, is in the lower part of the RVM. The decorative components used in this storage section complement the machine's environmental theme, highlighting the importance of sustainability and environmental friendliness.

With its user-friendly interface, the EcoMunch aims to make recycling food waste an enjoyable and simple operation. The UI, which was created as a mid-fidelity prototype in Figma. An adorable and funny mascot is featured prominently on almost every screen in the interface to increase user engagement and inject some fun into the experience. The playful element enhances the enjoyment of interacting with the RVM. To further enhance the user experience, basic animations are included to make the user interface (UI) more intuitive. Figure 2 shows the series of user interfaces when a user started to use the RVM and signed in as a registered member to recycle food waste. A concise instruction is used which asked user to scan their membership card, dispose their food waste, and the amount of money credited to them.

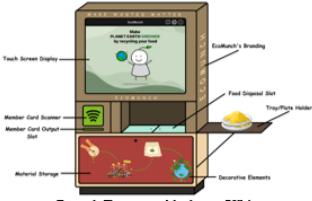


Figure 1. The proposed food waste RVM

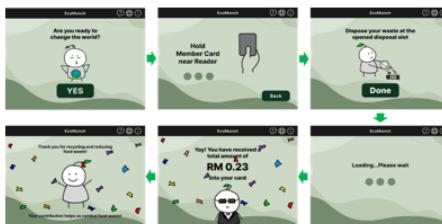


Figure 2. Series of screens when a user deposits food waste as a registered member

METHODOLOGY

Design

This study was designed as quantitative usability testing, measuring System Usability Score (SUS) scores rated by all participants. The study was held in a classroom at Xiamen University Malaysia where each participant had a face-to-face session with the researchers. The session was facilitated and observed. All participants were asked to complete three tasks, (1) sign up as a member, (2) recycle food waste as a guest, and (3) recycle food waste as a registered member. For the third task, participants were given a dummy membership card for them to scan.

Participants

A total of 20 university students from Xiamen University Malaysia took part. Their ages ranged from 18 to 22 years ($M = 19.9$, $SD = 0.97$), with 5 males, 14 females, and 1 person prefer not to say. All of

them were undergraduate students in the Digital Media Technology program taking the Human-Computer Interaction course.

Materials and Equipment

The equipment used for this study consists of a laptop and an iPad. The laptop is used for participants to read the concept of the proposed EcoMunch and visual appearance of the RVM and filled out questionnaires. The iPad is used for participants to complete all three tasks on the Figma prototype website. An informed consent form was used to ensure participants were aware of the purpose of the study and voluntarily participated in this study.

A document explaining the concept of the proposed EcoMunch RVM was prepared which also includes a visual appearance and description of the RVM. Two online questionnaires were prepared in Google Forms: (1) Demographic Recycle Survey and (2) SUS questionnaire. The SUS questionnaire has nine questions, nine questions are asked to understand food recycling habit, awareness and motivation. In the SUS questionnaires, 10 questions were adopted to understand the perceived usability of participants towards the RVM's screen display user interfaces. At the end of the SUS questionnaires, an additional open-ended question was asked to get participants' feedback or suggestions for improvement.

Procedure

Participants for this study were briefed about the purpose of this study. They were then asked to sign an informed consent form indicating their voluntary participation. Next, they filled out the demographic and habit questionnaires. Researchers gave them a document explaining the concept of the proposed EcoMunch RVM. After they understood the concept of the RVM, they used the prototype of the RVM's screen display from the given hyperlink on the iPad. The hyperlink will redirect them to the Figma prototyping website. After participants completed all tasks, participants filled out the SUS questionnaires. At the end of the session, participants were thanked by the researcher and given small gifts as a token of appreciation.

RESULTS AND FINDINGS

Data from both online questionnaires were gathered in a spreadsheet. Then, individual SUS scores were calculated from the ratings given. In the end, overall, SUS scores were averaged from all the individual scores.

Recycling Habit and Motivation

90% of participants (18 out of 20) are aware of the negative effects on the environment caused by food waste. However, only 5% of the participants (1 out of 12) practice recycling habits religiously. Even though most participants were not practicing recycling consistently, 50% of participants (10 out of 20) felt that recycling food waste is important.

Figure 3 shows the motivation factors chosen by participants. Based on the figure, 55% of participants (11 out of 20) were motivated due to the reward systems offered, and 50% of participants (10 out of 20) were motivated due to environmental concerns. Social media, peer and community influence were minor factors, yet they played a role in the recycling habits of a smaller portion of the participants.

Perceived Usability

Figure 4 presents the number of ratings given by the participants for each SUS question. The chart is separated into even and odd-numbered questions due to the nature of the questionnaire, in which odd-numbered questions generate a positive response and even-numbered questions generate a negative response. Results for each question are calculated according to (1) a percentage of the rating 4 to 5 for odd-numbered questions, and (2) a percentage of the rating 1 to 2 for even-numbered questions. Rating

3 is not counted because 'Neutral' indicates neither a positive nor negative response. Based on the figure:

- 100% of participants (20 out of 20) found the various functions in the RVM are well integrated (Question 5).
- 95% of participants (19 out of 20) thought that the user interfaces are consistent (Question 6), would imagine that most people would learn to use the RVM easily (Question 7) and felt very confident when using the RVM (Question 9).
- 90% of participants (18 out of 20) thought they would use the RVM frequently (Question 1), found it easy to use (Question 3), straightforward to use (Question 8) and felt they did not need to learn a lot of things before using the RVM (Question 10).
- 85% of participants (17 out of 20) thought they would not need technical support to be able to use the RVM (Question 4).
- 80% of participants (16 out of 20) disagree the RVM was unnecessarily complex (Question 2).

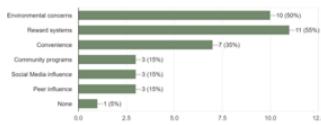


Figure 3. Factors that motivate participants to recycle food waste

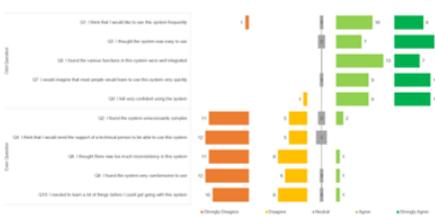


Figure 4. Number of ratings given for each SUS question

The mean SUS score for the proposed EcoMunch RVM's display is 65.00 ($SD = 12.15$), which is considered excellent. This score suggests users found the user interface highly usable by participants, suggesting that it might increase the food waste recycling rate and motivates them to keep on recycling. However, the result might differ when participants have different educational backgrounds and previous experience. All participants in this study have the same educational background and are familiar with usability. For additional questions asked for participants' feedback, one notable suggestion was to display more information on the conversion rules from food waste in kilograms to the rewards received.

CONCLUSION

The study indicates the possibility of EcoMunch, an innovative RVM that recycles food waste, which is the most pressing issue in sustainability. While awareness of the environmental impacts is high, actual recycling practices are limited, which shows a need for user-friendly and incentivized solutions like EcoMunch. While most food waste recyclers are designed for industrial and household usage, EcoMunch is designed for food waste recycling in restaurants. EcoMunch can be used in restaurants to encourage food waste recycling, food waste and has a direct connection to both environmental impacts and tangible advantages like cashback. As shown in previous studies (Samti et al., 2020; Lida et al., 2018), EcoMunch might increase the recycling rate and change recycling behavior. This is due to the positive feedback from the participants, especially for the convenience and frequent interaction.

Future work will focus on the design of the RVM machine including the feasibility of implementing existing food recycler technology integrated with thermal composter beyond household usage. In terms of the RVM's screen display, another usability study will be conducted with various demographic groups and exploring its behavioral impacts over time, particularly in varying environments.

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Certificate and Medal:



Group 3

Student Name: Hoo Zhi Ling (DMT2209141), Khor Jia Hui (DMT2209988)

Advisor Name: Dr. Ili Farhana Md Mahtar

Project Name: EcoPet: Gamified Paper Recycler for Campus

Abstract:

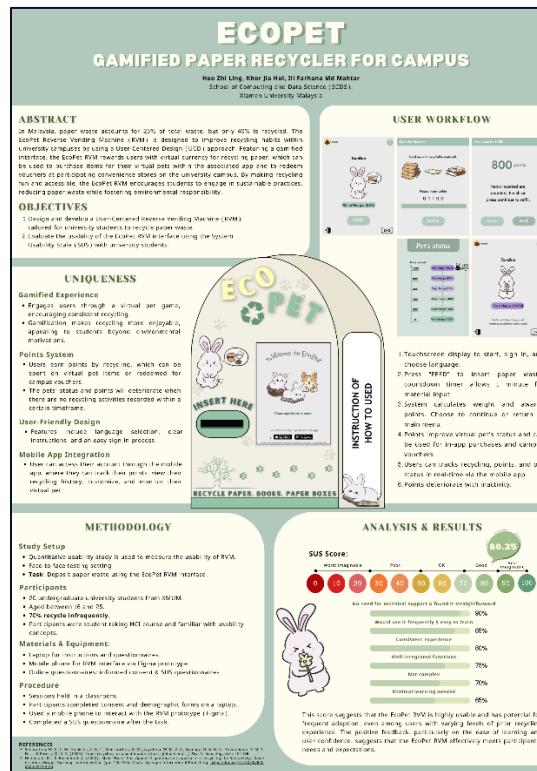
In Malaysia, paper constitutes about 25% of total waste, with a recycling rate of around 40%. To address this low recycling rate, an innovative Reverse Vending Machine (RVM) for handling paper waste is proposed to be used inside university compounds. User-Centered Design (UCD) is employed as the method to ensure the RVM is tailored to the unique needs of college students, who often accumulate paper waste from academic materials. The user interface of the RVM features a virtual pet game that rewards users with virtual currency, which can be exchanged for virtual pet accessories, creating a fun and interactive incentive for students. The concept of the RVM and the usability of its user interface are then evaluated with university students. The evaluation results showed the possibility of enhancing students' participation and fostering a culture of sustainability on campus, significantly reducing paper waste.

Student Testimony:

"Upon joining the Fusion 2024 Competition (Student Design Challenge), my participation pushed me to sharpen my skills and gave me the confidence to take on more challenging projects. The mentorship

and feedback from industry experts were invaluable in refining our project. I gained hands-on experience in teamwork, problem-solving, and project management, which has boosted my confidence. I highly recommend SDC Fusion to anyone looking to challenge themselves and expand their skills."

Poster:



Extended Abstract Paper Submission:

ECOPET: GAMIFIED PAPER RECYCLER FOR CAMPUS

Ho Zhi Ling, Khor Jia Hui, Jil Farhana Md Mahzar
Xiamen University Malaysia, Malaysia

ABSTRACT
In Malaysia, paper constitutes about 15% of total waste, with a recycling rate of around 40%. To address this low recycling rate, an innovative Reverse Vending Machine (RVM) for handling paper waste is proposed to be used inside university compounds. User-Centred Design (UCD) is employed as the method to ensure the RVM is tailored to the unique needs of college students, who often struggle with recycling paper waste. The EcoPet RVM is designed to be a gamified experience that rewards users with virtual currency, which can be exchanged for virtual pet accessories, creating a fun and interactive incentive for students. The concept of the RVM and the usability of its user interface are then evaluated with university students. The evaluation results showed the possibility of enhancing university students' participation and fostering a culture of sustainability on campus, significantly reducing paper waste.

Keywords: recycling, paper waste, Reverse Vending Machine, User-Centred Design, sustainable

INTRODUCTION
The escalating volume of paper waste is rapidly becoming a pressing environmental challenge, particularly within Malaysia. The increasing volume of discarded papers not only burdens landfill capacities but also contributes to significant environmental and public health issues. Improperly handled paper waste can lead to soil degradation, water pollution, and contribute to the spread of diseases such as mosquito-borne diseases. These issues often exacerbate other problems such as landslides and traffic congestion, further disturbing daily life and environmental sustainability. Despite the substantial generation of paper waste, recycling rates remain relatively low, particularly in university campuses. For instance, out of an estimated 250,000 metric tons of paper produced annually, only 100,000 metric tons are recovered, with the remainder left unutilized (Seneviratne et al., 2023). This gap highlights the urgent need for effective strategies to reduce paper waste and mitigate its negative impacts on the environment.

Recycling emerges as a sustainable solution to this growing crisis. However, challenges such as inconvenient locations and lack of incentives have been identified as barriers to recycling (Cho, 2016). Two factors that shape college students' recycling behaviour are recycling intention and self-determined motivation. The placement of recycling bins also directly impacts the success of recycling and contamination rates. A lack of motivation, communicated recycling bins, and lack of recycling knowledge were the recycling attitudes on university campuses (Bandy, Peas & Tahir, 2015).

Globally, the advancement of innovation in waste management and recycling technology introduces Reverse Vending Machines (RVMs). Many existing RVMs, such as SODA-MAT, DICON, T-REX, Recycle-Tech, and others, have implemented monetary incentives, such as cash or cash in exchange for recyclable materials (Tir et al., 2019). A feasibility study by Karanaker and Kunch (2024) conducted with four university campuses in Bangladesh showed encouraging insights into which incentives were preferred across the campuses. The study considered four types of incentives, such as donations, in-app credits, web planning and discount tokens. The study showed that no single type of

incentive was preferred by the students as different campuses preferred different incentives. However, 95.7% of students were willing to use RVMs if they were installed within the campus vicinity.

Previous literature indicated that gamification may elevate students' engagement and learning (Buckley & Doy, 2016). This is also supported by Alshabani (2018) findings, where gamification had a positive impact on user satisfaction. Studies on the impact of gamification on recycling behaviour and user behaviour in recycling (Hamedhafe & Rosenmund, 2019; Ghobek & Baharji, 2021). Rewards such as virtual tokens and gamified incentives positively affect recycling behaviours by motivating individuals to participate in recycling activities (Kwon, 2019). In a study conducted by Hagedorn, Happonen and Avtosh (2020) revealed gamified-based solutions were efficient in changing recycling behaviour, where the participants' recycling increased from 70% to 97%. However, the changes in behaviour may differ according to the cultural background of the people (Hu & Chen, 2021).

To address these challenges on university campuses, the authors propose a concept for the RVM, including a gamified feature for university students. The first iteration of the user interface of the user interface is also presented through usability testing conducted with university students. The RVM, known as EcoPet, aims to streamline the paper collecting and recycling process, making it more convenient and accessible for university students. By integrating gamification features and encouraging users with gamified rewards for returning paper materials, the EcoPet RVM aims to foster a culture of sustainability and encourage responsible waste disposal. The effectiveness of this initiative relies on the machine's functionality and the usability of the machine's interface, both of which are essential for encouraging widespread adoption.

PROPOSED DESIGN SOLUTION
In proposing the design solution, the authors employed the UCD methodology. There are four iterative phases: understanding the context of use, specifying user requirements, designing solutions, and evaluating against requirements.

Machine Design Concept
The EcoPet RVM is designed for recycling books, papers, and paper boxes, particularly for campus students. During exam periods, students typically accumulate a significant amount of revision notes and textbooks that are no longer needed. In these instances, the EcoPet RVM presents a convenient solution for decluttering spaces and disposing of unwanted papers and books with ease.

The EcoPet RVM builds upon existing RVMs, but with improved user engagement and functionality. While most RVMs focus solely on monetary incentives, this design adds or refunds, the EcoPet RVM incorporates a unique gamified experience through a virtual pet game. This element is designed to provide ongoing engagement to participants in recycling efforts. Users who enjoy digital pets may find this feature particularly appealing. The virtual pet game allows users to purchase virtual items that can be used not only to purchase items for their virtual pets within the associated app but also to redeem vouchers at participating convenience stores on the university campus. By providing an opportunity to collect and trade virtual items, the EcoPet RVM's gamified strategy not only makes recycling more enjoyable but also serves as an incentive for students who might not be motivated to recycle by environmental consciousness alone to recycle more frequently. Moreover, the inclusion of the framework as tangible components, such as tokens and coins, provides a sense of ownership and personal achievement. Additionally, recycled paper and boxes are sent to recycling centres, with the proceeds being channelled to support other schools in need. This approach not only promotes sustainability but also fosters a sense of community and social responsibility among students aware of its existence.

Furthermore, the EcoPet RVM contributes to charitable causes by providing recyclable materials to schools in need. Recycled paper and boxes are currently donated to local schools and educational institutions, enhancing their resources. Additionally, recycled paper and boxes are sent to recycling centres, with the proceeds being channelled to support other schools in need. This approach not only promotes sustainability but also fosters a sense of community and social responsibility among

students. Figure 1 shows the concept of the proposed EcoPet RVM. The RVM is equipped with a slot for users to deposit their waste items and a screen display where the user interface will be displayed. At the side of the RVM, step-by-step instructions on how to use the RVM are placed.

The RVM has a 31.7 x 48.04 cm touchscreen interface, designed to improve usability and the overall user experience by providing clear instructions and interactive elements. Beside the touchscreen is a 13 x 25 cm input slot where users can insert recyclable materials.



Figure 1. The RVM concept of the proposed solution

User Workflow

Activating the machine is simple and user-friendly. Users can start by pressing anywhere on the touchscreen display, which then transitions to a sign-in page followed by the main screen. If guidance is needed, it can be easily accessed by clicking the help button placed at the top right corner of the main screen. The machine is tailored for international usage, allowing students of different nationalities to select their preferred language by clicking the language buttons at the bottom right corner.

Figure 2 shows the user workflow when the registered user starts to recycle. To begin the recycling process, users press the "FREE!" button to feed their virtual pet with recyclable materials. It will transition the machine to a screen with a countdown timer, giving them one minute to insert materials into the input slot. During this period, the slot remains open, but once the timer ends, the machine enters a locked state, preventing further insertion. The system then calculates the weight of the inserted items and the corresponding points. After the calculation is complete, the total points are displayed on the screen, and students can choose either to continue recycling or return to the main menu. After completing the operation, the system displays an animation illustrating the pet's status improvement based on the points earned.

The EcoPet RVM's system is seamlessly integrated with a dedicated mobile app, providing users with a fully interactive recycling experience. Users can sign up and access their account through the mobile app, where they can track their points, view their recycling history, customize, and monitor their virtual pet. When the user recycles, the points are added to the user's account in real-time. The mobile app will also pop up a notification regarding the changes to their virtual pet's status. The status and points will deteriorate when there are no recycling activities recorded within a certain timeframe. Users can use these points earned to purchase accessories and clothing for virtual pets from the app's reward store, as well as vouchers redeemable at convenience stores on the university campus.

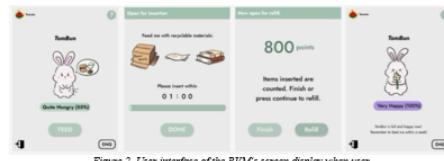


Figure 2. User interface of the RVM's screen display when user starts recycling

METHODOLOGY

This study was designed in two phases: the design phase and the evaluation phase. In the design phase, the machine and user interface designs for the EcoPet RVM were developed using software tools such as Canva and Figma. These tools allowed for the creation of a functional and visually appealing prototype. The design of the EcoPet RVM was evaluated using a SUS questionnaire, which was tested and refined using the System Usability Scale (SUS) questionnaire, a widely recognized and reliable tool for evaluating the usability of the user interface. The evaluation was carried out with university students who represent the primary target users of the RVM. Google Forms was utilized to efficiently collect responses from participants, streamlining the data collection process.

Study Setup

This study was designed as quantitative research, allowing for the calculation of scores rated by participants in questionnaires. The study was conducted in a face-to-face setting, which facilitated direct interaction with participants and real-time observation of their interactions with the prototype. All participants need to complete one task which requires them to deposit paper waste. To complete the task, participants were required to log in to a default account using the provided username and password.

Participants

The study involved 20 university students from Xiamen University Malaysia aged between 16 and 25. 70% of participants (14 out of 20) reported to participate in recycling less frequently. All participants are taking a course on Human-Computer Interaction (HCI) in the same cohort and are familiar with the usability field.

Materials and Equipment

The equipment used for the study included a laptop and a mobile phone. The laptop is used for participants to read instructions, an informed consent form and questionnaires, while the mobile phone was used to display the user interface of the RVM's screen display.

A document explaining the concept of RVM was prepared. The document shows the visual appearance of the machine, including some explanation about the machine. Two online questionnaires were prepared: (1) informed consent, including demographic and background questionnaires, and (2) SUS questionnaire. There are four questions in the demographic and background questionnaires, while ten questions in the SUS questionnaires. A Figma prototyping website is used to display the user interface of the RVM's screen.

Procedure

Participants were invited to their session which took place in a classroom within the university campus. Participants were given a brief explanation about the purpose of the study and the tasks they were going to undertake. They were given a chance to ask any questions before completing an informed consent form and demographic and background questionnaire using a provided laptop. The participant was given a mobile phone to complete the task on the Figma prototyping website. After they had completed the task, participants evaluated the usability of the user interface using the SUS questionnaire on the provided laptop.

RESULTS AND FINDINGS

Data from the online questionnaire were compiled into a spreadsheet and SUS scores for each participant were calculated. Then, a mean SUS score for all participants were calculated. Table 1 presents the ratings given by all participants for all 10 questions. Based on the table, a percentage is calculated for the given rating of 1 – 5 for odd-numbered questions and the given rating of 1 – 2 for even-numbered questions. Since a rating of 3 indicates Neutral, the mean was derived from the percentage calculation. In detail, 90% of respondents thought that the RVM is straightforward (Question 1), found it easy to learn to use the RVM (Question 3), imagined that most people would learn to use the RVM (Question 4), 85% of participants believed they would use the RVM frequently (Question 1), found it easy to learn to use the RVM (Question 3), imagined that most people would learn to use the RVM easily (Question 7), and felt confident using the RVM (Question 9). 80% of participants thought the RVM is consistent (Question 6). 75% of participants found the functions of the RVM were well integrated (Question 5). 70% of participants found the RVM not unnecessarily complex (Question 2). Finally, 65% of participants felt they did not need to learn a lot of things before using the RVM (Question 10).

Table 1. Ratings given by participants for each question in SUS questionnaire

No.	Questions	Strongly Disagree				Strongly Agree			
		1	2	3	4	5	6	7	8
1	I think that I could use this machine frequently.	5	4	3	2	1	11	1	1
2	I found the system to be unnecessary complex.	4	10	5	3	1	1	1	1
3	I found it easy to learn to use this machine.	0	0	3	6	8	11	1	1
4	I think that I could use this machine frequently.	9	9	2	0	0	0	0	0
5	I found the various functions in this system were well integrated.	2	1	2	0	9	9	1	1
6	I think that the system is consistent.	11	5	2	2	0	0	0	0
7	I would imagine that most people would learn to use the RVM easily.	0	1	2	3	3	14	1	1
8	I found the system very comfortable to use.	8	10	2	0	0	0	0	0
9	I felt very confident using this system.	0	0	3	9	9	9	1	1
10	I feel you can learn a lot of things before using this system.	0	0	0	0	0	0	0	0

In the aspect of user satisfaction on the user interface of the prototype for the RVM's screen display, the results of the overall SUS score yielded an average score of 80.25. This score suggests that the EcoPet RVM is highly usable and has potential for frequent adoption, even among users with varying levels of prior recycling experience. The positive feedback, particularly on the ease of learning and user confidence, suggests that the EcoPet RVM effectively meets participants' needs and expectations.

However, despite the overall positive feedback, there were some concerns raised by 15% of the participants who felt that certain aspects of the system were unnecessarily complex (Question 2), and the various functions were not well integrated (Question 5). This could be due to the usage of a separate mobile app. Even though the flow of recycling process with the EcoPet RVM is straightforward, it can be unclear for participants in terms of the points given to them and what they can do with the points. This result is expected since this study did not include the prototype development on the mobile app.

CONCLUSION

In conclusion, the EcoPet RVM presents a promising solution to the challenge of paper waste management within university environments. By combining gamification in RVM, the EcoPet RVM not only facilitates recycling but also fosters a culture of sustainability among students. Its unique integration of gamification elements, such as virtual pets and rewards, provides an engaging and motivating user experience. Virtual points for pet accessories or campus vouchers provide both practical and appealing incentives. An excellent SUS score and positive user feedback highlight the effectiveness of the machine's design. Besides, the high score indicates that the EcoPet RVM is not only easy to use but also has strong potential for widespread adoption on campus. The feedback received, particularly concerning the ease of learning and user confidence, suggests that the design effectively addresses the needs and expectations of the target users. However, some suggestions for improvement were noted, with a few participants perceiving the system as complex. These insights provide valuable guidance for further modification of the RVM's design and functionality.

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Certificate and Medal:



Group 3

Student Name: Tan Hao (DMT2209672), Ling Heng Hua (DMT2209669)

Advisor Name: Dr. Ili Farhana Md Mahtar

Project Name: Eco-Arcade: Gamified Reverse Vending Machine for Recycling

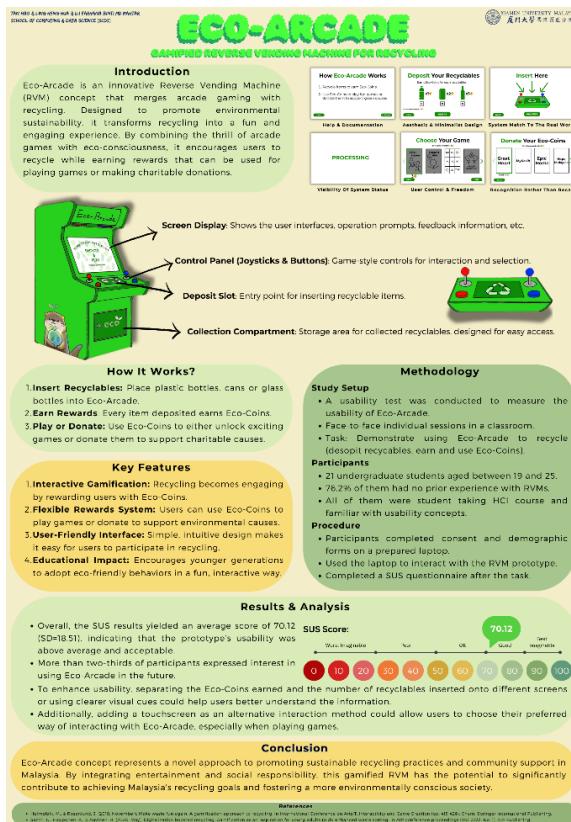
Abstract:

Statistics show that recycling is important for Malaysia to sustain. However, landfill is still the primary action to waste disposal. To propose a solution to the issue, an innovative Reverse Vending Machine (RVM) integrated with a gamified user interface to promote recycling is designed. The uniqueness of this RVM lies in its arcade game-like interface. Users are rewarded for recycling by unlocking and playing games, or they can choose to donate their rewards to a charity organisation of their choice. The objective of this study is to explore the usability of the proposed solution. The concept of this RVM and a mid-fidelity for the RVM's screen display are evaluated with undergraduate university students in a usability study. Participants rated their System Usability Scale (SUS) score after completing recycling tasks. The results showed a high usability score and the possibility of encouraging university students to participate in recycling and donation activities.

Student Testimony:

"This was our first academic competition in university. We are very grateful to Dr. Ili for her guidance throughout the journey, which gave us the opportunity to participate. Through this competition, we encountered outstanding talents from different universities and learned a lot from the seminars. Overall, it was a great experience!"

Poster:



Extended Abstract Paper Submission:

Eco-Arcade: Gamified Reverse Vending Machine for Recycling

Tan Hao¹, Ling Heng Hua¹, Ili Farhana Md Mahtar¹
¹Xiamen University Malaysia, Malaysia

ABSTRACT

Statistics show that recycling is important for Malaysia to sustain. However, landfill is still the primary action to waste disposal. To propose a solution to the issue, an innovative Reverse Vending Machine (RVM) integrated with a gamified user interface to promote recycling is designed. The uniqueness of this RVM lies in its arcade game-like interface. Users are rewarded for recycling by unlocking and playing games, or they can choose to donate their rewards to a charity organisation of their choice. The objective of this study is to explore the usability of the proposed solution. The concept of this RVM and a mid-fidelity for the RVM's screen display are evaluated with undergraduate university students in a usability study. Participants rated their System Usability Scale (SUS) score after completing recycling tasks. The results showed a high usability score and the possibility of encouraging university students to participate in recycling and donation activities.

Keywords: Recycling, Reverse Vending Machine, Gamification, Usability, Charity

INTRODUCTION

Recycling is essential for Malaysia's sustainability efforts, with the country aiming to achieve a recycling rate of 40% by 2025. Currently, about 31% of waste is recycled, highlighting a significant opportunity for improvement (Harindran, 2024). Waste is an inevitable by-product of human activities, and as the economy and population grow, the production of waste is increasing at an alarming rate. According to Harindran (2023), the amount of waste collected by one of the waste management companies in Kuala Lumpur alone can reach the height of the Petronas Twin Towers in just one week. Due to the lack of sustainable management and processing capabilities, sending waste to landfills has become the primary method of waste disposal in Malaysia (Ng et al., 2023). Clearly, this approach is not a long-term solution. Therefore, there is a need to develop innovative and sustainable solutions to gamify the process of recycling. A study by Helmeleff and Rosenlund (2020) demonstrates significant potential for gamification in improving recycling behavior. The study reported that incorporating gamification mechanisms such as instant feedback, knowledge provision, social competitive elements, and reward systems can effectively increase motivation and engagement in recycling. For example, a pilot project in student apartments in Finland, used a gamified solution called "Fox the Recycler" to enhance waste separation among young adults. Through the tool, the rate of participation increased from 6% to 97% and plastic recycling rose from 25% to 84% (Santti et al., 2020). This indicates that gamification can indeed effectively change the recycling behavior in certain situations. Given the pressing need to enhance recycling rates, Eco-Arcade, an innovative RVM concept has been proposed. Eco-Arcade integrates gamification and charitable elements, aiming to encourage more people to recycle through a reward system and community involvement. This study will present the design and conceptual framework of Eco-Arcade, highlighting how its gamified interface and charitable incentives can drive positive recycling behaviors in Malaysia. In addition, the findings on the usability of the solution through usability testing will be presented.

Figure 1. Conceptual Design of Eco-Arcade

The figure shows a 3D perspective view of the Eco-Arcade machine. It is a green cabinet with a screen display on top, a control panel with joysticks and buttons in the middle, and a deposit slot and collection compartment at the bottom. Arrows point to each component with labels: Screen Display, Control Panel (Joysticks & Buttons), Deposit Slot, and Collection Compartment. The machine has a logo with the word 'eco' and a globe icon.

PROPOSED DESIGN CONCEPT

The process began with user research to identify common behaviors and challenges in recycling. Insights from this research informed the creation of user personas, which guided the design. Mid-fidelity prototypes were then developed to visualize and test the core functionalities and user interactions.

Design Concept

Eco-Arcade operates by transforming the traditional recycling process into an interactive and rewarding experience. Users deposit recyclable items into the machine, which are then identified, sorted, and compacted using advanced sensors and artificial intelligence (AI). The system calculates rewards in the form of Eco-Coins, allowing users to either play games or donate to charity. Figure 1 shows the conceptual design of Eco-Arcade which draws inspiration from traditional arcade machines to highlight its gamified features. Except for manually placing recyclable items into the deposit slot, the user will interact with the machine entirely using the joysticks and buttons.

Gamification Elements

The Eco-Arcade's gamification approach is built around Reward Theory, where users are incentivized to recycle through a system of Eco-Coins. Each time users deposit recyclable items, they are rewarded with Eco-Coins, which serve as the primary currency within the system. These Eco-Coins can be used to either unlock and play games or donate to charity. Meanwhile, the inclusion of arcade-style games adds an element of fun and interactivity, making the recycling process more engaging. This reward-based system encourages repeated recycling behavior by providing immediate, tangible benefits, making recycling both enjoyable and socially rewarding for users.

Prototype Development

A mid-fidelity prototype of Eco-Arcade was created using Figma to create the user interfaces that will be displayed in the RVM's screen display. Figure 2 illustrates some screenshots of the user interfaces, guiding users through various stages. It begins with an overview of how Eco-Arcade operates and details on the Eco-Coin value assigned to different recyclables. Users can then deposit and process their recyclables, earn Eco-Coins, and use these coins to unlock and play games. Additionally, the interface allows users to donate their Eco-Coins to charitable causes.



Figure 2. Mid Fidelity Prototype of Eco-Arcade

METHODOLOGY

Following the development of the mid-fidelity prototype, a usability test was conducted to assess its user interfaces for the RVM's screen display.

Design

The usability testing involved face-to-face individual sessions, which was facilitated by the researchers. All participants were required to complete all three tasks: (1) deposit recyclables into the slot to earn Eco-Coins, (2) use earned Eco-Coins to unlock and play a game, and (3) donate the remaining Eco-Coins to a charity.

Participants

A total of 21 students from Xiamen University Malaysia participated. The participants, aged between 19 and 25 years, included 9 males and 12 females. Notably, 76.2% (16 out of 21) of the participants had no prior experience with RVMs. However, all participants had taken a course on Human-Computer Interaction and were familiar with the usability aspects of user interfaces.

Materials and Equipment

During the evaluation, participants used a laptop provided by the researchers. This laptop was used for reading instructions, signing the informed consent form, answering questionnaires, and interacting with the mid-fidelity prototype of the RVM's screen display. The consent form included a brief introduction to

the proposed RVM and outlined the purpose of the research. After agreeing to participate, the participants completed an online questionnaire regarding their demographics and background. A hyperlink was provided to direct them to the mid-fidelity prototype created in Figma. Another online questionnaire was administered to measure usability, adopting all 10 questions from SUS questionnaires. Participants rated each question on a 5-point Likert scale, with 1 indicating "Strongly Disagree" and 5 indicating "Strongly Agree."

Procedure

The evaluation sessions took place in a classroom at the university. Participants received a brief explanation of the study's purpose and had the opportunity to ask questions before starting. After agreeing to participate and signing the consent form, they completed the demographic and background questionnaire. They were then asked to simulate using the Eco-Arcade RVM and complete all three tasks of the prototype using the SUS questionnaire.

RESULTS AND FINDINGS

The SUS questionnaire data were compiled into a spreadsheet, and individual SUS scores were calculated for each participant. Following this, an overall mean SUS score was computed. Figure 3 shows the ratings given for each question. The questions are arranged into even and odd-numbered questions according to the nature of the SUS questionnaire, in which even questions generate negative responses and odd questions generate positive responses. The percentages are calculated according to the questions. For even-numbered questions, rating 1 (Strongly Disagree) and 2 (Disagree) is considered. For odd-numbered questions, rating 4 (Agree) and 5 (Strongly Agree) is considered. Ratings of 3, which indicate a neutral response, were excluded from the percentage calculation.

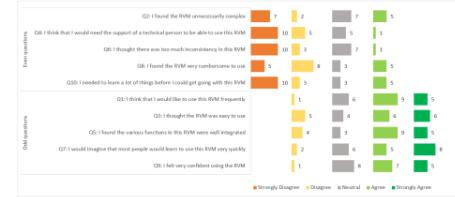


Figure 3. Ratings given for SUS questionnaire

Based on the figure, the results are listed according to the highest percentage order:

- 71.4% of participants thought they would not need the support of a technical person to be able to use the RVM (Question 4)

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- 66.7% of participants think they would like to use RVM (Question 1) and found the various functions of the RVM were well integrated (Question 5)
- 61.9% of participants thought the RVM is consistent (Question 6) and straight-forward to use (Question 9), imagined that most people would learn to able to use the RVM very quickly (Question 7), and not needed to learn a lot of things before they could get going with the RVM (Question 10)
- 57.1% of participants thought the RVM was easy to use (Question 3) and felt confident to use it (Question 9)
- 42.8% of participants found the RVM was not unnecessarily complex (Question 2)

Overall, the SUS results yielded an average score of 70.12 ($SD=18.51$), indicating that the prototype's usability does not seem favorable. Based on the results, 23.8% of participants found the RVM unnecessary complex (Question 2) and cumbersome (Question 8), was not easy to use (Question 3), therefore needed to learn a lot of things before they could get going with the RVM (Question 10). Upon further investigation, it was revealed that this was primarily due to the "Deposit Your Recyclables" screen displaying both the Eco-Coins earned and the number of recyclables inserted, which made it difficult to interpret the information. To enhance usability, separating these numbers onto different screens or using clearer visual cues could help users better understand the information. Additionally, they preferred a touchscreen over the joystick and button interaction, as the design was inefficient. Therefore, adding a touchscreen as an alternative interaction method could allow users to choose their preferred way of interacting with the RVM especially when playing with games.

CONCLUSION

This study introduced Eco-Arcade, an innovative gamified Reverse Vending Machine (RVM) concept designed to address Malaysia's recycling challenges. The research covered the current waste management issues in Malaysia, the potential of gamification to improve recycling rates, and the development and evaluation of the Eco-Arcade prototype.

The SUS score was above average, indicating that the Eco-Arcade concept is promising and well received, despite its complexity. Based on the results, however, there are notable limitations in the designed experiment. Firstly, the participants were primarily university students, many of whom might have had some background in design or usability studies, potentially biasing the results. Their familiarity with usability concepts could have led to higher scores than a more general population would provide. Secondly, the questionnaires were primarily focused on usability metrics, neglecting other important aspects such as user motivation, emotional engagement, or the long-term impact of the gamification elements. Including questions that address these factors could provide a more holistic understanding of user interaction with Eco-Arcade.

In terms of the Eco-Arcade design, while the prototype showed potential, there are areas for improvement. The user interface could be simplified to reduce unnecessary complexity, making the system more accessible to a wider range of users. Additionally, the current data presentation, such as the display of Eco-Coins and recyclables, could be clearer and more intuitive to enhance user comprehension. Finally, incorporating more diverse interaction methods, beyond the current options, would broaden user engagement and make the recycling process more immersive.

In conclusion, the Eco-Arcade concept represents a novel approach to promoting sustainable recycling practices and community support in Malaysia. By integrating entertainment and social responsibility, this gamified RVM has the potential to significantly contribute to achieving Malaysia's recycling goals and fostering a more environmentally conscious society.

Certificate and Medal:



Award Winning from International Innovation and invention competition 2024 (IIICE2024)

Team 1. Ng Yaw An (CST2204035), Wong Min Shuan (CST2104402) , Looi Pei Yi (SWE2104399), Chew Cheng Hong (SWE2204279) , Dr. Burra Venkata Durga Kumar

Title: Smart Magnifier for Plant Scanner using IoT

The School of Computing and Data Science congratulate Ng Yaw An, Wong Min Shuan, Looi Pei Yi, Chew Cheng Hong and Dr Burra Venkata Durga Kumar for have wining the Bronze Award for innovation “Smart Magnifier for Plant Scanner using IoT” from the International Innovation and invention competition 2024 (IIICE2024) organized by University Tun Hussein Onn Malaysia (UTHM) Malaysia.

Product Innovation:

Nowadays people like to travel around the world. Camping and jungle trekking are one of the choices for them. One of the key tools in these activities is the magnifying glass, which can be used to start fire and also to enlarge image of objects. The smart magnifying glass can not only do these activities, but also help in identifying plants and also to identify if a plant is safe for consumption to avoid food poisoning.

As a team leader of IIICE Competition, I was truly proud on my teammates to receive this bronze award and prize money heightened my sense of achievement. This competition was intense, filled with lots of talented competitors from various background, which made earning this award even more special. Before that, I would like to express my heartfelt gratitude to my all teammate, without them we surely won't get the bronze award in this competition. We also extend our thanks to Dr. Burra Venkata Durga Kumar, for his strong support. This competition had let us gaining lots of experience on different area. This award will surely motivate us to keep pushing our boundaries and strive for even greater achievement in the future. We are looking forward to participating this kind of competition and getting higher achievement, also continuing to grow through such experiences.

Team 2. Qin Yuyang (SWE2209537), Zhang Zhuoyi (SWE2209551), Dr Burra Venkata Durga Kumar

Title: Smart Hot Pot For Hygienic Food

The School of Computing and Data Science congratulate Qin Yuyang, Zhang Zhuoyi and Dr Burra Venkata Durga Kumar for have wining the Bronze Award for innovation "Smart Hot Pot For Hygienic Food" from the International Innovation and invention competition 2024 (IIICE2024) organized by University Tun Hussein Onn Malaysia (UTHM) Malaysia.

Product Innovation:

In many countries without separate dining, such as China, when eating hot pot, cross-infection of saliva in the soup is a serious hygiene problem. The high temperature of the soup can easily cause burns, which is a safety problem. In addition, the cooking process has complication, and you need to pay attention to prevent food spoilage and remember the cooking order. We hope to design a hot pot that can separate soup and food to prevent cross-infection and burns. In addition, other problems also need to be improved together. We hope to monitor the status of the ingredients and intelligently control the cooking time and temperature. Based on the above background and ideas, we designed our SHP.

Our smart hot pot app disconnects the remote controlled strainer so that food can be pulled out in time to prevent multiple tableware from mixing into the soup, ensuring hygiene and preventing infectious diseases. It also uses the latest sensor technology based on lab on spoon to detect the quality of the liquid. Combined with AI deep learning, it can intelligently detect the quality and status of food in the pot in real time. We also designed a remote software for it that allows the user to remotely control the temperature of the pot and the filter in the pot.

We truly proud to receive this award and prize money heightened my sense of achievement. I would like to express my heartfelt gratitude to my team, for making huge contributions to the project. We extend our thanks to Dr. Burra Venkata Durga Kumar, for his strong support, and guidance. The competition also boost our confidence and courage. Moreover, participating in the hosting innovation exhibition broadened my horizons, providing us with an deep comprehension of innovation products.

The essence of this competition lies in these experiences growth, knowledge, and the anticipation of future opportunities.





2022 Top 0.5% Scholars by ScholarGPS

The School of Computing and Data Science proudly extends its congratulations to D. Miraz Mahdi Hassan from the Computer Science and Technology Programme for his exceptional scholarly achievements. Dr Mahdi's remarkable publication record, the significant impact of his research, and the high caliber of his contributions have earned him an impressive distinction. According to ScholarGPS, Dr. Hassan is recognized in the top 0.5% of scholars globally. Specifically, he ranks 17th out of 61,705 scholars across all fields over the last five years and holds the 232th position in the Emerging

Technologies, Lifetime. This recognition underscores the profound influence of his work and the substantial contributions he has made to his field.

Six XMUM Staffs Named as 2022 Top 0.5% Scholars by ScholarGPS, out of which five faculty members, namely Wee-Jun Ong, Kit Wayne Chew, Rashmi Valvekar, Swee Keong Yeap, and Mahdi H. Miraz, under various domains within evaluation period of last five years and Chong Kim Ong and Wee-Jun Ong have been named amongst the top lifetime scholars. The results were released on 31st July 2024.

Wee-Jun Ong

Chemical Engineering

#2,710 [Overall (All Fields), last five years] and 4th [Graphitic carbon nitride, Lifetime]

Kit Wayne Chew

Chemical Engineering

#7 [Microalgae, last five years]

738 [Chemical Engineering, last five years], 8,153 [Chemical Engineering, Lifetime]

Rashmi Valvekar

Chemical Engineering

1,784 [Chemical Engineering, last five years], 11,501, [Chemical Engineering, Lifetime]

Swee Keong Yeap

Marine Sciences

187 [Marine Sciences, last five years], 864 [Marine Sciences, Lifetime]

Mahdi H. Miraz

Electrical and Computer Engineering

17th out of 61,705 [Overall (All Fields), last five years] and 232th [Emerging Technologies, Lifetime], see below.

Chong Kim Ong

362 [Physics, life time]

TECH EXPO 2024 XMUM & 2024 Malaysia-China Youth Innovation Competition & Malaysia Division Contest of China International College Student's Innovation Competition

Topic 1 : IoT Smart Storage

Silver Award

Yada Team: Huang Yuehan CST2309151, Wang Ya DMT2309241, Yan Jiachen JRN2209437, Meng Xiangyu DMT2309234, Yi Fan MAT2309456, Tu Chuanxin EGE2209338, Li Xingchen SWE2209524, Chen Jiayin CYS2309192, Yan Jiachen JRN2209437

Advisors: Ts. Dr.Teh Jia Yew, Dr. Burra Venkata Durga Kumar.

The XMUM TechExpo 2024 (Robotics & Automation) competition was held in Xiamen University Malaysia at B1 Building on 24th to 25th June 2024 6pm to 9.30pm. The competition was open to all XMUM undergraduates' students to participate.

The School of Computing and Data Science would like to congratulate D Teh Jia Yew, Dr Burra Venkata Durga Kumar along with the students Huang Yuehan, Wang Ya, Yan Jiachen, Meng Xiangyu, Yi Fan, Tu Chuanxin, Li Xingchen, Chen Jiayin , Yan Jiachen for have receiving the silver award for the project title " IoT Smart Storage".

The project addresses the increasing issue of foods theft in delivery service by developing a Smart Storage System. Using IoT technology, the team created a shelf with weight sensors that detect unauthorized changes in weight, signaling potential theft. This shelf is connected to a mobile app that sends rea-time alerts to users, ensuring immediate response. This project successfully demonstrated the effectiveness of IoT in enhancing food delivery security, providing valuable insights into practical applications of smart technology.



Topic: Next-Generation Disease Recognition for Dragon Fruit via YoLoV8: A Novel Approach

Silver Award:

Team: Xiao Yaxuan (SWE2209540), Huang Junhao (SWE2209517), Lei Luan (SWE2209522)

Mentor: Dr. Burra Venkata Durga Kumar

The School of Computing and Data Science would like to congratulate Dr Burra Venkata Durga Kumar along with the students Xiao Yaxuan, Huang Junhao, Lei Luan from the Software Engineering programme for have receiving the silver award for the project title “Next-Generation Disease Recognition for Dragon Fruit via YoLoV8: A Novel Approach” in the XMUM TechExpo 2024 (Robotics & Automation) competition and for receiving the Gold Award first prize winner with cash amount of RM3,000 from 2024 Malaysia-China Youth Innovation Competition & Malaysia Division Contest of China International College Student’s Innovation Competition.

The 3rd Malaysia-China Youth Innovation and Entrepreneurship Competition, is initiated by the Promotion Association for Global Youth Innovation Leaders Community (PILC) and organized by Xiamen University Malaysia, The South Sea Capital Sdn. Bhd., and co-organized by TusStar Malaysia, Koperasi Graduan Muda Kebangsaan Berhad (KoGRAD), New Century Hi-Tech Service (Malaysia) Sdn. Bhd., and Shanghai Guan'an Information Technology Corporation Limited with support from the Embassy of the People's Republic of China in Malaysia and the Malaysia-China Friendship Association.

The Competition aims to stimulate university students' enthusiasm for innovation and entrepreneurship, to promote the international integration of innovation and entrepreneurship education as well as to exchange and share resources related to innovation and entrepreneurship (such as projects, investment, and market), and build a cooperation platform for university students to solve global challenges.

Dragon fruit is an important cash crop in Malaysia, with a production of more than 10,000 tons in 2019 alone. However, it is extremely sensitive to fungal, bacterial and viral infections, and pests and diseases cause serious economic losses to farmers every year. To this end, we developed Dragon Vision, the first dragon fruit pest and disease detection technology. It aims to help farmers detect diseases in advance and promote the development of smart agriculture.

The model can successfully detect the lesion of dragon fruit and accurately locate the lesion location.

Its recognition accuracy and adaptability in different scenarios are greatly improved compared with before. In the future, we will also apply this technology to mobile phone apps and drone recognition to promote its practical application capabilities and promote the development of smart agriculture.

We are software engineering students from Xiamen University Malaysia. We participated in the 3rd Malaysia-China Youth Innovation Competition and won the Gold medal. I am truly proud to receive this award and prize money heightened my sense of achievement. I would like to express my heartfelt gratitude to my team, for making huge contributions to the project. We extend our thanks to **Dr Burra Venkata Durga Kumar**, for his strong support, and guidance. The competition also boost our confidence and courage. The essence of this competition lies in these experiences growth, knowledge,

and the anticipation of future opportunities. Express our heartfelt thanks to Dr Burra again!



Article 3

Topic: Pulse of Innovation

Team: Ayumu Miyamoto (ADT2302221), Fong Li Qing (IBU2109694), Wang Yi (DMT2209231)

BRONZE AWARD

Advisors: Dr. Burra Venkata Durga Kumar. Ts.Dr.Teh Jia Yew,

The School of Computing and Data Science would like to congratulate Dr Teh Jia Yew, Dr Burra Venkata Durga Kumar along with the students Ayumu Miyamoto, Fong Li Qing, and Wang Yi for have wining the Bronze award with cash amount of RM1, 000 for the project title "Pulse of Innovation: How Smart Shirts Are Transforming Health And Fitness Industry" " from the 2024 Malaysia-China Youth Innovation Competition & Malaysia Division Contest of China International College Student's Innovation Competition.

Smart shirts represent a significant advancement in the health and fitness industry, leveraging technology to enhance monitoring, performance tracking, and overall wellness. Here's how they are transforming the sector:

1. *Advanced Biometric Monitoring: Smart shirts integrate sensors directly into the fabric, allowing for continuous monitoring of vital signs such as heart rate, respiratory rate, and even ECG (electrocardiogram) signals. This real-time data collection provides more accurate insights into an individual's health metrics during various activities.*
2. *Seamless Integration and Comfort: Unlike traditional wearable devices like chest straps or wristbands, smart shirts offer a non-intrusive and comfortable monitoring solution. Users can wear them just like regular clothing, which enhances compliance and usability, especially during extended periods of wear.*
3. *Data-driven Fitness Optimization: By analyzing the data collected from smart shirts, users can gain personalized insights into their fitness levels and performance. This includes tracking metrics like calories burned, exercise intensity, recovery times, and sleep quality, enabling more informed decisions about training and recovery strategies.*
4. *Remote Monitoring and Telehealth: Smart shirts facilitate remote monitoring capabilities, allowing healthcare professionals to track patients' vital signs and progress outside of clinical settings. This is particularly beneficial for managing chronic conditions, post-operative care, and elder care, enhancing patient outcomes and reducing hospital admissions.*
5. *Enhanced Sports Performance: Athletes and sports professionals use smart shirts to monitor performance metrics in real-time, optimizing training regimens and preventing injuries. Coaches can access detailed analytics to tailor training programs based on individual physiological responses and performance data.*
6. *Integration with IoT and AI: Smart shirts often integrate with IoT (Internet of Things) platforms and AI (Artificial Intelligence) algorithms to provide predictive analytics and proactive health insights. This integration enhances the shirt's capabilities beyond simple data collection, offering actionable recommendations for improving overall health and fitness.*
7. *Growing Market and Innovation: The market for smart textiles, including smart shirts, is expanding rapidly as advancements in sensor technology, material science, and data analytics drive innovation. Companies are continuously developing new features such as washable electronics, stretchable sensors, and seamless connectivity with smartphones and other devices.*
8. *Consumer Adoption and Accessibility: With increasing awareness and affordability, smart shirts are becoming more accessible to consumers of varying fitness levels and health needs. This democratization of technology allows more individuals to benefit from personalized health monitoring and proactive wellness management.*

Overall, smart shirts represent a pivotal shift towards personalized, data-driven healthcare and fitness solutions. Their ability to seamlessly integrate technology into everyday clothing is transforming how individuals monitor, manage, and optimize their health and fitness goals.

Thanks to the university, organizers, and sponsors for providing us with this opportunity. This award is a recognition of our team's perseverance and hard work, as well as proof of our skills and teamwork. Each team member has contributed their strengths, collectively creating this success. This the 3rd Malaysia-China Youth Innovation Competition has not only enhanced our professional skills but also honed our communication. If there is another opportunity like this, I am eager to participate. I am truly proud to receive this award. We extend our thanks to Dr Teh Jia Yew and Dr. Burra Venkata Durga Kumar for their unwavering support. By Ayumu Miyamoto, Fong Li Qing, Wang Ye.



Science Direct Journal Publication

Motion capture (mocap) data, crucial for capturing skeletal movements in objects or humans, underpins a wide array of 3D applications including games, animations, virtual reality, surveillance, and medical diagnostics. Despite its vast potential, the exploration of steganography using mocap data is still limited despite its wide-range of potential practical applications. Unlike image, audio, and video steganography, mocap steganography presents unique challenges such as varying temporal lengths, complex topologies, and non-repetitive movements across data sequences.

To tackle these challenges, Dr Yau and his team proposed DSSteganoM, an innovative deep neural network (DNN) model specifically designed for hiding mocap data. The model leverages advanced DNN techniques to encode a sequence of skeletal motions into another, effectively utilizing the spatial and

temporal redundancy inherent in mocap data. Notably, DSteganoM integrates sophisticated upsampling and pooling mechanisms within its architecture, enabling it to handle mocap data of diverse topologies and dimensions.

Experimental results showcased DSteganoM's exceptional performance, surpassing existing state-of-the-art models by delivering robust reconstruction of both cover and secret data with high resistance to signal perturbations.

Dr Yau's research not only bridges a critical research gap but also propels the frontier of digital security applications. By harnessing the power of deep learning in mocap steganography, DSteganoM opens new avenues for securely transmitting and protecting sensitive information in dynamic 3D environments.

We extend our sincere congratulations to Dr Yau Wei Chuen on this outstanding research for providing further insights into the transformative potential of DSteganoM and its implications for the future of digital security.

The details are as follows:

[DSteganoM: Deep steganography for motion capture data - ScienceDirect](#)

IEEE ACCESS Journal Publication

entitled "Improving the Classification Performance of Asphalt Cracks after Earthquake with a New Feature Selection Algorithm" in the IEEE ACCESS journal.

Dr Raja's research addresses a critical issue: the enhancement of Classification Performance of Asphalt Cracks after Earthquake using a pioneering Feature Selection Algorithm. This study comes at a time when large-scale earthquakes pose significant risks to infrastructure, including highways crucial for post-disaster relief efforts.

Following the devastating earthquakes in Turkey on February 6, 2023, Dr Raja conducted rigorous field studies in severely affected provinces. His team collected images detailing the condition of asphalt cracks on highways, crucial for determining urgent maintenance needs. Through meticulous labeling and dataset creation, images were categorized as requiring immediate attention ("Major") or not ("Minor").

To optimize classification accuracy, Dr Raja employed advanced techniques beyond traditional softmax algorithms. Notably, he introduced the Combined Metaheuristic Optimization-Relieff (CMO-R) algorithm, designed to elevate classification performance to unprecedented levels. Extensive experiments using popular pre-trained Convolutional Neural Network (CNN) models showcased remarkable results. The VGG16 model, in particular, achieved an impressive accuracy of 80.32%, demonstrating robust performance without succumbing to overfitting.

By improving the ability to swiftly identify and prioritize maintenance needs post-earthquake, Dr Raja's work contributes significantly to enhancing infrastructure resilience and minimizing disruptions to vital transportation networks.

We extend our sincere congratulations to Dr Raja Majid Mehmood on this outstanding research, which not only advances scientific knowledge but also holds profound implications for disaster response and infrastructure management worldwide.

The details are as follows:

Improving the Classification Performance of Asphalt Cracks after Earthquake with a New Feature Selection Algorithm

M Yılmaz, E Yalçın, S Kifah, F Demir, A Şengür, R Demir, RM Mehmood IEEE Access, 2024

IEEE Access, vol. 12, pp. 6604-6614, 2024, doi: 10.1109/ACCESS.2023.3343619.

URL: <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10388226&isnumber=10380310>

Fundamental Research Grant Scheme (FRGS) 2024

The research focuses on developing lightweight security authentication mechanisms for multi-UAV networks. UAVs are increasingly used in applications such as search and rescue, disaster monitoring, traffic policing, and parcel delivery. When deployed in groups, UAVs form Flying Ad-hoc Networks (FANETs), enabling dynamic and decentralized communication among nodes. However, these networks are exposed to significant security threats, particularly due to the vulnerability of air-to-ground communication links to interception, modification, and fabrication. At the same time, UAVs are highly resource-constrained in terms of computational power and storage capacity. To address these concerns, the research investigates data hiding techniques as a means of lightweight authentication. The expected outcome is the creation of robust, energy-efficient authentication strategies that improve the security and reliability of FANET communications.

The research paper has been published in Web of Science (WoS) indexed journal

The details are as follows:

Publication: Dilshani Mallikarachchi, KokSheik Wong, and Joanne Mun-Yee Lim. "A message verification scheme based on physical layer-enabled data hiding for flying ad hoc network." *Multimedia Tools and Applications* (2024): 1-21..

DMT Showcase Event 2024

Digital Media Technology Programme from School of Computing and Data Science has organised DMT Showcase Event on Friday 26th April 2024 to Saturday 27th April 2024 at A3-Ground Floor, Xiamen University Malaysia.

Objective of the event

1. To showcase the diverse talents of DMT students.
2. To position DMT students for internship opportunities in the gaming industry and related digital media sectors.
3. Provide networking opportunities between DMT students and industry companies related to digital media sectors.

The Digital Media Showcase Event typically serves as a platform for students or professionals in digital media-related fields to exhibit their creative projects, innovations, and talents.

Key highlights of the event:

Artwork Display

The students feature a display of digital media artworks, including 2D animation and 3D animation, Game Design and Development, Augmented Reality, Virtual Reality, 3D Modeling, Video Editing and Final Year Projects.

Interactive Demonstrations

Attendees have the opportunity to interact with the students to know more on their digital media projects. This may include trying out video games, exploring virtual reality (VR) environments and experimenting with interactive installations.

Presentations and Talks

The students present their digital artworks and talk on various topics related to digital media, such as emerging trends, career opportunities, and technological advancements. These sessions provide valuable knowledge and insights to the attendees.

Networking Opportunities

Digital Media Showcase Events offer excellent networking opportunities for students, professionals, educators, and industry representatives. Students are able to connect with industry experts, share ideas, collaborate on projects, and explore potential internship or job opportunities within the digital media industry.

Certificate of Recognition

Certificate of Recognition were provided for the participants, companies, and committee members.

Feedback from attendees was overwhelmingly positive, with many praising the event for its impact on fostering innovation and collaboration within the digital media technology field. Students expressed gratitude for the opportunity to showcase their artwork and engage with industry professionals, while the lecturers and industry representatives lauded the talent and creativity demonstrated by the students.

Overall, the DMT Showcase event at Xiamen University Malaysia was a resounding success. It serves as a vital platform for the students to showcase talent, fostering creativity, facilitating industry connections, and promoting the advancement of digital media technologies and practices.

As the digital landscape continues to evolve, events like these play a crucial role in nurturing the next generation of innovators and shaping the future of technology-enabled storytelling and communication.

As we reflect on the success of the DMT Showcase event, we look forward to witnessing the continued growth and innovation within the digital media technology field, driven by the passion and creativity of the DMT students.





Paper Accepted the 10th International Conference on Computing and Artificial Intelligence (ICCAI 2024)

Article no 1

The School of Computing and Data Science congratulate Dr Hejab Al-Fawareh from School of Computing and data Science, Xiamen University Malaysia for Paper accepted at the 10th International Conference on Computing and Artificial Intelligence (ICCAI 2024) which will be on April 26-29, 2024 in Bali, Indonesia entitled “Improvement of Morphological Analysis based on Three Layers of Lemmatization”.

Currently, the world impress with the ChatGPT. ChatGPT works with more than one Natural Language Processing(NLP) techniques to analyzed and inputted data in text form. Started from analysing the lexical and the syntactic ofttext, it is moved to pragmatic or discourse analysis. To process unstructured data such as natural language text, theapps should start with the morphological analysis. Morphological analysis plays a critical role in NLP to study theinternal structure of words that involve with syntactic and semantic analysis. Lemmatization is one of the technique in morphological analysis involves with high-level processing techniques to increase the accuracy. This paper proposes a new model that incorporates the Stanford morphology class, WordNet lexical dictionary, adaptive learning framework, and longest-match algorithm in lemmatization process. The outcome of the proposed model shows tremendous improvement with 96% accuracy compared with other existing algorithms in morphological analysis. Improvement of the morphological analysis will increase the accuracy of the semantic meaning of any natural language text processing apps like chatbot, question answering system etc.

Article no 2

The School of Computing and Data Science congratulate Dr Hejab Al-Fawareh from School of Computing and data Science, Xiamen University Malaysia for Paper accepted at the 10th International Conference on Computing and Artificial Intelligence (ICCAI 2024) which will be on April 26-29, 2024 in Bali, Indonesia entitled “HelpBot: A Web-Based Chatbot to Handle Depression Among Adolescents”.

Depression is a pervasive mental health condition affecting millions of individuals including adolescents worldwide. In spite of the growing awareness of mental health issues, access to timely and personalized support remains a challenge. The advent of technology has offered new possibilities for providing support and assistance to those grappling with depression. This paper introduces a web-based chatbot called HelpBot. This chatbot is designed to be an innovative personal companion to offer personalized support, and encouragement to adolescents facing depression. By analyzing user's chat, the HelpBot tailors its responses and recommendations to suit individual needs. This personalized approach enhances the effectiveness of the support provided, offering a more meaningful and relevant experience for each user. The development of the HelpBot utilized .NET Framework technology, Natural Language Processing Technique (NLP) and Template based approach. The technology of .NET

is used to create a dynamic web-based application, NLP technique is used to synthesize user's chat, and the template-based approach is used to offer a personalized response.

Testimonial from Dr Hejab

I am truly honoured to have the opportunity to present my research works in the field of artificial intelligence, specifically Natural Language Processing, at ICCAI 2024, Bali Indonesia. With participants around the world, I would have a chance to chit-chat with researchers within my domain of interests "

SCDS Cloud Computing Students Gain Practical Insights through Industry Visit to Silver Lining Systems Sdn Bhd November 2023

In a unique learning experience, Software Engineering students from the School of Computing and Data Science (SCDS) at Xiamen University Malaysia (XMUM) visited Silver Lining Systems Sdn Bhd, a leading provider of cloud-based solutions, on November 30th, 2023. This academic visit, **organised as part of the Introduction of Cloud Computing (SWE309) course, aimed to provide students with first-hand exposure to the real-world applications of cloud computing concepts.**



The visit was led by Dr Mahdi H. Miraz, the SWE309 course instructor and Head of SCDS Postgraduate Programmes. He expressed his satisfaction with the visit, stating, "industry visits are crucial in bridging the gap between theoretical knowledge and practical application. By interacting with industry professionals, our students can gain valuable insights into the latest trends and technologies in the field. It provides students with a broader perspective and helps them understand the practical implications of what they learn in the classroom". Another two SCDS faculty members, viz. Dr Iftekhar Salam and Dr Mailasan A/L Jayakrishnan, have also joined the trip.

Dr Miraz acknowledged the support received from the Chief Technology Officer (CTO) of Silver Lining Systems, Ts Krishna Ramasamy, SCDS Deputy Dean Dr Geetha Kanaparan, SCDS Assistant Dean Dr Tee Sim Sui as well as SCDS Software Engineering Programme Head Dr Chandra Reka Ramachandiran. The trip was financially supported by Xiamen University Malaysia (XMUM).

The visit began with a warm welcome from Silver Lining Systems' representatives including the organisation's CTO Ts Krishna Ramasamy, who provided a comprehensive overview of the company's operations and their expertise in cloud computing solutions. This included presentations on various cloud services, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).



Following the presentations, the students were given a guided tour of Silver Lining Systems' state-of-the-art data center, allowing them to witness the physical infrastructure behind cloud-based services. They also had the opportunity to interact with experienced professionals, who answered their questions and shared their experiences working in the cloud computing industry.



The students were particularly impressed by the company's emphasis on innovation and its commitment to providing secure and reliable cloud solutions to its clients. They also found the interactive session with professionals to be highly beneficial, as it provided them with a deeper understanding of the practical challenges and opportunities in the field.

The students found the visit to be highly informative and appreciated the opportunity to learn from industry experts. They expressed eagerness to apply the knowledge gained during the visit in their future academic and professional endeavours.

Commenting on the visit, one student remarked, "This visit has been truly eye-opening. Seeing how cloud computing is being used in real-world scenarios has given me a much clearer picture of its potential and practical applications".

Another student added, "The interaction with the professionals was invaluable. Their insights and advice will be extremely helpful as we continue our studies and prepare for our future careers".

The academic visit to Silver Lining Systems Sdn Bhd proved to be a successful educational experience for the SWE309 students. It provided them with a unique opportunity to bridge the gap between theory and practice, gain valuable industry insights, and solidify their understanding of cloud computing concepts. This experience will undoubtedly prepare them for future success in their chosen field.

This visit is a testament to SCDS's commitment to providing its students with comprehensive and practical learning experiences, preparing them for the demands of the ever-evolving tech industry.

XMUM Team Brings Home Silver & Bronze Awards at Asia Youth Innovation Competition 2023

A team from Xiamen University Malaysia won Bronze Award and Silver Award in the Asia Youth Innovation Competition 2023, under the category “Industrial and Product Design, Web Interface Design & Printing Technology”.

The Asian Youth Innovation Awards were launched in 2014 by Malaysia Technology Expo, one of the region’s most recognised and respected international invention exhibitions, with the aims to nurture, develop, and encourage youth engagement in Science, Technology, and Innovation.

Team members: Guo Haonan, Li Jiayin, Jiang Jixiu, Zhong Yanjun, Ng Wei Chen, Qu Ziran, Ts. Dr. Siti Nurliana Binti Jamali, Ts. Dr. Teh Jia Yew and Dr. Burra Venkata Durga Kumar.

Participants from XMUM School of Computing and Data Science Win Best Presentation Award at ICECC 2023

The School of Computing and Data Science congratulates ***Dr. Burra Venkata Durga Kumar and Ong Yi Jun, both from Software Engineering programme, for receiving the best presentation award at the 6th International Conference on Electronics, Communications and Control Engineering (ICECC 2023).***

Launched in 2018, ICECC is an annual conference aiming to publish the latest & high-quality research works on Electronics, Communications and Control Engineering in theoretical and practical aspects. This year, the conference was held at Fukuoka Institute of Technology, Japan during March 24-26, 2023.

The current emerging fifth-generation (5G) system has a significant impact on the usage of Internet of Things (IoT) devices. Load balancing plays an important role in the distributed system, as it is directly associated with the performance of the whole system. Entitled “Distributed Internet of Things Load Balancing using Deep Reinforcement Learning”, the paper put forward a load-balancing method for distributed IoT systems based on deep reinforcement learning (DRL), which is capable of dealing with dynamic and large-scale network situations.



The award-winning paper will be published in the International Conference Proceedings Series by ACM (ISBN: 979-8-4007-0000-2), which will be archived in the ACM Digital Library, and indexed by Ei Compendex, Scopus.

XMUM Students Win Two Silver and Five Bronze Prizes from the 8th China International College Students' Internet+ Innovation and Entrepreneurship Competition

Students from Xiamen University Malaysia have received a total of 7 awards at the 8th China International College Students' Internet+ Innovation and Entrepreneurship Competition, including 2 Silver Prizes and 5 Bronze Prizes.

In 2022, with the theme of "Dare to Differ, Dare to Win", the competition attracted 14.5 million participants and 3.4 million projects from 4,554 colleges and universities across 108 countries and regions. This is the 6th time that XMUM has participated in the competition, taking home a total of 38 awards including 1 Gold, 8 Silver, and 29 Bronze prizes. This competition is organized by the Ministry of Education of the People's Republic of China, which aims to encourage colleges and universities to strengthen the cultivation of innovative and entrepreneurial talents, exchange innovative ideas and inspire entrepreneurship, and create a better future for the world.

Dr. Miraz Mahdi Hassan and Gan Yu En Win 2022 IEEE Malaysia Section FYP Poster Competition (Systems, Man and Cybernetics track)

2023-02-13

The School of Computing and Data Science congratulates **Dr. Miraz Mahdi Hassan and Gan Yu En from Computer Science and Technology Programme for winning 2022 IEEE Malaysia Section Final Year Project (FYP) Poster Competition (Track 05: Systems, Man and Cybernetics)**.

Entitled “Detection and Prevention of SQL Injection Attacks with Machine Learning”, this work aims to propose a machine learning approach in detecting and preventing SQL injection attacks. By analysing user input from a simple login web application, the system will identify if the user input is classified as SQL injection or benign input. Also, the system has to be designed in a way to learn new inputs whenever it encounters an unknown input. Once malicious input is detected, the program will not allow the execution of the query to perform what the user has requested, and SQL injection will be prevented.

Organized yearly by IEEE Malaysia Section (Student Activities Committee), 2022 IEEE Malaysia Final Year Project (FYP) Competition was opened to all undergraduate students who were undertaking their Final Year Project or have recently completed their studies in 2022.

Two Papers from School of Computing and Data Science Accepted by AISC 2023: IEEE International Conference on Artificial Intelligence and Smart

Two papers from School of Computing and Data Science have been accepted by the AISC 2023: IEEE International Conference on Artificial Intelligence and Smart Communication, an international conference that brings researchers from interdisciplinary domains together for interaction and exchange of ideas. ***The project “Improving quantitative stock trading prediction based on MAD using Q-learning technology” was produced by Dr. Burra Venkata Durga Kumar, Dr. Teh Jia Yew, Zhao Pengcheng and Yin Siyuan from Software Engineering Programme***, which attempted to employ reinforcement learning models to predict the change of stock trading.

Both projects were led by Dr. Burra Venkata Durga Kumar.

XMUM Students Win Silver Medals in the Fusion 2022 Student Design Competition Communication

The School of Computing and Data Science **congratulates Elizabeth Khoo Ming Zhen and Khoo Yu Qi for being awarded Silver Medal in the Fusion 2022 Student Design Competition (Development Category)**. Entitled “A Mobile Application to Improve in Learning Science for Primary School Students with Attention Deficit Hyperactivity Disorder”, Elizabeth Khoo Ming Zhen from Soft Engineering Programme designed SciencePop, a mobile application, focused to present the design guidelines for creating mobile learning applications, to offer ADHD students an assistive learning tool to improve their study performance and enhance their motivation.

Both projects were conducted under the supervision of Ms. Siti Nurliana Jamali.

Participants from School of Computing and Data Science Win Silver Award in iVEDIIC2022

The School of Computing and Data Science **congratulates Dr. Burra Venkata Durga Kumar, Dr. The Jia Yew, Ms. Siti Nurliana Binti Jamali, Heng Chia Ying and Loong Qing Zhe for winning Silver Award in International Virtual Educational Invention, Innovation, And Design Competition (iVEDIIC2022).**

With the title “Real-Time System for Anesthesia Dosage to Surgical Patients Using Big Data Analytics”, the research aims to utilize big data to recommend anesthesia doses for each patient, and to design a Graphical User interface (GUI) for the dashboard to present data in real-time according to different factors affecting the dosage used. iVEDIIC2022 was organized by the Faculty of Education, University Teknologi MARA (UiTM) Selangor, Campus Puncak Alam. With its theme ‘Humanising Innovation for Creative Society through Collaboration’, the competition opens to professionals from all the culture of designs, inventions, and innovations in the academia and school community. Participants were eligible to attend three workshop sessions, providing them with opportunities to improve the quality of their entries.

Digital Media Technology Students Win Silver Award in FUSION 2022 Student Design Competition

The School of Computing and Data Science congratulates ***Dr. Valarmathie Gopalan, Diandra Kathyusha Herli and Clarissa Alda Wijaya from Digital Media Technology Programme for winning the silver award in the Fusion 2022 Student Design Competition.*** Entitled “Edume: A Study to Enhance Academic Performance By Reducing Emotional Stress Through The Use Of Educational Program Management Application”, this study proposed a mobile application for educational program management (EDUME) that will assist in managing educational programs in order to improve students’ academic performance by reducing their emotional stress.

Fusion 2022 Student Design Competition (SDC) is a competitive event that showcases the problem-solving and design ability of students in proposing solutions for real-world issues facing Malaysia and the world. This competition is organized by the Kuala Lumpur ACM SIGCHI chapter, or myHCI-UX.

ICT Students Shine in FUSION 2022 Student Design Competition

Two groups from School of Computing and Data Science have ***won first place and third place in Fusion 2022 Student Design Competition,*** for Development Category and Development Category respectively. Organized by the Kuala Lumpur ACM SIGCHI chapter, Fusion 2022 Student Design Competition (SDC) is a competitive event that showcases the problem-solving and design ability of students in proposing solutions for real-world issues facing our nation and the world. Third Place Winning Project: “Zeta: Smart Electricity Tracking and Optimization Embedded Systems with Mobile Application.

Team Members: Dr Ahmad Affandi Supli, Jocelyn Neo Hui Lyn, Lee Jin Yu, Oh Yi Wei, Shane Ho Ken Wae & Teo Hao Jing (Digital Media Technology Programme)