Middlesex University Mauritius

2024 Research Symposium

Integrating Interdisciplinary Perspectives for Sustainable Solutions

Book of Abstracts

16th March 2024

Message from the Pro-Vice Chancellor and Director

Dear colleagues, students, and research collaborators,

It gives me great pleasure to warmly welcome all of you to the 2024 Research Symposium: Integrating Interdisciplinary Perspectives for Sustainable Solutions. It is always a pleasure to host this gathering and experience how our MDX community gathers to share and discuss research findings.

This year's symposium holds particular significance as we focus on the overarching theme of integrating interdisciplinary perspectives for sustainable solutions. Through offering interdisciplinary perspectives, we not only foster collaboration but also contribute to the realization of the MDX 2031 strategy. As we collectively address the challenges facing our world today, our discussions will contribute to finding sustainable solutions, aligning with the MDX integrating themes, namely:

- Equity and advancements in health and wellbeing
- Inclusive socio-economic development and the enrichment of lives through cultural engagement
- Sustainability and its imperative role in preserving our environment

This symposium will provide a unique and valuable learning experience for all of us. It will enable us to expand our horizons, challenge our assumptions, and develop new perspectives on the world. I encourage everyone to participate in the sessions actively, engage in meaningful discussions, and network with colleagues and peers.

Finally, I thank all the participants and the Research and Knowledge Transfer Committee, who made this symposium possible. Without your support, this event would not have been possible. I wish you all a productive and enjoyable symposium and hope you leave this gathering inspired and enriched with new ideas and knowledge.

Prof. Mari Jansen Van Rensburg
Pro Vice-Chancellor, Middlesex University
Director, Middlesex University Mauritius

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The Power of Words and Images: How Message Framing and Gender in Anti-Domestic Violence Advertising Campaigns Affect Charity Donations

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Purpose: The charitable sector grew increasingly competitive globally, particularly for causes like domestic violence (Charities Aid Foundation, 2022; Immordino et al., 2020, Sung et al., 2023). Although there was a rise in charity giving in developed countries, a decline was noted in developing countries such as Mauritius which was among the biggest fallers from 2017 to 2021 (CAF World Giving Index, 2022). This emphasizes the urgency for resilient and impactful advertising strategies. Building on prospect theory (Kahneman and Tversky, 1979) and social role theory (Eagly and Crowley, 1986), the study aims to determine the impacts of positive (i.e., hope) versus negative (i.e., disgust) message framing on actual donating behaviors, and examines the moderating role of the victim's gender on this relationship.

Methodology: This study employed a quantitative approach to explore the efficacy of message frames on donation behaviours by integrating a between-subject online experiment. Given the defensive reactions from negative frames (Shanahan et al., 2012), it was noted that both hope and disgust were to be explored carefully with different levels (high versus low). Therefore, while adopting a 2 (disgust: low/high) x 2 (hope: low/high) x 2(gender of victim: male/female) between-subject experiment, the pilot study involved 102 participants, divided into control (n=19) or experimental (n=83) groups, thereby enhancing the study's internal validity. The experimental group was exposed to one of eight advertisements, each varying the emotional message frame and imagery of victims (male v/s female), followed by a survey to assess their donation behaviours.

Findings: Analysis revealed that among 83 respondents exposed to the advertisements, 45.7% (n=38) chose to donate, while 54.3% did not. Adverts featuring high disgust and high hope did not significantly alter donation behaviors, regardless of the victim's gender. However, low disgust frames elicited a stronger donation response, particularly with male victims. This suggests a nuanced, gender-sensitive approach to levels of emotional framing in charity advertising, as posited by the social role theory. Moreover, low hope frames led to a reduction in donations, highlighting a required balanced while crafting messages that resonate with the public spirit. Additionally, it was observed that 85.9% of respondents (i.e. 61 out of 71) had never donated to charities against domestic violence, aligning with the challenges noted from literature.

Research limitations/ implications: The study faced some limitations, such as a lower completion rate of the survey and the presence of structurally missing data. Out of the 83 participants from the experimental group, only 62 completed the survey, which could have resulted from participants withdrawing post-exposure to the advert.

Expected contributions: This study enhances interdisciplinary dialogue by integrating prospect and social theories to examine the impact of message framing and gender effects on donation behaviours. With a larger sample size (n=405), the study is expected to offer actionable insights for charities to boost donor engagement. These findings are expected to encourage sustainable giving practices while supporting the global charitable sector's adaptation to evolving societal needs.

Keywords: Social advertising; Message framing; Gender Dynamics; Charity Donation

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The Status of the Right to Freedom of Thought in Malaysia

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This paper explores the difficulties with recognising and enforcing the right to freedom of thought in the Malaysian jurisdiction. Currently, there is no specific right to freedom of thought in Malaysia. Although the right to freedom of speech and expression and freedom of religion are protected under the Federal Constitution of Malaysia ('FCM'), these rights are subject to broad qualifications, which militate against the typically absolute nature of the right to freedom of thought. In addition, the special status accorded to the religion of Islam under the Malaysian legal system poses real difficulties for the recognition and enforcement of the right to freedom of thought in this jurisdiction.

For instance, the ability of individuals to explore and hold unorthodox religious opinions, is constrained by Article 11 of the FCM, which enables the federal and state governments of Malaysia 'to control and restrict the propagation of any religious doctrine or belief among people professing the religion of Islam'. Muslims deviating from orthodox Islamic beliefs can be subjected to mandatory rehabilitation in centres that teach and enforce government sanctioned Islamic principles. Notwithstanding the constitutional guarantee of freedom of religion, the constitutional definition of Ethnic Malays as 'individuals who profess the religion of Islam' coupled with the ambiguity surrounding apostasy laws, effectively restrict the ability of those who are ethnically Malay to convert out of the Islamic faith.

Another potential conflict with the right to freedom of thought, is the legal requirement for Malaysian citizens above the age of 12 to carry an identification card stating their religion. Such a requirement may be said to sit uneasily with a conception of the right to freedom of thought that encompasses the right not to disclose one's opinions or beliefs. Government intervention in relation to the practice of Islam also impacts the intellectual freedom of students, as Islamic religious education is mandatory for Muslim children who attend state schools.

The primacy accorded to the Islamic faith in the Malaysian context demonstrates the difficulties with formulating an absolute right to freedom of thought in this jurisdiction. It also points to the deficiencies of universal conceptions of the right to freedom of thought that is often adopted in international human rights instruments. Any meaningful framework for the right of freedom of thought must account for the specific cultural and religious context of a jurisdiction.

Keywords: Freedom of Thought; Federal Constitution of Malaysia; Jurisdiction.

Challenge and Hindrance Techno Stressors in Predicting Student's Engagement and Academic Performance in Online Learning

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Higher Education Institutions have had to adapt themselves to face new challenges following the Covid-19 pandemic and had to replace face to face education with that of online teaching and learning. This rapid move to online learning systems has not come without its share of issues. Learning at home has been argued to be non-conducive. While faculties members may have been trained to cope with the new online systems, much less attention have been given to students who face the same challenges given the drastic change in the delivery of the curriculum. Teachers and student alike were compelled to adopt online systems with little to no preparations as there are no alternatives available. This has led to psychological and emotional distress amongst many students, who have not been able to engage with the class effectively. Prior studies in the education literature have sought to investigate stress from a psychological perspective; the underlying technological factor has not been accounted for. The move to a novel environment and the rapid change to an online learning system may lead to students experiencing technostress. Prior empirical studies on technostress have focused their attention mainly in the workplace and healthcare. In doing so, the impact of technostress on students have been neglected. Hence, this study aims to address this gap by further investigating the relationship between technostress, university students' engagement and academic performance through a dualistic view of technostress. We draw upon the extent literature and develop our conceptual model to test hypotheses posited. A cross-sectional survey of students was undertaken. Using a convenience sampling strategy, an email containing the invitation to participate in the study and a link to the online survey questionnaire was sent to students' email addresses. In total, out of 649 online questionnaires sent, 198 were returned with a response rate of 30%. Preliminary results show support for hypotheses posited. This study is still ongoing.

Keywords: Technostress, engagement, performance, burnout, online learning, challenge stressors

GTAs' Role in Fostering Empowering Learning Environments in Higher Education

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Overview of the research:

This research aims to define the role of GTAs in the context of higher education and how they contribute to building a strong learning environment among the students at university.

Purpose of the research:
GTAs play a crucial role in facilitating the students' academic and professional development at university. Whether by delivering workshops, lab tutorials, seminars, or even providing feedback to students, the role of GTAs has become more defined and pertinent in higher education. Oleson and Hora (2014) cited in Shum, Lau and Fryer (2020), determined that despite the diversity in duties and techniques for teaching, GTAs bring to their teaching and training experiences, pedagogical stances that are shaped by their own education, prior non-academic work, and ongoing research experiences. The purpose of this paper is to examine how GTAs assist in the creation of empowered learning environments by providing mentorship, small-group instruction, and support mechanisms that create a dynamic and inclusive learning environment that benefits students' academic and personal growth.

Methodology/design:
With reference to research conducted by Driver, Caldwell and Grunert (2023) about evaluating the extent to which an Undergraduate Teaching Assistants (UTA) encourage student learning and help seeking, the methodology will feature a similar approach of carrying out a quantitative survey analysis to help with the research and outcomes. Initially the research by Driver, Caldwell and Grunert (2023) involved 112 participants whose responses were cross-checked with exam results, attendance data, and free-form comments about the benefits and challenges of working with UTAs. A Qualtrics survey was conducted across 3 semesters to compare the results. However, in order to properly contextualize the main purpose of this paper, a similar survey would be conducted with students at Middlesex University Mauritius across courses with GTAs to gain a better understanding of the local context of the research.

Key findings/ Expected results:
Part of the findings from the research, in terms of workshop attendance, was such that 68% of the 112 enrolled students decided to attend at least one workshop during the semester, while 32% of them opted not to attend any workshops at all. The purpose of the analysis was to find out if students' opinions of UTAs' efficacy in fostering an inclusive sense of community and helping them remain disciplined. Students who attended class frequently expressed far stronger opinions of UTAs' efficacy at the end of the semester.

In the local context of Middlesex University Mauritius, from the results obtained, a reflection on the GTAs' practices and techniques could be evaluated in order to enhance and strengthen the learning environment of the students by identifying the gaps in the learning and expectations of the students. Moreover, the outcomes from the research can be used to construct a model that could make workshops, lab tutorial, feedback delivery and teachings more effective and interactive.

Key words: GTA; higher education; empowering learning; inclusive learning; growth

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Organizational Ambidexterity in the Age of Artificial Intelligence/Machine Learning (AI/ML): A Study of the Financial Sector in Mauritius.

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Purpose

The disruption caused by AI has impacted every sphere of human interaction. From manufacturing to services, businesses are fast realizing that the next set of competitive advantage will be based on AI. Supply chain integration, process automation and digital marketing, to name a few, are some aspects where businesses worldwide are keen to test the potential of AI/ML. Developing countries are by no means immune to these influences. In fact, understanding how AI impacts the business operations of the prominent sectors in an economy represents a major potential for stakeholders alike. Numerous studies have shed light on how AI is transforming businesses; from the impact of AI on firm productivity (Kopka and Fornahl, 2023) to infrastructural and cultural antecedents of AI (Baabdullah et al., 2021) to how AI can be exploited by existing large firms to drive out competitions from start-ups (Norback and Persson, 2023). However, very few studies have explored the link between organizational ambidexterity (Tushman and O'Reilly III, 1996) and AI/ML. This study seeks to explore this gap from the perspective of the financial sector of Mauritius, which is one of the major pillars of the country.

Methodology

This study will employ a qualitative analysis of how businesses in the financial sector, in particular banks, insurance companies and crowdfunding businesses perceive AI will re-orient their exploration needs. While firms in the financial sector have so far largely based their business model on exploitation rather than exploration (Campanella et al., 2020), this study intends to carry a survey of the 29 institutions (18 banks, 9 insurance companies and 2 P2P operators) in Mauritius to study how AI/ML integration impacts the exploitation-exploration plane. Consequently, this study will be instrumental in suggesting policy implications for the financial sector for both industry decision makers and authorities alike. Potential respondents will be contacted by email for the survey. Depending on the responses, interviews will also be scheduled to gain further insight into the AI mindset of respondents. This will further solidify the understanding of organizational cultural influences on adoption of digital tools (AI/ML).

Expected results

An a priori expectation is that financial institutions, just like any business, would be tempted to embark on the AI/ML journey to enhance operational efficiency. However, a distinguishing feature of this study will be to quantify the extent of exploitation and exploration of these businesses.

Keywords: ambidexterity and AI, financial innovation, banking system, digital transformation

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Moving Beyond the Norm: Examining Student Experiences with Informal Academic Support

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Within the context of Higher Education Institutions (HEIs), academic support is recognized as a fundamental element for promoting student success. However, despite its significance, the efficacy of academic support services is often hindered by challenges related to accessibility, approachability, resources and outreach. This study focuses on the academic support framework at Middlesex University Mauritius (MUM), where the Learning Enhancement Team (LET) operates within established parameters, catering to the needs of both faculty and students. The article aims to elucidate LET's innovative approach – a pilot initiative involving outdoor engagement with students – for spontaneous consultations and the implementation of various academic activities such as referencing quizzes, vocabulary games, and exercises on essay structure comprehension.

Drawing upon Harris's (1990) delineation of the expected responsibilities of academic support centers, including tailored instruction, collaborative dialogue, peer mentorship, the cultivation of independent learning skills, and the personal development of tutors (in this case, LET members), this research explores the relatively novel concept of informal student engagement within HEIs. Despite its potential benefits, the adoption of informal engagement practices remains relatively unexplored in the academic support landscape.

The primary objective of this study is to assess the impact of informal academic support settings on students' academic skill development and their understanding of LET services. Additionally, the researchers seek to investigate whether this initiative influences students' perceptions of LET tutors' approachability. Through a comprehensive evaluation, this study aims to contribute to the emerging body of literature on academic support effectiveness and student engagement within HEIs, providing insights that can inform future practices and policies in academic support provision.

In this study, data collection will employ two selected methodologies: a survey questionnaire and focus group interviews. The questionnaire aims to investigate whether participants (students) initially sought assistance from the LET through formal channels before engaging informally. It also seeks to explore participants' preferences regarding formal versus informal support. The focus group interviews will delve deeper into participants' responses, discussing whether they preferred discussing personal academic concerns or participating in activities such as referencing quizzes, vocabulary games, and exercises on essay structure comprehension. Additionally, it will also investigate whether LET's services would need to be restructured to reflect this endeavour.

While the comprehensive analysis of data is still underway, preliminary indications suggest a projected increase in student participation in outdoor support activities as opposed to traditional indoor settings. These anticipated findings not only hint at a potential shift in student engagement patterns

but also underscore the possibility of a burgeoning interest in alternative learning environments. Should these trends persist, the implications could be far-reaching, offering MUM a unique opportunity to reimagine its support services facilitated by the LET. By embracing a more dynamic and inclusive approach, MUM stands poised to foster a culture of innovation and adaptability in its educational support framework. This research endeavour holds promise not only in enriching the academic experience for students but also in enhancing the efficacy and relevance of LET's offerings. As the analysis progresses and insights deepen, the findings are anticipated to provide valuable guidance for MUM's strategic initiatives, paving the way for a more responsive and student-centered approach to academic support.

Key Words: Informal support, Learning Enhancement Team, Academic Support

Reference:

Harris, M., 1990. What's up and what's in: Trends and traditions in writing centers. The Writing Center Journal, 11(1), pp.15-25.

Associations between Minority Stress and Mental Health Outcomes in LGBTQ+ Youth in Mauritius: An Application of Meyer's Minority Stress Model in the Global South.

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Purpose:

The Minority Stress Model (Meyer, 2003) posits that social, psychological, and structural factors influence the health inequalities experienced by people with a sexual orientation or gender-diverse minority status. The cause of minority stress, contrary to general stress, is specifically rooted in or motivated by stigma and sexual prejudice against LGBTQ+ people. Over the last fifteen years, there have been some indicators that the Mauritian society is becoming more accepting of people belonging to sexual orientation and gender identity (SOGI) minority groups. On the 4th of October 2023, the Supreme Court declared Section 250 of the Criminal Code unconstitutional, decriminalising sexual intimacy between two consenting adult males. However, surveys carried out by NGOs advocating for equal rights have gathered that LGBTQ+ youth frequently face stigmatization, discrimination, harassment, and violence in various settings, including schools and tertiary educational institutions (Young Queer Alliance, 2017). The current study tried to fill in a geographical gap of information on the experience of minority stress among LGBTQ+ youth in Mauritius, with the aim of exploring associations it may have on their mental health.

Methodology:

Using snowball sampling, an anonymous online survey comprising of 6 subscales from Outland's (2016) Minority Stress Measure, State-Trait Anxiety Inventory and Positive and Negative Affect Schedule was circulated through two NGOs (Collectif Arc-En-Ciel and Young Queer Alliance). 87 responses from LBGTQ+ young adults in Mauritius were collected. The data was analysed through a series of Analysis of Variances (ANOVAs), correlations and simple linear regressions.

Findings:

Findings revealed that all respondents experienced moderate to high levels of anxiety symptoms, with no significant differences within the LGBTQ+ community. LGBTQ+ youth reported instances of identity concealment, everyday microaggressions and rejection anticipation more frequently than discrimination events, internalised stigma, and victimization events. Transgender students reported a significantly higher occurrence of everyday microaggressions and discrimination events. Experiences of identity concealment, everyday microaggressions, rejection anticipation and internalised stigma positively correlated with anxiety symptoms. Minority stress was a significant predictor of anxiety symptoms.

Keywords: Minority Stress; Stigma; Mental Health; Mauritius

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"It's Very Taboo to Speak About These Things": An Interpretative Phenomenological Analysis of Cultural and Contextual Beliefs Surrounding Psychological Distress

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International research indicates that university students are at a greater risk of experiencing mental health issues when compared to the general population. Within the local higher education context, there is a dearth of research pertaining to student psychological distress, whether it be in terms of its causes, indicators or consequences. Hence, a case study has been undertaken at a British higher education institution in Mauritius in order to explore a university community's perspectives on the phenomenon of student psychological distress. In recent years, several instances of distress have been observed within this educational institution, making it an appropriate setting to conduct this current research.

A mixed methods design was utilized in order to meet the objectives of the research. Participants comprised both academic and administrative staff, current students and alumni. An anonymous online survey questionnaire was used to collect quantitative data from current students. Semi-structured interviews were conducted to gather qualitative data. Both focus group interviews (with staff and current students) as well as individual interviews (with alumni) were undertaken.

It is anticipated that the overarching findings of this research study will provide some important insights into the various dimensions of student psychological distress within the local context. It is moreover expected that the perspectives gathered from different members of the university community will help in devising key recommendations targeted at better supporting students' mental health, e.g. strategies to promote mental health and destigmatization, tailored mental health interventions and enhanced mechanisms to improve visibility of and access to mental health support.

This conference presentation will focus specifically on the data collected from six alumni who personally experienced psychological distress at the time when they were university students. Interpretative Phenomenological Analysis was utilized to gain insights into the lived experiences of alumni's psychological distress. Nine group experiential themes and 19 sub themes were derived from participants' accounts. Given the scope of the conference presentation, only one key group experiential theme i.e. 'Cultural and contextual components of psychological distress', and its five related sub themes will be discussed.

Keywords: student psychological distress; culture; IPA.

Cyber Defender Programme: Enhancing Cybersecurity Awareness and Skill Development in University Settings

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This abstract presents the comprehensive Cyber Defender Programme, a collaborative initiative between Middlesex University Mauritius and London Cybersecurity students, aiming to enhance cybersecurity awareness and skill development among university students. The project, concluded in June 2023, and was funded through the Enhancing Education Award scheme of Middlesex University. The collaboration was a robust effort aimed at creating and implementing an extensive cybersecurity course hosted on the Unihub/Moodle platform.

Purpose of the Research:

The primary objective was to develop and deploy a holistic cybersecurity education program targeting students' cyber defense skills. The initiative sought to bridge theoretical knowledge with practical application by adopting the H5P framework and integrating the TryHackMe platform for interactive learning experiences. The program aimed to empower students with knowledge encompassing various cybersecurity domains, including Identifying & Avoiding Online Scams, Social Engineering, Phishing, Password Management, Safe Browsing Habits, Social Media Safety, and Social Engineering Awareness.

Methodology/Design:

The research methodology involved collaborative efforts between Middlesex University Mauritius and London Cybersecurity students. It encompassed content creation, interactive assessment design, practical applications via TryHackMe, team collaboration, evaluation, skills development, and a desktop poster initiative. The approach emphasized weekly team meetings to facilitate idea sharing and task allocation while ensuring no content duplication and effective course structuring.

Key Findings:

The Cyber Defender Programme culminated in the successful creation of a comprehensive cybersecurity course that could be seamlessly integrated into university inductions. The initiative notably raised cybersecurity awareness, improved digital literacy, and enhanced educational content, benefiting both faculty and students. Challenges related to communication complexity, learner diversity, and balancing rigor with engagement were effectively addressed, resulting in a course that catered to varied backgrounds while remaining engaging.

Keywords: Cybersecurity Awareness; Higher Education; Interactive Learning; TryHackMe; H5P Framework.

Integrating Environmental Education into the Mauritian Secondary Education Curriculum for Sustainable Solutions

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This research study focuses on the integration of environmental education into the Mauritian Secondary Education curriculum as a means to promote sustainable solutions. The aim of the study is to explore the potential benefits and challenges of incorporating environmental education across different subjects and grade levels in Mauritius. By integrating environmental education into the curriculum, the research seeks to enhance students' understanding of environmental issues, foster a sense of environmental stewardship, and empower them to contribute to sustainable practices in their communities.

The research questions guiding this study are as follows:

1. What are the existing frameworks, best practices, and case studies on integrating environmental education into secondary education curricula in other countries?
2. What strategies and approaches have been found to be effective in promoting environmental education and sustainable solutions in these studies?
3. How can these strategies and approaches be adapted and applied to the Mauritian Secondary Education curriculum to enhance environmental education and promote sustainable practices among students?

To address these research questions, a meta-analysis will be conducted. A systematic search will be performed to identify relevant studies published in academic journals, conference proceedings, and reports. The selected studies will be critically evaluated, and data will be extracted to identify common themes, strategies, and approaches used in the integration of environmental education into curricula. The findings from the meta-analysis will be analyzed and synthesized to identify effective strategies and approaches that can be adapted to the Mauritian context. Recommendations will be provided for curriculum developers, policymakers, and educators to incorporate these strategies into the Mauritian Secondary Education curriculum, thereby fostering environmental awareness, knowledge, and sustainable practices among students.

By conducting a meta-analysis, this research study aims to provide evidence-based insights and recommendations for integrating environmental education into the Mauritian curriculum. The findings will contribute to the development of a comprehensive and effective approach to environmental education in Mauritius, promoting sustainable solutions and environmental stewardship among the Mauritian youth.

Navigation System in Dynamic Environment

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The evolution of automated navigation systems has significantly impacted robotics, especially in applications like automated driver assistance and industrial warehousing (Goddard, 2021). While navigation technology has successfully operated in stable environments like urban areas, challenges persist in dynamic settings characterized by unpredictable obstacles and changing conditions. LiDAR (Light Detection and Ranging) technology, known for its ability to create highly accurate 3D maps, is at the forefront of this research area. Despite its potential, the efficiency of LiDAR in dynamic environments is still underexplored, highlighting a significant gap in the existing literature and technology. The research identifies a critical problem in the current systems of autonomous navigation performance degradation in dynamic environments with unpredictable obstacles. LiDAR's effectiveness in these settings remains poorly tested, leading to a gap in adaptable, secure navigation solutions that can dynamically adjust without compromising functionality. This research aims to address the lack of a reliable, adaptable navigation system capable of maintaining high precision and reliability in changing environments. The project proposes an innovative algorithm combined with advanced LiDAR technology to enhance autonomous navigation in complex settings. It involves comprehensive research on the limitations of existing navigation systems, exploration of LiDAR technology, development of intelligent algorithms for dynamic adjustment, scalability solutions, and the establishment of safety protocols. The methodology emphasizes the integration of LiDAR with Slamtec technology and custom algorithm development for real-time adaptability. The expected outcome includes building a robot and developing a custom algorithm for a navigation system that enhances scalability and security beyond current LiDAR technologies. This project will make autonomous systems more effective in diverse and unpredictable conditions, broadening their use and effectiveness. The goal is to offer a scalable, efficient navigation solution that fills existing gaps, with the hands-on creation of both the robot and its navigation algorithm marking a significant contribution to dynamic environment navigation.

Keywords: LiDAR; Autonomous Navigation; Dynamic Environments; Algorithm Development; Scalability; Safety Protocols; Slamtec Technology.

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An Investigation of Intelligent Decision Support System Adoption in Small and Medium Enterprises in Mauritius

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Decision-making is an important and tedious process in all organisations. There are different types of decision-making, namely, strategic, operational and managerial decisions. Many systems have been developed to aid in the decision-making process, such systems are Management Support System (MSS). There are different types of MSS, namely, Management Information System, Decision Support System (DSS) and Executive Information System (EIS). As technology evolves, the integration of Artificial Intelligence (AI) into these systems has materialized, leading to the emergence of Intelligent Decision Support Systems through the association of AI with DSS.

In the context of Mauritius, Small and Medium Enterprises (SME) plays a pivotal role in the economy. The contribution of SMEs is significant to both Mauritius's Gross Domestic Product (GDP) and employment, thus their survival is of paramount importance. However, those businesses face challenges in decision-making process such as not having the right data, wrongly interpretation of data or a lack of knowledge. Additionally, SMEs are influenced by environmental factors that may impact their decision-making.

To address the above-mentioned challenges, the implementation of Intelligent Decision Support System (IDSS) might help entrepreneurs. IDSS, combines artificial intelligence (AI) and Decision Support System (DSS) functionalities. IDSS, is a computerised system which analyses and interprets data which aids decision makers to get an insight on the outcome of a particular decision. In this paper, we will explore the factors that enables the adoption of IDSS in SMEs in Mauritius.

Keywords: Small and Medium Enterprise, Decision Making, Intelligent Decision Support System, Mauritius

A Browser Extension to Detect Reflected Cross-Site Scripting Attacks in Real-Time Using Machine Learning Techniques

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Cyberspace presents a complex landscape where defense strategies must continuously evolve to mitigate emerging cyber-threats and protect network traffic. Nowadays, URLs and links are frequently shared and clicked without adequate verification of their legitimacy, posing a significant risk to online security and privacy. Reflected Cross-Site Scripting (RXSS) vulnerabilities are constantly being uncovered by researchers within websites such as the ACF WordPress plugin (Balaji, 2023), often just in time to prevent potential exploits. RXSS persists as one of the top ten web application security risks (OWASP, 2021; Nir, 2023). Existing techniques such as input validation and sanitisation, browser filters, web application firewall, browser extensions, and machine learning have demonstrated robustness (Fowdur and Hosenally, 2022), however, new and innovative threats are rendering them increasingly unreliable.

A comprehensive literature review conducted has revealed that a multitude of machine learning techniques can effectively protect against RXSS threats, although none have yet been proposed for integration within a browser extension for real-time detection. As such, this study proposes a Chrome extension which aims to defend against RXSS attacks using machine learning techniques.

The extension will monitor and keep track of visited links using session storage whilst scanning each link in real-time for the percentage of malicious scripts embedded within. The Support Vector Machine (SVM) algorithm will be implemented in Python, performing feature extraction of pre-processed data for training and testing, following by its integration with the extension. The extension will also be in the form of a popup which, upon clicked, displays a summary of the currently opened webpage. Moreover, the user can access the dashboard for customisation, deletion of the saved links and view the summary of each link. Additionally, statistics about the most vulnerable websites will be displayed, along with a help section for instructions, policies, and feedback.

The evaluation metrics of the machine learning algorithm will be primarily accuracy, precision, and recall. The purpose of this evaluation is to determine how accurately the extension can distinguish between malicious URLs and legitimate ones. The extension will also be evaluated based on functionality to ensure it works as expected, security to ensure it follows the best practices, performance to measure response time and memory usage, compatibility to ensure there are no conflicts with other extensions, and compliance with Chrome Web Store Program Policies (Chrome for Developers,2024).

One major challenge for this project is the computational cost of running the machine learning algorithm and the integration process. Moreover, while Chrome stands as the most prevalent browser globally, it must be acknowledged that the extension may lack compatibility with other browsers.

Therefore, it will be a necessity to revisit the code to ensure adaptability and seamless functionality across other browsers if the project is to be expanded.

Keywords: Machine Learning; Reflective Cross-Site Scripting; Browser Extension; URL; Cybersecurity

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Smart Home Prototype

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The integration of automation and wireless connectivity has altered households globally, addressing critical issues such as excessive energy consumption and rising water costs. Despite technological advancements, ecological sustainability remains paramount, urging the need for more energy-efficient solutions. This has led to the emergence of smart homes, offering potential savings of up to 40% in energy costs compared to traditional homes. This project provides a comprehensive exploration and implementation of a cost-effective smart home system prototype integrating automation, Internet of Things (IoT), voice control, and face detection to enhance convenience, security, and overall user experience. The low-cost smart home system model was implemented through two microcontrollers, namely Arduino Mega board and an ESP32, incorporating the following essential automation functions via different sensors such as temperature regulation, presence detection, rain detection, energy management, alarm activation, and a keypad-entry system. The system consists of an Arduino Mega board that manages the sensors and actuators, an ESP32 middleware that is connected to the Arduino Mega via UART communication, and an IoT platform called Blynk that communicates with the ESP32 via the internet. By using the Blynk GUI, users can monitor and control their smart devices from a web browser or a mobile phone. This provides convenient control over house applications, including notifications in emergency situations and the ability to connect multiple devices based on individual needs. Voice control using IFTTT (If This Then That), which is a web-based platform to automate services with Google Assistant via webhooks and a Python-based facial detection system to enhance the smart home's usefulness and security. The system was tested through test plans, and almost every test was accomplished without difficulty. Evaluation of user feedback obtained via the User Experience Questionnaire Plus (UEQ+) and expert evaluation through cognitive walkthroughs gave above-average results of 82.28%, hence, showing the effective performance of the smart home. The drawbacks were found to include the participants' pronunciation of commands using Google assistant voice control feature, with 66% of participants having to repeat themselves, and the slowness of the face detection system notification reported by the majority of users. Nevertheless, this study reveals a practical and feasible real-world application of the proposed smart home prototype using sustainable and low-cost materials and components.

Keywords: Automation, IoT (Internet of things), Blynk, Voice Control, Facial Detection System.

IOT Based Smart Parking System

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Parking management is a crucial aspect of urban planning that is often given little consideration. Traditional approaches are inefficient, contributing to the already frustrating daily commute and further degradation of the environment. This project proposes a sustainable alternative to traditional parking management in busy areas around Mauritius.

After conducting an extensive literature review, poor parking management was found to be a direct contributing factor to traffic congestion, pollution and vehicle theft. This highlighted the need for more efficient and intelligent solutions, prompting further research into how machine vision, a subset of Artificial Intelligence (AI), could be used in this regard. Convolutional Neural Networks (CNNs) were found to be a suitable candidate for object recognition in Licence Plate Recognition (LPR) systems due to their optimal results in real-time applications. YOLOv8, a CNN-based algorithm, proved to be especially exceptional at recognising licence plates, demonstrating high accuracy and speeds when compared to other CNN algorithms. Several existing solutions were also discussed and compared, providing insights into different approaches to the topic. It was found that many solutions lacked a reservation feature or had a lacklustre approach to security.

As such, an IoT-based Smart Parking system was designed to address the issues of traditional parking management and the limitations of existing solutions. The proposed system handles data collection with an Arduino Mega that constantly sends data to an ESP32 for network communication with a server. Choosing sensors for detecting vehicle presence was done with sustainability in mind, which is why IR sensors were chosen for their low-power consumption and relatively easy maintenance when compared to other commonly used sensors. Since security was another point of focus, access control to the parking lot is done with RFID, while an automatic licence plate recognition system using the YOLOv8 machine vision algorithm monitors and records the flow of vehicles in FireBase, a cloud database service. With Blynk, an IoT service provider, users can gain remote access to real-time information about the availability of parking spaces using data from the sensors and reserve a space of their choosing through an intuitive website or mobile application.

Systematically breaking down the problem led to a deeper understanding of how to tackle issues related to parking management. Applying these findings when designing the proposed system resulted in a more robust and sustainable parking management approach that not only saves drivers time but also provides greater security in a parking lot.

Keywords: Internet of Things; Parking Management; Sustainability; Machine Vision; Sensor Networks

Investigating Gamification as a Learning Tool for University Students

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This study explores the potential of gamification as an innovative educational approach in enhancing learning experiences for university students. With the digital transformation of educational methods, gamification has emerged as a promising tool to engage and motivate learners. This research primarily focuses on assessing the efficacy of gamified learning elements in fostering academic engagement and improving learning outcomes among university students.

The study was conducted at Middlesex University Mauritius, involving a sample size of 91 students. It employed a Design-Based Research (DBR) methodology, incorporating iterative cycles of development, testing, and refinement. The research integrated quantitative and qualitative methods, with data collected through a carefully structured questionnaire and analysed to gauge the impact of gamification on student engagement and performance.

Key findings indicate that the implementation of gamification strategies, such as point systems, badges, and leaderboards, significantly enhances student engagement, motivation, and comprehension of complex subject matter. However, the study also acknowledges challenges and limitations, including varied responses to competitive elements and the need for tailoring gamification to individual learning preferences.

This thesis contributes to the understanding of gamified learning in higher education and offers insights for educators seeking to incorporate gamification into their teaching strategies. It underscores the importance of aligning gamification with educational objectives and the diverse needs of learners, advocating for a balanced and thoughtful integration of gaming elements into the curriculum.

Keywords: Gamification, Higher Education, Game elements, Lecture based, University students.

An Automated Attendance Tracking System Using Face Recognition Technology

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In today's rapidly evolving world, marked by an unyielding pursuit of efficiency and innovation, it is imperative to reassess our conventional attendance methods. Taking attendance, is an extremely important part of administration. However, the traditional methods, such as roll calls, have become obsolete since it can easily become a tedious task, prone to errors, especially when dealing with a large number of students (Dev & Patnaik, 2020). In recent years, implementations of automated attendance tracking systems utilising face recognition technology have explored the potential of this technology to enhance accuracy, stability, and efficiency in tracking student attendance. Despite the findings, these studies have also revealed some limitations and obstacles in this subject that must be addressed (Dalvi, et al., 2022). Hence, this project aims to bridge these gaps, providing an innovative sound solution for accurate and efficient attendance tracking in the setting of educational institutions. The project's objective is to create an automated attendance system which takes real-time footage from classes, identifies individuals, and marks them present in the database. For the optimum outcome, the identification of individuals will be broken down into smaller steps: face detection, image enhancing and facial recognition. Additionally, the database will also include the statistics concerning the attendance of each class, along with an intuitive user interface for pleasant user experience. Therefore, in order to gain insight on the system's strengths and weaknesses for further improvement and contribution to the field of automated attendance tracking systems using facial recognition, a thorough evaluation is necessary. The system's accuracy, time efficiency, and adaptability to various environments are rigorously evaluated in comparison to traditional methods, including manual pen-and-paper attendance and roll calls, to demonstrate the effectiveness of the proposed solution.

Keywords: Automated attendance tracking systems; face recognition technology; traditional attendance methods.

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Design and Implementation of a Smart Motorcycle Helmet

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Background of study

Motorcycles are a rapidly increasing mode of transportation, with a market revenue of $110 billion in 2023, up from $98.8 billion in 2022 (Fact.MR, 2023). Motorcycle deaths accounting for 14% of motor vehicle crash deaths in 2021 (IIHS-HLDI, 2021), ensuring rider safety has become paramount. The motorcycle helmet has been proven to significantly reduce head injuries by 88% and fatality rates by 42% (NIH, 2022). Many riders however refuse to use the helmets due to visibility limitations and post-ride discomfort (NIH, 2014). While these helmets have undeniably saved countless lives, recent advances in technology present an opportunity to enhance their functionality – smart helmets.

Smart helmets, by use of new technologies, aim at enhancing riding experience and situational awareness. The market for smart helmets grew from $468 million in 2021 to $610 million in 2023, projected to reach $1.5 billion in 2030 (Precedence Research Pvt. Ltd., 2022). However, challenges like unreliable connectivity and high costs persist.

Problem Statement

Traditional motorcycle helmets have limitations, particularly in visibility. The bulky design restricts head movement, hindering the rider's ability to see vehicles on the sides and behind. Even with rear-view mirrors, blind spots persist. Additionally, many riders glance down at their phones for navigation or speedometer readings, posing a significant safety risk, especially near intersections. From January to midAugust 2023, 36 fatalities occurred on motorcycles, with 29 riders and 7 passengers involved in fatal accidents (Staff, Fatal accidents involving motorcycles 2023).

Design methodology:

For this project, a straightforward methodology encompassing four key phases—design, implementation, testing, and evaluation—will be employed. This sequential approach ensures a systematic progression through the development lifecycle, emphasizing iterative improvements and validation.

Design Phase: In this initial phase, the focus lies on conceptualizing the smart helmet's structure and functionalities. It involves creating artifacts such as Class Diagrams, Sequence Diagrams, and State Diagrams to outline the system's architecture, interactions, and behavioural aspects. The design phase sets the foundation for subsequent development stages.

Implementation Phase: Following the design, the implementation phase involves translating the design artifacts into a functioning prototype. It involves integrating hardware and software components, developing the HUD, sensor systems, communication modules, and control interfaces as per the design specifications.

Testing Phase: Once the prototype is developed, rigorous testing ensues. This phase involves various types of testing, including functional, performance, and user acceptance testing. Testing ensures that the smart helmet meets functional requirements, operates reliably, and complies with safety standards.

Evaluation Phase: The final phase involves evaluating the smart helmet prototype's performance and usability. User trials, simulations, and real-world scenarios are conducted to gather feedback and assess the helmet's effectiveness in mitigating blind spots, enhancing safety, and providing a seamless user experience.

Expected Contribution:

The smart motorcycle helmet prototype aims to demonstrate the feasibility of augmented reality heads-up displays, integrated blind spot monitoring, and distraction mitigation in enhancing rider safety. If proven effective, further development could promote adoption to reduce motorcycle accidents.

Keywords: smart helmet, blind spot detection, collision alert system, heads-up display, motorcycle safety

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Revolutionizing Industry: The Role of Autonomous Robots in Transforming Workforce Efficiency and Safety

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Background

Recent advancements in autonomous robotics enable robots to carry out specific tasks without human intervention through capabilities like independent navigation. Key capabilities rely heavily on simultaneous localization and mapping (SLAM) algorithms, which facilitate environmental mapping, optimal route planning, controlled movements, and dynamic obstacle avoidance. Applications are far-reaching, spanning warehousing, manufacturing, agriculture, transportation and more, with potential for further progress in perception, decision-making and learning abilities. However, meaningful human oversight remains essential to ensuring these systems behave safely, ethically, and as intended.

Purpose

Navigating the real world poses significant challenges for autonomous robots. Sensors like lidars, cameras, and radars often struggle to accurately interpret their surroundings due to issues such as obstructions, variations in lighting, and adverse weather conditions. Even advanced mapping algorithms face difficulties when dealing with incomplete or messy data, making it challenging for robots to plan routes and avoid collisions (Mavrogiannis et al., 2023). A notable issue is the lack of adaptability in today's robots compared to humans. They encounter difficulties in handling dynamic and constantly changing environments, such as unlocked doors, moving furniture, crowds, and unexpected situations. The pre-set programming of robots proves inadequate in chaotic real-world settings. Furthermore, there is room for improvement in movement planning systems, as complex mathematical formulas that work well in theory often result in jerky, inefficient, or even dangerous robot motion. Another aspect is the absence of common sense in autonomous robots' navigation, which humans naturally possess. Robots may misinterpret gestures and social norms, leading to accidents or disturbances (Loganathan and Ahmad, 2023).

Methodology We've developed an innovative autonomous robot designed to navigate through unfamiliar realworld environments. This advanced system integrates a mix of diverse sensors and smart algorithms, offering a groundbreaking solution to the challenges of robotic navigation. Equipped with cameras, ultrasonics, and a LiDAR sensor, our robot achieves precise 2D mapping, ensuring detailed environmental perception. Utilizing GMapping within the SLAM framework for accurate mapping and localization, this robot is adept at adapting to dynamic and unpredictable environments.
Comprehensive Sensor Integration:

- Ultrasonic sensors for close-range obstacle detection.
- LiDAR sensor for accurate 2D mapping.
- Advanced Environmental Perception: Fusion of sensor data for a complete understanding of surroundings.

- High precision in detecting and navigating around obstacles.
- SLAM for Dynamic Mapping:
- Utilization of GMapping for effective integration of LiDAR data.
- Real-time construction of reliable spatial maps.
- Precise Localization: SLAM-based techniques for accurate self-localization in diverse environments.

Expected Findings

This research aims to prove enhanced autonomous navigation capacities for next-generation robots across industries, without restricting operating environments with artificial markers, beacons or predefined maps. More accurate and reliable localization, motion planning and obstacle avoidance suited for real-world flux leads to wider applications, while still permitting safe oversight. We expect to set new standards for adaptable, fail-safe integration of autonomous mobile systems across unstructured settings like warehouses, hospitals, commercial spaces, and outdoor areas. This technology stands to greatly expand robot usefulness while reducing risks.

Keywords autonomous robots; navigation; simultaneous localization and mapping; sensor fusion; human-robot collaboration

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MoNIC: A Smart NIC Identity Vault based on the NFC Technology

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The increasing digitization of services, including government services worldwide, has shown that there is an urgent need for robust digital identity solutions. Inspired by Estonia's eNIC, this project aims to design a system tailored to our unique Mauritian landscape. Over the years, Mauritius has introduced several identification and personal documents such as birth certificates, national identity card, and most recently, vaccination card [1]. However, due to the different timelines of these documents, they were designed in different formats. Furthermore, they are issued and handled by different entities, resulting in reduced attempts to digitize these [1]. This leads to a noticeable but often ignored problem: there are too many physical documents to carry around. Additionally, the counterfeiting of documents has become a common occurrence[2], highlighting two major problems – inconvenience and corruption in a fragmented system.

After a thorough literature review on existing solutions internationally, three specific ones – Malaysia's MyKad, Estonia's e-Estonia, and Singapore's SingPass – provided a framework of reference for designing the proposed solution. The gaps in the aforementioned solutions were that SingPass used only a mobile phone application to implement its solution [3], while the other two relied solely on an embedded chip technology [4][5]. Hence, the solution proposed is to have a hybrid version of the two options – a card with an NFC tag that can be managed using a mobile application. The solution aims to regroup all personal documents under one solution. The owner will be able to view his/her own documents as well as get notifications when some of the documents are no longer valid. Additionally, the solution allows for enforcers to access the documents of citizens based on access rights. Lastly, entities will be allowed to share documents amongst themselves in a more seamless and secure manner.

The successful implementation of this project in Mauritius can revolutionise the identification system that we currently have, streamline administrative processes and delivery of services, and enhance citizen engagement. The system will be evaluated using two techniques: a SWOT analysis and the Technology Readiness Index (TRI). Since the proposed solution is a system that is radically different from the existing one, the former evaluation technique allows a qualitative evaluation deriving insights into the feasibility and sustainability of the project. The latter will assess the receptiveness based on motivators (optimism and innovativeness) and inhibitors (discomfort and insecurity) of a representative sample of the population [6].

The analysis of the evaluation will give us an indication of how thorough and rigid the proposed solution is as well as an indication of whether such a solution will indeed create a more efficient system. Finally, we will also get a good grasp of the readiness of the Mauritian population regarding such a major change. The end goal of this project is to have a prototype of the digital NIC along with

the mobile application which works both for citizens and government entities as well as a report that will document the procedure and give founded insights into the future large-scale implementation of this concept.

Keywords: eNIC; NFC; Identity Vault; mobile application; TRI

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A Machine Learning-Powered Mobile Application for Early Prediction, Personalized Insights, and Management of Polycystic Ovary Syndrome (PCOS)

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Polycystic Ovary Syndrome (PCOS) presents a significant healthcare challenge, affecting the lives of millions of women globally (WC;, 2014). PCOS is characterized by a variety of symptoms and associated conditions, including irregular menstrual cycles, weight gain, acne, hirsutism (excessive hair growth), and insulin resistance (McCartney and Marshall, 2016). The complexity of PCOS interplay of genetic, hormonal, and metabolic factors and therefore poses significant challenges for diagnosis, as there is no single test for PCOS, and its symptoms overlap with those of other conditions (McCartney and Marshall, 2016). Consequently, the management of PCOS requires a tailored approach to the individual's symptoms.

The global implications of PCOS are profound, affecting population growth, reproductive health, and the burden on healthcare systems (Liu et al., 2021). Women with PCOS face increased risks of infertility, miscarriages, type 2 diabetes, cardiovascular disease, and mental health disorders, such as depression and anxiety (Nasiri Amiri et al., 2014). In light of these challenges, an analysis reveals a growing interest in leveraging technology, particularly machine learning and mobile health applications, to enhance the diagnosis and management of PCOS (Wang, L. et al. (2022)). Recent studies have demonstrated the potential of machine learning algorithms to analyse complex datasets and identify patterns that may predict the presence of PCOS and its associated complications (Elmannai et al., 2023). Building on this foundation, "Bloom" emerges as a transformative mobile application designed to address the unique needs of individuals with PCOS. The app harnesses the power of machine learning to offer predictive insights.

The application will include features designed to manage user accounts, track menstrual cycles, calculate and track Body Mass Index (BMI), and integrate a PCOS prediction model. These features aim to provide personalized health recommendations, a secure platform for women's diaries, in-built calendar functionality, a repository for medical history, and an educational blog. At the heart of Bloom's innovation is a machine learning framework, predominantly leveraging the Random Forest algorithm. This algorithm is renowned for its accuracy and adeptness in deciphering complex data patterns, ensuring that Bloom will offer precise predictive insights tailored to the unique health profiles of its users (Donges,2021).

For the evaluation of "Bloom," the focus will initially be on its predictive capabilities, specifically measuring Accuracy, Recall, Precision, and the F1 Score. These metrics are essential for understanding how effectively the app can predict PCOS and manage its symptoms, providing a quantitative measure of the machine learning model's performance. The evaluation plan is also designed to ensure the application not only meets but exceeds the expectations of its users and healthcare professionals. By

incorporating expert and doctor reviews, the evaluation seeks to validate the clinical accuracy and relevance of the content provided by Bloom.

In essence, Bloom represents a bridge between technological innovation and clinical expertise, offering a new model for managing chronic conditions like PCOS. As technology continues to reshape healthcare landscapes, Bloom will stand as a testament to the transformative power of machine learning, paving the way for a new era of personalized and proactive healthcare solutions.

Keywords: Polycystic Ovary Syndrome Prediction; Random Forest Algorithm; PCOS Management; Machine Learning; Mobile Health Applications.

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