INTERNATIONAL RESEARCH SYMPOSIUM -2025 (IRS2025-UoVT)

"Breaking Barriers Empowering Change"

UNIVERSITY OF VOCATIONAL TECHNOLOGY
SRI LANKA

12th December, 2025

ABSTRACTS

INTERNATIONAL RESEARCH SYMPOSIUM -2025 (IRS2025-UoVT)

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PREFACE

It is with great pleasure that the University of Vocational Technology (UoVT) presents the *International Research Symposium 2025* and its accompanying Abstract Book. Since its establishment, UoVT has continued to advance its mandate of promoting research, innovation, and knowledge creation within Sri Lanka's Technical and Vocational Education and Training (TVET) sector. Building on the foundations laid through previous symposiums and annual research publications available on *uovt.ac.lk*, this year's event further strengthens the university's commitment to evidence-based development and global academic collaboration.

The International Research Symposium has evolved into a key platform that brings together academics, researchers, industry partners, policymakers, and students to share emerging insights and solutions relevant to vocational technology, engineering, education, and labour-market transformation. Each year, the symposium has expanded in scope and quality, reflecting UoVT's growing research culture. The 2025 edition continues this tradition by encouraging interdisciplinary inquiry, fostering innovation, and supporting applied research that addresses national and regional development priorities.

This Abstract Book showcases the collective intellectual contribution of researchers whose work spans diverse fields—including engineering technology, ICT, teaching–learning innovation, TVET policy, industrial training, entrepreneurship, and sustainable development. These abstracts highlight ongoing efforts to strengthen the TVET system, enhance workforce readiness, integrate emerging technologies, and promote inclusive, future-focused skills development.

We extend our sincere appreciation to all authors, reviewers, session chairs, and partners who contributed to the success of this symposium. Their dedication has ensured the quality and relevance of this year's research outputs. We also acknowledge the leadership of UoVT's academic and administrative teams for their continued support in nurturing a vibrant research environment.

It is our hope that the findings presented here will inspire further inquiry, inform policy and practice, and contribute meaningfully to the advancement of vocational education—locally and globally.

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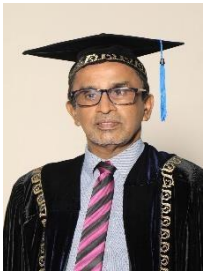
Message of the Vice Chancellor



It gives me immense pleasure to extend my warmest greetings to all participants, organizers, and contributors to the 9th International Research Symposium -2025 of the University.

The publication of this Abstract book marks a significant milestone in our collective pursuit of academic excellence and innovation. Research and innovation serve as the cornerstone of any thriving academic institution. It sparks curiosity, encourages critical thinking and drives the advancement of knowledge that benefits society at large. This symposium is a testament to the vibrant research culture nurtured within our university and among other contributors and partners. It provides a vital platform for scholars, researchers and students to share ideas, present their findings and engage in meaningful discourse across disciplines.

I am particularly delighted to see the collaborative spirit evident in many of the contributions—an essential ingredient for impactful, real-world research.

I sincerely thank the organizing committee for their dedication in bringing this symposium to fruition and for ensuring the quality and integrity of this publication.

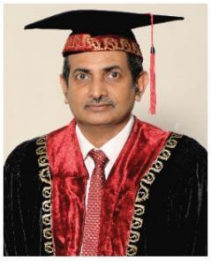
As we turn these pages, may we be inspired by innovation, insight, and determination presented in every paper.

My best wishes to IRS 2025 ….!!

Dr. L.W.S. Kularatne

Acting Vice Chancellor
University of Vocational Technology
Dean / Faculty of Education

Message of The Dean, Faculty of Engineering Technology



It is a privilege to extend my warmest wishes to the 9th International Research Symposium (IRS-2025) of the University of Vocational Technology. The IRS stands as a reflection of our unwavering commitment to advancing knowledge, fostering innovation, and nurturing a vibrant research culture across our academic community.

Each researcher has contributed to this event through rigorous exploration, creative thinking, and a dedication to solving real-world problems. These research works reflect not only technical excellence but also the passion and curiosity that drive meaningful progress. I am truly encouraged to see how our researchers continue to explore emerging technologies, interdisciplinary perspectives, and novel solutions that are shaping the future of vocational and technological education.

IRS 2025 provides an invaluable platform for dialogue, reflection, and collaboration. As you share your findings today, I encourage you to engage openly, question boldly, and learn generously from one another. The interactions you build here with peers, academics, and industry partners etc., can lead to transformative insights and opportunities for future research and innovations.

I wish every participant continued success in your research journey. May this symposium IRS 2025 inspire new collaborations, broaden your perspectives, and guide you toward even greater accomplishments in the years to come.

Dr. Jayalal Wettasinghe
Dean
Faculty of Engineering Technology

Message from Dean, Faculty of Information Technology

It is my great pleasure to extend a warm welcome to all participants of the 9th International Research Symposium at the University of Vocational Technology. This prestigious event brings together scholars, researchers, industry experts and students to share knowledge, exchange ideas and explore innovative solutions to contemporary global challenges.

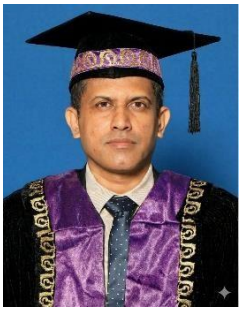
I extend my heartfelt gratitude to all presenters for enriching the symposium with their valuable insights, to the reviewers and committees for their rigorous engagement and to the organizing team for their comprehensive planning and coordination. Your collective efforts have been crucial in making this symposium both successful and impactful.

As you participate in the presentations and discussions, I encourage you to engage openly, exchange ideas, and explore opportunities for future collaboration. May this symposium inspire new research directions, foster academic partnerships and support the development of innovative solutions for a sustainable future.

On behalf of the faculty, I wish all participants a productive, stimulating and rewarding symposium experience.

Eng. (Ms.) T.K. Malwatta
Dean - Faculty of Information Technology

Message from the Dean, Faculty of Industrial Technology



Research is a fundamental mandate of any university—an essential function through which we contribute to the continuous advancement of society. Throughout human history, people have reached beyond the boundaries of mere existence, driven by curiosity, the need to understand their environment, and the desire to improve the quality of life. Although many early contributors to human knowledge remain nameless, the technological and material comforts we enjoy today stand as evidence of their efforts. Thus, research is not an isolated activity but a continuous, progressive force deeply woven into human and social evolution. As we reflect on our own research culture, it is important to consider whether we provide adequate opportunities, resources, and an enabling ecosystem for meaningful scholarly work. True research excellence is not a personal accolade but a collective contribution—something to be shared for the benefit of the wider community. In Sri Lanka's Tertiary Vocational Education and Training (TVET) sector, researchers and research organizations hold tremendous potential to strengthen the system, revitalize
areas that require attention, and make discipline-specific contributions that uplift national development.

The significantly high response to IRS 2025 is a promising indication of the growing research enthusiasm within our university. I extend my warm wishes to all presenters for their commitment and passion. I also express my sincere appreciation to the Symposium Chair, Secretary, Organizing Committee, Reviewers, Session Chairs, and all collaborators for their unwavering dedication to the success of this event.

May this symposium foster new insights, inspire innovation, and further strengthen our collective research journey.

Mr. Dilantha Panduke Ratnayake
Dean - Faculty of Industrial Technology

Message of the Symposium Chair

"Education is the most powerful weapon which you can use to change the world." – Nelson Mandela

It is with immense pride and purpose that I welcome you to the International Research Symposium (IRS2025) of the University of Vocational Technology. This symposium stands as a beacon of innovation, collaboration, and knowledge creation, bringing together scholars, practitioners, and policymakers to share insights that will shape the future of Technical and Vocational Education and Training (TVET) and higher education.

The abstracts compiled in this volume reflect the diversity of thought, creativity, and commitment of contributors from across disciplines and institutions. They highlight not only academic rigor but also practical relevance, offering solutions to challenges faced by learners, educators, and industries in a rapidly evolving world. IRS2025 is more than an academic gathering; it is a platform for dialogue, partnership, and transformation.

This year marks the 9th International Research Symposium organized by the University, a testament to the sustained growth and collective commitment of our academic community. I wish to express my deepest gratitude to the Vice Chancellor, Secretary of IRS2025, reviewers, editorial committee members, program committee members, track chairs, session chairs, all other supporting staff and to past chairs, secretaries, and dedicated staff whose tireless contributions have brought this symposium to its current stature. Their efforts have laid the foundation for continuity, excellence, and impact.

May this symposium be remembered not only for the knowledge it has fostered, but also for the spirit of unity and shared purpose it represents. Through our collective efforts, we can advance equity, transparency, and innovation, thereby shaping a resilient and future-ready TVET system for Sri Lanka and beyond.

Dr. Janaka Jayalath
Chair – International Research Symposium 2025

Message of the Guest of Honour

It is a distinct honor to extend my warm greetings to all participants of the International Research Symposium 2025 (IRS2025) hosted by the University of Vocational Technology (UoVT), Sri Lanka. This symposium brings together researchers, educators, innovators, and industry leaders at a time when the world is rapidly transitioning toward intelligent, interconnected technologies that are redefining how we learn, work, and collaborate.

The research compiled in this symposium reflects an impressive breadth of inquiry across emerging technologies, vocational excellence, sustainable development, and human-centered innovation. These contributions not only address contemporary challenges but also illuminate new pathways for shaping societies that can thrive alongside transformative technologies such as artificial intelligence, robotics, and immersive digital systems.

At HACOLAB, our mission is to explore how humans and AI systems can coexist and collaborate productively, ensuring that technological advancements enhance human capability and societal well-being. Through the CHINA–UAE–USA Task-force for Futuristic Partnership Development (CHINUSA), we further champion global cooperation, recognizing that meaningful progress requires shared insights and collective effort across nations and sectors.

UoVT's continued commitment to applied research, skill development, and technology integration positions it as a significant contributor to the global innovation landscape. I commend all authors, reviewers, and organizers for their dedication to advancing knowledge that serves both local and global communities.

I wish IRS2025 every success and hope it inspires new partnerships, bold ideas, and impactful innovations for the future.

Eng. Liu Yang Sloan
CEO / Chief Engineer, Human–AI Collaboration & Coexistence Laboratory (HACOLAB), Masdar, Abu Dhabi, UAE

Secretary-General, CHINA–UAE–USA Taskforce for Futuristic Partnership Development (CHINUSA)

Message of the Keynote Speaker

De-Risking Innovation: A Systems Approach to Greening Industries through Design Thinking

Sustainable industry transformation does not fail because we lack ideas, technologies, or talented people. It fails because innovation is often too risky for most small and medium-sized enterprises (SMEs) - the very backbone of economic growth in countries like Sri Lanka. The financial risk, operational risk, skills gaps, and uncertainty around new materials or sustainable processes often create barriers that are too high for SMEs to cross.

Drawing on fifteen years of experience working with institutions such as Bauhaus-Universität Weimar, GIZ, iceaddis, GoodLifeX, and TVET colleges in Ethiopia, South Africa, and Sri Lanka, this keynote explores how to reduce that risk and make sustainable innovation safe, practical, and commercially viable. Early in my career, I managed a regional design award that paired designers with SMEs and provided small prototyping budgets. This simple structure unexpectedly became a repeatable model, later adopted in multiple GIZ programs, because it consistently lowered the cost of experimenting and created space for meaningful innovation.

This keynote introduces "Design Thinking" as a strategic method for de-risking innovation, not as a creative exercise but as a structured process that helps organizations:

Empathize: understanding real environmental and human pain points

Define: identifying problems clearly and convert them into actionable opportunities

Ideate: exploring circular and resource-efficient solutions

Prototype & Test: validating assumptions quickly and cheaply

Through real examples, from educational recycling tools to decentralized spice-drying machinery, sustainable logistics solutions, and AI-enabled greenhouse monitoring I will demonstrate how Design Thinking enables sustainable products and services that are viable, desirable, and feasible in real market conditions:

Startup Example	Green Industry Sub-Theme Focus	Design Thinking Insight
Kanil (Plastic Shredder Bike)	Sustainable Services & Education.	Empathy & Prototype: Made recycling an active, fun experience for kids to create raw material for new products.
Hiruni (Spice Drying Machine)	Manufacturing & Agricultural Services.	Empathy & Economic Well-being: Addressed a critical farmer pain point (post-harvest loss) with an affordable, faster conservation method, directly boosting income.
Sebastco (Sustainable Footwear Materials)	Manufacturing & Material Research	Ideate & Prototype: Identified the toxic materials and waste in the fashion supply chain. Developed new materials for footwear and fashion
Novapal (Chipwood Pallet)	Manufacturing & Logistics (Resource Efficiency).	Define & Ideate: Used sustainably sourced material (chipwood) to create a reusable, stackable pallet that saves logistics companies storage space and operational cost.
Govi AI (Greenhouse Monitoring)	AI/IoT for Smart Services (Resource Efficiency).	Technology Integration: Applied AI/IoT to optimize resource consumption (water/fertilizer), demonstrating digital transformation in sustainability.

Finally, the keynote connects these insights to the Sri Lankan context and the role of TVET institutions as catalysts for change. By providing skills, experimentation spaces, and industry partnerships, TVET colleges strengthen a system that breaks barriers and empowers change, enabling SMEs to innovate sustainably with confidence.

Key Message:

If we make innovation less risky, we unlock the creativity and capacity that already exist in our industries. Sustainable transformation begins not with large-scale solutions, but with small experiments and the courage and structures that make those experiments possible.

Florian Manderscheid
Co-Founder & CEO, DoseBev UG, Colombo, Sri Lanka & Frankfurt, Germany

INTERNATIONAL RESEARCH SYMPOSIUM -2025
(IRS2025-UoVT)

University of Vocational Technology

ABSTRACTS OF THE PROCEEDINGS

AI AND IOT FOR SMART INDUSTRIES

Impact of Artificial Intelligence (AI) Based Instructional Strategies on Students' Engagement at University College of Kuliyapitiya, Sri Lanka

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Abstract

With the identification of low students' engagement rates, the researchers have undertaken the study with the main objective of investigating the impact of AI based instructional strategies on students' engagement at the University College of Kuliyapitiya, Sri Lanka. Under the study, the impact of Intelligent Tutoring Systems, Gamification, and Automated Grading and Feedback has been tested The study population consists of nearly 380 students, and by adopting Krejcie and Morgan's table, a sample of 191 students was randomly selected. Standard questionnaire has been utilized to collect the data. Statistical Package for the Social Sciences (SPSS) version 30 was utilized for the data analysis, and the regression analysis was used to explore the possible impact of several independent variables on dependent variables. According to the results, it was found that all three independent variables of intelligent tutoring systems, gamification, and automated grading and feedback have a statistically significant positive relationship with the dependent variable of students' engagement. Accordingly, it is recommended to use automated grading and feedback strategies followed by the gamification and intelligent tutoring systems, which have a positive impact on the students' engagement at the University Colleges.

Keywords: Artificial Intelligence (AI); Engagement; Instructional, Strategies, Students

Development of A Predictive Maintenance System for Electric Motors

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Abstract

Electric motors are critical components within manufacturing systems, and unexpected failures often result in significant production losses. This project presents the development of a cost-effective predictive maintenance system for industrial motors, utilizing real-time vibration and temperature monitoring. The system was built around an Arduino Mega microcontroller, integrated with an ADXL345 accelerometer and DS18B20 temperature sensor to collect operational data. Vibration signals were processed via Fast Fourier Transform (FFT), and filtering algorithms were applied to reduce sensor noise. Extracted features were analyzed by a machine learning model implemented in Python to evaluate motor condition and predict failures. The user interface was delivered through a web dashboard built with Flask, displaying live sensor measurements, providing alerts for emerging faults, recording breakdown events, and generating predictive maintenance schedules based on historical trends and operational data. Experimental results demonstrated that the proposed system could detect early signs of motor degradation and support timely maintenance decisions, minimizing unplanned downtime. The solution is technologically scalable, readily deployable in industrial environments, and offers enhanced operational reliability with minimal financial overhead.

Keywords: Predictive Maintenance; Electric Motors; Machine Learning; Industrial Automation; Web Interface.

A CNN-Based Mobile Application for the Recognition of Ancient Sinhala Inscriptions in Sri Lanka

Thejani Perera[1]*, T.K. Malwatta[2], and Dilshan Senanayaka[3]

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Abstract

Inscriptions are crucial historical artifacts that provide valuable insights into the past, especially in cultures like Sri Lanka, where ancient Sinhala inscriptions offer rich information about religious, cultural, and political practices. Despite their importance, there are currently no mobile applications capable of effectively recognizing and classifying these inscriptions. This research aims to bridge this gap by developing a mobile application that utilizes Convolutional Neural Networks (CNN) for the recognition of ancient Sinhala inscriptions, spanning from the 4th to the 15th century AD. The study begins with a detailed review of existing technologies for inscription recognition, pointing out their limitations, such as the inability to identify visual symbols or classify inscriptions based on historical periods. By focusing on a CNN-based model, the research provides an innovative solution to these challenges. A custom dataset of Sinhala inscriptions is created, incorporating over 1,000 images that represent various inscription eras and pictorial symbols. This dataset is used to train the CNN models, which are then optimized for mobile platforms using TensorFlow Lite. The mobile application developed in this study offers a user-friendly interface where users can upload images or take pictures of inscriptions using their smartphones. The app provides instant analysis, identifying both the historical period and any symbolic elements present in the inscription. The CNN model has achieved impressive accuracy, with over 94% success in classifying inscriptions into their respective historical periods and 87% accuracy in identifying symbolic representations. This research contributes to the preservation and digital study of Sri Lanka's ancient inscriptions. It provides a reliable, accessible, and efficient tool for scholars, archaeologists, and the general public, making the cultural heritage of Sri Lanka more accessible and easier to understand.

Keywords: Sinhala inscriptions; Convolutional Neural Network; Mobile application; Historical text recognition; Cultural heritage digitization

Design and Implementation of a Smart Healthcare Glove with Global IoT Enabled Communication System

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Abstract

In wearable healthcare technology, reliable communication between patients and healthcare providers remains a critical challenge, particularly for individuals with speech impairments or communication difficulties. This research presents the evolutionary development of a signal passing unit for the HYGEIA smart glove system, progressing through three distinct technological implementations to address range limitations, connectivity issues, and accessibility challenges. The system enables gesture-based communication through eight programmable switches, allowing patients to convey essential needs and emergency situations to healthcare providers. Our research progression from basic Bluetooth communication to ESP32 local networking, and finally to Blynk IoT global connectivity, demonstrates significant improvements in range (from 15 meters to unlimited global reach), reliability (achieving 99.7% uptime), and user accessibility. The final implementation eliminates geographical constraints, enabling real-time patient- healthcare provider interaction regardless of location. Performance testing confirmed message delivery within 2 seconds globally, supporting up to 50 simultaneous patient connections per provider with 72+ hour battery life under normal usage conditions.

Keywords: Wearable Healthcare Technology, IoT Communication, ESP32 Microcontroller, Signal Processing, Wireless Protocols

Design of an Intelligent Waste Segregation System

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Abstract:

Urbanization and population development have stressed already existing waste management problems, improper segregation having posed environmental and health hazards. Whereas Arduino-based waste segregation was previously attempted, limitations in connection, energy efficiency, and data analytics prevailed. These limitations ask whether on integrating IoT (ESP32), renewable energy, and cloud analytics will be able to improve the accuracy, autonomy, and policy utility of smart waste bins. We modified an existing smart dustbin prototype by: Changing Arduino for ESP32 to bring WiFi/Bluetooth connectivity, Developing a React JS dashboard with plug-in monitoring fill level in real time, Providing solar energy for off- grid operation, and Sensor fusion (IR, proximity, raindrop + ultrasonic) together with greenhouse-alibrated algorithms. The system was tested in 5 locations on campus with 250 waste items).This upgraded system greatly enables integration to the betterment of the smart dustbin, offering consideration for sustainable, data-driven waste management. Being modular in design, the system allows scaling to municipal deployment. This work provides a bridge for policy make between academic prototypes and real-world IoT waste solution.

Keywords: Smart Dustbin, IoT, ESP32, Solar Power, Waste Analytics

Artificial Intelligence in Smart Manufacturing: Applications and Challenges-A Review

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Abstract

Over the past decades, artificial intelligence has been integrated rapidly with manufacturing products. This paper presents a review of smart manufacturing. Here, we briefed the main AI technologies used in smart manufacturing, such as Machine Learning (ML), Deep Learning (DL), Reinforcement Learning (RL), Computer Vision, and Natural Language Processing (NLP). Then we analysed critical applications of AI like predictive maintenance/fault diagnosis for minimising downtime, robotics/automation and human-robot collaboration (HRC) enhancing productivity and safety; and AI driven quality control/inspection enabling high-precision defect detection. Despite important developments, challenges like data scarcity, model interpretability, and legacy system integration remain. Using edge AI for real-time processing, digital twins for simulation, and explainable AI (XAI) to create trust are some of the things that will happen in the future. To fully realize AI's promise in driving Industry 4.0, several problems must be solved.

Keywords: Artificial Intelligence (AI); Smart Manufacturing; Industry 4.0; Predictive Maintenance; Human-Robot Collaboration (HRC).

Smart Car Parking System Using Arduino Uno: An IoT-Based Solution for Urban Traffic Management

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Abstract

Parking control in urban centers has become a serious problem in contemporary cities, which consequently results in traffic jam, wastage of fuel, and frustration among the drivers. This study fulfills the increasing demand of automated parking in the smart city infrastructure development in Sri Lanka. The research introduces the design and application of an intelligent car parking system based on Arduino UNO microcontroller that comes along with ultrasonic sensor and real time display technology. The procedure used consisted of development of a two- microcontroller system based on Arduino MEGA and UNO platforms, 6 ultrasonic vehicles sensors, LED indicators to show slot status and LCDs to present real-time data. The system was simulated in proteus professional 8.12 and the functionality of the system was checked. Findings indicate effective automated vehicle identification, gate operating and real-time slot availability with an accuracy of 95% detection. The prototype offers high parking efficiency, minimizing the average search time of parking to about 60 per cent, and helps in the sustainable urban mobility of the Sri Lankan cities. Its scalability and the capability to integrate with IoT systems are what makes it appropriate in terms of application in shopping malls, universities, and commercial complexes in order to facilitate the development of smart cities.

Keywords: Smart parking, Arduino UNO, IoT, Urban traffic management, Sustainable mobility

Smart IoT Device for Septic Tank Over flow monitoring and alert system

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Abstract

Septic tank overflow is a serious environmental and public health issue that needs immediate attention with new technology. This study presents an Internet of Things (IoT) monitoring system designed to prevent water overflow incidents through real-time detection and automated alerts. When the house's drainage system approaches overflow, reaching about 80% capacity, this device sends an alert. This early warning gives homeowners enough time to take action before an overflow happens, preventing unexpected drainage problems. The research tackles the urgent need for sustainable water management by using ultrasonic sensors combined with Arduino microcontrollers and GSM communication modules. This system plays a key role in developing smart urban infrastructure by providing a cost-effective, dependable, and easy-to-implement solution. It supports sustainable water management practices while protecting the environment and maintaining infrastructure.

Keywords: IoT monitoring; Ultrasonic sensors; Arduino microcontroller; GSM module; Water overflow prevention

A Comprehensive Fleet Management Platform for Transport Optimization

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Abstract

This study presents the design and implementation of a web-based Fleet Management System (FMS) tailored for Independent Television Network (ITN) Ltd., a leading media organization in Sri Lanka. The existing manual processes for handling transport services were inefficient, time-consuming, and prone to human error. These issues led to delays in vehicle scheduling, poor resource utilization, and a lack of transparency in operational reporting. To address these challenges, the proposed system introduces a fully automated, centralized platform that streamlines the entire workflow from transport request submission to vehicle assignment, driver allocation, trip tracking, and report generation. The system facilitates real-time access and updates to transport-related data, enhancing communication among stakeholders and ensuring timely decision-making. The application was built using a modern technology stack: Spring Boot for a robust and scalable backend architecture, Angular for a dynamic and responsive user interface, and MySQL as the relational database, integrated with Hibernate ORM for efficient data persistence. The system supports role-based access control, with tailored interfaces and privileges for four primary user types: applicants, drivers, transport managers, and administrators. Each module was designed with a focus on usability, data validation, and real-time synchronization, ensuring that users can efficiently perform their respective tasks with minimal training. Comprehensive testing, including unit and integration tests, was conducted to validate system reliability, performance, and security. The Fleet Management System has significantly reduced manual workload, minimized scheduling conflicts, and improved overall fleet visibility. It enables ITN Ltd. to better manage its vehicle

assets, monitor driver assignments, and generate detailed reports for auditing and operational planning.

Keywords: Automation, Fleet Management, Transport Optimization, Web Application, Workflow Efficiency.

A Unified Ecosystem for Smart Hostel Management: Integrating Proactive IoT Hazard Detection with a Centralized Administrative Platform

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Abstract

Management of university hostels using traditional methods is often considered slow and reactive, which creates risks for student safety and reduces transparency in daily operations. A key limitation of these conventional approaches is the lack of integration between IoT-based hazard detection systems and administrative software used for handling student complaints. This research proposes a unified smart hostel management ecosystem that connects both domains, enabling proactive monitoring and streamlined responses. The system integrates a web- based front end for user interaction, a real-time backend supported by a cloud- based database, and an IoT sensor network capable of detecting smoke, water leaks, and unusual motion. It provides separate dashboards for students and administrators, allowing complaints and automated hazard alerts to be managed within a single interface. When a sensor is triggered, the system automatically generates a prioritized ticket and routes it to the administrator for timely action. In addition, the consolidated notification flow enhances situational awareness by presenting both user-generated and sensor-based events through a uniform channel. The architecture also supports scalability and extensibility, enabling

future incorporation of predictive analytics or advanced maintenance automation. The system ultimately aims to provide a safer, faster, and more transparent hostel environment by reducing manual dependencies and enabling proactive hazard response.

Keywords: Smart Hostel Management; Internet of Things (IoT); Complaint Management; Sensor Networks; Smart Building

Comprehensive Evaluation of Modern Wi-Fi Generations (802.11ac/Ax/Be) With Machine- Learning-Assisted Optimization

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Abstract

With the rapid evolution of wireless communication technologies, WiFi has become a fundamental component of modern networks. This study provides an extensive performance evaluation of three significant Wi-Fi generations: Wi-Fi 5 (802.11ac), Wi-Fi 6 (802.11ax), and Wi-Fi 7 (802.11be). we Examine and evaluate these standards according to critical performance metrics such as speed, latency, and capacity to demonstrate their advancements and potential impact on various applications. Also, analysis how machine learning (ML) could enhance the performance of various Wi-Fi generations by optimizing networks, dynamically managing resources, and intelligently prioritizing traffic. We provide insights into the advantages and disadvantages of each Wi-Fi standard through empirical study and simulation-based assessments. This will facilitate future wireless network implementations. This study aims to inform industry experts, researchers, and network engineers on the evolving advancements in Wi-Fi technology and their integration with innovative machine learning techniques.

Keywords: Wi-Fi 5; Wi-Fi 6; Wi-Fi 7; Performance Analysis; Machine Learning

The Role of Generative AI in Fostering Soft Skills Among Undergraduate Computer Science Students

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Abstract

Soft skills such as communication, teamwork, creativity, and critical thinking are becoming increasingly important for computer science graduates in today's fast-changing digital world. However, many undergraduate programs still focus mainly on technical subjects and give less attention to interpersonal skill development. This study examines how Generative Artificial Intelligence (GenAI) tools—including ChatGPT, Google Bard, GitHub Copilot, and DALL·E—are being used to support the growth of these essential soft skills among undergraduate computer science students. A systematic literature review (SLR) was conducted, analyzing 34 peer-reviewed articles published between 2022 and 2025. These articles were selected from databases such as IEEE Xplore, SpringerLink, ScienceDirect, MDPI, and Google Scholar using clear inclusion and exclusion criteria based on PRISMA guidelines.

The findings show that GenAI tools support a wide range of soft skills. Communication appeared most frequently, followed by teamwork and critical thinking. Tools like ChatGPT were often used for role-playing tasks, peer-feedback activities, and written communication practice. Visual and multimedia tools such as DALL·E and Synthesis helped students build creativity and presentation skills by generating images, videos, and other design elements. Even with these advantages, several challenges were noted, including over-reliance on AI responses, reduced opportunities for critical thinking, and unequal access to GenAI tools across learning environments.

Overall, this review suggests that when used with clear learning goals, GenAI tools can meaningfully support soft skill development in computer science education. Their use should, however, be balanced with human guidance, ethical considerations, and thoughtful instructional design. The study offers useful insights for educators, curriculum developers, and policymakers who aim to build AI- supported learning environments that promote holistic student growth.

Keywords: Generative AI; Soft Skills; Systematic Literature Review; Undergraduate Learning

An Automated Method for Small Farmers to Classify Guava by Color and Defects

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Abstract

The demand for machine learning-based fruit classification has grown significantly fast in recent years due to various reasons such as economical value, high demand, and fruit waste minimization. Concerning this, an automated guava classification system is proposed. Image processing and support vector machines are used for the classification of guavas. Performance of the proposed method is evaluated using a classification confusion matrix and class-wise performance comparison. The proposed method shows satisfactory results by achieving 96.67% accuracy.

Keywords: Support Vector Machines, Fruit Classification, Image Processing,

Poster Presentations

Improving Product Recommendations in Online Shopping Using Association Rule Mining

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Abstract

This study develops a product recommendation system using Association Rule Mining with the FP-Growth algorithm on 10,000 online shopping transactions. The dataset was divided into training, validation, and test sets, and a grid search identified optimal minimum support (0.01) and confidence (0.3) parameters, generating 66 meaningful association rules. To enable real-time recommendations, a fast lookup dictionary was constructed, keyed by tuples of sorted antecedent items (average 1-3 rules per antecedent). When multiple rules suggest the same product, the system selects the highest confidence score to rank recommendations. The system achieved moderate precision (0.568), recall (0.392), F1 score (0.464), and a hit rate @ 5 of 0.559. Key recommended pairs include expected rules such as jam → butter and soda → chips, as well as less obvious ones like milk, sugar → coffee, and demonstrating comprehensive pattern coverage. This work presents an efficient, scalable ARM-based approach for large e-commerce platforms that balance recommendation relevance, speed, and extent, supported by a detailed evaluation. Future work will focus on improving recall and integrating additional recommendation methods.

Keywords: Association Rule Mining (ARM), FP-Growth Algorithm, Fast Lookup Structure, Online Shopping, Parameter Optimization, Product Recommendation

Design of an Automated Green House Monitoring System to Overcome Existing Issues

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Abstract

This paper investigates the application of bilateral filtering as a preprocessing technique to enhance the accuracy of boosting-based classification algorithms. In many image classification tasks, the quality of input data significantly affects the performance of machine learning models, especially those relying on edge and texture features. Traditional linear smoothing filters, such as the Gaussian filter, are commonly used to reduce noise in images. However, these methods often blur important edge information, which can degrade the effectiveness of feature extraction and, consequently, classification performance. To address this issue, we explore the bilateral filter, first introduced by Tomasi and Manduchi [1], as a more advanced alternative. Unlike Gaussian filtering, the bilateral filter preserves edge information by simultaneously considering spatial proximity and photometric similarity when smoothing an image. This dual consideration allows the filter to remove noise while maintaining critical structural details that are essential for accurate object recognition and classification. Our study evaluates the impact of bilateral filtering on boosting algorithms, with a particular focus on Adaptive Boosting (AdaBoost). We conduct experiments comparing image preprocessing using bilateral and Gaussian filters, analyzing their effects on classification accuracy. Performance metrics such as ROC curve analysis and object detection results are used to quantify improvements. The results demonstrate that bilateral filtering consistently outperforms Gaussian filtering in terms of classification accuracy. This finding highlights the value of incorporating edge-preserving denoising techniques into preprocessing pipelines, particularly in applications where fine structural details are crucial for model performance. Overall, bilateral filtering proves to be a beneficial preprocessing step for boosting-based image classification.

Keywords: Bilateral filter, edge-preserving smoothing, boosting algorithms

Multisensory Arduino-Based Fire Detection and Alarm System with Shortest Fire Exit Identification via Dynamic Lighting Path

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Abstract

Traditional fire detection systems that rely primarily on sound-based alarms often fail to provide intuitive, real-time evacuation support, especially in large or high-occupancy buildings with complex spatial arrangements. Prior research emphasizes the importance of multisensory emergency systems capable of enhancing decision-making under stressful conditions (Gwynne, Kinsey, & Kuligowski) (Kinateder M., Kuligowski, Reneke, & Peacock, 2015). This study presents an integrated Arduino-based fire detection and evacuation guidance system that incorporates hazard sensing, automated GSM communication, and dynamic LED-based visual navigation. The system was designed and evaluated using a physical scale model of the University of Kelaniya Auditorium, selected for its multiple entry points, high seating density, and complex occupant flow patterns. The auditorium layout was analyzed and divided into three fire-safety zones following CIDA fire protection guidelines ((CIDA), 2015), ensuring optimal placement of smoke and gas sensors and improving the system's reliability and responsiveness. When hazardous smoke or gas levels are detected, the Arduino microcontroller triggers an audible alarm, dispatches GSM alerts, and activates a dynamic lighting pathway guiding occupants toward the safest and shortest exit. Experimental validation confirmed that the proposed system significantly improves evacuation efficiency, reduces occupant confusion, and strengthens overall emergency response performance. These results demonstrate the potential

of low-cost microcontroller technologies to enhance fire safety and provide scalable upgrades for institutional, commercial, and public buildings.

Keywords — Fire detection, Arduino, Shortest exit path, Dynamic lighting, GSM communication

Edge Preserving Smoothing and Denoising for Enhanced Classification Using Bilateral Filtering

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Abstract

This paper investigates the application of bilateral filtering as a preprocessing technique to enhance the accuracy of boosting-based classification algorithms. In many image classification tasks, the quality of input data significantly affects the performance of machine learning models, especially those relying on edge and texture features. Traditional linear smoothing filters, such as the Gaussian filter, are commonly used to reduce noise in images. However, these methods often blur important edge information, which can degrade the effectiveness of feature extraction and, consequently, classification performance. To address this issue, we explore the bilateral filter, first introduced by Tomasi and Manduchi [1], as a more advanced alternative. Unlike Gaussian filtering, the bilateral filter preserves edge information by simultaneously considering spatial proximity and photometric similarity when smoothing an image. This dual consideration allows the filter to remove noise while maintaining critical structural details that are essential for accurate object recognition and classification. Our study evaluates the impact of bilateral filtering on boosting algorithms, with a particular focus on Adaptive Boosting (AdaBoost). We conduct experiments comparing image preprocessing using bilateral and Gaussian filters, analyzing their effects on classification accuracy. Performance metrics such as ROC curve analysis and object detection results are used to quantify improvements. The results demonstrate that bilateral filtering consistently outperforms Gaussian filtering in terms of classification accuracy. This finding highlights the value of incorporating edge-preserving denoising techniques into preprocessing pipelines, particularly in applications where fine structural details are crucial for model performance. Overall, bilateral filtering proves to be a beneficial preprocessing step for boosting-based image classification.

Keywords: *Bilateral filter, edge-preserving smoothing, boosting algorithms*

DIGITALIZING CREATIVE INDUSTRIES

The Impact of AI-Powered Audience Experience Film Viewing in Sri Lanka: Insights from a Public Survey

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Abstract:

Artificial intelligence (AI) is rapidly transforming the global film industry.
It changes how audiences experience and connect with films. This study examines the perspectives of Sri Lankan audiences on how AI-driven technologies impact their film experiences and interactions. The research focused on several areas: AI in film production and design, improving audience experience and interaction, modernizing the industry and skill development, as well as challenges and ethical concerns. A questionnaire was distributed to 120 participants to understand their views on personalized film experiences, interactive storytelling, and AI's role in streaming services. The results reveal a strong belief in AI's ability to tailor content to individual preferences (81%), create engaging storytelling (78%), and transform film distribution through streaming platforms (90%). This paper discusses these findings in relation to Sri Lanka's evolving film industry and explores how AI technologies may change audience engagement and consumption habits in the near future.

Keywords: Artificial Intelligence (AI); Personalized Experiences; Interactive Storytelling; Streaming Distribution

Assessing the Impact of Social Media on Accommodation Selection among Inbound Tourists in Sri Lanka

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Abstract

Hotel accommodation plays a vital role in shaping a traveller's overall experience, serving as a "home away from home" by offering comfort, food, and leisure after a long journey. This study investigates the impact of social media on the purchase decisions of hotel accommodation, with specific reference to inbound tourists visiting Sri Lanka. Recognizing the growing influence of digital platforms in consumer decision-making, the research explores how Functional Benefits, Social Benefits, Psychological Benefits, Monetary Benefits, and Hedonic Benefits affect tourists' selection of hotel accommodations. A quantitative research approach was adopted using a self-administered, structured questionnaire distributed through Google forms and printed surveys among international inbound tourists in Sri Lanka during November 2024 to April 2025 at major tourist locations. Data were analyzed using SPSS software, employing reliability, descriptive statistics, correlation, and multiple regression analysis techniques to evaluate the relationship between these social media dimentions and purchase decisions. Findings reveal that all five social media dimensions significantly and positively influence tourists' accommodation choices. Among them, the entertainment aspect such as enjoyment and emotional satisfaction has the strongest influence, followed by social engagement and Monetary Benefits. The findings offer valuable implications for hospitality marketers, tourism stakeholders, and digital strategists seeking to enhance customer engagement and booking conversions via social media platforms.

Keywords: Social Media, Hotel, Purchase Decision, Inbound Tourists

Predicting Social Media Addiction Using Machine Learning and Deep Learning: A Comprehensive Analysis

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Abstract

Abusive use of social media among students is a major concern because it can negatively impact academic performance, mental health, and overall well-being. The proposed study will examine the use of machine learning (ML) and deep learning (DL) algorithms to predict and categorize social media addiction among students based on their demographics, social media usage habits, and academic performance (such as sleep quality and grades percentage). Data were collected at different education levels in various countries, pre-processed to address missing information, and categorical data were converted into numerical format. The addiction index was classified into three levels: low, moderate, and high. Standard scaling was applied, and the data were split into training and testing sets with 80% and 20% proportions, respectively, for model training. Several models were tested, including Support Vector Machines (SVM), Convolutional Neural Networks (CNN), a combination of CNN and SVM, Multilayer Perceptron (MLP), and Vision Transformer. The CNN+SVM and MLP models achieved the highest accuracy rates of 0.9220, with training times of 24.23 and 11.58 seconds, respectively. Notably, all models achieved their best training accuracy with MLP, which reached 0.9263. Hybrid models demonstrated strong capabilities in processing extensive tabular data and extracting necessary features through multiple embedded layers. Hyperparameter tuning also improved the performance of ML, DL, and hybrid models. Results indicate that ensemble and hybrid models outperform standalone DL models. This research supports the potential of ML and DL to identify students at risk of academic difficulties due to social media addiction and offers possible interventions. Future research could utilize larger datasets or real-time data to enhance the models and address current gaps.

Keywords: Social media overuse, Machine learning, Deep learning, Academic performance, Mental wellness

Impact of the Work Environment on the Mental State of Television Production Crews in Sri Lanka

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Abstract

This study investigates the influence of the work environment on the mental wellbeing of television production teams in Sri Lankan major television channels. It inspects how work pressure, extended working hours, interpersonal relationships and organizational culture influence the mental state of professionals engaged in television production. A qualitative approach was adopted, with data gathered through in depth, convenience based interviews. The research focuses on identifying environmental stressors and assessing their effects on the mental health of individuals working in this sector. Findings highlight that several aspects of the Sri Lankan television work environment require improvement such as staff, resources, updated technologies and knowledge. Lack of these factors contribute to heightened stress levels and reduced overall wellbeing. The study reveals that certain roles particularly camera operators and editors are disproportionately affected, experiencing significantly higher levels of mental strain compared to other members of the production team. By finding these challenges, the research highlights the urgent need for organizational and industry level strategies to safeguard mental health and enhance productivity. Creating supportive policies, promoting healthier work cultures and ensuring a more balanced work life environment are essential steps toward sustaining both the wellbeing of television professionals and the creative output of the industry.

Keywords: Television Production, Work Environment, Mental Well-being, Occupational Stress

The Effect of ASMR Videos on Stress, Anxiety and Sleep Quality Among the Young Generation in Sri Lanka

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Abstract

This study investigates the acceptance of ASMR among the youth aged 20-29 in Sri Lanka for stress, anxiety and sleep patterns. A purposive sample of 75 participants (40 females, 35 males) was recruited, and data were collected through in-depth interviews conducted face-to-face and online. Thematic analysis revealed that 72% of participants primarily consumed ASMR through YouTube, while 69.3% preferred ASMR food-related videos. Findings indicate that 65.3% experienced stress reduction, 65.3% reported decreased anxiety, and 45.3% experienced improvements in sleep quality. Additionally, 77.3% of participants aged 22–23 used ASMR mainly for mental relaxation, and 97% recommended ASMR to others as a coping tool, while 3% expressed concerns about dependency and distraction. According to the analysis, these findings confirm the effects of ASMR on stress, anxiety and sleep patterns among the youth in Sri Lanka, and the objective of this study was achieved. Accordingly, these findings can be used to educate professionals and creators about mental health and improve mental well-being, and the potential for ASMR to be used as a tool.

Keywords: ASMR, Stress, Anxiety, Sleep Quality, Young generation, Digital Media

Digital Platforms and Rural Resilience in Sri Lanka: Pathways, Barriers, and Policy Implications

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Abstract

Digital technologies are increasingly acknowledged as vital tools for enhancing resilience and adaptive capacity in rural economies. This study examines how rural households in Sri Lanka are adopting digital platforms to diversify livelihoods, foster community linkages, and strengthen their ability to withstand social and economic pressures. A mixed-methods design was employed, combining survey data from 250 respondents across six rural provinces with qualitative thematic insights, all analyzed within a resilience framework. The results reveal that smartphone ownership (72%) and internet access (52%) are expanding, although laptop or desktop ownership remains relatively low (23%), mirroring national trends. Basic uses such as communication (65%) and social media (61%) dominate digital engagement, whereas advanced applications like e-commerce (25%) and freelancing (9%) remain limited. Statistical analysis indicates strong associations between education and freelancing ($r = 0.74$, $p < 0.01$), and between income and internet reliability ($r = 0.61$, $p < 0.05$). Qualitative findings complement these results, showing that digitally connected youth are using platforms for micro- entrepreneurship and peer-to-peer support. However, barriers such as high internet costs, unreliable connectivity, and cybersecurity risks undermine broader adoption and reduce the resilience benefits of digital engagement. Overall, the study highlights both opportunities and inequalities: while a digitally engaged minority is creating new pathways for diversification, many households remain excluded due to affordability, infrastructure, and skill gaps. Policy recommendations include expanding affordable connectivity, embedding digital and financial literacy in education, promoting inclusive entrepreneurship, and integrating digital resilience into national development strategies.

Keywords: Digital Platforms; Resilience; Rural Sri Lanka; Livelihood Diversification; Digital Inclusion

Exploring Color Awareness among Key Creative Personnel in Film Production: A Director's Perspective

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Abstract

This research preliminarily explores the awareness of the role of color in Sri Lankan cinema among three directors and related key creative personnel; production designers, Directors of Photography (DOPs), and Colorists- through three purposively selected case studies. Using a qualitative research design supported by a literature review, the study gathered data through in depth interviews with directors using guided questions that explored their awareness of color design process and the contribution of the other key creative personnel. While global practices lack comprehensive documentation, insights from industry professionals highlight collaborative dynamics among them in applying color. Directors highlight symbolic usage, Production Designers stress pre-production emphasis, and Directors of Photography highlight the importance of effective collaboration. Directors unanimously acknowledge color's significance but employ distinct approaches in the productions. Production Designers views aligned with directors' visions, stressing for extended pre-production phase focus and technical proficiency. DOPs recognize color's storytelling impact, emphasizing effective collaboration among key creative people. Colorists' involvement varies, indicating a need for standardized integration of color process across all filmmaking phases. The study concludes by emphasizing standardized practices in the color process, heightened technical proficiency of the key collaborators, and empowered roles within the industry as crucial for consistent and impactful use of color in storytelling in films. It underlines the inevitability for consistent color integration across all stages of film production, promoting a harmonized approach for meaningful and evocative visual narratives.

Keywords: Role of color, Key Creative Individual, Production Design, Film Production, Cinematography

Poster Presentations

Enhancing Vocabulary Through a Mobile Game for Migrants: A Game-Based Learning Approach with Speech Recognition

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Abstract

Language learning is a critical skill for individuals migrating to foreign countries, particularly to Japan, Korea, and English-speaking nations. Traditional learning methods, such as textbooks and classroom instruction, often fail to maintain learner engagement. 'Fluent League', a mobile-based educational game, was developed to address this limitation by integrating gamification, interactive storytelling, and speech recognition technology to enhance vocabulary acquisition and pronunciation skills. The game narrates the story of an immigrant who is new to the language and navigate real-life situations such as visit a bank, seeing a doctor, enrolling in a school, or ordering food at a restaurant. The game involves brief interactive dialogue based on a narrative, the use of new vocabulary, and pronunciation training via a speech recognition module. It is done immediately and this means of delivering feedback may be beneficial in achieving better vocabulary acquisition results as well as improve speech accuracy (Sailer & Homner, 2019). In the background, the app runs on the Google Speech-to-Text, analyzing pronunciation at the same time as another AI tool customizes the experience to the individual learner. It was developed alongside C#, with a 2D colorful looking vector-art style and a reward system where the player can gain points and level up, something that helps to stay motivated.

Keywords: Gamification, Game-Based Learning; Mobile Learning, Speech Recognition,Vocabulary Acquisition

Child-Care Education App: A Digital Platform for Safety and Awareness

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Abstract

Child abuse remains a critical social issue, affecting children's physical, emotional, and psychological well-being. Many cases go unreported due to fear, lack of awareness, or the absence of proper communication channels. To address this, the Child Care Educated Application is designed as a comprehensive digital platform aimed at educating, supporting, and protecting children, parents, and educators. The application provides a secure and interactive environment where users can access educational resources, report abuse cases, and monitor child safety in real time. Key features include a chatbot for anonymous guidance and educational videos to help prevent child abuse. Additionally, a child location tracking system enhances parental oversight, ensuring timely intervention in potentially dangerous situations.

Keywords: Child Abuse Prevention, Child-Care Education, Child Protection, Mobile Application, Real-Time Monitoring.

Web-Based Face Recognition Attendance System Using Laravel, Fastapi, and Pinecone Vector Database

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Abstract

This research presents an automated face recognition attendance system designed to improve accuracy, efficiency, and scalability in educational environments. The system follows a modular architecture in which facial features are extracted through a standardized detection and embedding pipeline and matched using vector similarity search. This eliminates the need for continuous model retraining, enabling fast and consistent identification. Real-world evaluation within a classroom setting achieved an accuracy of 86.95%, demonstrating the feasibility of the approach for practical deployment. The study highlights how automated facial recognition can reduce manual workload, minimize proxy attendance, and support centralized analytics for administrative decision-making. Additionally, the architecture supports multi-campus extensibility and departmental grouping, offering flexibility for institutions with large student populations. Overall, the findings emphasize the potential of vector-based face recognition systems to modernize attendance processes and contribute to more transparent and efficient academic management.

Keywords: ArcFace; Face Recognition; Open CV; Pinecone; Vector Database;

INTERDISCIPLINARY APPROACHES TO TECHNOLOGICAL EDUCATION

The Readiness and the Integration of Technology with ESL Instruction by ESL Teachers: A Comparative Study Between Government and Private Sector In-Service ESL Student-Teachers

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Abstract

The rapid development of technology has significantly increased efficiency and introduced new capabilities across different fields globally, including education. It has left a remarkable mark on English language teaching, especially in English as a Second Language (ESL) contexts such as Sri Lanka. Thus, integrating technology into Sri Lankan ESL classrooms is essential to enhance language learning. This study explores the readiness of ESL teachers from government and private sector schools regarding the integration of technology with ESL instruction, and the technological devices, educational websites, mobile applications, and computer software integrated by ESL teachers from both sectors with ESL instructions. The study utilized a mixed method and a case study design. The sample consisted of 30 in-service ESL teachers following the Bachelor of Education in English Language Teaching at a technological university in Sri Lanka. A questionnaire was used as the main data collection tool. The findings indicate that ESL teachers from both sectors are ready to integrate technology in ESL classrooms in terms of practical use, awareness and perceptions. The findings further illustrate that ESL teachers use a variety of modern technological devices, educational websites, mobile applications, and computer software in ESL classrooms.

Keywords: ESL Teachers, Facilities, Technological Devices, Educational Websites, Mobile Applications, Computer Software

The Attitudes of Undergraduates Towards Peer Learning in ESL Classrooms: A Survey

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Abstract

Peer learning is the process where students learn from and with each other through collaboration and discussion. By assuming the roles of both instructor and student, students encourage interaction and the sharing of ideas. Peer learning stresses student interaction as a way to enhance language fluency, foster critical thinking, and deepen comprehension rather than depending exclusively on teacher-led instruction. Therefore, the study examines the attitudes of ESL learners towards peer learning and the strategies of peer learning used in ESL classrooms. This study involves 30 final-year ELT undergraduates following purposive sampling techniques, enrolled in a B.Ed. ELT degree program at one of the higher education institutions in Sri Lanka. A survey research design was employed using a mixed- methods approach, combining both quantitative and qualitative data collection and analysis. Interviews and questionnaires were used in the data collection process. The study found that students used a variety of collaborative strategies, including scaffolding, reciprocal peer learning, peer tutoring, and structured approaches including think-pair-share, the jigsaw method, and group problem-solving. The results demonstrate how well peer learning works to encourage constructive attitudes and strategic cooperation among ESL students. According to the study, in order to enhance student motivation, engagement, and language growth, ESL courses should include structured peer learning activities. To build on these findings and investigate long-term effects on language ability, new studies with bigger and more varied sample sizes are advised.

Keywords: Attitudes; ESL; ESL classrooms; Peer learning; Undergraduates

Effects of Mother Migration on the Performance of Female English as Second Language Learners; A Study on Batticaloa West Educational Zone

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Abstract

Migration has become increasingly common in Sri Lanka due to various socio-economic factors, especially in the aftermath of the COVID-19 pandemic where mothers leave the country for employment opportunities abroad, often leaving their young children in the care of fathers or other relatives. This situation becomes particularly complex when daughters are left behind, as the mother typically plays a crucial and irreplaceable role in a girl's emotional, social, and psychological development. In the absence of a mother's presence, children's academic progress can be adversely affected—particularly in English language learning, which is essential for their future professional development. Fifteen ESL teachers from the Batticaloa West Educational Zone were randomly selected to participate in the study. Their responses were used to inform the development of a questionnaire for the female students. A total of 87 female ESL students, from both migratory and non-migratory mother households, were then selected using a stratified sampling method. The questionnaire consisted of 16 items, categorized into sections on demographic information, academic performance indicators, and open-ended questions. In addition, secondary data such as school attendance records and examination results were collected to further support the study. A mixed-method approach, incorporating both qualitative and quantitative data analysis, was employed in this study. The findings clearly indicate that female students with migratory mothers perform at a lower level compared to those with non-migratory mothers. The study recommends that policymakers and school administrators prioritize the well-being and mental health of these students and implement targeted interventions to support their academic and emotional development.

Keywords: Effects; Female ESL learners; Mother migration; Performance

Improving Examination Readiness and Participation of Students at the National Youth Corps Hotel School in Sri Lanka

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Abstract

This study explores why many students at the National Youth Corps Hotel School do not attend their final examinations and examines practical solutions to improve their exam readiness. Using a mixed-method research design, stratified sampling was employed to gather insights from past students, current instructors, and focus groups of active learners. Primary data collection methods included surveys, semi-structured interviews, and group discussions, while secondary sources consisted of attendance registers, exam records, and institutional performance reports. The study identified five main factors affecting exam participation: financial difficulties, exams scheduled during peak hospitality seasons, limited awareness of NVQ certification value, insufficient academic and emotional support, and low motivation. Both students and instructors consistently confirmed these barriers. To address these issues, the study introduced motivational workshops, counseling services, employer collaboration to provide exam leave, and structured revision sessions**.** Departments that adopted these strategies recorded notably higher participation compared to those that did not. *The findings suggest that improving exam attendance requires a coordinated, institution-wide approach, including better exam scheduling with TVEC, stronger academic and financial support, greater NVQ awareness, and improved collaboration with employers.* Recommendations include adjusting exam schedules in consultation with the Tertiary and Vocational Education Commission (TVEC), providing financial and academic support mechanisms, increasing awareness of the National Vocational Qualification certification's value, and fostering stronger ties with employers. These improvements can help increase exam participation, strengthen student employability, and positively contribute to the development of Sri Lanka's hospitality sector.

Keywords: Final Examinations, Hospitality Training, Student Participation, Vocational Education,

Challenges Faced by the Teachers and Students in ESL Classrooms When Their L1 Differs from One Another

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Abstract

This qualitative study explores challenges encountered by teachers and students in ESL classrooms, when their L1 differs from one another. It also investigates strategies employed by both parties in the absence of a shared language between them within an English only instructional approach. This study was conducted in government Tamil-medium estate schools in Kothmale Educational Zone, Sri Lanka. Employing semi-structured interviews to collect data from 10 ESL teachers; (entire population within the zone) and employing direct - interviews to gather data from 10 students in Grade 4 and 6, from 5schools, the research revealed significance themes through content and thematic analyzing. Teachers struggled with alienation, high stress levels, and lower job satisfaction with less support from school staff, administration and parents, being the only resource to teach English. Difficulties in communication, giving instructions, delivering lessons which led to fragmental comprehension with no formal training for teaching in linguistically diverse classrooms intensified the challenges. Students experienced fear, shy, confusion, lack of engagement and motivation, fragmental comprehensions in English-only environments, depending entirely on peer support as a strategy rather than finding individual solutions. The research highlights lack of basic needs, emotional support and socio - economical status as additional barriers for effective L2 learning. The study recommends revising recruitment and training policies to support ESL teachers in multilingual settings, promoting use of L1 of students where it is necessary for a better comprehension, and strengthening school-based support systems, offering valuable insights for policymakers, educators, and researchers concerned with inclusive and effective ESL education in multilingual and low-resource contexts.

Keywords: ESL Classrooms, L1 Difference, English only Instruction, Challenges, Strategies

Effectiveness of Smartboards in Enhancing Students' Performance During Grammar Lessons in ESL Classrooms: A Study on Grade 9 ESL Learners in the Kekirawa Educational Zone

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Abstract

Technological advancements change the existing processes in every field. The latest technological advancement, smartboards, had initiated altering the conventional pedagogy in the field of education decades ago. Despite its popularity, the use of smartboards in ESL classrooms, especially in teaching grammar, is limited and remains largely unpracticed. This research aimed at exploring the effectiveness of smartboards in enhancing students' performance during grammar lessons in ESL classrooms compared with the conventional teaching methods, focusing on two objectives: to explore the effectiveness of smartboards on student performance and to explore students' perceptions on utilizing smartboards during grammar lessons in ESL classrooms. The sample consisted of 80 grade 9 students in the Kekirawa educational zone, including 40 subjects for experimental and control groups. The convenient sampling method was utilized. A mixed-method approach with an experimental research design was employed. The sample was tested by a pre-test and a post-test before and after the intervention period. During the intervention period, the experimental group and the control group were taught with smartboard technology and traditional teaching methods, respectively. A focused group discussion was conducted aiming at the second objective. The results of the pre-test and the post-test were analyzed utilizing the independent two-sample t-tests, and the results suggested that the usage of smartboards during grammar lessons is effective in enhancing ESL learners' performance. The results of the focused group discussion revealed that smartboards have enabled the boosting of individual participation as well as collaboration within the language learning classroom, resulting in the enhancement of performance. Based on the results, it was recommended to incorporate smartboards into ESL classrooms for grammar lessons and to conduct further research by cooperating with different school settings.

Keywords: Smartboards,Grammar, Performance, ESL classroom, Effectiveness

Factors Affecting ESL Teachers' Speaking Skills in Their Professional Settings: A Case Study

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Abstract

This study was a case study which examines the factors influencing ESL teachers' speaking skills in their professional settings. The objectives of this study are to explore the social and psychological factors affecting ESL teachers' speaking skills in L2 (second language) in their professional settings and their practices affecting the speaking skills. Primary data was collected through conducting guided interviews of purposefully selected 09 ESL teachers in a selected education zone. It covers all three divisions in the selected education zone in the North Central Province. Teachers were selected from different types of schools (1AB, 1C, Type 2, and Type 3 each). Based on the information gathered from the interview, some psychological factors that prevent effective English communication were identified, including low self-confidence, shyness, fear of making mistakes, and language anxiety. The study reveals that these difficulties are further compounded by social factors, such as institutional cultures that discourage the use of English and reluctance to use the language in their professional settings. In order to identify factors affecting the ESL teachers' development of speaking skills in L2, the study intends to reveal these social and psychological issues. Thus, this study provides practical ways of overcoming them through continuous self-evaluation, selfpractice, specified training programmes and workshops for enhancing ESL teachers' speaking skills in L2.

Keywords: English speaking; ESL teachers; Professional settings; Psychological factors; Social factors

Exploring Imagined Teacher Identities of Prospective ESL Teachers

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Abstract

Understanding teacher identity is important because it influences how future aimed to find out how these undergraduates imagine themselves as teachers think, behave, and connect with their students. This study explores the imagined teacher identities of final year ELT undergraduates, who are prospective teachers. This research teachers, what kind of classrooms they want to create, and what personal and professional values shape their future roles. The study used qualitative approach and involved ten participants selected through purposive sampling technique studying in a university in Western province who read for B.Ed. in ELT degree programme. Two data collection tools were used: semi-structured interviews and a drawing task. The interviews allowed participants to talk about their beliefs, goals, teaching styles, and inspirations. The drawing task gave them a chance to visually represent their future teaching roles. The data were analyzed based on relational content analysis to uncover deeper meanings behind both verbal and visual data. The findings revealed that most participants imagined themselves as caring, supportive, and approachable teachers. They wanted to help the students to improve their English communication skills, especially speaking. Many stated that they wish to use technology such as smart boards and projectors in their imagined classrooms. Some participants highlighted values such as honesty, kindness, discipline, and cultural respect. Others focused on their personal appearance and the physical setup of their classrooms. The study also showed that teacher identity is influenced by personal experiences, training, cultural background, and career goals. This research contributes to the understanding of how ESL prospective teachers see themselves and how imagination supports their identity formation. It highlights the need to include reflective and creative tasks in teacher education programmes. The study concludes that imagining future teaching roles helps undergraduates to develop stronger and more meaningful identities, which can positively affect their growth as educators.

Keywords: ELT undergraduates; future selves; imagined teacher identity; prospective ESL teachers; teacher identity

Code Switching in English Language Advertisements - Perspectives of Youth

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Abstract

Code Switching (CS) is widely used in advertisements today. This takes place due to the rising markets and competition amongst products. In the modern world television advertisements dominate the field of media. Due to the competition in the market and in the field of advertisements code switching is vastly used as a strategy to accommodate the viewer. In this study the researcher looks at the use of code switching in advertisements and researches how the youth look at the use of code switching. For this youth in the ages of 20 to 30 were selected and from this sample 60 questionnaires were administered and 20 interviews were carried out until it reached the point of saturation. The sample consisted of bilinguals whose mother tongue is Sinhala and in terms of English they belonged to various levels of English levels from poor to excellent English language skills. Further the sample was selected from Colombo only for the current study and this article is part of a much larger study that was carried out. According to the perspectives of the participants the use of CS was seen as trendy. Especially the viewers who were in the ages 20 to 25 stated that since they code switch in day to day life it was not something new for them. It was revealed that CS attracted them but the study also revealed that those in the ages of 26 to 30 were more judgemental on the use of CS stating that it could destruct the purism of the language.

Keywords: Bilingual Viewer, Code Switching, Sinhala to English, Advertising, youth views

Impact of Extracurricular Activities on Academic Performance of Undergraduates: A Review

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Abstract

Extracurricular activities (ECAs) often appears to be pivotal over the decades of history in the overall comprehensive development of undergraduates, influencing not only their academic outcomes, but enhancing their existing skills, help in identifying their unique interests, strengths, emerging their innovation and creating a well balanced exceptional student with ready hands for a better future. Reviewing studies has recently published in times between 2020 and 2025 ranging through the eyes of global overviews to focus analysis on South Asia and specifically in Sri Lanka, into three main domains as: academic performance, skill development and employability, and student well-being with social integration. Moderate and structured engagement in ECAs is repeatedly linked to improving grades,enhanced leadership, stronger teamwork, better communication, and in building an employee ready student towards a future productive workforce to the nation. In the context of South Asia and Sri Lanka, ECAs particularly play a significant role in improving social network systems and fostering adaptability, flexibility with students often acquiring transferable skills that are difficult to be easily picked up in a traditional or an usuall classroom environments. When referred closely to the selected domain, there's still a glaring lack in connecting systematic integration into university life, due to some barriers such as heavy academic workloads, cultural expectations and limited institutional recognition making the potentiality for ECAs often seem underutilized. However, literature makes a solid case for universities to design inclusive, well-supported frameworks that help students balance academic work and active engagement in extracurricular. Furthermore, upcoming researches should adopt longitudinal and comparative approaches to solidly capture causal relationships between ECAs and undergraduate outcomes especially in highlighting the nuanced differences across various cultures and dynamic institutions.

Keywords: Extracurricular activities, undergraduate students, academic performance, Sri Lanka, co-curricular programs

Poster Presentations

Investigation on Occupational Health and Safety Practices in University Colleges of Sri Lanka

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Abstract

The International Labor Organization (ILO) predicted that 2.3 million deaths per year would be reported due to workplace accidents or diseases globally while having an approximation of 340 million workplace-related accidents. Most workers have undergone proper education while concentrating on the global annual death and accident rate. A significant relationship between work-related incidents and the education sector's health & safety (H&S) culture should exist. Identifying the significance of the H&S culture of the University Colleges (UC) in Sri Lanka will assist the further development of H&S culture of the vocational education sector in Sri Lanka. This research aimed to improve Occupational Health and Safety (OHS) practices and recommend a framework for enhancing OHS practices in University Colleges in Sri Lanka. A quantitative research approach was adopted, and data were collected through a structured questionnaire from 249 participants studying in all six University Colleges in Sri Lanka. Reliability and validity tests were undertaken, and data were evaluated using correlation analysis and multiple regression analysis. The findings demonstrated that workplace dangers, policies, and awareness were substantially connected with occupational health and safety practices. Multiple regression analysis revealed that workplace hazards, policies, and awareness significantly predicted OHS practices in Sri Lanka's University Colleges. These results suggest that a higher level of OHS practices can be achieved in the vocational education sector by implementing effective policies and procedures and raising awareness among management, staff, and students. These findings imply that vocational education institutions must prioritize implementing comprehensive policies and procedures related to OHS. It is also necessary to promote awareness among all stakeholders to enhance the overall level of OHS procedures in the vocational education sector in Sri Lanka. Overall, this study provides valuable insights into the relationship between workplace hazards, policies, awareness, and OHS practices in the vocational education sector in Sri Lanka.

Keywords: Occupational Health and Safety, Workplace Hazards, Policies and Procedures, Vocational Education Sri Lanka

English Language Skills as a Key Competency for Safe and Effective Pharmacy Practice in Sri Lanka

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Abstract

English occupies a central place in the daily operations of Sri Lanka's community pharmacies, where pharmacists rely on it to interpret prescriptions, complete documentation, counsel patients, and communicate with doctors and regulatory authorities. Because these tasks draw on reading, writing, speaking, and listening skills, pharmacists' proficiency in English has important implications for the clarity and safety of patient care. This study examines how community pharmacists experience the use of English in routine practice, the challenges they encounter across different language domains, and the strategies they adopt to navigate those challenges. A qualitative design was employed, using semi-structured interviews with twenty-five registered community pharmacists selected through purposive sampling from the Western Province. Participants varied in age, experience, and educational background, and all provided informed consent prior to participation. Interviews were analysed thematically. Findings showed that English is embedded in almost every aspect of pharmacy work, from deciphering handwritten prescriptions and updating records to consulting international guidelines and discussing treatment issues with medical practitioners. Senior pharmacists reported that these tasks had become largely automatic after years of professional exposure, whereas younger pharmacists and those from rural educational backgrounds expressed uncertainty, especially in spoken communication and pronunciation of technical terms. Several participants described situations in which limited English proficiency contributed to patient confusion about dosage or treatment instructions, illustrating how language gaps may intersect with patient safety and treatment outcomes. To manage these difficulties, pharmacists frequently shifted between English, Sinhala, and Tamil, simplified complex terminology, used drawings or labels, or relied on digital translation tools. Moreover, the study highlights a mismatch between the linguistic demands of community practice and the communication training provided in pharmacy education. Strengthening medical- English instruction, expanding simulation-based learning, and developing bilingual patient-education materials may help pharmacists provide clearer, safer, and more accessible care.

Key words: Pharmacists, Community Practice, English Proficiency, Healthcare Delivery, Professional Development.

E-Study Helper an Innovative E-Learning Application for Students and Lecturers

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Abstract

Traditional e-learning often faces significant limitations, including biased keyword-based grading, lack of personalized retention strategies, and vulnerabilities in academic integrity. The important fact is that humans often provide the same answer with the same meaning but in different ways. Because responses can vary in wording, keyword matching may fail to detect semantic equivalence. To address these, we propose E-Study Helper, an integrated platform employing ontology- based semantic similarity. Additionally, this project includes learning techniques for remembering, called Spaced Repetition, a psychological technique that reviews information at gradually increasing intervals. It helps students to learn in a lesser amount of time. There are some language learning apps using this method. For solving the human forgetting problem, multiple-choice questions are used for the solution. The platform uses a LLaMA 3.3-powered chat feature integrated with Retrieval-Augmented Generation. This will allow lecturers to generate MCQs automatically from supplied learning materials. These MCQs are then used to quiz students. Students can also upload study materials and engage in interactive discussions based on the uploaded content. Furthermore, the platform includes a Secure Assignment Mode with time-based restrictions and background-application monitoring to ensure that students remain focused and do not access external resources.

Keywords: Semantic Similarity, Space Repetition, NLP, RAG, Secure Exam Mode

GREENING INDUTREIS

Solar Power Embedded System Based on Off-Grid Operation for Smart Waste Management

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Abstract

Present Waste Management face the power supply problem without harming the environment. This paper presents a solar-powered embedded system design that may be employed to power an intelligent waste sorting station in off-grid and low-resource environments. The system incorporates a photovoltaic solar panel and a maximum power point tracking (MPPT) charge controller in an attempt to harvest as much energy as possible. Energy efficiency is achieved with multiple optimization techniques such as duty cycling for time-varying operations, microcontroller deep sleep states for time wasted idling, and low-power sensor configurations. The system operated adequately under sunlight exposure, with microcontroller operation steady and minor voltage oscillations at peak motor use alleviated by capacitor buffering. Battery life was tested at 6 to 8 hours depending on motor load and actuation rate. The research finds that the architecture enables sustainable and autonomous operation independent of electrical grid infrastructure and hence is appropriate for deployment in remote rural areas or hazardous landfill sites. The modular layout enables future upgrade with equipment such as solar tracking units, cloud monitoring via the SIM module, and interfacing with IoT dashboards. The research achieves a scalable and energy-hardened solution for decentralized smart waste management applications.

Keywords: Solar-Powered Embedded Systems, Off-Grid Waste Management, Embedded Systems, Energy Optimization.

Reuse of Extracted Blower Dust as a Filler of Tire Tread Compound

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Abstract

The powdery waste generated as a result of compounding of rubber mixes is called 'blower dust'. This study was aimed to check the reusability of the extracted blower dust of tire industry, to replace the carbon black filler in a tire tread compound. Blower dust waste is regarded as a mix of few chemicals, and found to be hazardous. Usually, it isn't properly disposed, and therefore water sources and soil of factory-surrounding may have impacted. In the research, five sample mixes were prepared by varying the added blower dust to replace the carbon black in a tire tread compound. These mixes were checked for several technical properties, and the test results were compared with the results of the control mix. The two mixes which contain 20% and 40% blower dust respectively, displayed better characteristics for a tire thread compound. Another mix containing 60% of blower dust displayed average properties, and it cannot be recommended for heavy duty applications, such as tire treads. The other two mixes which contain 80% and 100% blower dust, aren't not suitable for tire tread applications due to low hardness and low wear resistance. However, the latter two mixes have some good characteristics which might be suitable for the base layer of solid tires and some other household components and automotive carpets. This research proved that blower dust has a value for reusability, and can apply as a raw material of tire manufacturing process. The ease of waste management of the tire industry and the related cost reduction are other notable achievements.

Keywords: Carbon black filler; Extracted blower dust; Technical properties; Tire tread compound; Waste material

Efficiency Assessment of Light Pipe Technology for Energy Conservation in Tropical Climates: A Sustainable Lighting Approach

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Abstract

Energy consumption for lighting accounts for approximately 20% of global electricity usage and 6% of worldwide CO_2 emissions, with projections indicating a 60% increase by 2030. This research assesses the effectiveness of light pipe technology in energy saving in tropics compared to artificial lighting systems. The study was based on the comparative analysis of the common LED lighting and light pipe systems on a 1000 square feet basement of a two-story building. The Lumen Method calculations showed that when using the traditional LED lighting with 358.5 kWh/month (83 lamps × 12W/lamp, including a room utilization factor of 0.5 and maintenance factor of 0.75) the energy used by the lamps would be 358.5 kWh/month, and when the proposed 0.58m diameter, 6m length polycarbonate light pipe was used the energy used by the lamps would be 253.67 kWh/month (reduction of The concept was tested with a 1:250 scale model created out of polycarbonate pipes and optical lenses. The readings of the light intensity were taken at various locations within the coverage area and means calculated to have the representative illumination readings. Findings established that compared with artificial lighting systems, light pipe technology is able to save energy. Nonetheless, the fact that the upfront costs involved in installation are still very high is still a major detriment to mass residential uptake. The research paper finds that although the light pipe technology has a significant potential of saving energy, policy interventions and cost minimization strategies are required to make it workable in the developing world that has tropical climates.

Keywords: Light pipe technology; Energy conservation; Sustainable lighting; Daylight harvesting; Tropical climate applications

Implementation of Environment- Related Sustainable Development Goals and Perceived Challenges among Privet Tourism Stakeholders in Sri Lanka's North Western Province

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Abstract

The concept of the sustainability changed the practice in time to time basis of social, environmental and economics. Commence of Agenda 30 in 2015 the concept of sustainability converted to implementing sustainable development goals (STD) Globally. Aligned with international guideline, Sri Lankan government declared national policy to implement SDGs in Sri Lanka in every industry including tourism. According to UNWTO, There are different applications in tourism to each SDG. As the key pillar and essential element in tourism operation, directly or indirectly environment related SDGs, 6,11,12,13,14,15 are very important. It has been found that there are many cases of policy design, participating, content, implement and many more in every country. Considering above researcher intended to focus the study to assess the awareness of SDGs and sustainable tourism among private stakeholders, measure adoption of environment- related practices (SDGs 6, 11, 12, 13, 14, 15) and to identify perceived implementation barriers to implement of environment related SDGs with the special reference of tourism privet stakeholders in North western province. The comprehensive literature was conducted to identify the success factors on implementing environment related SDGs. Structured questionnaire employed among 80 registered privet stakeholders and response rate was 100% to study the statues of implementation of environment related SDG and short questions were asked from the same group to analyze the perceived challenges to implement environment related SDGs.

Keywords: Environment; SDG implementation; privet stakeholders; Challenges; Northwestern province.

Exploring the Potential of Promoting Sri Lanka as a Sustainable Blue Tourism Destination from the Perspectives of Public Stakeholders in the Tourism Industry

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Abstract

The word "blue tourism" has become a buzzword in the global arena since it has emerged as an ex- tended version of blue economy. Being a country, which has always been identified primarily a beach destination, Sri Lanka nourishes with all the essential elements required to make it an ideal blue tour- ism hotspot. Although, Sri Lanka is positioned perfectly to deliver extraordinary blue tourism experi- ences with the ability to differentiate its offering from regional rivals, the country has not yet reaped the full potential of this emerging tourism segment. As a result, it is still at the stage of underutiliza- tion. Therefore, incorporating blue tourism component into the national tourism strategy has become a mandatory requirement in the Sri Lanka rather than just an option. Hence, the purpose of this re- search was to explore the potential of promoting Sri Lanka as a sustainable blue tourism destination from the perspectives of key public stakeholders involved in the tourism industry. Accordingly, this research examined the key barriers and strategies that influence the promotion of blue tourism in Sri Lanka. This study used a qualitative approach, and this research was carried out by using primary data collected through the semi-structured interviews. The purposive sampling method was employed to select 15 key individuals representing public sector tourism organizations who have immense knowledge, expertise and industry exposure. The collected data were analyzed using content analysis. The findings of this research identified several key challenges including policy fragmentation, ab- sence of blue tourism knowledge sharing platforms, lack of marine spatial planning and few other burning challenges. Consequently, this research identified key strategies that influence the promotion of Sri Lanka as a sustainable blue tourism destination.

Keywords: Barriers, Blue Tourism, Public Stakeholders, Strategies, Sustainable Development

Greywater Treatment System Using a Vertical Flow Constructed Wetland at University College Kuliyapitiya

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Abstract

This study investigated the use of a vertical flow constructed wetland (VFCW) system as a sustainable solution for greywater management and reuse at University College Kuliyapitiya. A pilot-scale VFCW model was designed and implemented, featuring a multi-layered filter media composed of gravel, sand, and coco peat, and was vegetated with 'Vetiveria zizanioides' to enhance biological filtration. The project aimed to demonstrate the system's efficiency in treating greywater for non-potable applications. Laboratory analysis of water samples, conducted using standard methods for water quality assessment, showed exceptional pollutant removal, with a 100% reduction in Biochemical Oxygen Demand (BOD), a 99.9% reduction in Chemical Oxygen Demand (COD), and a 99.1% reduction in Total Suspended Solids (TSS). These results confirm that the treated effluent met the Tolerance limits for the discharge of industrial waste into inland surface water SLS Requirement 652- 1984. These findings confirm the VFCW's viability as a highly effective, low cost, and environmentally sound technology for decentralized greywater treatment. While based on preliminary data, these results provide a strong foundation for the scalability of the system for wider residential and community-level applications in water-scarce regions.

Keywords - Greywater management, Constructed wetlands, Vertical flow, Sri Lanka, Decentralized treatment

Fully Automated Fly Ash Pond Unloading System

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Abstract

Fly Ash (FA), a byproduct of biomass combustion, poses significant environmental and operational challenges due to manual unloading processes in settlement ponds. This study presents an automated FA unloading system integrating mechanical, electrical, and control components to enhance efficiency and sustainability. The system features a height-adjustable rotor, motorized slider gate valve, ultrasonic sensors, and Programmable Logic Controller (PLC)-based automation. Key innovations include real-time monitoring of settlement tanks, automated layer-wise FA removal, and high-pressure water jet cleaning. Testing demonstrated a 10 RPM operational speed for the rotor, precise height adjustment, and successful valve automation, reducing unloading time by 60% compared to manual methods. The system addresses environmental pollution, labor dependency, and safety risks associated with FA handling. Results validate its potential for industrial adoption, contributing to sustainable waste management in biomass power plants.

Keywords: Automation, Fly Ash, Industrial Waste Management, PLC Control, Sustainable Engineering

Comparative Analysis on Level of Human Comfort in Colombo Municipal Council Head Office Buildings

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Abstract

Indoor Environmental Quality (IEQ) is a critical factor that decides the health, comfort and productivity of the employees. The Colombo Municipal Council operates from two separate head office buildings, an old building and a new building with modern Air Conditioning System and lighting systems. This study addresses how IEQ conditions and perceived comfort in these two buildings compare with one another, and the extent to which they comply with ASHRAE and ISO standards. A mixed methods approach was employed, combining quantitative measurement of temperature, relative humidity, CO_2 concentration, illuminance and noise in nine office spaces with a formal questionnaire survey of 63 occupants. The results show the New Building generally to provide more stable conditions, with lower CO_2 concentrations and consistent thermal performance (27°C ± 0.7), while the Old Building showed higher variability and critical CO_2 peaks (up to 1,316 ppm). Neither building achieved recommended levels of lighting (300-500 lux) and both experienced occasional noise exceedances, though survey response indicated greater discomfort with temperature, ventilation and noise in the Old Building, and humidity and glare issues in the New Building. Overall, the findings suggest that the Old Building requires immediate ventilation and lighting retrofits, while the New Building might be enhanced through improved humidity and acoustic control. The study emphasizes the significance of post-occupancy evaluations as an evidence-based approach to workplace retrofitting and enhancing occupant well- being in public sector tropical climate buildings.

Keywords: Indoor Environmental Quality, Human comfort, post-occupancy evaluation, Colombo Municipal Council

An Analysis of Refurbished Devices as A Cost-Effective Solution to Reduce E-Waste in Sri Lanka's Telecom Sector

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Abstract

The rapid growth of electronic and telecommunication equipment has intensified risks to the environment, economy, and human health, with electronic waste emerging as a critical global issue. In Sri Lanka, this problem is aggravated by the importation of low-quality electronics with short lifespans, contributing to an estimated 0.09 million tons of e-waste in 2021.Refurbishment offers a sustainable solution by extending product lifecycles, reducing imports, and lowering environmental impact. However, consumer acceptance remains limited. This study examines the key factors influencing Sri Lankan consumers' willingness to purchase refurbished electronic and telecommunication devices. A survey of 400 respondents from Colombo and Kalutara districts assessed five key factors: warranty, durability, after-sales support, price difference, and work performance. Quantitative evaluation employing statistics and t-tests revealed that price benefits and the presence of warranties are the most influential elements affecting buying choices whereas durability, performance and after-sales service also play important roles. Findings suggest that certified warranties, rigorous quality assurance and dependable service can boost consumer confidence and uptake. In addition to benefits refurbishment promotes lower e-waste, greater digital access and market growth, within Sri Lanka's telecommunications industry. This study contributes to understanding consumer behavior and offers strategies for balancing economic growth with environmental sustainability.

Keywords: E-waste, refurbished devices, consumer willingness, Sri Lanka, circular economy

Development of a Night Cream Containing Kojic Acid (Kojic Dipalmitate): A Cosmetic Approach to Tyrosinase Inhibition

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Abstract

Kojic acid (Kojic Di palmitate) based night cream was developed incorporating emollients, humectants, and active ingredients such as hyaluronic acid and aloe vera gel with the aim of skin lightening and pigmentation. Developed cream was evaluated physiochemically, and subjected to sensory analysis. A 9-point hedonic scale was used to evaluate texture, spread ability, greasiness, smell, and overall acceptability among 10 participants. Significant differences across formulations were found by statistical analysis using Tukey's HSD test and one-way ANOVA ($p < 0.05$). Superior physicochemical characteristics, such as ideal spread ability, homogeneity, and stability over a range of temperatures, were demonstrated by FN2. Formulation FN2 with the composition of 3% of E wax, 6% of Butter, 12% of Sunflower oil, 4% of Stearic acid, 53% of DI water, 6% of Aloe gel, 11% of Glycerin, 2% of Hyaluronic acid, 2% of Kojic acid, 0.5% of Fragrance and 0.5% of DMDMH showed exceptional performance based on the combined findings of laboratory testing and sensory analysis, suggesting that it is suitable for additional optimization and commercialization. The formulation effectively balances skin brightening action of kojic acid with moisturizing agents like hyaluronic acid and aloe vera, providing both efficacy and desirable sensory properties. This study contributes to the development of a stable, consumer- acceptable night cream focused on pigmentation control using kojic acid dipalmitate as the active ingredient.

Keywords: Formulation, Kojic acid, Night cream, Physiochemical, Sensory

Development and Shelf-Life Evaluation of a Functional Coconut Based Non-Dairy Paste

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Abstract

In recent years, the demand for dairy-free and low-calorie food products has increased due to growing health concerns such as lactose intolerance and diabetes, along with a consumer shift toward clean- label, minimally processed products. This study was aimed to develop a non-dairy coconut paste using coconut milk and sucralose as alternatives to traditional dairy and caloric sweeteners, improving both nutritional and sensory quality. The formulation was prepared using coconut milk (26.82%), sucralose (0.05%), corn starch (4.02%), vanilla essence (2.01%), eggs (20.12%), salt (0.07%), and potassium sorbate (0.03%). The mixture was heated to 80–85°C under continuous stirring to achieve a thick, smooth consistency and ensure microbial safety. The final product was subjected to physicochemical (moisture and ash content), microbiological, and sensory analyses. The moisture content was 3.5 ± 0.2%, and the ash content was 0.2 ± 0.04%, indicating desirable shelf stability. Microbial analysis showed no presence of harmful organisms, including *E.coli* and yeast and mold counts within acceptable limits, complying with SLS standards for paste-type products. Sensory evaluation was conducted using a five-point hedonic scale by 30 untrained panelists. The Friedman test revealed significant differences ($P < 0.05$) across all sensory attributes. The coconut paste received the highest scores in taste (4.6 ± 0.3) and texture (4.5 ± 0.4), followed by aroma and appearance, indicating strong consumer acceptability. The developed paste, free from dairy and added sugar, is suitable for individuals with lactose intolerance and diabetes. The formulation offers a nutritious and convenient alternative to conventional sweet spreads and desserts. The product remained microbiologically safe and organoleptically stable for up to one year under ambient storage conditions, making it suitable for long-term shelf-stable applications.

Keywords: coconut paste, non-dairy, sucralose, lactose intolerance, sensory evaluation, shelf life

Proximate Analysis of Four Jellyfish Species from the Southern and Western Coasts of Sri Lanka

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Abstract

Jellyfish are Cnidarians, known for painful stinging and interferences with coastal human activities. In the present study, four jellyfish species; Acromitus flagellatus, Acromitus maculosus, Chiropsoides buitendijki, and Cyanea sp. collected from the Southern and Western coasts of Sri Lanka were analyzed for their proximate compositions to assess their applicability in the food industry. The proximate compositions differed significantly among different jellyfish species ($p < 0.05$). The moisture contents of all four species were greater than 95% of their wet mass. Ash content was the highest of the dry matter, followed by crude proteins. However, C. buitendijki contained protein as the highest percentage of dry matter. The highest crude protein content (39.08 ± 1.01%) was observed in C. buitendijki. The highest and the lowest ash contents were found in A. flagellatus (58.98 ± 0.86%) and C. buitendijki. (37.21 ± 2.02%), respectively. All four jellyfish species consisted of minute amounts of fat. The highest total fat content was found in Cyanea sp. (2.23 ± 0.18%), while A. maculosus contained the lowest fat content (0.80 ± 0.06%). The findings of the study suggest that jellyfish can be a potential ingredient in functional foods and nutraceuticals attributed to their high mineral and protein contents together with the lower fat contents.

Keywords: Fat content; Functional foods; Jellyfish; Nutraceuticals; Protein; Proximate composition

Formulation and Development of Jackfruit Seed (Artocarpus Heterophyllus) Incorporated Glow Gel as Skin Care Preparation

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Abstract

This study explores the formulation and evaluation of a sustainable cosmetic product Jackfruit Glow Night Gel prepared using a cold-process method. The key ingredient, jackfruit seed extract, was derived from locally sourced jackfruit seeds (*Artocarpusheterophyllus*), which are typically discarded as agricultural waste. The extract was prepared by soaking jackfruit seed powder (10g) in a mixture of glycerin (45g) and distilled water (45g) over 5–7 days and preserved with phenoxyethanol (1%). The gel base included aloe vera, cucumber extract, calendula extract, glycerin, panthenol (Vitamin B5), lightweight plant oils (rosehip, jojoba, grapeseed), and natural essential oils. Four gel samples were formulated with varying concentrations of xanthan gum and oils to study their effect on viscosity, pH,spread- ability, absorption, and overall user satisfaction. Physicochemical parameters were measured using standard laboratory methods. pH was measured using a digital pH meter, viscosity were measured using a Brookfield viscometer, and spread abilitywas measured using glass plate technique. Stability testing was conducted for 30 days at 4°C, 25°C, and 40°C. Sensory evaluation and patch testing were performed with volunteer participants using a structured questionnaire. Sample 1 was thin and unstable (pH 6.86), Sample 2 showed fast absorption but minimal moisturization (pH 4.40); Sample 3 had a greasy feel (pH 5.49), while Sample 4 identified as the most desirable results with smooth texture, pH 4.95, viscosity 2800 cP, spread-ability 7.2 cm, and no irritation reported. Compared with a commercial aloe-vera gel, the jackfruit gel offered comparable hydration with additional antioxidant and exfoliating properties due to jackfruit seed actives and salicylic acid. This study concludes that jackfruit seed extract is a promising, eco-friendly cosmetic ingredient, and the optimized gel formulation presents a stable, skin- friendly, and consumer-accepted night skincare product suitable for normal to oily skin types.

Keywords: antioxidant; cold-process; Jackfruit seed extract; night gel; natural cosmetics; sensory evaluation,

Evaluating Consumer Perception and Designing a Plant-Derived Detoxification System for Water Purification

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Abstract

Growing concerns about pollutant and heavy metal exposure in water sources have highlighted significant environmental and public health risks, prompting increased interest in natural purification methods. The aim of this study was to develop and evaluate a natural detoxification mixture pack using mature natural plant components to improve water quality. The research focused on whether natural ingredients can effectively reduce toxic contaminants in water samples and on the level of consumer awareness and acceptance of such a purification method. The detoxification package is prepared using activated carbon (from coconut shells, moringa (*Moringa oleifera)* bark and leaves, pandan (*Pandanus amaryllifolius*) leaves, curry (*Murraya koenigii*) leaves, araththa (*Alpinia calcarata*) leaves and arjuna (*Terminalia arjuna*) fruits, roots and leaves). A survey involving 106 respondents was conducted to assess public perception. It was found that most participants (84.9%) were aged 18–25 and 67% were male. While only 29.2% had prior awareness of detoxification techniques, 75.5% expressed willingness to use the product if proven safe and effective. Activated charcoal (64.2%) was the most preferred ingredient, followed by curry leaves (52.8%) and moringa (50.9%). For product validation, 200 mL raw well water samples were analyzed before and after treatment using Inductively Coupled Plasma Mass Spectrometry (ICP- MS), following USEPA 3010A procedures. Results demonstrated that arsenic, cadmium, lead and mercury were below detectable limits in the treated samples. In conclusion, the developed detoxification pack could not be confirmed as effective in removing heavy metals, as arsenic, cadmium, lead and mercury were already below detectable limits.

Keywords: Natural detoxification, Water purification, Activated carbon; ICP-MS, Consumer perception

Development and Physicochemical Characterisation of Bio-Sheets from Refused Tea for Sustainable Packaging Applications

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Abstract

This study explores the development and characterisation of bio-sheets derived from refused tea as a sustainable alternative to conventional plastic packaging materials. With the increasing environmental hazards posed by non-biodegradable plastic waste, the demand for eco-friendly packaging solutions has grown significantly. The tea industry in Sri Lanka generates a substantial volume of refused tea, a byproduct that remains largely underutilised despite its rich composition of cellulose, polyphenols, and proteins. This research investigates the feasibility of converting refused tea into biodegradable bio-sheets by incorporating cassava powder, carboxymethyl cellulose (CMC), glycerol, and sorbitol. The bio-sheets were developed using different formulations, and their physical, mechanical, and chemical properties were analysed. Key parameters such as colour, film thickness, density, tensile strength, elongation at break, moisture content, solubility, and swelling index were evaluated to determine their suitability as a packaging material. The results indicated that the bio-sheet formulated as TW-x-25/3 exhibited desirable mechanical properties (Tensile strength - 4.76 ± 0.99 N, Thickness- 0.25mm, swelling index- 2.26, elongation at break - 1.70 ± 1.12 %), reduced moisture content, and improved barrier properties, demonstrating their potential for practical application in sustainable packaging. This study highlights an innovative approach to addressing both plastic waste and agricultural byproduct management, contributing to a circular economy and environmental conservation. Further research is recommended to enhance the scalability and commercialization of this bio-based material.

Keywords: Agricultural waste, Biodegradable packaging, Bio-sheets, Refused tea, Sustainable materials

Development of Spread Incorporate with Banana Blossom and Turkey Berry

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Abstract

Banana blossom (Musa acuminata Colla), locally known as "Kesel muwa," and turkey berry (Solanum torvum) are underutilized plant ingredients valued for their high nutritional content, including iron, dietary fiber, vitamins and bioactive compounds. Despite their health-promoting properties, their incorporation into value-added food products remains limited. This study aimed to develop a novel functional spread using banana blossom and turkey berry as primary ingredients, targeting enhanced consumer acceptability and dietary diversification. An online survey was conducted with 100 randomly selected participants across various age groups, genders and education levels to assess awareness, preferences and potential acceptability of products formulated from these ingredients. Results indicated that 77.9% of respondents were female, and 94.1% belonged to the 20–24 age group. Among the proposed product options, a spread was the most preferred choice. Based on the survey outcomes, four formulations (F1, F2, F3, F4) with varying proportions of banana blossom and turkey berry were prepared. Sensory evaluation was performed with 30 untrained panelists using a 5-point hedonic scale, assessing color, texture, aroma and taste. Formulation F1, containing 40% banana blossom and 40% turkey berry, achieved the highest overall acceptability, with significantly higher scores for color and taste compared to the other samples. In conclusion, banana blossom and turkey berry can be successfully incorporated into a spread, combining traditional ingredients with modern product formats to enhance consumer appeal. The study highlights the potential of these underutilized plants in functional food development, offering opportunities to promote nutritional benefits and increase value addition to local crops.

Keywords: Banana blossom, Turkey berry, Functional food, Sensory evaluation, Spread

Development of Garlic-Incorporated Sugar-Free Cookies

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Abstract

Cookies are widely consumed snacks but are typically high in calories and low in fiber. On the other hand, replacing sugar with natural sweeteners can reduce their caloric content and make them more suitable for the health of the consumers. Thus, this study aimed to develop a healthier cookie by using Stevia as a sugar substitute due to its zero-calorie sweetness and enriched with garlic powder (*Allium sativum*) as a functional ingredient which known antioxidant, antibacterial, and anti- inflammatory properties, thereby enhancing the nutritional and functional value of the cookies. A completely randomized design with sweeteners (stevia - 0.5%) and Garlic powder concentrations (2%, 3%, 4%, and 5%) was used. Other ingredients such as wheat flour, fat, maltodextrin, egg, salt, sodium bicarbonate and essence were used for cookie preparation. The sensory qualities of the cookies were evaluated using a 7-point hedonic scale and data were analyzed using SPSS and treatment comparison were conducted using Duncan multiple range test under $P<0.05\%$. The results showed that there was significant difference ($P<0.05$) in the color, texture, taste, appearance and overall acceptability compared with the control samples. Among all the treatments, 0.5% of stevia enrich sample achieved the highest preference in the hedonic test for color (mean score), texture, taste, appearance and overall acceptability. The proximate composition of the biscuits was determined using AOAC official methods. The Analysis of Variance (ANOVA) was carried out to nutritional quality of sugar free cookie at 95% confidence interval. The proximate composition of standardized cookies showed a mean percentage of moisture as 26.77±0.81 and pH as 6.44±0.10. The results of proximate composition of the control sample with garlic powder incorporated sugar free cookie indicated increasing level of protein (g/100 g) and ash (g/100 g) were 17.79 ± 0.81 to 25.62 ± 0.43, respectively while there was decrease in levels of TSS [2.97 ± 0.09 ,1.08 ± 0.06] and fat (g/100 g); [16.07± 0.77,13.47 ± 0.52].

Keywords: *Sugar free Cookie, Stevia rebaudiana*, *Allium sativum*, sensory evaluation, *Anti-oxidant activity*

Development and Quality Evaluation of Jackfruit (Artocarpus Heterophyllus) Incorporated Bread

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Abstract

Jackfruit (Artocarpus heterophyllus) flesh is an underutilized yet readily available resource in Sri Lanka, often subjected to significant postharvest losses. It is also a rich source of fiber and Gluten Free Flour (GFF) that can be identified as a alternative potential source of wheat flour for bakery products. The present study aimed to produce GFF high fiber bread using Jackfruit Flesh Flour (JFF). Preliminary studies were conducted to find the best proportion of Wheat Flour into JFF were 75:25. JFF flour is separated using two different sieve sizes and each JFF flour type was used to prepare bread formulations that included fried JFF, Xanthan gum (0.01%), and Dawul Kurundu (DK) (Neolitsea cassia) (0.05%). In total, six bread samples were developed and they were subjected to sensory evaluation (taste, texture, color, aroma, and overall acceptability) using a 5-point hedonic scale with 30 untrained panelists. Among the six formulations, the sample prepared with small particle size JFF with DK 0.05% was selected as the best sample. Finally the selected bread sample was compared with a commercial control sample for sensory, proximate analysis, physiochemical and microbial analysis. After sensory analyses, composite breads with JFF and DK were found sensory better than control sample. According to proximate analysis, JFF-DK bread formula contained more crude fiber
2.64±0.09% compared to control sample (1.93±0.06%). During the texture analysis, the JFF-DK sample showed higher hardness value at 295.00 g compared to the control sample at 50.00 g. For all samples, yeast and mold counts were less than 10 CFU/g, while total plate count (TPC) and coliforms were not detected. According to the study, it was concluded that bread can be produced using a mixture of 25% JFF and 75% wheat flour, with 0.05% DK, as a gluten-free bread. Conference Name

Keywords: Artocarpus heterophyllus, Xanthan gum, Dawul Kurudu, Texture profile analysis, Bulk density

Poster Presentations

Ethanolic Extraction of Centella Asiatica Using 96% Ethanol: Extraction Process and Yield Evaluation

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Abstract

Centella asiatica (L.) is a medicinal plant that is widely utilized in both traditional medicine and modern cosmetic formulations due to its anti-inflammatory, antioxidant, and wound-healing properties. The purpose of this study was to extract C. asiatica using 96% ethanol, to asses extraction yield in order to use cosmetic products preparation. After being gathered from the Matara District in Sri Lanka, aerial parts of the plant were shade-dried, crushed, and cold macerated for 72 hours using 96% ethanol at a solvent-to-plant ratio of 10:1. A rotary evaporator set to 40°C and lower pressure was used to filter and concentrate the extract. The finished crude extract had a distinctive herbal smell and was a dark green, semi-solid mass with a sticky stickiness. It was found that the average extraction yield was 14.8(w/w) ± 0.26%. These results show that ethanol is an effective solvent for removing alcohol-soluble substances from Centella asiatica. The extract is suitable for further development in herbal and cosmetic formulations, especially where natural active ingredients are desired.

Keywords: Centella asiatica, ethanolic extraction, medicinal plant, extraction yield, herbal processing

Electrotherapy Applications in Cosmetology: A Narrative Review of Potential Skin Benefits

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Abstract

In recent years, electrotherapy modalities have gained growing interest in cosmetology, extending beyond their conventional roles in pain management and rehabilitation to promote aesthetic skin care. This narrative review explores existing evidence on the skin related benefits and mechanisms of commonly used electrotherapy techniques in cosmetic practice. A structured literature search was performed across PubMed, Scopus, Google Scholar, ScienceDirect, SpringerLink, MDPI, and Frontiers up to July 2025. Keywords combined "electrotherapy," "radiofrequency," "PEMF," "iontophoresis," and "microcurrent therapy" with cosmetic dermatology terms. Following systematic screening and review, five studies were included. Findings reveal that electrotherapy shows diverse potential in cosmetic applications. When combined with pelotherapy, iontophoresis improved skin barrier function and reduced inflammation by enhancing ionic delivery. Noninvasive contouring technologies such as radiofrequency, ultrasound, and cryolipolysis demonstrated improvements in fat reduction, skin tightening, and cellulite appearance. Electrotherapy following dermatological procedures was associated with microbiome restoration and reduced inflammation. Preliminary evidence also suggests safe application of electrocosmetic devices in oncology aesthetics and rehabilitation settings with both functional and aesthetic benefits. Proposed mechanisms include fibroblast activation, enhanced ATP production, improved microcirculation, greater transdermal absorption, cytokine modulation, and lymphatic stimulation. Applications range from acne care and rejuvenation to wound healing and barrier repair. Despite encouraging results, current evidence is limited and inconsistent. Future research should emphasize standardized protocols, larger clinical trials, and diverse population inclusion. Combining electrotherapy with aesthetic rehabilitation concepts may advance integrated approaches to skin health.

Keywords: Electrotherapy, cosmetology, radiofrequency, iontophoresis, skin rejuvenation, aesthetic rehabilitation, microbiome, non-invasive treatments

Smart Food Quality Monitoring Using Sensor Technology: A Review of Recent Advances (2021–2024)

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Abstract

The importance of maintaining food safety and quality has grown in the modern food industry due to globalized supply chains and increased consumer awareness. Conventional methods for quality inspection are always labor intensive and time consuming, and they are unable to identify issues in real time. In addition, smart sensor technologies offer contemporary methods for accurately, continuously, and instantly monitoring food quality at every stage of the process from supply chain to production. Recent developments in the food industry's use of biosensors, gas sensors, optical sensors, and temperature and humidity sensors are covered in this review paper. Spoilage detection, shelf life estimation, smart packaging, and cold chain tracking are a few of the applications that are highlighted. Additionally, traceability, automation, and data-driven decision making are enhanced by integrating these sensors with Internet of Things (IoT) platforms. Sensor calibration, environmental sensitivity, cost and integration complexity are some of their drawbacks despite their benefits. This review identifies the revolutionary power of smart food quality monitoring systems and presents upcoming trends like AI based sensors and blockchain technology integration. In conclusion, smart sensor technology can significantly improve food safety, reduce waste, and contribute to the future sustainability of food processing.

Keywords: Smart food quality, Sensor technology, automation

Antioxidants for Healthy and Youthful Skin: A Review on Mechanisms, Efficacy and Emerging Strategies

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Abstract

Antioxidants are key molecules which regulate redox homeostasis of the skin. They achieve this either by donating electrons to stabilize the oxidants or by enhancing enzymatic pathways encompass in oxidative defense mechanism. This action mitigates skindamage and preserves skin integrity thereby promoting healthy youthful skin. Oxidative stress that is recognized as the central mechanism, is enhanced by intrinsic; genetic and hormonal and extrinsic; ultraviolet (UV) radiation and other environmental factors and this up-regulation cause a multifactorial biological process known as skin aging. The accumulation of reactive oxygen species (ROS) contributes to extra cellular matrix degradation, cellular dysfunction and inflammation trigger the process of skin aging leading the skin unhealthy. Antioxidants mitigate these effects by neutralizing ROS, supporting collagen synthesis and preserving skin structure and function.This review systematically explores the mechanism of oxidative stress in skin aging highlighting the roles of both endogenous and exogenous antioxidants in cutaneous defense. Recent advancements in antioxidant delivery systems and emerging strategies,specified here will be consistent with the integration of science of antioxidants with biotechnology, dermatological diagnostics and sustainable practice which reveal a promising frontier in preventing skin aging. Continued interdisciplinary research, regulatory oversight and clinical validation are indispensable to advancement of these novel approaches into more safer and efficacious dermatological applications.

Keywords: Antioxidants, Healthy and Youthful Skin, Reactive Oxygen Species (ROS), Oxidative Stress

Use of Sawdust Ash in Cement Mortar Mixtures

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Abstract

Cement mortar mixtures are an integral part of the construction industry. However, the increase of price of cement is difficult for the consumer to be borne. Because of this, cutting down the cost spent on cement is a factor to be considered. Furthermore, the problem of waste sawdust is now greatly exacerbated. This study was designed by considering both factors. In this study, cement mortar mixtures were made using waste Sawdust Ash (SDA) as a substitute material for cement. Six mixes of cement mortar were prepared by partially substituting SDA in different percentages of 0%, 5%, 10%, 15% and 20% by weight, in a conventional mortar mixture. Considering cost and properties, the optimum content of SDA to substitute for cement was selected as 10%. For this mix, 0.16 m of slump value, 1820 kg/m^3 of density, 03.70% of water absorption, and 24.63 MPA of compressive strength were the observed results.

Keywords: Mortar mixtures, Sawdust ash, Substitute material, Waste material

Sensory Quality and Antimicrobial Enhancement of Condiment Powder by Incorporating Bilimbi (Averrhoa Bilimbi) Powder

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Abstract

The Bilimbi (*Averrhoa bilimbi*) is an underutilized seasonal fruit grown in Sri Lanka. In this study focused to introduce value addition powder enrich with nutritious form to the consumer. The form of condiment powder by incorporating Bilimbi prepared different ratios of formulation and provided to the thirty untrained panelists for organoleptic evaluation. Five point hedonic scale was used to analysis. Selected sample was evaluated for physio-chemical parameters and results revealed that 2.5% moisture content, 4.4% ash, 1.3% fat, 15.89% protein, and 10.57 Acidity content. No microbes were recorded during the three months of period. The finally selected formulation was contained with 35.7% bilimbi, 19.3% Maldives fish with other spices that can be recommended to use for sambal preparation. The study concludes that adding bilimbi powder with spices and Maldives fish powder produces a functionally superior and sensory quality. This condiment powder recommended to seasoning alternative to synthetic additives.

Keywords: Bilimbi, Condiment powder, Spices, Sour taste

Enhancing Green Technology in Sri Lanka: Engineering Innovations, Sustainability Challenges and Future Opportunities: A Review

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Abstract

For countries worldwide, there is a universal need to move away from fossil fuels to greener energy sources to mitigate climate change and environmental harm associated with fossil fuel use. As Sri Lanka relies on imported fossil fuel energy, mitigating climate change by moving away from fossil fuels has been identified as an economic and environmental imperative. This review uses geographical, economic and policy contexts to examine engineering innovations in green energy production, including green hydrogen, solar, wind, hydro, biomass and emerging energy technologies in Sri Lanka. Engineering innovations in battery systems, smart grids and digital monitoring approaches, energy storage and sustainable energy distribution may face unexpected challenges with capital, start-up costs, limited knowledge, grid issues and government policies. Sustainability challenges also require broader approaches to managing sustainability issues, adaptive governance for project design and land use, and other forms of environmental trade-offs and trade-offs. Finally, this review suggests the need for systemic change, including a collaborative systemic architecture that engages political leaders at all levels of government, system operators, the electricity supply industry, and public and private stakeholders accelerates research and development options, as well as science and innovation for a better transition to a sustainable energy future for Sri Lanka. Significant steps need to be taken to improve energy security, reduce greenhouse gas emissions, and enhance long-term economic resilience, while advancing the sustainable integration of renewable energy into the national energy mix, with improved energy literacy and the inclusion of local communities in the transition. While the opportunities identified above present serious challenges, implementing these opportunities through integrated planning inclusive policies or strategies illustrates the potential for Sri Lanka to become a significant regional partner as a leading example of sustainable energy transition.

Keywords: Green energy, Renewable energy in Sri Lanka, Engineering innovations, Sustainability issues, Energy policy, Low carbon, Energy security, Smart grids, Green hydrogen

Refused Tea as a Resource: A Review of Its Practical Applications

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Abstract

Sri Lanka's tea industry, renowned globally under the "Ceylon Tea" brand, significantly contributes to the national economy. Sri Lanka is ranked as the world's fourth-largest producer in the world. However, the processing of tea generates a byproduct known as refused tea, constituting 4-6% of total processed tea. As defined under the Tea Control Act No. 51 of 1957, refused tea comprises sweepings, red leaves, fluff, and stalks. Sri Lanka is currently facing significant regulatory challenges regarding refused tea, as it is being misused by traders. Refused tea's chemical composition is rich in fiber, polyphenols, caffeine, and bioactive compounds. Currently, Sri Lanka is allowing traders to take tea extract from refused tea to make instant tea and also to sell after reprocessing". Emerging applications of refused tea include its conversion into bio-absorbents and activated carbon capable of removing heavy metals and organic pollutants from wastewater, promoting environmental remediation. It also enhances green packaging materials by providing antioxidant and antimicrobial effects and improving mechanical properties in biopolymer films, with innovations in smart packaging that can indicate food spoilage. Furthermore, refused tea serves as an effective substrate supplement for mushroom cultivation, improving yield and nutritional content. Additionally, its use in biogas production, instant tea production and bio-oil production has been demonstrated. Through effective communication, people can maximize the proper utilization of refused tea and reduce its misuse by illegal business.

Keywords: Byproducts of tea industry, Refused Tea, Tea Fiber, Tea waste

Harnessing Plant Bioactives for Sustainable Packaging: A Critical Review of Lemongrass (Cymbopogon Citratus) and Aloe Vera (Aloe Barbadensis Miller)

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Abstract

Harnessing plant bioactives from Aloe vera (Aloe barbadensis Miller) and lemongrass *(Cymbopogon citratus)* for sustainable food packaging represents an innovative approach to tackle the environmental issues linked with conventional plastic packaging. These natural compounds offer multifunctional benefits including antioxidant, antimicrobial, and anti-inflammatory properties that enhance food preservation and extend shelf life. Aloe vera gel acts as a natural barrier to moisture and oxygen, preserving nutritional quality, while lemongrass essential oils, rich in citral and terpenes, exhibit potent antimicrobial effects against foodborne pathogens. Integration of these bioactives into packaging materials not only meets functional food preservation needs but also promotes eco-friendly practices by utilizing agricultural residues and reducing plastic dependence. Despite promising potential, challenges such as regulatory approval, production scalability, stability of bioactives during storage, and consumer acceptance remain. Future perspectives focus on leveraging nanotechnology and smart packaging to improve bioactive delivery and efficacy while ensuring safety and sensory acceptance. Overall, using Aloe vera and lemongrass bioactive symbolizes a pivotal shift toward greener food packaging solutions aligned with circular economy goals.

Keywords: Aloe vera; Bioactive compounds; Food preservation; Lemongrass essential oil; Sustainable package

Building Envelope Optimization for Tropical Climate Conditions: A Sri Lankan Office Building Case Study

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Abstract

According to the Ceylon Electricity Board (CEB), Sri Lanka consumes approximately 49.19 GWh of electricity per day, of which 13.72 GWh is generated by fossil-fuel power plants. Electricity produced from fossil fuels is a major source of carbon dioxide (CO_2) emissions, a primary driver of global warming. Buildings are among the largest end users of energy, and their operational demand significantly affects national electricity consumption. Among all end-use systems, the air-conditioning system is the dominant energy consumer. The aim of this research is to develop and propose recommendations to optimize the energy consumption of the Head Office Building of the State Ministry of Home Affairs in Kollupitiya which is a multi-story office building. The objectives of this study are to examine the current building electrical loads and materials used for the building, required for developing an accurate energy model, to model the building and identify the combination of parameters that significantly influence its energy consumption, by multiple modeling exercises and to determine the most energy efficient combination for retrofitting. The building was modeled using eQuest open-source software. Subsequently changed the selected parameters of the building envelop with the possible combinations to check the impact on the energy consumption. The changed parameters are roof type, wall type and window shadings. Tested the model for two roof types, two wall types and four shading effects. The yearly energy consumption was obtained by manipulating the parameters for sixteen combinations. The modeled baseline building consumed 1947 MWh/year, while the optimized configuration with optimum parameters reduced consumption to 1527 MWh/year, representing a 36 % reduction. These findings highlight the effectiveness of envelope enhancement strategies in reducing operational energy demand and provide recommendations for future retrofitting.

Keywords: Energy; Modelling; Optimization

INTEGRATING SUSTAINABILITY INTO TVET

Implementing AI-Enhanced Learning Environments in Vocational Education: A Case Study on Adaptive Learning Technologies for Skill-Based Training

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Abstract

Artificial Intelligence (AI) is increasingly reshaping educational practices, offering innovative solutions to enhance learning outcomes in vocational education. Vocational training in developing countries, such as Sri Lanka, faces challenges including diverse learner backgrounds, varying skill levels, limited instructor capacity, and constrained technological infrastructure. These factors can hinder effective skill acquisition and learner motivation. AI-enhanced adaptive learning technologies provide personalized instruction, real-time feedback, and competency-based learning pathways, allowing learners to progress at their own pace and supporting instructors in managing diverse classrooms. This study investigates the implementation of an AI-powered adaptive learning platform in vocational training centers in Sri Lanka, focusing on two accredited courses: Automotive Servicing (NVQ Level 4) and Welding (NVQ Level 3). A rigorous mixed-methods approach was adopted, combining quantitative measures pre- and post-tests, platform analytics with qualitative insights from semi-structured interviews and instructor observation logs. Analysis of Covariance (ANCOVA) revealed that learners in AI- supported environments achieved statistically significant and substantially larger gains in theoretical knowledge and practical skills compared to peers in traditional settings, with large effect sizes (Cohen's $d > 1.7$). Low-performing learners benefited most, highlighting the effectiveness of adaptive scaffolding and personalized feedback. Instructors reported increased efficiency in monitoring learner progress and providing targeted support. The discussion is grounded in Constructivist, Self-Regulated Learning (SRL), and Mastery Learning frameworks, and includes a detailed examination of ethical considerations, the necessity of Explainable AI (XAI), and strategies for sustainable scaling in low-resource contexts.

The study demonstrates that AI-driven adaptive learning can transform vocational

education by improving learner engagement, skill development, and instructional efficiency. Recommendations for sustainable implementation include investment in digital infrastructure, continuous professional development for instructors in AI literacy, and the adoption of transparent, ethical AI practices aligned with accredited competency frameworks.

Keywords: Adaptive Learning, Vocational Education, Artificial Intelligence, Skill-Based Training, Personalized Learning

A Review of Greening the TVET Sector: Advancing A Paperless Culture in Sri Lankan Vocational Institutes

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Abstract

This study examines the feasibility of transitioning to a paperless culture within Sri Lanka's Technical and Vocational Education and Training (TVET) sector as part of national digital transformation and sustainability priorities. The central research question explores how Sri Lankan TVET institutions can adopt paperless practices effectively while maintaining educational quality and operational efficiency. A Systematic Literature Review (SLR) of 82 documents published between 2020 and 2025 including academic studies, policy frameworks such as the ICTA Policy for Digital Transformation of Education, reports on post-COVID-19 digitalization trends, and TVET digital platforms such as "Career One" was conducted. After screening for relevance and quality, 38 studies were included in the final synthesis. Findings indicate that although digital adoption increased during COVID-19, uptake remained uneven. Evidence suggests that an estimated 50–60% of TVET courses temporarily shifted online during the pandemic; however, full adoption was constrained by infrastructural limitations, unequal access to technology, and resistance among staff and learners. Nonetheless, initiatives such as the development of e-learning quality standards by the Tertiary & Vocational Education Commission (TVEC) and partnerships with UNESCO-UNEVOC demonstrate progress toward a more digitally integrated and environmentally sustainable TVET system. The review concludes that successful implementation of a paperless culture requires coordinated policy execution, robust ICT infrastructure, capacity building for educators, and strong stakeholder engagement. A shift toward paperless TVET can reduce administrative costs, enhance learning access, and support Sri Lanka's climate resilience and digital inclusion goals.

Keywords: Paperless education, Green TVET, Digital transformation, Sustainable education, Sri Lanka

The Impact of Work–Life Balance on Internship Students' Performance in Hospitality Education: A Case Study of the University College of Anuradhapura

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Abstract

Work-life balance (WLB) is a critical determinant of student well-being and performance for hospitality students who must combine demanding internship schedules with academic responsibilities. This mixed-methods study investigates the relationship between WLB during internship placements and both academic and practical performance among 20 hospitality students from the University College of Anuradhapura (UCA). Quantitative data were collected using a structured 5-point Likert questionnaire measuring time pressure, fatigue, emotional stress, academic engagement, and job satisfaction; data were analyzed with descriptive statistics and correlation analysis in SPSS. Qualitative data from semi-structured interviews were analyzed using thematic analysis. Key quantitative findings: 42% of respondents reported difficulty maintaining WLB; poor WLB correlated negatively with academic performance ($r = -0.56$, $p < 0.01$) and balanced routines correlated positively with supervisor-rated practical performance ($r = 0.63$, $p < 0.01$). Thematic analysis identified long working hours, transport challenges, academic deadlines, and emotional exhaustion as primary stressors; supportive supervision and flexible rostering emerged as protective factors. The study recommends coordinated institutional and industry interventions flexible scheduling, mentorship, accessible counselling, and WLB awareness integrated into curricula to improve student outcomes and build a sustainable hospitality workforce in Sri Lanka.

Keywords: Work-life Balance, Internship, Hospitality Industry, Academic Engagement, Students' Performance

Bridging the Gap Between Vocational Education and Employment in Sri Lanka: Strengths and Limitations of the Current System

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Abstract

Vocational education plays a significant role in preparing the workforce with appropriate competencies that meet the demand in the labor market, particularly in developing countries like Sri Lanka. Despite continuous investment and expansion of industrial training programs, the gap between graduate competencies and employer requirements remains very high, hence the low employability. This research paper looks at the strengths and weaknesses of Sri Lanka's vocational education system and its relevance to labor market needs. The main strengths are wide accessibility, diverse course offerings, and institutional support from agencies like the Tertiary and Vocational Education Commission. However, persistent limitations include outdated curricula, weak industry linkages, a lack of soft skill development, and limited career guidance. The study concludes with recommendations such as updating the curriculum, strengthening the links between the training institutes and industries, giving more importance to digital and soft skills, and introducing structured mechanisms for career counseling. Such recommendations are needed to reduce skill mismatches, enhance employment rates, and contribute to socio-economic development in Sri Lanka.

Keywords: Vocational education, employability, skills gap, Sri Lanka, curriculum development, industry collaboration.

The Role of ICT in Greening Practices for Sustainable TVET: A Comparative Study Between Sri Lanka and Selected Countries in the Asian Region

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Abstract

Sustainable development has become dominant for governments and education systems across the world, especially in regions confronting rapid environmental issues and resource pressure, which necessitates the corrective and preventive actions for recovery and avoidance. The Technical and Vocational Education and Training (TVET) sector plays an influential role as it directly links workforce preparation and industry practices. While the idea of "Greening TVET" is not new, recent years have seen digital technologies emerge as a key enabler for both pedagogical innovation and institutional transformation, which highlights the evolving discourse on this subject. Digital technologies enable energy-efficient training delivery, supports environmental monitoring, and expands access to green-skills development. This paper examines how digital technologies contributes to greening practices in Sri Lanka's TVET system, while drawing comparative insights from five Asian countries—Singapore, India, Malaysia, Vietnam, and South Korea. The analysis is based entirely on documented literature, enabling a broad regional assessment of policy, infrastructure, pedagogical practices, and institutional environmental responsibility measures. The findings show that Sri Lanka has established a strong policy foundation but still requires more strategic digital integration, institutional readiness, and consistent implementation capacities. The study concludes by outlining pathways for enhancing Sri Lanka's digital technologies-enabled greening agenda based on regional lessons and current national priorities.

Keywords: ICT, Greening, TVET, Sustainability, Skills

Poster Presentations

Understanding and mitigating the skilled labors shortage in Sri Lankan construction industry

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Abstract

The shortage of skilled labors in construction sector of Sri Lanka is a major threat to its future development. The purpose of this research is to review the current knowledge regarding important causes, assess potential and actual effects, and provide recommendations for managing this problem. To do so the research includes a systematic literature review, interviews with selected experts in the field and an questionnaire survey for industry professionals and labors. The study establishes key reasons for the shortage namely; Low wages, inadequate training programs, poor perception towards the construction industry, ageing construction workers, and migration. It results in time extension and cost increases, reduce quality of work, reduce long term sustainability and reduce productivity. In order to tackle such issues, the study calls for improved training and apprenticeship, rising wages, better safety, and better cooperation between the industry, government, and education. The study underlines that, the key policy approaches and government and private sector engagement have to be targeted to maintain skill talent and to minimise the skills shortage. Thus, if efforts are directed to improve the construction sector capacity to meet the anticipated demand from its training initiatives aligned to the requirements as well as providing better working conditions, it can be act as the backbone of the country's economic growth and development of Sri Lanka

Keywords: Skilled labour shortage, Construction Industry, Productivity Challenges, Key Policy Approaches, Economic Growth

MANAGEMENT & TECHNOLOGY FOR RESOURCE EFFICIENCY

Performance Comparison of Rechargeable Cells Made with Poly (3,4-Ethylenedioxythiophene) (Pedot) Cathode and Polyaniline (Pani) Cathode

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Abstract

Research on sustainable, safe energy-storage technologies increasingly highlights zinc-based systems due to their low cost, abundance, and improved safety. Although various cathode materials—metal oxides, carbon composites, and conducting polymers such as PEDOT and PANI—have been reported, comparisons are difficult because studies employ different electrolytes, substrates, and fabrication conditions. Consequently, the intrinsic performance differences between conducting polymers remain unclear. This study directly compares PEDOT and PANI cathodes synthesized under identical electrochemical polymerization conditions and assembled with the same gel polymer electrolyte, enabling a fair evaluation of their electrochemical properties. With growing interest in alternatives to lithium-ion batteries, this work investigates the suitability of PEDOT and PANI for zinc-based rechargeable cells. Both polymers were electrochemically deposited on stainless-steel substrates and assembled into Zn/GPE/Polymer cells. Electrochemical Impedance Spectroscopy (EIS), Cyclic Voltammetry (CV), and Galvanostatic Charge/Discharge (GCD) analyses were conducted to assess resistance, charge-transfer behavior, redox reversibility, capacity, and cycling stability. The PEDOT-based cell showed an open-circuit voltage of 1.18 V, a discharge capacity of 3.72 mAh/g, and high charge-transfer resistance (2270.32 Ω), with poor cycling retention. In contrast, the PANI-based cell delivered a higher open-circuit voltage of 1.32 V, a discharge capacity of 26 mAh/g, and much lower charge-transfer resistance (19.8 Ω), maintaining 63% capacity after 1000 cycles. Overall, PANI demonstrates superior promise as a cathode material for safe, low-cost, non-lithium energy-storage applications.

Keywords: PEDOT, PANI, Rechargeable cells, Electrochemical performance, Conducting polyme

Design and Development of an Automated Cereal Packaging Machine

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Abstract

The Automated Cereal Packaging Machine project creates a successful solution to handle the problems of manual grain packaging through its implementation of cost-effective mechanical components and Programmable Logic Controllers. This packaging device serves small and medium-scale producers with the arrangement of Programmable Logic Controller technology with affordable mechanical elements. The machine produces packets of 50g and 100g at a rate of one packet every 6-10 seconds, which indicates its potential to boost industrial output values while minimizing product loss.

The combination of a DC gear motor and a rack and pinion design allow the machine to deliver cost-saving performance instead of expensive imported systems. The system offers price advantages for low-income business owners who wish to enter competitive markets effectively.

Keywords: Programmable Logic Controller (PLC); Ultrasonic Sensor, Filling Unit, Sealing Unit

Impact of Air Intake Temperature on Fuel Efficiency and Emissions in Naturally Aspirated Gasoline Engines

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Abstract

Better fuel economy with reduced exhaust emissions is the ultimate target for the modern automotive industry. For the enhancement of the engine with reduced emissions, improved combustion methods are required, for example, utilising ultra-lean air-fuel mixtures and air-fuel mixing improvement. Amongst the methods that are found to be beneficial is decreasing the intake air temperature (IAT), as cold air is denser and contains a higher oxygen concentration, which produces better combustion inside the engine and shorter ignition delay, and an improved rate of fuel burning. This study examines the impact of IAT on brake specific fuel consumption (BSFC) and tailpipe emissions—i.e., unburned hydrocarbons (UHCS) and carbon monoxide (CO)— of a naturally aspirated 1.5 L spark ignition gasoline engine. The experiments were conducted at constant load and different engine speeds (1,500–3,000 rpm) with intake temperatures set at 20 °C, 25 °C, and 30 °C. Fuel consumption was measured with the Dataq Pro V2 system, and UHC and CO exhaust emissions were measured with an MRU exhaust gas analyzer. The results indicate that the increase of IAT from 20 °C to 30 °C elevates BSFC by as much as 10%, and UHC and CO emissions by around 15% and 12%, respectively. Reducing IAT slightly increased combustion duration but resulted in more complete fuel burning, as had been previously established for 1.5-liter (1500 cubic centimeter) engines. Finally, reduced intake air temperatures improve fuel economy and reduce toxic emissions in naturally aspirated gasoline engines.

Keywords: Intake Air Temperature (IAT), Brake Specific Fuel Consumption (BSFC), Spark Ignition Engine, Unburned Hydrocarbons (UHC), Carbon Monoxide (CO)

Design and Implementation of an Educational Testbed for A 12V PMSM Integrated Starter Generator

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Abstract

Most current automotive control units are proprietary "black boxes," inhibiting application in practical academic settings. In this setting, an open-source educational testbed was developed based on the Smart Hybrid Vehicle by Suzuki system installed in the Wagon R. Based on the reverse engineering methodology applied previously to a KIA mildhybrid, this project bypasses the closed control unit of the manufacturer to allow direct access to the powertrain. We propose a dedicated controller based on a Texas Instruments C2000 DSP, with integrated AMR position sensing and Halleffect current sensors. Validation on a dynamometer test bench demonstrated that the system successfully emulated core SHVS functions, including idle start-stop sequences and torque assist. A flexible hardware platform has been created where researchers and students can experiment with hybrid drive algorithms on real-world hardware.

Keywords: Suzuki SHVS, Mild-Hybrid, Integrated Starter Generator (ISG), PMSM Control, Educational Testbed

Comparative Study of Shipping Container House Concept in Sri Lanka

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Abstract

An innovative and economical solution to housing, this research analyses the feasibility of shipping container houses in Sri Lanka. As the demand for affordable housing and sustainable building practice increases, shipping containers offer an attractive alternative to usual building methods. A review of current housing concepts in Sri Lanka is first undertaken in this study, identifying the challenges in the construction sector. Then it pin points the many benefits of utilizing shipping containers on many grounds, economic viability, social inclusivity and environmental sustainability. In addition, the study assesses the challenges that limit the usage of shipping container houses in the local construction industry including; legislation, perception and technical restraints. In surveys of quantitative approach, information from the stakeholders in the industry is collected to know these difficulties. Finally, it was recommended to target at the future improvement of shipping container house into local construction industry particularly with policy changes, sensitization and coherent efforts among various stakeholders. Further, this research is relevant to the discussions on new forms of housing and recommendations to achieve it within Sri Lanka. Through the above findings this research proves that shipping container houses are indeed a feasible and possibly revolutionary kind of housing opportunity in Sri Lanka. The effects on environment, construction time, and space advantages make it very promising for container houses to be an integral part of the emerging housing systems. Overall, the study shows a very positive outlook of the actors involved in the deployment of smart grids with the view that the challenges posed both socially and financially will be surmountable with the concerted efforts of involved stakeholders.

Keywords: Construction, Shipping Containers houses, Sri Lankan construction industry, Housing Solution

Development of Pavement Maintenance Management System for Urban and Rural Roads in Sri Lanka

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Abstract

Sri Lanka's road network comprises over 92,700 km, where 40% of national roads and 60% of provincial/local roads are in poor condition. The absence of a comprehensive Pavement Maintenance Management System (PMMS) has resulted in poor and untimely maintenance and increased costs. This focused on developing an effective PMMS framework for Sri Lanka's urban and rural road networks to optimize maintenance planning and resource allocation. Hence, a systematic database which is covering five components (Pavement Inventory, Pavement Condition, Maintenance Activity, Maintenance Schedule, and Pavement Condition Index (PCI) calculations) was developed using MS Access. The interactive forms allow data entry by authorities while analytical queries calculate PCI values and deduce values from pavement distress assessments. Therefore, the developed PMMS successfully centralized pavement maintenance data and provides an efficient solution for managing pavement data in Sri Lanka. Further, the developed PMMS is based on MS Access, which allows the local authorities to access easily and cost effectively. The system enhances decision making, optimization of maintenance costs, and supports proactive strategies, improving road safety and infrastructure durability.

Keywords: Pavement Maintenance Management System; Pavement Condition Index; Road Infrastructure; Database Management

Design and Fabrication of Semi-Automatic Liquid Dispensing Machine

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Abstract

In the world of fully automated processes, the small-scale industries or retail outlets finds difficulties in investing for the modern measuring equipment like PLC driven dispenser for the liquid filling process. Due to such challenges in utilizing novel technologies, industries and commercial centers have to hire the expertise and the devices and it will add another expenditure to lower the productivity. With the expectation of eliminating such issues, this semi-automatic liquid filling machine has been designed. In this design, it has been considered that the arrangement of every machine component can be customized by the client with respect to their liquid and container dimensions. It can be easily operated even by any semi-skilled worker. This can be used to fill an accurate amount of liquid into bottles and containers. These machines work as per the filling working principle of gear pump. Further, this is a compact machine fabricated with food graded PVC material. This machine is designed for low power consumption and easy to operate. The required amount of the liquid can be entered through the customer interface - screen. This proposed machine is very useful for retail outlets and with a small modification, it can also be used to distribute toxic or harmful liquids such as thinner, acids, and fertilizers.

Keywords: Liquid Dispenser, Measurement, Semi-Automatic, User friendly, Accurate

Design and Implementation of an Automated Tool Cupboard Using Fingerprint Authentication for Secure Industrial Storage

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Abstract

Tool misplacement is a common problem in industrial workshops and often leads to workflow delays and unnecessary replacement costs. This study presents a low-cost Automated Tool Cupboard (ATC) designed with fingerprint authentication to improve tool security and accountability in small workshop environments. A capacitive fingerprint unit was linked with an ESP32 board, and the board was used to process biometric data, store entry records, and trigger the locking mechanism. After setting up the cupboard in a functioning workshop, measurements were taken for accuracy, speed, and overall user feedback. The prototype achieved a 96% successful authentication rate and prevented all unauthorized access attempts. The average unlocking time was 1.8 seconds, which minimized delays during tool retrieval. Users reported approximately a 30% reduction in misplaced tools following the introduction of controlled access. From the results, it was shown to me that low-cost biometric features can improve how tools are managed, and the setup can be used later to add options like RFID tracking or links to IoT systems.

Keywords: Fingerprint Authentication, Tool storage, Smart Workshop, Access control, Industrial efficiency

Forensic Study of Survival Strategies of Main Contractors During Sri Lankan Economic Crisis

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Abstract

Strong influential storms of Sri Lanka's economic crisis of 2019 to 2022 identified greater hardship for construction industry participation towards national GDP. Overall construction industry and supply chain thereof impacted with losing jobs, significant time-cost overruns and project terminations. Thus, effects and challenge on construction Main Contractors with recovery strategies overcome the impacts is discussed in this timely study. Qualitative approach occupied in collect data: semi structured interviews conducted at construction professionals at Main Contractor organizations: building, road, and bridge projects interviewed to reveal practical causes, effect of challenge with recovery strategies taken by main contractor organizations. Accordingly, as per the manual content analysis unprecedented inflation of construction materials, lack of funds, fuel and power crisis identified as most critical factors effected at Main Contractors performance. Interviews highlighted challenges as Contractual obligations, inadequate price escalation indices. On the other hand, cost reduction strategies and the implementation of effective project management strategies found as the most effective recovery measures to enhance construction project performance during the crisis. Improve sustainable development and procurement strategies, joint ventures with foreign parties, value management techniques are proposed as long-term strategies to overcome the impacts of economic crisis on Sri Lankan Main Contractors point of view.

Keywords: Main Contractors, Economic Crisis, Survival Strategies, Project Management, Construction Industry

Application of Passive Fire Protection for the Buildings

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Abstract

Building fires pose a major safety risk in urban areas, with Sri Lanka experiencing an increase in incidents due to rapid urbanization, outdated infrastructure, and lax enforcement of fire safety laws. Systems such as Passive Fire Protection (PFP) which include fireproof materials, compartmentalization, and fire-resistant doors delay the rate of spreading fires and facilitate safe egress. This study examines the efficacy of PFP practices in Sri Lankan buildings, their relevance to building safety, and their current state. Mixed methods were applied that involved 265 occupant surveys, engineer and consultant feedback, senior fire official interviews, experimental simulation, and global case studies. The findings indicate that 69.9% of occupants lacked basic awareness of PFP and 41.5% reported no familiarity at all. And 77.4% of professionals prefer an integrated use of active and passive systems, and 41.9% rated PFP as very effective and 38.7% as effective in inhibiting fire spread. The primary obstacles were found to be high initial costs (45.2%), a lack of awareness or training (38.7%), and non-enforcement of codes (16.1%). The study concludes that PFP improves evacuation safety and building resilience greatly but only with proper maintenance and application. Strengthening enforcement of regulations, subsidization of low-cost materials and targeted public awareness and training programs are recommended to reinforce national fire safety standards.

Keywords: Passive Fire Protection (PFP), Fire Safety Regulations, Building Fire Safety

The Impact of Eco-Tourism Practices on visitor Satisfaction (Special reference to Cultural triangle, Sri Lanka)

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Abstract

Eco-tourism has rapidly emerged as a major segment within the global tourism industry, largely fuelled by rising environmental consciousness and traveller interest in sustainable experiences. Within Sri Lanka, the Cultural Triangle has become a prominent attraction for nature-oriented visitors, creating a growing need for hotels to adopt environmentally responsible practices. This study examines how selected eco- tourism practices influence visitor satisfaction in eco-lodges and sustainable hotels in the region. Five dimensions of eco-tourism practices were evaluated: sustainable water usage, energy-saving measures, solid waste handling, air-quality management, and contributions to the local community. A quantitative, deductive approach was employed, and primary data were gathered from 150 tourists using face-to-face questionnaires distributed across sustainable hotels in Kandy, Anuradhapura, Polonnaruwa and Dambulla. Data were analyzed using SPSS 27, using descriptive statistics, correlation, and regression analysis. Findings reveal that sustainable water practices, energy conservation efforts, and effective waste management strongly enhance visitor satisfaction. Conversely, air-quality initiatives and community-related benefits, while still positively perceived, show comparatively lower influence, possibly due to their limited visibility or indirect nature during the guest experience. Overall, the study highlights that eco-tourism practices were directly improve visitor satisfaction. The results offer useful guidance for eco-lodges and tourism operators aiming to strengthen sustainable operations and address the expectations of environmentally aware travellers. Additionally, this research contributes to the limited empirical work on eco-tourism practices in Sri Lanka and identifies opportunities for future studies, particularly regarding how less tangible environmental initiatives can be made more engaging and noticeable to visitors.

Keywords: Customer Satisfaction, Sustainability

The Impact of Perceived Value on Brand Loyalty with Special Reference to The Star Grade Hotels in North Central Province in Sri Lanka

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Abstract

Sri Lanka has a rich cultural triangle relationship in the North Central Province area, and this study investigates the relationship between perceived value and brand loyalty in the context of star grade hotels in the North Central Province of Sri Lanka using sustainable practices as the mediating variable. In a highly competitive hospitality industry, particularly within key tourist destinations such as Anuradhapura and Polonnaruwa, building and maintaining brand loyalty is crucial for long-term sustainability. As the hospitality industry becomes increasingly competitive, understanding the role of customer perceptions in fostering brand loyalty is crucial. The study examines the core dimensions of perceived value, namely functional, emotional, and social aspects and how they impact customer loyalty behaviors, including repeat patronage and favorable word-of-mouth information. Data were collected from a representative sample across multiple star-grade establishments in the region. A quantitative research design was employed, and data were collected from a sample of 258 star-grade hotels in the North Central Province using the self— administered questionnaires. The findings reveal a significant positive correlation between perceived value and brand loyalty, suggesting that enhancing customer perceived value can effectively strengthen long-term customer relationships. The analysis was conducted using statistical tools such as structural equation modelling to determine the strength and nature of the relationship between perceived value components and brand loyalty. The study also highlights the mediating role of sustainable practices between perceived value and brand loyalty. This research explores the relationship between perceived value and brand loyalty in the hospitality sector, with a specific focus on how sustainability initiatives influence this dynamic. By concentrating on star- grade hotels in Sri Lanka's North Central Province, the study aims to provide insights into consumer expectations, hotel practices, and strategic approaches that can enhance brand loyalty through sustainable value creation.

Keywords: Brand Loyalty; Brand reputation; Guest perceived value; Sustainable Practices; Revenue Management

Impact of Adventure Tourism Development on Attracting Tourists to Rural Areas of Sri Lanka; With Special Reference to Selected Villages in Uva and Central Provinces

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Abstract:

Adventure tourism is increasingly recognized as a catalyst for sustainable development in rural areas across the globe. In Sri Lanka, rural regions endowed with natural landscapes, traditional lifestyles, and cultural authenticity hold significant potential for immersive adventure experiences. This study investigates the factors influencing both domestic and international tourist interest in authentic rural adventure tourism within selected villages in the Uva and Central Provinces. It explores tourist motivations, infrastructure limitations, community preparedness, and the role of experiential marketing. A mixedmethods approach was adopted, combining surveys of tourists with interviews of local stakeholders. The research also examines how modern technology can enhance adventure tourism development, particularly through personalized recommendations, predictive analytics for visitor patterns, and technology driven digital marketing strategies. Key adventure offerings identified include waterfall trekking, forest camping, paddy field exploration, and immersive village life experiences. Major challenges include limited accessibility, weak safety standards, and a lack of effective promotional strategies. However, the growing demand for non-touristy experiences presents new opportunities. Strategic recommendations include the development of eco-friendly infrastructure, capacity building for community based tourism providers, and the integration of tools for customer engagement, virtual storytelling, and real-time visitor feedback. This study offers practical insights for tourism authorities, rural communities, and travel entrepreneurs aiming to promote inclusive, data-informed, and sustainable growth through rural adventure tourism

Keywords: Adventure Tourism; Rural Development; Sustainable Travel; Community-Based Tourism; Experiential Tourism

Design and Implementation of a Low-Cost Programmable Modular Constant Current Source Kit for Undergraduate Lab Experiments

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Abstract

Traditional constant current sources often lack flexibility and digital programmability, which limits their adaptability in diverse academic lab environments. To address these limitations, this research introduces a Programmable Modular Constant Current Source (PMCCS) kit tailored for undergraduate laboratory experiments. The research introduces a digitally controlled current source that integrates a microcontroller, digital potentiometer (X9C103), voltage regulator (LM317) and three current sensors (INA169). Current sensing was achieved via three INA169 sensors with relay-switched shunt resistors for improved resolution across different current ranges. The system allows for precise current regulation in the range of 0 mA to 1.5 A and is controlled via a user-friendly graphical interface developed using Visual Basic. This Graphical User Interface (GUI) enables real-time monitoring and adjustment of current levels, which enhances the learning experience for students. The modular structure of the system ensures both safety and expandability, allowing for its use across a variety of laboratory experiments, including sensor calibration, LED characterization, and circuit testing. Observations were recorded using a calibrated digital multi-meter connected in series with a tungsten-element load, and the results showed strong agreement between the set and measured values. Experimental evaluation demonstrated an average deviation of 1.3 mA and a standard error of ±0.47 mA, confirming the system's accuracy. Its simple design, coupled with robust performance, offers significant pedagogical value and supports hands-on learning. By bridging the gap between analog instrumentation and modern digital control, this system provides a versatile, cost-effective and scalable solution for laboratory experiments in different educational institutions.

Keywords: Constant Current Source; Digital Potentiometer; Microcontroller Control; Modular Design; Undergraduate Laboratory Experiments

An Investigation of Factors Affecting Attraction to the Hospitality Industry: Perceptions of Hospitality and Tourism Undergraduates at University Colleges in Sri Lanka

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Abstract

Background: The hospitality and tourism sector is a major employer in Sri Lanka and is central to post-pandemic economic recovery. Understanding how future professionals' hospitality and tourism undergraduates perceive the industry is essential to design curricula and policies that improve recruitment, retention, and industry readiness. Objective: This study explores motivations, perceived value, career expectations, and perceived gaps between academic preparation and industry requirements among final-year hospitality and tourism students at Sri Lankan university colleges. Methods: A qualitative phenomenological design was employed. Twelve purposively sampled final- year undergraduates from four university colleges (Anuradhapura, Matara, Jaffna, and Kuliyapitiya, Batangala) participated in semi-structured interviews (30-45 minutes). Interviews were audio-recorded, transcribed, and analyzed using thematic analysis with NVivo software. Trustworthiness was established through member checking and peer debriefing. Results: Four principal themes emerged: (1) motivations and passion: students reported intrinsic interest, opportunities for travel, and desire for people-centered work; (2) perceived industry value: many recognized international mobility and vibrant work environments but questioned long-term stability; (3) career concerns: worries about irregular hours, low entry salaries, and limited promotion pathways in the local context;(4) education–industry gap: students reported insufficient practical exposure, weakly structured internships, and limited industry-academic collaboration. Conclusions: While students are attracted to the social and cultural aspects of hospitality, structural issues-work conditions, curriculum-practice mismatch, and societal perceptions-reduce attraction and may affect retention. Recommendations include stronger industry-embedded learning (structured internships, mentorship), curriculum updates to include current sectoral trends,

and awareness campaigns to enhance the profession's status in Sri Lanka. Implications for educators and policymakers are discussed.

Keywords: Hospitality education; undergraduate perceptions; Sri Lanka; career expectations; curriculum industry alignment

The Critical Role of Employee Awareness in Implementing Eco-Friendly Practices: A Case Study of Araliya Green Hills Hotel, Sri Lanka

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Abstract

To reduce the impact on the environment, it is necessary to integrate environmentally friendly practices in hospitality, like recycling, composting, and water conservation. This paper will discuss the implementation gap between the sustainability policy and practice in the hotel industry in emerging economies. A stratified sample of 61 employees and observational audits were conducted in a mixed-methods case study at Araliya Green Hills Hotel, Sri Lanka, to understand how awareness is translated into environmental action. The study revealed a sharp paradox, despite the high percentage of staff (80.3%) stating that they have general knowledge of eco-initiatives; a high degree of knowledge fragmentation was identified, with awareness of composting being only 12.1% compared to water conservation (25.0%). In addition, 27.9% of the employees rated training as insufficient, even though 70.5 % had been formally trained, thus pointing to pedagogical shortcomings. Training shortages (49.2%) and resource limitations were cited as major barriers. Employee-proposed solutions, such as continuous role-specific training (65.6 %) and recognition systems (19.7%), are recommended to address this. The high turnover (47.5% tenure <1 year) increases the necessity to apply innovative engagement strategies. In turn, three actionable lessons were summarized: policy awareness is not sufficient without contextually relevant competence building, recognition systems are essential behavioral catalysts, and demographic-specific training can transform high turnover into an asset. The findings indicate the pivotal importance of human capital investment as an ecological resilience, providing evidence-based solutions to change front-line personnel into proactive environmental stewards and bridge the green implementation gap by changing the organizational culture.

Keywords: Sustainable hospitality; Employee engagement; Environmental training; Resource conservation; Organizational culture

Analysis Impact of Eco-Friendly Tourism Practices on Destination Loyalty: Case from Central Province Sri Lanka

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Abstract

Central Province Latied with its beautiful landscapes, cultural heritage, and potential of attracting eco-tourism, Sri Lanka is under increased pressure to embrace sustainable tourism. This paper examines how eco-friendly programs affect tourist destination loyalty in Kandy, Nuwara Eliya and Sigiriya. Four major independent variables were studied including use of renewable energy in hotel/resorts, waste reduction initiatives, sustainable transport and community based tourism. Destination loyalty, which is the dependent variable. A quantitative survey was carried out on 100 international and 50 domestic tourists in eco-certified hotels, heritage sites and nature-based attraction. Regression analysis was used to analyze the data to determine the effect between sustainable practices and loyalty. Research results of the study have shown that community-based tourism initiatives and garbage reduction programs are important factors that increase loyalty. The effect of sustainable transport was minor implying a problem in infrastructural obstacles in the hilly terrain of Sri Lanka. The research presents practical recommendations that the policymakers, hoteliers, and tourism boards in Sri Lanka can use to focus on environmentally-friendly activities that can help them retain tourists. The Central Province can reinforce its status as one of the best green destinations by complying with the National Sustainable Tourism Certification Scheme. The results are also in line with the United Nations Sustainable Development Goals (SDGs), especially SDG 12 (Responsible Consumption) and SDG 8 (Decent Work and Economic Growth). Further studies on regional differences and perceptions of the local communities should be conducted.

Keywords: Eco-tourism, destination loyalty, renewable energy, waste management, community tourism.

Effect of Marketing Mix on Customer Satisfaction of Supermarkets in Sri Lanka

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Abstract

Customer satisfaction plays a vital role in the success of the modern supermarket industry, especially in highly competitive markets such as Sri Lanka. This study examines how the elements of the marketing mix (product, price, place, and promotion) affect customer satisfaction in Sri Lanka's supermarkets. The primary research question explores the extent to which each element influences customer satisfaction. A structured questionnaire was given to 384 customers as part of a quantitative approach. To investigate the relationship between variables, data were analyzed with SPSS, which included descriptive statistics, correlation analysis, and multiple regression. The findings indicate that all four elements of the marketing mix have a statistically significant effect on customer satisfaction. Among them, promotional strategies revealed the strongest positive influence. These results indicate that strategic marketing initiatives, especially in promotion and communication, are essential for influencing customer perceptions and building brand loyalty. The study concludes that Sri Lankan supermarkets can improve customer satisfaction by implementing an integrated marketing strategy focused on impactful promotions, consistent product standards, competitive pricing, and accessible store locations. These findings will be helpful to managers who want to improve their marketing strategies in response to the expansion of the industry in Sri Lanka. They also add to the larger conversation on customer-centric business practices.

Keywords: Product; Price; Place; Promotion; Customer Satisfaction

Assessing the Impact of Inbound Logistics Performance on Operational Performance of Manufacturing Firms in the Western Province

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Abstract

In developing countries, the manufacturing sector's operational performance is highly dependent on reliable inbound logistics. Firms in Western Province in Sri Lanka experience significant delays due to port congestion, customs inefficiencies, and underdeveloped infrastructure. However, empirical research into the specific impact of these inbound logistics practices on operational performance in this region is insufficient. This study employs a quantitative approach, utilizing a structured questionnaire distributed to 30 logistics professionals from four manufacturing firms in the Western Province. Correlation and multiple regression analysis were employed to assess the impact of key inbound logistics practices on operational performance, encompassing inventory management, warehousing, order processing, transportation, and procurement. The regression model explained 66% (R^2=0.660) of the variance in operational performance, indicating statistical significance (F=9.331, $p<0.001$). Procurement had the strongest positive impact (β=0.885, $p<0.001$), while transportation indicated a significant positive correlation (r=0.525, $p<0.01$). Order processing exhibited a significant negative beta coefficient ($\beta = -0.370$, $p < 0.05$), indicating underlying inefficiencies. According to the study, effective inbound logistics management is an important determinant of operational performance, with procurement being the most influential practice. The findings provide a clear roadmap for firms to enhance competitiveness by pursuing procurement streamlining, overhauling order processing systems, and strengthening transport links, all of which contribute to overall economic resilience and development.

Keywords: Inbound logistics; Operational performance; Procurement; Manufacturing firms; Western Province

Poster Presentations

Studying & Controlling the Spread of Panicum Maximum (Local Name Mana or Gini-Thana) Along Rural Roadsides of Attanagalla Division

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Abstract

Mana grass (Panicum maxima), locally known as mana or Gini-thana, has rapidly spread along rural roads in Attanagalla Division, creating significant environmental, safety, and maintenance challenges. Its rapid growth has been attributed to high sun exposure, proximity to forest reserves, moist soil conditions, and irregular maintenance practices.The objective of this study was to assess the impact of this spread on road visibility and user safety and to evaluate sustainable management strategies suitable for rural road environments. A 9.40 km section of the Attanagalla-Galapitamada road was surveyed through field observations, growth monitoring, and interviews with officials from the Road Development Authority, agricultural officers, maintenance workers, and local road users. Cost data from the 2024 Attanagalla Maintenance Report was analyzed to determine the economic burden of current management practices. Additional assessments were conducted to explore potential alternative production uses of Mana grass. The findings show that there is a strong correlation between sunlight intensity and the height and density of Mana grass. Areas adjacent to forest reserves and areas with limited human activity showed the highest prevalence. Overgrowth, especially around road curves, significantly reduces sight distances, increases the risk of accidents, and limits road space for vehicles, pedestrians, and cyclists.Current control methods are mainly manual and mechanical cutting - effective but expensive when carried out frequently. Tree planting and scheduled cutting cycles have shown long-term effectiveness. Productive uses such as animal feed, mushroom substrate, handicrafts, and paper production provide additional value.The study concludes that an integrated ecological-mechanical management approach can sustainably control mana grass while reducing maintenance costs. The findings provide practical recommendations for road maintenance authorities to improve road safety, environmental conservation, and cost-effective vegetation management.

Keywords: Panicum maximum, Mana Grass, Road safety, Tree shading, Sustainable weed control

Developing an Endoscopic Probe Disinfection Machine

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Abstract

Endoscopic procedures are essential in modern medical diagnostics and treatment, but they carry a risk of cross-contamination if reusable probes are not properly disinfected. Traditional manual disinfection methods are often inconsistent, time-consuming, and dependent on human precision, increasing the risk of infection. To address these issues, this study presents the development and implementation of an automated endoscopic probe disinfection machine, designed to ensure a standardized and reliable disinfection process.

The proposed machine incorporates automated cleaning cycles, accurate chemical dosing systems, and thorough rinsing and drying stages. These features have been tailored to meet stringent medical hygiene standards and minimize human intervention. The machine's design enhances the efficiency and consistency of the disinfection process, reducing the burden on healthcare workers and allowing them to focus more on patient care.

Comprehensive testing was conducted in both simulated and clinical environments. Results showed consistent high-level disinfection and significant reductions in processing time, helping to prevent infection risks and improve workflow in healthcare facilities. This innovation plays a crucial role in ensuring patient safety and maintaining the reliability of endoscopic equipment in high-demand clinical settings. The study suggests that the adoption of automated disinfection systems can greatly contribute to enhanced hygiene practices in modern medical environments.

Keywords: Endoscope, Disinfection, Automation,Cross-Contamination, Patient Safety

Development of a High-Voltage Short Pulse Generator

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Abstract

This paper discussed the design and development of a high voltage short pulsed generator (HVSPG), which controls the output pulse amplitude and pulse width precisely as required. It can be applied for high voltage testing, biomedical system applications water purification and plasma generations. The pulse generator system is designed to create output pulse with controlling amplitude of 0 kV to 2.2 kV and controlling pulse width 0 ms to 2 ms as per user requirement. Cockcroft-Walton voltage multiplier is used to create high voltage DC output. To get 2.5 kV DC V out, 230VAC controllable supply is fed to diode and capacitor arrangement. The controllable 230 AC input is achieved by using Auto transformer. It provides smooth controllability of voltage out of the voltage multiplier as per the user requirements. To obtain variable short pulse (0ms-2ms), a high-speed semiconductor device is used such as IGBT. A gate pulse to the IGBT is created by microcontroller and PWM technique is used to vary the Output high voltage pulse width, which can be adjusted in real time. A potentiometer with circuit arrangement is used to provide the pulse width of the required signal. The protection of the microcontroller from electrical noise and potential surges and conversion of 5VDC micro controller signal to 12 VDC IGBT gate signal was done by opt isolator.

Keywords: Cockcroft–Walton Voltage Multiplier (CWVM); High voltage short pulsed generator (HVSPG); IGBT with PWM Gate Drive; Pulse Width Control

Timeframe Analysis of Capital Expenditure Procurement at University of Vocational Technology (Uovt): A Review of The Procurement Process 2023 – 2024

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Abstract

This study examines the capital expenditure (CapEx) procurement process at the University of Vocational Technology (UoVT) during 2023-2024 to identify time-related inefficiencies and opportunities for process optimization. Using a mixed-method approach, the study combines quantitative analysis of 27 procurement projects with qualitative insights from 16 participants, including procurement officers, academic evaluators, committee members, and administrative staff. Results show that awarded projects took an average of 165 days while recalled projects averaged 186 days, with projects exceeding 200 days significantly more likely to fail. The key delays were traced in specification submissions and the Bid Evaluation Committee (BEC) stages. The findings reveal systemic issues, such as insufficient process ownership, academic workload conflicts, estimation errors, and inconsistent technical specifications. The study proposes reforms, including structured timeframes, procurement dashboards, pre-approved specifications, enhanced capacity building, and decoupling academic duties from evaluation roles. These findings contribute to strengthening public-sector procurement efficiency, optimum utilization of capital funds, and offer a replicable framework for similar higher education institutions.

Keywords: Capital expenditure procurement: public sector efficiency: procurement delays: evaluation committees: UoVT

Improvement of Engineering Properties of Fired Clay Bricks Through the Addition of Sludge of Sand Manufacture

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Abstract

The increasing demand for sustainable construction materials has led to the exploration of alternative raw materials in brick manufacturing. This study investigates the utilization of waste material, sludge of sand manufacturing (SSM), as a partial replacement for clay in the production of fired clay bricks. Various proportions of sand waste were mixed with clay, and subjected to standard molding, drying, and firing processes. The technical properties of the bricks including visual appearance, water absorption, compressive strength, and thermal conductivity were analyzed to assess their suitability for construction applications. The results indicate that the incorporation of waste of sand manufacture can improve essential properties of the bricks, especially compressive strength. As per the results, 30% SSM added bricks displayed the best technical properties.

Keywords: Fired clay bricks; Sludge of sand manufacture; Additive material; Technical properties

A Comprehensive Review and Analysis of Ai-Enhanced Vibration Diagnostics for Predictive Maintenance in Industrial Rotating Machinery

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Abstract

Rotating machinery is the backbone of modern industrial systems, where unplanned failures, especially in bearings and gears, result in significant economic losses and safety hazards. This paper presents a comprehensive review of how AI is improving failure prediction in such essential industrial equipment like motors and pumps. By conducting a systematic review of 30 peer-reviewed studies on vibration-based fault detection in rotating machinery, we compare older vibration analysis methods with new AI techniques. While traditional methods are simple and fast, they struggle with complex data. Deep learning models are more accurate but require vast amounts of data and are difficult to understand. We discuss how new explainable AI (XAI) techniques are making AI decisions more transparent. The paper also covers the role of low-cost sensors and new strategies like transfer learning to make these advanced systems more practical for industry use. The synthesis provided herein aims to guide researchers and practitioners in developing more robust, scalable, and interpretable predictive maintenance solutions for the industrial sector.

Keywords: Predictive Maintenance; Vibration analysis; Convolutional Neural Networks; Signal Processing; Explainable AI

Design and Development of a Spray Rig for Diesel Injector Nozzle Testing - Minimization of Environmental Pollution

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Abstract

This research showcases the design and development of a diesel vapor capture system for use with diesel nozzle tester machines (pop tester), along with the objective of enhancing the environment safety and improving health standards in vocational training institutes in Sri Lanka. The problem was identified at the one of the technical institutes, frequently exposure to diesel vapor during injector testing has led to health complaints from students and staff, in addition to notable diesel fuel wastage. The research commenced with a detailed literature review and onsite analysis to quantify diesel vapor emissions and their impacts. Through comprehensive literature it was identified that diesel vapor contains Volatile Organic Compounds (VOCs) and exposing to them poses a risk of respiratory irritations, neurological effect and long-term carcinogenic exposure. In response to this a closed-loop vapor capture system was conceptualized. This system includes a sealed enclosure around the diesel nozzle, VOC filters, and a diesel recovery container all designed to operate in sync with existing testing procedures without disrupting the learning process. Fabricated set up and testing of this design ensured that diesel injector testing can be carried out while capturing diesel vapors. The system was designed to be cost effective and promotes the sustainability by reducing environment pollution and diesel consumption. Recommendations include adopting this proposed system across training institutes and testing places, establishing Standard Operating Procedures, and conducting periodical air monitoring and maintenance of the system.

Keywords: Nozzle Tester Machine; Diesel Vapor Capture; Occupational Safety; Activated Carbon; Local Air Pollution