CONFERENCE PROCEEDINGS

THE 1st RUHUNA INTERNATIONAL CONFERENCE ON INNOVATION AND TECHNOLOGY

"Technological Transformation: Navigating Innovations and Trends"

24th November 2023

2023 RICIT
Ruhuna International Conference on Innovation and Technology

Faculty of Technology - University of Ruhuna
Sri Lanka

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MESSAGE OF THE VICE CHANCELLOR

It gives me a great honor and a privilege to be the chief guest and send this message to the proceedings of the 1st international symposium (RICIT-2023) of the Faculty of Technology, University of Ruhuna, Sri Lanka under the theme "Technological Transformation: Navigating Innovations and Trends" on 24th November 2023. The future of the world lies in the hands of researchers and technology will definitely play a leading role in that endeavor in every field such as environment, food, climate, engineering, chemistry, medicine, IT, and many more to be named. Therefore, exchanging technological ideas, innovation, and transformation generates much interest among scholars, practitioners, and policymakers as it is a critical instrument for achieving sustainable development and its goals.

The Annual Research Session at the Faculty of Technology covers important tracks such as Science and Agriculture, Engineering and IT, and Management based on the current trends of the country and the world at large. The Faculty of Technology is the newly founded faculty of all the established faculties at the University of Ruhuna, Sri Lanka. I believe that this research conference provides the opportunity for all researchers to present their findings to an audience of experienced researchers. The endorsements of the research findings by intellectuals in this conference will help to promote the dissemination of the new knowledge in demand for the 21st century through the proceedings of publications and presentations. It would be the first step in peer reviewing of the research findings.

Further, the undergraduate research projects and the commercialization strategy for the prototypes developed by them is a good opportunity to showcase their products and demonstrate the unique capabilities of these products, with significant market potential within the constantly evolving tech industry.

Finally, I would like to express my sincere appreciation for the commitment and enthusiasm of the organizing committee and wish all the researchers every success.

Senior Professor Sujeewa Amarasena

Vice Chancellor

University of Ruhuna

Sri Lanka

24th November 2023

MESSAGE OF THE DEAN

I am delighted to welcome you all to the 1st International Research Conference (RICIT 2023) organized by the Faculty of Technology, University of Ruhuna, Sri Lanka organized under the theme of "Technological Transformation: Navigating Innovations and Trends" on 24th November 2023. This is indeed a great platform for researchers, educators, students, and industries to exchange latest innovative research experiences/outputs, recent developments, and trends in the field of technology.

The future of the world lies in the hands of the researchers, and I am confident that technology will give a strong impetus to explore the world beyond horizons with its overarching- multifaceted applications across a myriad range of fields. Therefore, this herculean effort made by the faculty in its quest towards a research driven culture will definitely create new knowledge filling the inherent vacuum in tech and research driven educational settings.

On par with its 1st conference, the faculty also organizes a students' innovation showcase to share the innovative ideas of students with the aim of fostering and inculcating a research and innovation driven culture to equip undergraduates with the skill framework required to function in the modern world with cutting-edge technologies. This pioneering gateway to make connections with the stakeholders in the industry and academia will undoubtedly transform the experience of the students to see and experiment beyond boundaries.

I hope that RICIT 2023 will offer a wonderful opportunity to bring together researchers, scientists, engineers and academicians around the world and I take this opportunity to congratulate all the participants and extend my sincere appreciation to all the faculty members who contributed their fullest support to turn this event into a reality.

I wish RICIT-2023 a grand success.

Prof. P.K. Subash Jayasinghe

Dean of the Faculty

Faculty of Technology, University of Ruhuna, Sri Lanka.

24th November 2023

MESSAGE OF THE CONFERENCE COORDINATOR

We are delighted to present the proceedings of the 1st Ruhuna International Conference on Innovation and Technology 2023 (RICIT 2023) organized by the Faculty of Technology, University of Ruhuna, Sri Lanka on November 24th, 2023. Hosting this international meeting at the completion of the faculty's seventh year will be marked in our history as an important milestone. The theme of the conference, Technological transformation: Navigating innovations and trends, envisage itself the fact that RICIT 2023 offers a productive platform for academics, scholars and practitioners to exchange, knowledge, ideas and experiences on developments in technology.

This is our faculty's first attempt at hosting an international conference so, we take this opportunity to thank all those who made this conference possible and the enthusiasm they had to bring this conference to a reality is remarkable. This year we are happy to have 4 keynote speakers, from three different countries and it is also a pleasure to receive over 100 manuscripts from ten different countries, out of which 57 of them were accepted. This is also an opportunity for inventors as we could organize a product showcase in parallel to the conference. We also thank the University administration and other faculties for all the support they have extended. I personally must thank all my teammates of RICIT 2023, for their hard and sincere work.

Over the next few hours, we will have the opportunity to learn from each other, share our experiences, and explore new ideas. It is our aim that the conference will be educational, informative and engaging, and that you will leave with new connections, new ideas, and a renewed sense of purpose in your work.

Finally, once more, we appreciate your attendance at this conference and hope to see you at the next RICIT.

Thank you.

Dr. K. K. N. B. Adikaram

Conference Coordinator

Department of Multidisciplinary Studies

Faculty of Technology, University of Ruhuna, Sri Lanka.

24th November 2023

KEYNOTE ABSTRACT

Wise Use of Organic Waste for Environmentally Positive Agriculture

Professor Morihiro Maeda

Graduate School of Environmental, Life, Natural Science and Technology, Okayama University, Japan

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Organic waste management is key in the present world that has a population of more than 8 billion. Agricultural sectors provide more cereals, vegetables, and meats in response to the increasing population. In the processes of agricultural production and consumption, a large quantity of organic waste is produced. These organic wastes usually contain many nutrients such as nitrogen and phosphorus, which may be unexpectedly discharged into the environment and deteriorate water quality or emit greenhouse gases (GHGs). Our laboratory team has studied (1) a catch crop-biological soil disinfestation system, (2) nitrate leaching and GHG emissions from livestock manure compost, (3) the potential use of manure ash as phosphorus fertilizer, and (4) biochar application to the soil for mitigation of GHG emissions and for improving the performance of sediment microbial fuel cells (SMFCs). The catch crop-soil disinfestation system can absorb residual nutrients from the soil after the main crop and reduce nitrous oxide (N_2O) emissions in biological soil disinfestation in research (1). In research (2), similar nitrate (NO_3-N) leaching occurred both from organic and inorganic N sources after several years, and mature compost can be used for GHG reduction. Application of cattle manure ash worked P fertilizer with low environmental impact in research (3). In research (4), advanced biochar reduced N_2O emissions from soil, but the biochar's function was declined with aging if the biochar was pyrolyzed at a lower temperature of 500oC rather than 800oC. Biochar application to SMFCs was also effective in reducing phosphorus release from the sediment. We need to study more the efficient use of organic waste to establish environmentally positive agricultural systems in the future.

Keywords: *Biochar, Nitrate Leaching, Nitrous Oxide, Manure Ash, Sediment Microbial Fuel Cells*

KEYNOTE ABSTRACT- COMPUTER SCIENCE

Advancing Person-Centered Healthcare with Generative Artificial Intelligence and Large Language Models

Professor Ping Yu/Director

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Since its inception on 30 November 2022, generative artificial intelligence (AI), particularly large language models (LLMs) like ChatGPT, has catalysed a global paradigm shift. Its potential to revolutionise various societal sectors, including healthcare, is becoming increasingly evidence. The healthcare industry, strained by escalating costs due to an ageing population, the growing demand for care, and inflating expenses, will benefit from these new AI technologies enormously. Central to quality healthcare is efficient information management. Traditionally, the capturing, storing, and reusing of health data have been costly and complex endeavours. The advent of generative AI and LLMs illuminate a path towards enhanced information management in healthcare with cost-effective solutions, attributed to these new increasing capability of AI technologies at facilitating data capture and information retrieval. This presentation will first outline the value of AI technologies like ChatGPT in healthcare. It will detail the AI technologies, research methodologies, and processes that enable generative AI to achieve its potential. A focal case study will illustrate how prompt engineering can expedite effective information retrieval, specifically in identifying health risk factors. To develop machine learning models with these capabilities, a structured approach is essential: 1) data collection; 2) data pre-processing; 3) selection of a suitable LLM; 4) model training; 5) model evaluation; 6) model tuning; 7) model application for inference; and 8) outcome evaluation. These case studies will demonstrate the practical value of generative Ai in healthcare, showing the methods and approaches for developing impactful AI solutions. Furthermore, they will highlight the pivotal role of computing and information scientists in driving digital transformation of society, business, and healthcare. This talk aims to be a catalyst for accelerating the adoption and realisation of contemporary AI benefits, fostering digital transformation of industry, health and economy for better human society and health.

KEYNOTE ABSTRACT- SCIENCE AND AGRICULTURE

Unlocking the Symphony of Life

Assoc. Prof. Ajith Karunarathne

Associate Professor in Chemical Biology and Molecular Pharmacology, Department of Chemistry & Institute for Drug and Biotherapeutic Innovation, Saint Louis University, Saint Louis, MO, USA

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In the world of scientific exploration, the evolution of life stands as an enigma continually unfolding before us, which follows the laws of thermodynamics that unite energy and matter available on our planet, which happens to be located in the Goldilocks zone of the solar system. This keynote speech embarks on a journey through the intricate tapestry of life, drawing upon the properties of essential elemental building blocks: carbon (C), hydrogen (H), oxygen (O), nitrogen (N), and Phosphorus (P), which are sufficiently small to make strong covalent bonds to make self-organizing molecules that create and reshape life through handling energy endowed by the sun while laying the foundation for the rich complexities of our existence. Our narrative emerges from shedding light on the fascinating world of animal vision, an extraordinary feat of nature that intricately links the remarkable abilities of molecules with π-electrons, helping photopigments in the eye to sense photons of light emitted by the sun and reflected by our surroundings. This exact overlap of energies required for π-electron transition from the ground state to the excited state and the photon energies of the narrow visible segment of the electromagnetic spectrum is an absolute testament to the beauty of science. Delving into such intricate processes that support the sustainability of life, we shall explore the fascinating domain of molecular engineering, where we harness these natural phenomena to exercise control over cellular and animal behavior using the power of light and expose targets for therapy. Furthermore, our excursion leads us to the captivating realm of low Reynolds number bodily fluids, where the dance of cells unfolds. Here, we study the programmed movements of immune and cancer cells using optical tools that grant us the power to manipulate cellular signaling with subcellular spatial and millisecond precision. These investigations shed light on the intricate regulation of cell migration and guide our quest for a deeper understanding of life's inner workings. Our efforts are a gateway of novel tools, molecules, and repurposed pharmaceuticals for life-threatening diseases and conditions, including cancer and addiction. My goal is to convince you that our journey is not one of duplication or regurgitation; instead, it is an exploration into the mysteries of nature an endeavor to enhance the quality of life on Earth, bringing happiness and comfort to all living beings.

KEYNOTE ABSTRACT- ENGINEERING AND TECHNOLOGY

Pressure-Gain Combustion of Hydrogen and Alternate Fuels in Gas Turbines

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Gas turbine engines are widely used for power generation, typically burning gaseous fossil fuels, whereas in aircraft they burn liquid fossil fuels. The imperatives of decarbonized energy production to address climate change led to the consideration of hydrogen or alternative fuels with low carbon content. However, the burning of hydrogen in traditional gas turbine combustors presents challenges in avoiding flame instability, flashback, excessive pressure fluctuations, and mechanical stresses, as well as higher nitrogen oxide (NOx) emissions. This presents an opportunity to consider a significant redesign of gas turbines while seeking to retrofit existing machines with new technology. A novel class of pressure-gain combustors are being developed that not only thrive on hydrogen fuel; they can produce higher thermodynamic cycle efficiency and (with appropriate redesign) increased power output of gas turbine engines. These include rotating detonation combustors, pulse combustors, and wave-rotor combustors. Wave rotor combustors have several advantages, including low exit pressure fluctuations, the use of stratified mixtures for low NOx emissions, the provision of high-pressure air for turbine cooling, and the possibility to use slanted rotating combustion chambers to develop shaft power separately from connected turbomachinery. A wave-rotor constant-volume pressure-gain combustor being developed at Purdue University in collaboration with Rolls-Royce Corporation achieved stable combustion at near-atmospheric inlet conditions and demonstrated the potential of pressure-gain combustion using a wave rotor. The experiment rig with a motor-driven, room-temperature rotor with a large thermal mass operated for short durations within heating limits of extensive in-passage rotating instrumentation. Fast deflagrative combustion was observed with varied fuel distribution in the passages, showing good combustor operability, and insensitive to leakage. Remarkably high flame speeds and a net pressure gain were indirectly indicated from measurements. Separate experimental testing of jet ignition in a constant-volume combustion chamber was studied with high-speed Schlieren videography and other tools to reveal insights into the role of vortex mixing in successful ignition. Due to the high capital costs of developing gas turbine technology, the current focus of wave rotor combustor research is to develop a small-scale power generator unit burning hydrogen.

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SCIENCE AND AGRICULTURE

Nitrous Oxide Emissions from Soil Amended with Autoclaved Lightweight Aerated Concrete (Alc) Under Different Compaction and Moisture Conditions

N. R. R.W. S. Rathnayake[1], M. Maeda[2], and D. A. L. Leelamanie[1*]

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Abstract

Nitrous oxide (N_2O) is one of the longest-lived greenhouse gases (GHGs) with a global warming potential which is 298 times higher than that of carbon dioxide. Different sources affect on GHGs emissions. Among them, soil physical conditions such as compaction and moisture content affect GHGs emissions from soil. Conditioners or amendments applied into soils may affect terrestrial N_2O emissions. Autoclaved lightweight aerated concrete (ALC) is used as a soil amendment and conditioner. In this study, we examine the effects of soil compaction, moisture content, and ALC (Inenica, Clion Co., Ltd, Japan) addition on N_2O emissions from soils. Laboratory experiments were conducted using a paddy soil amended with and without ALC (0% or 5%), under two levels of compaction (compacted and non-compacted), and two soil moisture contents (60% and 100% water holding capacity: WHC) in 200-mL glass bottles. All samples were incubated at 25°C for 21 days under aerobic conditions. Emissions of N_2O were determined at 0, 1, 3-, 7-, 14- and 21-days using gas chromatography with thermal conductivity detector. Higher moisture content (100% WHC) and the addition of ALC significantly decreased N_2O emissions. Soil compaction significantly increased N_2O emissions from soil. The interaction between ALC addition with compaction and ALC addition with moisture content on cumulative N_2O emissions was statistically significant (p<0.05). Results revealed that ALC addition suppressed the N_2O emissions from soil, which was more effective at non-compacted and 100% WHC. Our study suggested implementing the precise dosage (5%) of ALC, along with an adequate moisture (100% WHC) and non-compacted conditions actively contribute the suppression of N_2O emissions from soil while creating an ideal soil environment.

Keywords: *Aerobic, Autoclaved Lightweight Aerated Concrete, Compaction, Moisture Content, Nitrous Oxide*

Development of Mechanistic Models for Nitrous Oxide Emissions from Two Soil Types Amended with Manure Composts at Different Ammonium Nitrogen Rates

T. D. P. Liyanage[1*], M. Maeda[2], H. Somura[2], M. Mori[3], and T. Fujiwara[4]

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Abstract

Existing process-based biogeochemical models do not sufficiently assess the impacts of manure composts on nitrous oxide (N_2O) emissions due to a lack of model equations satisfactorily explaining N_2O emission mechanisms in manure compost-amended soils. We aimed to develop mechanistic models for N_2O emissions in nitrification and denitrification processes from two soil types amended with two manure compost types at different initial ammonium N (NH_4^+-N) rates. The data of N_2O emissions and NH_4^+-N and Nitrate N (NO_3^--N) contents from an aerobic incubation experiment, which used cattle manure compost and mixed compost-amended Kochi (K) and Ushimado (U) soils at three different initial NH_4^+-N rates were used for model development. The linear models for N_2O emissions were developed using parameters of soil NH_4^+-N (nitrification) or NO_3^--N (denitrification) contents. In addition, N_2O emissions in nitrification showed a steady state with consumed NH_4^+-N contents. In the linear model, NH_4^+-N contents could satisfactorily evaluate N_2O emissions in nitrification in both manure compost-amended K and U soils regardless of the initial NH_4^+-N rates. The regression coefficient value of the linear model clearly showed the effects of soil and compost properties on N_2O emissions. In the model for N_2O emissions in denitrification, NO_3^--N contents reasonably reflected N_2O emissions only in K soil. In conclusion, N_2O emissions in manure compost-amended soils can be assessed by NH_4^+-N (both K and U soils) and NO_3^-N contents (only K soil).

Keywords: *Cattle Manure, Kochi, Mixed Compost, Nitrification, Ushimado*

Enhancing Urban Sustainability through Rooftop Agriculture: A GIS Based Approach

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[1] Department of RSGIS, Faculty of Geomatics, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka.

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Abstract

Urban agriculture holds immense promise in addressing pressing social and environmental challenges in developed cities worldwide, such as food insecurity, economic opportunities, and community building. While greenery offers several benefits to the environment, planting new trees and vegetation in urban areas is difficult due to limited space. Despite being a popular concept in many countries, green roofs remain relatively new and limited in Sri Lanka, with low awareness among professionals, developers, government authorities, building owners, and the general public. This study aims to evaluate the potential of rooftop agriculture in Sri Lanka by utilizing a multicriteria decision-making technique implemented in a GIS environment to identify suitable rooftop areas. The analysis was conducted in Dehiwala-Mount Lavinia, revealing a net area of 0.9 km^2 for rooftop farming, representing 14% of the total roof area and 5% of the total land area. The comprehensive GIS environment used in this study not only enhances the quality of research but also allows for continuous updates and monitoring of factors that influence the development of green roof policies. The findings of this research have significant implications for policymakers and stakeholders, highlighting the potential of green roofs to enhance the sustainability of urban areas in Sri Lanka.

Keywords: *Urban Agriculture, Rooftop Agriculture, Geographic Information System (GIS), ArcGIS*

Consumer Perception on Dairy Foods and Development of a Food Safety Cloud for the Dairy Industry in Sri Lanka

A.W. U. Dhanawardhana[1], V. S. Jayamanne[1*], and M. K. D. K. Piyaratne[2]

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Abstract

The means for consumers to get food safety information are limited and, therefore, the present research focuses on evaluating consumer perception on safety of dairy food products and presenting data via a Food Safety Cloud. Survey data were analyzed, and a web database was developed to present the results. Out of 120 participants, the majority (52.9%) consume dairy foods 2 to 3 times weekly with the highest preference (49%) being cheese. A substantial portion of participants (41.5%) demonstrated awareness of non-communicable diseases attributed to food additives. Gender and education significantly influence ($p<0.05$) consumer awareness of nutritional composition in dairy products. Age and education significantly affect ($p<0.05$) the final choice in purchasing dairy products. Types of food additives, their safety level, recommended amounts, and the side effects of consumption were analyzed for all dairy products and the data were fed to Ruhuna Food Safety Cloud. The Cloud enables consumers to access scientific information on food additives through a QR code for informed decision-making before purchasing dairy products. Additional research is required to validate the Food Safety Cloud. Ruhuna Food Safety Cloud should further be expanded by incorporating information on diverse food categories such as fish and meat products, bakery products, fruits, vegetables, and beverages.

Keywords: *Consumer Perception, Dairy Products, Food Additives, Cloud Computing, Food Safety Cloud*

Comparative Effects of Soil Amendments and their Hydrophobicity on Stability of Soil Aggregates

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Abstract

The stability of soil aggregates is an important soil attribute, which is known to be affected by soil hydrophobic conditions that result from the presence of organic materials. Organic and inorganic soil amendments may have hydrophobic properties that could influence aggregate stability. The objective of this study was to determine how the hydrophobicity of soil amendments affects the stability of soil aggregates. The experiment was conducted using four soil amendments, cattle manure (CM), hydrophobic leaf-litter (*Casuarina equisetifolia*, CE), biochar of CE leaf-litter (BC_{CE}), and quick lime (CaO). Sieved (2 mm) surface soil was mixed with 3% CM, CE and BC_{CE} and 1% CaO. Surface soil without amendments was used as the control. The samples were moistened to 80% of field capacity and incubated for 5 weeks. The moisture content was maintained by spraying water on moisture-loss basis. After 5 weeks, aggregates were separated into 3 size categories (<3, 3-6, 6-10 mm) and the percentage of water-stable aggregates (%WSA) was determined. The highest %WSA values of all three aggregate size categories were recorded with 3% CE amendment, showing ~37% increment compared with the control. The %WSA of <3 and 3-6 mm size categories were significantly higher ($p<0.05$) for treatments with CE, CaO and CM (26–37% increment compared with control), whereas the %WSA of 6-10 mm category was significantly higher in all four treated amendments (7–36% increment). Results revealed that the hydrophobic litter material (CE) was the most effective soil amendment in improving %WSA. Further experiments are necessary to identify the long-term impacts.

Keywords: *Aggregate Stability, Hydrophobicity, Soil Amendments*

Effect of Probiotic Incorporated Feed on Growth Performances and Survival Rate of *Oreochromis Niloticus*

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Abstract

Probiotics are living microorganisms that confer positive effects on the health of the digestive system when incorporated with feed in a defined dosage and help to stimulate the immune response in fish against virulent fish bacterial pathogens. Therefore, focusing on the gastrointestinal health of fish is quintessential. This study was carried out to evaluate the effect of probiotic isolated from the intestine of healthy Nile tilapia (*Oreochromis niloticus*) on the growth performance and survival of Nile tilapia. A total of 180 healthy juvenile Nile tilapia (5.61±0.14g, 4.09±0.24cm) were randomly divided into five experimental variants. Five experimental diets were supplemented with different concentrations of *Lactobacillus* namely, Control diet (no probiotic, d0), High dose gut *Lactobacillus* (1.5×10^9 CFU/g, d1), Medium dose gut *Lactobacillus* (1.5×10^8 CFU/g, d2), Low dose gut *Lactobacillus* (1.5×10^7 CFU/g, d3), and Yoghurt *Lactobacillus* (1.5×10^8 CFU/g, d4). Fish were fed 3% of their body weight for 8 weeks and subjected to a 5 days *Aeromonas hydrophylla* challenge test. Results showed that the fish fed with diet d1 had the best growth performance. Weight gain, length gain and specific growth rate were significantly higher in fish fed with d1 ($p < 0.05$), while feed conversion ratio was not significantly different ($p>0.05$) among the experimental groups. The challenge test result revealed that fish fed with d1 had a high survival rate against *Aeromonas hydrophylla* than other treatments. Therefore, it is concluded that using fish gut probiotic as supplementary feed on *Oreochromis niloticus* showed positive effects on growth parameters and health status. Furthermore, this study indicates the feasibility of using isolated probiotics as a feed additive and as an immune enhancer in aquaculture.

Keywords: *Probiotics, Lactobacillus spp., Nile Tilapia, Growth Performance, Survival Rate*

Lignin-Based, Surface-Deposited and Embedded Nano Zero-Valent Iron for P-Nitroaniline and P-Nitrophenol Remediation

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Abstract

Para nitroaniline (PNA) and para nitrophenol (PNP), used as pharmaceutical precursors, are highly carcinogenic and mutagenic priority pollutants. Nano zero-valent iron (nZVI) has garnered much recent attention as a remediation tool, owing to its advanced oxidation and adsorption capabilities. However, bare nZVI has inherent issues of agglomeration and passivation which can be mitigated using a support material like biochar (BC) known for its cost-effectiveness and eco-friendliness. Carbothermal reduction is a popular, relatively non-toxic approach for nZVI synthesis, forming highly stable nZVI. Allowing carbothermal reduction of iron on BC creates a surface-deposited material while allowing simultaneous pyrolysis and reduction of a mixture of iron and carbonaceous material to form an nZVI-embedded BC. There have been no previous studies done on organic contaminant removal by nZVI-embedded BC, nor have there been a comparative study between the two carbothermally synthesized materials. A comprehensive batch sorption study was carried out including pH, kinetic, isotherm, and regeneration experiments. Data indicates that the surface-deposited material shows higher adsorption capability while the embedded material exhibits superior regeneration ability. Thermodynamic data validate the spontaneity and feasibility across different temperatures. This study highlights the efficiency of BC-based nZVI as a potent tool for PNA and PNP remediation in aqueous systems.

Keywords: *Nanoscale Zero-valent Iron, Biochar, Lignin, Para Nitroaniline, Para Nitrophenol*

Review on In Vitro Antibacterial and Antioxidant Potential of Ingredients of Sri Lankan Traditional Herbal Formula, *"Dasapanguwa"*

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Abstract

The '*Dasapanguwa*' herbal formulation which is commonly consumed as a traditional medicine in Sri Lanka consists of ten ingredients, namely the rhizome of Zingiber officinale (Ginger), the dried stem of *Coscinium fenestratum* (Tree Turmeric) leaves, stems of *Oldenlandia corymbosa* (Pathpadagam), dried berries of Solanum *xanthocarpum* (Katuwelbatu), dried leaves of Justicia adhatoda (Pawatta/Adathoda), *Piper nigrum L.* (Black Pepper), the dried stem and roots of *Glycyrrhiza glabra* (liquorice), dried seeds of *Coriandrum sativum* (Coriander), *Solanum melongena L.* (Elabatu /Eggplant) and the rhizome of *Alpinia calcarata* (Snap ginger). The objectives of this project were to identify the antibacterial and antioxidant properties of the herbal components of *dasapanguwa* and their ability to heal diseases. All ingredients have antioxidant components such as polyphenols, and flavonoids which have been examined using 2,2-diphenyl-1-picrylhydrazyl-hydrate radical scavenging ability. Antibacterial properties of *Coscinium fenestratum*, *Oldenlandia corymbose, Justicia adhatoda, Piper nigrum L, Glycyrrhiza glabra, Coriandrum sativum and Solanum melongena L.* were demonstrated using antimicrobial susceptibility testing. This review contributes to the collective understanding of the antioxidant and antibacterial properties of the ingredients in *Dasapanguwa,* as synthesized from literature on Google Scholar and PubMed. Further research is needed to assess the antibacterial and antioxidant properties of *Dasapanguwa* decoction due to the lack of existing literature on its capabilities.

Keywords: *Antibacterial, Antioxidant, Ayurvedic, Dasapanguwa, Herbal Formulation*

Exploring the Feasibility of Mushrooms as a Nutritious Protein Alternative: A Survey Study Among the Youth Community in Colombo District

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Abstract

Mushrooms are a nutritious food source, supplying vegetable proteins, chitin, amino acids, vitamins, and minerals, making them a popular meat substitute due to their low calorie and fat content. This study aims to explore the potential benefits of mushrooms as a plant-based protein substitute for young people in Colombo District. Data collection was done through an online questionnaire using random sampling. The survey, targeting Generation Z, was aimed at understanding the future impact on the mushroom industry through 208 responses to a questionnaire with 24 questions. The survey shows that only 0.48% of people use mushrooms as their primary protein source, and 8.17% consume them several times a week, with 52% being aware of their protein content. There was a statistically significant relationship between awareness about the protein content of mushrooms and education related to that field ($P<0.05$). There is a lack of awareness of mushroom-based food products, with 58.17% of respondents unaware of it, while 29.72% show interest only in crispy mushrooms. The survey reveals that 57.21% of people were not interested in mushroom cultivation. The study highlights a lack of awareness among young people about mushroom-based food products and their nutritional benefits, emphasizing the need for further research to promote mushroom consumption as a protein alternative.

Keywords: *Mushrooms, Protein-Alternative, Youth-Community, Colombo-District*

Investigation of "Wathupalu" (*Mikania Cordata*) Plant Extracts on Wound Healing Using Scratch Assay

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Abstract

Mikania cordata (Brum.) Robinson is a fast-growing perennial vine that belongs to the family of Asteraceae. Different parts of *M. cordata* are frequently used to treat cuts and wounds in traditional medicine. The aim of this study was to evaluate the wound-healing ability of different extracts of *M. cordata* leaves and separate the chemical constituents which are responsible for wound healing. Leaf extracts were prepared by sonicating dried *M. cordata* leaf powder in Dichloromethane (DCM), ethanol, and methanol. Each of these extracts was analyzed on Thin Layer Chromatography (TLC). The scratch assay was performed to analyze the collective cell migration during the wound healing process using the DCM extract on MCF7 epithelial cells. Cells were grown in culture dishes and the wound was created as a scratch when the cells were at 100% confluency. Cells were treated with different concentrations of 100 µg/ml, 500 µg/ml, and 1000 µg/ml of crude DCM extract dissolved in 2.5% (v/v) methanol. The "width of the scratch" was considered as an indicator of collective cell migration. Images were captured at different time intervals of the 0^{th}, 6^{th} and 24^{th} hours during a 24-hour incubation period using an inverted microscope. The width of the scratches was compared with the control {methanol [2.5% (v/v)]}. TLC analysis of ethanol, methanol, and DCM extracts of *M. cordata* leaves showed that the DCM extract possesses the highest number of chemical components compared to the ethanol and methanol extracts. The results of the scratch assay showed that the DCM extract of *M. cordata* did not possess a positive effect on collective cell migration within the range of concentrations used during the 24-hour incubation period and methanol caused no effect for Michigan Cancer Foundation-7(MCF7) cells. Further studies with a wide range of concentrations of DCM extract need to be carried out to identify the chemical constituents responsible for scratch closure activity in MCF7 epithelial cells.

Keywords: *Mikania cordata (Brum.), Plant Extracts, Wound Healing, Scratch Assay, TLC*

A Study of the Economic Impact of Terrestrial Animal Damage on Crop Production in Kamburupitiya Area: A Case Study of Paddy, Cinnamon, and Coconut

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Abstract

Crop damage by wildlife has become a serious issue at present. The aim of this study was to get an estimate about the crop damage caused by selected wild animals in Kamburupitiya area. A hundred random households were visited, and data were collected using a questionnaire. The most significant crop losses attributed to wild animals were observed in cinnamon (33.3%), followed by paddy (30.1%), vegetable crops (21.6%), and coconut (15%). The primary wildlife animals responsible for crop damage were peacocks (31.3%), followed by wild boar (27.6%) and monkeys (18.2%). In the study, 45 households reported crop damage losses below Rs. 10,000, 36 households experienced losses ranging from Rs. 10,000-50,000, while 12 households incurred losses exceeding Rs. 50,000 due to wild animal activities. Furthermore, 51 households incurred economic losses below Rs. 10,000, 18 households experienced losses ranging from Rs. 10,000-50,000, and 5 households reported losses exceeding Rs. 50,000 while attempting to control the wildlife population. Many farmers use different tactics to control wildlife such as making fences (33.8%), using fish nets (21.4%) and crackers (12.5%). Due to lack of documented secondary data, this study only provides an estimation about crop damage and further research should be implemented to mitigate crop damage.

Keywords: *Economic impact, Preventing strategies, Kamburupitiya area, Crop damage, Wildlife.*

Nano Zero-Valent Iron Decorated Biochar, Produced via Asynchronous and Synchronous Routes of Pyrolysis and Carbothermal Reduction for Water Remediation: Characteristics and Applications

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Abstract

Nanoscale zero-valent iron (nZVI), together with a biochar (BC) support, provides advantageous materials for wastewater purification via adsorption, reduction, complexation and advanced oxidation mechanisms. Fabricating the materials can be done via two production routes: nZVI loaded BC subjected to subsequent carbothermal reduction (BC-nZVI) and nZVI loaded biomass (BM) subjected to synchronous pyrolysis and carbothermal reduction (BM-nZVI). Nonetheless, the physicochemical characteristics and the remediation capability of the two materials have not been comparatively evaluated. The present study focuses on preparing and extensively characterizing these materials with subsequent comparative analysis of remedial action. Surface morphology, functionality, elemental composition and point of zero charge were evaluated. XRD peak pattern confirmed the formation of zero-valent iron and the nano-scale was confirmed by TEM. Synergistic adsorptive and degradative behavior of the materials towards p-nitroaniline (pNA) and p-nitrophenol (pNP) were studied by evaluating the optimum pH, which was pH 3.0, contact time of 180 minutes and isotherm patterns. Higher initial adsorption capacity was observed in BM-nZVI while more sustainability and stability over the regeneration cycles were portrayed by BC-nZVI. Therefore, it is conclusive that materials produced through both synchronous and asynchronous routes have signature advantages in purifying pNA and pNP contaminated water.

Keywords: *Biochar, Nanoscale Zero-valent Iron, Rice Husk, P-nitroaniline, P-nitrophenol*

Carbothermally Prepared Surface Deposited and Embedded Nanoscale Zero-Valent Iron Supported on Lignin Biochar for Cd (II) And Pb (II) Remediation

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Abstract

The remediation of Cd (II) and Pb (II) was investigated by comparing two nanocomposites, synthesized via two different carbothermal reduction routes, with lignin biochar (Lig-BC) acting as the control. The two nanocomposites formed were Lig-sG@nZVI and Lig-eG@nZVI. Lig-sG@nZVI was produced by depositing the nanoscale zero-valent iron (nZVI) onto the surface of Lig-BC, whereas Lig-eG@nZVI was formed by embedding the nZVI into the Lig-BC matrix itself. An evaluation of the effect of pH and contact time for both metals was carried out. The best-fitted model was the Sips isotherm for both Cd (II) and Pb (II). Maximum Sips capacities for Cd (II) and Pb (II) were reported as 6.7, 9.7, 8.1 mg g^{-1} and 24.8, 35.7, 52.4 mg g^{-1} for Lig-BC, Lig-eG@nZVI and Lig-sG@nZVI respectively for both metals. Regeneration studies were also carried out to explore the reproducibility of the materials. A greater remediation was observed with Lig-eG@nZVI for CD(II) and Lig- sG@nZVI for PB(II) respectively, and thereby it can be concluded that the remediation of heavy metals can vary with different types of materials. Compared to the control, both materials showed an enhanced performance, suggesting that nZVI composites are a promising solution for heavy metal remediation.

Keywords: *Biochar, Nanoscale zero-valent iron, Remediation, Heavy Metals*

Economic Viability of Cabbage Cultivation Under Protected Houses with and without Artificial Lights in Low Country Wet Zone of Sri Lanka

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Abstract

Cabbage is one of the most nutritious vegetables grown in Sri Lanka. Although, they are successfully grown in up country areas of Sri Lanka, recent studies have shown that there is a potential to grow cabbages in low country too. Therefore, this study aims to assess the economic viability of growing cabbage in protected houses with and without artificial lights in low country wet zone in Sri Lanka. The benefit-cost ratio was used to assess the economic viability of cabbage cultivation. The variable costs (agricultural inputs, labor and utility) and revenues were calculated to determine the benefit-cost ratio. The results revealed that benefit-cost ratio (revenue/variable cost) per unit area of cabbage cultivation without and with artificial lights are 0.56 and 0.60 respectively excluding the labor cost. Additionally, the benefit-cost ratio per unit area of cabbage cultivation without and with artificial lights are 0.31 and 0.38 respectively including the labor cost. Therefore, cabbage cultivation with artificial lights has a higher benefit-cost ratio than cabbage cultivation without artificial lights. However, temperature reducing mechanisms and installing renewable energy systems (i.e., solar power) are good alternatives in constructing protected houses in low country wet zone in Sri Lanka to reduce the cost and obtain more economic advantages.

Keywords: *Artificial Lights, Benefit-Cost Ratio, Cabbage, Protected House, Variable Cost*

Developing a Framework to Assess the Suitability of Energy Mixes for Fishing Vessels: A Narrative Literature Review

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Abstract

The global economy is moving towards new energy types and energy mixes. In the energy sector, energy diversification and energy transition are popular topics. The energy consumption of the fisheries industry is one of the widely discussed topic in the world. The aim of this research was to develop a framework that evaluates the suitability of energy mixes for fishing vessels with different energy diversification and energy transition scenarios. A narrative review of literature was utilized. Twenty-eight research papers were gathered using a string of key words: "energy mix", "energy source", "energy consumption", "fishing", and "shipping" applied to the Web of Science database. Four inclusion and exclusion criteria were used to select the final set of literature (17) of this study. A framework for evaluating the acceptability of various energy mixtures for fishing vessels has been designed based on the knowledge synthesized through thematic analysis. The framework consists of seven criterions: 1) energy diversification and transition scenarios, 2) characteristics of the industry, 3) types of suitability assessments, 4) assessment lenses, 5) assessment criteria, 6) energy types (level 01) and energy mixes (level 02) and 7) identification of the level of suitability. This can be regarded as a basic structure that can be modified to meet the objectives of energy diversification. Hence, this framework can be utilized as a tool for policy decision making in both fisheries and energy sectors. A developed and modified version of the framework can be used for the other stages of the fishery industry and other industries to assess the suitability of the energy mixes.

Keywords*: Energy diversification, Fishing vessels, Framework, Structure*

Assessing Land Use and Land Cover Changes in Three Selected Grama Niladhari Divisions in Homagama Parallel to the Evolution of Techno-City Project

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Abstract

Homagama Techno-City project is one of the largest projects in Sri Lanka with over 182 ha of area focusing on promoting artificial intelligence, distributed computing, robotics, genetics, nanotechnology, and bioengineering and it is essential to determine the environmental impact caused by the land use change for the sustainable development of the area further. Therefore, this study was conducted to (I) analyse the land use /land cover changes in three GN divisions (Pitipana South, Pitipana North, Dampe), of Homagama Sri Lanka over the years 1980 to 2022 by using Geographic Information System (GIS) maps and geometric calculations and (II) to estimate the environmental impact of land use changes by analysing runoff coefficients of the area from 2003 to 2022. Three GIS maps were generated for three GN divisions using Arc GIS (version 10.8) for the years1980, 2003, 2022 separately and geometry calculations were carried out. For the determination of the environmental impact, runoff coefficients were calculated. The mainland uses of Pitipana GNs were classified as paddy, cultivation, forest, residential, Techno-City, rocks & bare lands, and unknown lands. The Techno-City project accounts for 4.4% of the total land area. The total cultivation area has been decreased by 11% while the residential area has been increased by the same percentage from 2003 to 2022. According to the developed GIS map for the land use in the year 2003, paddy land area represents 14.5% of the total area, while cultivations, forest, residential areas, rocks and bare lands account for 18.99%, 24.35%, 35.15%, and 7% respectively while it was 14.21%, 7.97%, 19.42%, 46.41%, 7,14%, and 4.38% for paddy cultivations, forest, residential, rocks, bare lands, and Techno-City respectively in the year of 2022. There is no significant difference in runoff coefficient in the year 2003 (0.32) and 2022 (0.30) with the land use change according to the study. A detailed study is recommended and will be beneficial for preserving the sustainability of the area.

Keywords: *Land use/land Cover, GIS, Runoff Coefficient*

Remediation of Ni^{2+}, Pb^{2+} and Cd^{2+} by Nano Zero-Valent Iron Decorated Biochar Produced via Asynchronous and Synchronous Routes of Pyrolysis and Carbothermal Reduction

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Abstract

Heavy metals in the environment pose significant ecological and human health concerns worldwide. Nano Zero-valent iron (nZVI) is a promising heavy metal removal agent due to its non-toxicity and low standard reduction potential. Avoiding agglomeration, passivation, and long-term stability requires a carrier. The porousness and heavy metal binding properties of biochar (BC) make it an effective carrier. This study presents a comparative evaluation of the remediation of Pb^{2+}, Cd^{2+} and Ni^{2+} by two nZVI-biochar nanocomposites produced via asynchronous (BC-nZVI) and synchronous (BM-nZVI) routes of pyrolysis and carbothermal reduction. A comprehensive evaluation of the effects of pH, contact time, and isotherm pattern studies were carried out with BC serving as the control. The alkalinity of the medium was contributive in the enhanced remediation. The optimal contact times were 50 minutes and 90 minutes for Cd^{2+} and Ni^{2+} respectively. For Pb^{2+}, all materials exhibited fast kinetics of adsorption. For Pb^{2+} and Ni^{2+}, Langmuir model was best fitted while the Cd^{2+} sorption was best described by Redlich-Peterson isotherm model. BM-nZVI showed the highest Langmuir capacities of 36.403, 15.388 and 4.553 mg g^{-1} for Pb^{2+}, Cd^{2+} and Ni^{2+} respectively. Decreased sorption of BC-nZVI might be due to pore blockage. The present work demonstrates the efficiency of BM-nZVI for heavy metal remediation.

Keywords*: Nano zero-valent Iron, Biochar, Rice Husk, Heavy metals*

Microbial Synthesis and Characterization of Iron Nanoparticles from *Escherichia Coli*

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Abstract

Nanotechnology is one of the developing areas with wide applications and iron (Fe) is a very common and easily accessible option for manufacturing nanoparticles (NPs). Iron nanoparticles (FeNPs) can be produced through physical, chemical, or biological processes. Therefore, the objective of this study was to synthesize iron nanoparticles by *Escherichia coli.* The state of microorganisms and their morphological characteristics were investigated prior to the synthesis of nanoparticles. *Escherichia coli* bacterium (ATCC 25922) was selected for synthesized FeNPs using extra cellular method. *Escherichia coli* was cultured and incubated on a shaking water bath and on an orbital shaker at room temperature to identify the suitable way for the growth of *Escherichia coli*. The biomass of *Escherichia coli* was harvested and centrifuged. Then, the pellet was collected for the further reaction to the synthesis of nanoparticles. The Ferric Chloride ($FeCl_{3)}$ solution of different concentration was used for synthesized iron nanoparticles. Nanoparticle formation was confirmed by UV- visible spectroscopy, Fourier-Transform Infrared Spectroscopy (FTIR), and Scanning Electron Microscopy (SEM) analysis methods. According to the results, the UV spectrum of FeNPs synthesized by *Escherichia coli* exhibited broad absorption peaks between 220 and 250 nm; the interaction of extracts with the nanoparticle was explained by FTIR spectroscopy. Accordingly, scanning the FeNP sample between the range of 1000 and 4000 cm^{-1} was used to get FTIR spectra for FeNPs produced by *Escherichia coli*, and (SEM) examination of iron nanoparticles revealed the presence of the FeNPs. Extracellular enzymes in microorganisms have the ability to reduce metallic ions on their surfaces and the synthesis of iron nanoparticles using *E.coli* plays a vital role in the reduction of metal ions in the microbial synthesis method.

Keywords: *Iron nanoparticles, Ferric Chloride, Ultraviolet-Visible Spectroscopy, Fourier- Transform Infrared Spectroscopy, Scanning Electron Microscopy*

Effect of Different Organic Liquid Foliar Solutions on Growth and Yield of Okra

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Abstract

Foliar fertilization effectively augments plant nutrition under unfavourable soil, plant, and environmental circumstances, when compared to chemical fertilizers applied to the soil. A field experiment was carried out to evaluate the effect of vermiwash and biogas slurry as plant growth and yield enhancers on two okra (*Abelmoschus esculentus*) varieties (Haritha and MI-5). In this experiment, five different ratios of vermiwash and biogas slurry (T1-1:0, T2-0:1, T3-3:1, T4-2:2, and T5-1:3) were used. To study the effect, data on the medium, including pH, EC and organic carbon available phosphorus, potassium, and nitrogen were analysed as per the standard procedures. All other management practices were carried out according to the recommendation of the Department of Agriculture. Data on plants such as plant height (cm), number of leaves per plant, leaf length (cm), stem width (cm), number of flowers per plant, pod length (cm), pod diameter (mm), individual pod weight (g), and number of pods were recorded. The results of this study revealed that T1 and T3 showed better performance in number of leaves in both varieties. T1 was identified with higher leaf length, width and plant height in both varieties. Comparing all the treatments, T1 was observed with the highest stem diameter in both varieties. Similarly, in yield attributes, T1 produced a highest pod length of 21.1cm in Haritha and 17. 3cm in MI-5, T1 also produced a highest pod diameter of 2.1cm, with a Pod weight of 37.2g, including 7 pods in Haritha while the highest pod diameter of MI-5 was 2.2mm, with a pod weight of 39.2g, including 6 pods. As revealed from the results, the application of foliar solution (T1) from the age of 2nd week has been evidenced with better performance in almost all the parameters measured. The findings of this study can be recommended to farmers as the use of chemicals is associated with health hazards.

Keywords: *Abelmoschus Esculentus, Vermiwash, Biogas Slurry, Organic Farming*

Developing a Surface Sterilization Protocol and Multiplication Media for Philodendron Black Cardinal Plants

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Abstract

The Philodendron Black Cardinal plant is an ornamental plant with a higher market demand. However, despite its demand the production is low, and there is no any exact surface sterilization protocol available for the preparing of the In-vitro propagation. Therefore, this investigation was aimed at developing a surface sterilization protocol to select a suitable multiplication media. The experiment was conducted at TC PLANT, Homagama. For the surface sterilization protocol, mother plants were treated with fungicide and then shoot tips were taken. Shoot tips were washed in Tepol, soaked in fungicide, Clorox solution [(10%, 15%, 20%, and 30% concentration) for a time duration of 20 and 30-minutes, and 70% alcohol, Mercuric chloride ($HgCl_2$) were inoculated to the media. During the initiation period, contamination rate, implementation of the length in shoots and viability of shoots were taken as data. The experiment was led in a Complete Randomized Design (CRD) and all the taken data were analyzed with SAS software package. According to the data analysis 15%, (30 minutes) Clorox concentration was selected as the best surface sterilization protocol. In the multiplication stage, 6-Benzylaminopurine (BAP) levels were changed in the Murashige and Skoog (MS) medium. Data obtained for one month were used to select the most suitable medium for multiplication. Medium with the BAP 5g/L was selected as the best multiplication media based on the number of shoots obtained.

Keywords: *Philodendron Black Cardinal Plant, Surface Sterilization Protocol, Multiplication Media, Shoot Tips, BAP*

Molecular Detection and Confirmation of New Co-Occurring Whitefly Species in Coconut in Sri Lanka

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Abstract

Identification of the species complex of a pest is necessary in an alien pest invasion. As whiteflies have not been widely reported in coconut in Sri Lanka, identification of the whitefly species is important. The present study was conducted for the molecular identification of the whitefly species in coconut in Sri Lanka. Whiteflies were collected from Gampaha district and were morphologically identified. Then the total Genomic deoxyribonucleic acid (gDNA) was extracted separately from them using the Cetyltrimethylammonium bromide (CTAB) method. The extracted DNA were subjected to polymerase chain reaction (PCR) using universal DNA primer pairs; LCO 1490 and HCO 2198. Amplification of partial mitochondrial cytochrome c oxidase subunit 1 (mtCOI) genes of total genomic DNA resulted in PCR product with a size of 658 bp and all the sequences were bidirectional Sanger sequenced. All the sequences were subjected to Nucleotide BLAST (BLASTn) similarity search through National Center for Biotechnology Information (NCBI) and found that they were 99-100% matched with the species identified morphologically. The species were *Aleurodicus rugioperculatus, Paraleyrodes minei, Aleurotrachelus atratus* and *Aleurodicus disperses.* The species *A. rugioperculatus, P. minei and A. atratus* are reported for the first time in Sri Lanka. The invasion of these new whitefly species possesses a potential threat to the agriculture sector owing to its polyphagous nature and their rapid dispersing ability.

Keywords: *Coconut, Molecular Identification, Pest Invasion, Polyphagous, whitefly*

Vulnerability of Salinity Intrusion for Groundwater in Coastal Line from Negombo to Galle

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Abstract

Coastal groundwater systems are at risk of saltwater intrusion caused by excessive pumping and rising of sea levels. To address this, vulnerability assessments of coastal aquifers is crucial. This study aimed to use a model with Geographic Information System (GIS) to assess groundwater vulnerability of seawater intrusion in coastal line from Negombo to Galle, observe salinity distribution patterns, predict salinity intrusion, and examine the influence of geology and population. The GALDIT model considered factors influencing vulnerability to seawater intrusion, including groundwater occurrence, aquifer hydraulic conductivity, depth of groundwater level above the sea, distance from the shore, impact of existing seawater intrusion, and aquifer thickness. For the purpose of this study groundwater data from 2016 to 2019 in both during and off monsoons for above factors were measured in addition to the data on population and geology. The used model demonstrated high explanatory power and showed that the existing status of seawater intrusion was the most influential factor. The study found lower salinity intrusion during monsoon seasons compared to off-monsoon periods. No significant relationship was observed between salinity data and population. Vulnerability maps categorized divisional secretariats, identifying Beruwala, Colombo, Ambalangoda, Hikkaduwa, Bentota, and Balapitiya as the most vulnerable areas. Leucocratic rock type majorly affects, and Alluvial Lagoonal Clay formations have minimal impact on salinity intrusion. The findings offer valuable insights for sustainable management of coastal groundwater resource. Future implications suggest including transient population in assessments for a more accurate understanding of water demand.

Keywords: *GALDIT Model, Geographic Information System (GIS), Regression Analysis, Salinity Intrusion*

Body Mass Index of University Students and Gender Differential: A Survey at the Faculty of Technology, University of Ruhuna, Sri Lanka

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Abstract

Calculating the Body mass index (BMI) can raise awareness among undergraduates about the importance of maintaining a healthy weight. It can be helpful in understanding the relationship between their weight and overall health, encouraging them to adopt healthy habits and instrumental in assisting them make informed choices about their lifestyles. The study aimed at determining the relationship between BMI and gender differentiation, academic performance, activity level, socioeconomic factors, health conditions, and age in university students at the Faculty of Technology, University of Ruhuna. A structured questionnaire was delivered using both online and physical methods. Among 250 students that completed the survey, 138 respondents (55.2%) were female and 112 (44.8%) were male. The BMI was calculated based on students' weight and height, while academic performance was determined by students' cumulative Grade Point Average (GPA). According to the results of the analysis, there was a significant difference ($p=0.020$) between BMI and gender and also between BMI and age ($p=0.034$). There is a significant association between BMI with that of both gender and age ($p<0.05$). According to the results obtained from the survey there is no any significant difference between BMI and ($p=0.201$) academic performance, ($p=0.178$) activity level, health conditions ($p=0.150$) and socioeconomic factors ($p=0.891$). These findings infer the importance of studying BMI and associated factors and future research should be conducted in the university level.

Keywords: *BMI, Gender, Socioeconomic, Academic-performance, Health Condition*

Present Status of Food Safety and Hygiene Practices in Tourist Hotels in Uva Province towards Sustainable Business Operations

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Abstract

Food safety and hygiene practices in tourist hotels play a critical role in ensuring the well-being of travelers and the reputation of a region's tourism industry. This study aimed to assess the current status of food safety and hygiene practices in tourist hotels in the Uva Province of Sri Lanka, with the goal of promoting sustainable business operations and contributing to the socio-economic development of the region. A sample of 60 tourist hotels from both Badulla and Moneragala districts was selected for the study, and a combination of quantitative and qualitative research methods, including questionnaires, interviews, focus group discussions, and direct observations, were employed for data collection. The results revealed that a majority of hotels in the Uva Province were not certified with food safety or quality-related standards, indicating a need for improvement in compliance. In terms of raw material handling, most hotels exhibited good practices, such as checking for impurities and dates, but there was room for enhancement in other aspects, including supplier details and cleanliness of transporting vehicles. Personal hygiene practices among hotel staff were generally satisfactory, with a few exceptions, highlighting the importance of consistent adherence to hygiene standards. The study identified areas for improvement related to cross-contamination prevention, sanitation, time and temperature management, as well as staff training and awareness. Financial and management constraints were found to be key challenges in adopting food safety and hygiene practices. However, waste management practices in the hotels were generally adequate, though a few hotels required improvement. This research emphasizes the importance of enhancing food safety and hygiene practices in tourist hotels in Uva Province to meet sustainable development goals and maintain the region's reputation as a tourist destination.

Keywords: *Food Safety, Hygiene, Quality, Tourism*

Impact of Combustion Temperature on Water Repellency of Burned Litter in Japanese Cedar *(Cryptomaria Japonica*) and Japanese Cypress (*Chamaecyparis Obtuse*) Forests

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Abstract

Water repellency (WR) prevents the spontaneous penetration of water into soil and limits almost all hydraulic movements. It is primarily caused by organic matter and is highly dependent on vegetation and litter material. Forest fires burn the forest litter biomass, reducing it to ash and charred debris on the forest floor. This transforms the organic matter of litter, altering the water-repellent levels of the surface litter cover. There is a lack of information regarding how litter WR alters with different heat levels that can be caused by fire events. This study aimed to examine the impact of different heating temperatures on the WR level of burnt forest litters of two Japanese coniferous plant species: Japanese Cedar – CED (Cryptomaria japonica) and Japanese Cypress – CYP (Chamaecyparis obtuse). Litter samples were exposed to heat at 100, 200, 300, 400, 500, and 600°C in a muffle furnace for 20 min, and the resulting ash and charred materials were left to stand for 24 hours. The WR of heated litter was assessed in triplicate using the water drop penetration time (WDPT) test. With increasing temperature, WR of litter material increased up to 200°C (WDPT > 5 h) and decreased up to 600°C (WDPT = ~40 s). Results revealed that the WR of litter increased with increasing heating temperatures up to 200°C and decreased beyond that. The increased WR with increasing temperature could be a result of the melting and reorientation of organic substances, whereas the decreased WR could be a result of the complete burning of organic substances at high temperature levels.

Keywords: *Water Repellency, Combustion Temperature, Forest Litter, Cryptomaria Japonica, Chamaecyparis Obtuse*

SCIENCE AND AGRICULTURE

(Abstracts of Undergraduates)

Use of Natural Plant Extracts to Detect the Adulteration of Milk

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Abstract

The detection of adulteration of raw milk in field is an essential process to maintain the quality of dairy products. Industrially acceptable pH range for raw milk is pH 6.6 - 6.8. This study was designed to propose alternative indicators to identify deteriorated raw milk using water and ethanol extracts of e. i. flower petals of Hibiscus rosa-sinensis L. (Shoe-Flower) and Clitoria ternatea (Butterfly Pea), Curcuma longa (turmeric) rhizome and Brassica oleracea (red cabbage) leaves in central stem. Each plant extract was tested with pasteurized raw milk to evaluate the color change within pH range of 6.0 to 7.0. The Hibiscus rosa-sinensis L flower ethanol extract (pH 7.0; gray, pH6.6 – 6.8; grayish light pink and pH 6.0; light pink) and Brassica oleracea water extract (pH 7.0; bluish gray, pH 6.6 – 6.8; Light purple and pH 6.0; Pinkish light blue) were opted. The other tested plant extracts were not observed noticeable and significant in terms of color variation with the pH change. The color variation was analyzed by using a CM-5 konica Minolta spectrophotometer. According to the results, color values (L values) for ethanol extract of Hibiscus rosa-sinensis L flower were pH 7.0; 1.88, pH 6.6; 2.17 and pH 6.0; 2.33 and water extract of Brassica oleracea were pH 7.0; 1.52, pH 6.6; 1.41 and pH 6.0; 1.84. In conclusion, it was demonstrated that the potential use of ethanol extract of Hibiscus rosa-sinensis L. flower and water extract of Brassica oleracea can be used as alternative indicators to methylene blue dye reduction methods to ensure rapid, cost effective and precise microbiological quality assessment of detecting deteriorated raw milk in household level.

Keywords: *Indicators, Plant extracts, Colour Variation, Decolorization*

Green Synthesis of Urea Nano Particles by Using Water Extract of Banana Peels

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Abstract

Bio-based synthesis of nanoparticles from various parts of plants has accomplished huge interest, especially since it is an eco-friendly synthesis process and due to its paramount importance in reducing environmental impact. In the present study, secondary metabolites-rich aqueous banana peel extract was employed for the green synthesis of urea nanoparticles as a capping agent. Banana peel (*Musa acuminata*) extract, potassium hydroxide, urea, and citric acid solution were used to synthesize nano urea. pH of the initial banana peel extract was 12.97 and it was heated to 80^0C while stirring at 300rpm for 30 minutes. To synthesize urea nanoparticles, 650.0 mL of heated banana peel extract was mixed with 5% urea and 5% citric acid solution. Then the pH was dropped to 8.12 and that mixture was stirred at 102 rpm for 2 hours. Urea nanoparticle synthesis was visually confirmed by the changing of brown color to dark brown. The resulting urea nanoparticle mixture was characterized qualitatively using UV visible spectroscopy at a range of 200nm to 600 nm. Urea nanoparticle-specific absorption peaks were given at 425 nm and 470 nm. The green synthesis approach not only offers a sustainable and an environmental-friendly route to nanoparticle production but also utilizes an agricultural waste product, reducing waste and promoting resource efficiency. This study provides a sustainable and an economical approach to urea nanoparticle synthesis and its potential application in agriculture to increase the yield of crops by reducing the application of bulk urea as a fertilizer.

Keywords: *Nanoparticles, Bio-Based Synthesis, Urea Nanoparticles, Capping Agent, Banana Peel Extract*

Application of Pralong's Method in Assessing Ecotourism Potential in Sri Lanka: A Case Study of Kamburupitiya, Matara, Sri Lanka

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Abstract

Ecotourism is a type of tourism which relates to the responsible travelling in the natural environment, aiming to minimize the negative impact on the environment, promoting conservation efforts while providing an educational, enjoyable experience for tourists while increasing the wellbeing of local community. Kamburupitiya district secretariat division in Sri Lanka is enriched with a significant eco-tourism potential in terms of biodiversity, historical significance, and culture. This study is focused on identifying such locations with ecotourism potential in Kamburupitiya divisional secretariat division and providing recommendations for sustainable tourism development in the selected area. A three-month cross-sectional study was conducted from August,2023 to November,2023. Primary data were collected through field visits, observations, and a questionnaire. The results of the primary data collection were instrumental in identifying seven potential locations in the study area, namely Sabarale Sri Niwasarama Purana Viharaya, Bibulewela water bubble, Arambegoda Pabbatharama viharaya, Oliyagankale conservation forest, Lenabatuwa lake, Badde Viharaya-Vihara Forest and Nidangala rock. The eco-tourism potential was evaluated using Pralong's method in the seven identified locations, where the method was used to identify locations with apparent aesthetic value, scientific value, cultural value, economic value and tourist value. Results revealed that the Lenabatuwa tank is the most potential eco-tourist destination (0.5438) while, Bibulewela water bubble claimed the lowest (0.2665) in the area. According to the Likert scale, local people were highly aware of Lenabatuwa tank (4.392), and the least awareness was for Badde viharaya (2.272). Lack of awareness, weak infrastructures, and less government involvement were the main weaknesses in developing ecotourism in Kamburupitiya area.

Keywords: *Eco Tourism, Pralong's Method, Likert Scale, Kamburupitiya Area*

COMPUTER SCIENCE

Online Maintenance of the Convex Hull in the Plane

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Abstract

The convex hull of a set of points in the plane is defined as the point, the shortest line segment, or the minimum area convex polygon containing all the points in the set. There are mainly two types of the convex hull problem: offline and online. Suppose that points arrive one by one, and the position of the next point is always unpredictable. Then the maintenance of the convex hull of the currently available set of points is called the online convex hull problem. If all the points are available from the beginning, then the construction of the convex hull is called the offline convex hull problem. The offline convex hull problem has been extensively studied in literature and several optimal algorithms are available for this. However, there are only two algorithms available in literature to solve the online convex hull problem. Furthermore, these two algorithms are theoretical ones without corresponding computer implementations. Therefore, an optimal offline algorithm is used in practice to solve the online convex hull problem. This approach takes $O(k \log k)$ update time and $O(n^2 \log n)$ total time. A new practical online convex hull algorithm is proposed in this work. The convex hull is represented using the list of edges in arbitrary order. The existing convex hull should be modified only if the new point arrives outside. The edges visible to the new point are deleted from the list. Consequently, the convex hull becomes incomplete. Then, at most two edges are added to the list in order to complete the convex hull. Thus, the convex hull is maintained online. The algorithm can be implemented using an object-oriented programming language. The proposed algorithm takes $O(k)$ update time and $O(n^2)$ total time. Therefore, the proposed algorithm is faster than the existing practical approach.

Keywords: *Computational Geometry, Convex Hull, Computational Complexity, Algorithms, Data Structures*

Investigation of Augmented Reality's Influence on Heritage Tourism Satisfaction

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Abstract

This research investigates the influence of augmented reality (AR) on destination satisfaction in cultural and heritage tourism, with a specific focus on the historical sites of Polonnaruwa in Sri Lanka. The study seeks to shed light on the potential of AR as a practical and affordable solution in addressing the challenges of limited funds for site reconstruction while aiming to enhance tourists' experiences. The research objectives include examining the influence of AR on destination satisfaction, investigating the mediating role of perceived value and immersive experience, and exploring the relationship between immersive experience and perceived value. In order to bridge this gap, the researcher employed a structured questionnaire and the convenience sampling technique to survey 256 visitors to cultural and historical destinations as part of a quantitative research approach using IBM SPSS Statistics 25 and Smart PLS 4. The results indicate a positive and significant relationship between AR and destination satisfaction, suggesting that AR significantly impacts tourists' overall satisfaction with historical and cultural sites. The researchers found that perceived value and immersive experience mediate the relationship between AR and destination satisfaction, emphasizing the importance of value perception derived from the AR experience and shaping tourists' satisfaction. Moreover, a positive and significant relationship between immersive experience and perceived value indicates that the immersive aspects of the tourist experience positively contribute to the perceived value of visiting cultural and heritage sites. The study recommends utilizing AR technology to improve cultural and heritage tourism destination satisfaction. Authorities should integrate AR experiences at historical sites and train tourism professionals to use AR. Moreover, future researchers can explore the long-term effects of AR on tourist behavior and loyalty and influences on future visitation and repeat visits. These discoveries have potential applications in improving the tourist experiences at other Sri Lankan cultural and historical sites.

Keywords: *Cultural Tourism, Heritage Tourism, Augmented Reality, Tourist Satisfaction, Immersive Experiences*

Dissemination of Good Agricultural Practices (GAPS) through "Govi Nena" Mobile Application

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Abstract

Agriculture is the mainstay of Sri Lanka's economy. However, inadequate farming methods from production to the post-harvest stage adversely influence the safety and quality of agriculture in Sri Lanka. Hence, this study intends to disseminate Good Agricultural Practices (GAPs) through the "Govi Nena" mobile-based certification model as a sound solution to overcome these challenges in this technologically advanced era. Potato crop was selected as the first test crop and primary data were collected using pre-tested structured questionnaires and discussions from 225 potato farmers by random sampling technique and the model was developed using the Design Science Research methodology. The survey findings indicate that the majority of potato farmers, encompassing 90% of the respondents, rigorously adhere to proper agricultural practices such as soil conservation, crop rotation, cropping methods, and land preparation. Nonetheless, challenges persist, including the excessive use of inorganic chemicals and fertilizers, inadequate soil fertility management, subpar Integrated Pest Management (IPM) implementation, and unsatisfactory post-harvest handling practices. In response, a certification model which covers all necessary information for pest and disease management was developed. It was noted that several factors significantly influence the development of the certification model, including farmers' experience ($p=0.000$), age ($p=0.000$), education level ($p=0.014$), awareness of GAPs, the willingness to acquire knowledge about GAPs ($p=0.000$), and the eagerness to implement GAPs through a mobile-based application ($p=0.000$). This application is designed to provide actionable information and guidance on GAPs, offering a promising solution to mitigate improper farming practices in Sri Lanka by disseminating knowledge and guidance effectively.

Keywords: *Certification Model, Design Science Research Methodology, Good Agricultural Practices, Govi-Nena, Integrated Pest Management*

The Role of Standardization in DevSecOp Practices in Improving the Security Posture of Software Development in Sri Lanka

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Abstract

The development, security, and operations (DevSecOps) paradigm, which involves incorporating security practices into the software development process, is becoming increasingly popular as an effective way to achieve secure and efficient software development. This research explores the crucial role of standardization in DevSecOps practices and its impact on enhancing the security posture of software development in Sri-Lanka while attempting to identify the current industry standards for DevSecOps. Secondly, it intends to choose a suitable standard to assess the security level of software development companies in Sri-Lanka and then to analyze the DevSecOps components that are most effective for measuring security levels. Additionally, a Standardization Maturity Model (SMM) is designed and developed to measure security levels based on the selected standard. Finally, the research measures security levels in Sri Lankan software development companies by utilizing the DevSecOps standards at the Department of Defense. The study employs a mixed-methods approach, to understand the current state of DevSecOps practices and standardization efforts in the Sri-Lankan software development industry. The research methodology involves surveys and interviews with DevOps stakeholders: practitioners, engineers, tech leads, and security professionals. The collected data were analyzed to assess the existing practices, identify security challenges, and evaluate the level of adoption of standardized DevSecOps practices in Sri-Lanka. The study contributes to the existing body of knowledge by highlighting the significance of standardization in DevSecOps practices in Sri-Lanka. The findings will shed light on the security landscape in software development, identify potential areas for improvement, and propose recommendations for adopting standardized DevSecOps practices.

Keywords: *DevSecOps, Standardization, Security Posture*

A Community-based Shopping Experience Improvement System with Sinhala Feedback Analyzing

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Abstract

With emerging technologies and constantly changing lifestyles, shopping has become an essential factor in society. There are people who frequently do shopping as a major activity in their day-to-day life. They tend to use the internet to find the best sellers. People often browse through many reviews to arrive at an informed decision. As a solution, we propose a community-based software platform that analyses customer reviews to provide tailored recommendations. In the proposed solution, textual feedback is analysed using sentiment analysis, which helps to categorize user responses. An important factor is proposed system can analyse Sinhala and English textual feedback. The analysed data is then stored as negative, positive, or neutral feedback. We found that customers mainly consider four features when they are selecting a seller, the price of the goods, the quality of the goods, customer service, and after-sales services of the seller. A score for each feature and an overall score is calculated based on the feedback to rank the sellers. The overall score is calculated using a weight-allocating mechanism which increases the accuracy of the results. The system acts as a common software platform that helps to improve their shopping and selling experiences.

Keywords: *Customer reviews, Sentiment-analyzing, Recommendation System*

COMPUTER SCIENCE

(Abstracts of Undergraduates)

Cutting-Edge AI-Powered Real-time Surveillance System for Proactive Threat Detection and Response in Robbery Situations

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Abstract

In today's security-conscious world, the need for advanced surveillance systems is paramount. This research focuses on pioneering a cutting-edge real-time surveillance system driven by artificial intelligence (AI) to proactively detect and respond to potential robbery situations. Utilizing deep learning, this system surpasses traditional surveillance methods by identifying specific anomalies linked to robberies, such as individuals wearing helmets and carrying weapons or knives. The system's core strength lies in its robust object detection and tracking capabilities, powered by state-of-the-art deep learning algorithms analyzing live video streams. It swiftly identifies anomalies like people entering monitored areas with helmets and various weapons, such as rifles, handguns, or knives. Upon detection, an automatic alarm is triggered, notifying security personnel and relevant authorities for immediate action. This study introduces an innovative automated response feature, allowing security personnel to take control of the system. Once a robbery is confirmed, it triggers alarm & access doors can be closed promptly, preventing illegal entry and limiting potential attackers' movements. This seamless integration of AI-driven detection and automated security response not only enhances overall security but also reduces human error and response time, ultimately safeguarding lives and valuable assets. The AI-powered real-time surveillance system described in this study represents a significant advancement in security technology. It establishes a new standard for crime control and prevention due to its ability to adapt to dynamic scenarios, accurately detect anomalies, and automate security protocols. The research incorporates the latest object detection frameworks with models for precise object detection and proper algorithm for efficient object tracking. This technology reshapes the landscape of modern security systems, offering a robust solution to safeguard public spaces, corporations, and institutions as threats continue to evolve.

Keywords: *Surveillance Systems, Robbery Situations, Object Detection, Object Tracking, AI- driven Surveillance*

Predicting the Quality of E-Commerce Products using Machine Learning

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Abstract

E-commerce product reviews are vitally important for maintaining a positive reputation and for increasing sales opportunities. Generally, there are thousands of reviews available for a product and therefore, it is time consuming to analyze reviews to get the idea of the product manually. This study is focused on evaluating the quality of e-commerce products by analyzing reviews gathered from AliExpress online marketing. In this analysis, a security camera product was selected, and 568 textual reviews were collected for this product. Then, after preprocessing, this dataset was divided into a training (80%) set and a testing (20%) set for analysis. Reviews in English language were selected for this research and therefore non-textual elements such as emojis were disregarded. To address potential imbalances in the dataset, particularly in instances of class imbalance, the Synthetic Minority Over-Sampling Technique (SMOTE) was employed. This technique helped to ensure a more equitable representation of different classes within the dataset. After that, binary vectorization method was used to transform the text data into numerical vectors, facilitating the application of machine learning techniques. The Support Vector Machine (SVM) served as the chosen machine learning model for this analysis, achieving a remarkable training accuracy of 95.8% and a testing accuracy of 86% of the prediction model. Then a prediction pipeline designed method was used to classify the reviews as either "positive" or "negative," assessing the quality based on the customer feedback. The results of this analysis are presented in graphical and tabular formats, aiding potential consumers in making informed purchasing decisions. This model helps consumers to quickly see the quality of the product, as it reviews all the data providing a predictive model for product quality. Despite limitations, our approach offers valuable insights for consumers navigated online marketplaces, aiding them in evaluating the desirability and worthiness of products under consideration.

Keywords: *Product Reviews, E-commerce, Quality of the Product, Natural Language Processing,*

Identification and Classification of Cabbage Quality using Machine Learning

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Abstract

Cabbage is a globally usable vegetable which plays an important role in the agricultural industry and in consumer preferences. Traditional methods of visually inspecting cabbage quality are subjective and prone to human error; therefore, this research aims to evaluate the quality attributes of cabbage, focusing on leaf color, head color, and cutworm status. By focusing on advancements in machine learning techniques, specifically convolutional neural networks (CNNs), a model that can accurately classify cabbage quality into categories such as high quality, medium quality, and low quality was trained. This classification enables consumers to make relevant decisions and it is beneficial to the sellers as well. In this research, an extensive dataset of cabbage images was meticulously assembled, along with unique features, utilizing the Redmi Note 10 Pro smartphone. Maintenance of the same lighting conditions was carefully ensured throughout image acquisition of the dataset. In the initial approach, single, pre-trained models named Inception V3, ResNet50, VGG16, and DenseNet121 were applied, yielding accuracy levels of 86%, 55%, 81%, and 82%, respectively. According to the outcomes of the single predefined models, a decision was made to combine together the two models which had the highest accuracies, namely the customized model combining Inception V3 and DenseNet121. A higher accuracy of 88% was achieved through the combined model. The outcome of the study shows a higher accuracy with the combined models, and provides insights into dataset characterization, while contributing to future work.

Keywords*: Cabbage Quality, Feature Extraction, Classification, Convolution Neural Network*

Identification of Teak Wood Cupboards in Sri Lanka using Machine Learning

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Abstract

Teak timber, scientifically referred to as *Tectona grandis*, is a timber species of exceptional value celebrated for its outstanding characteristics and wide-ranging uses. Teak wood cupboards hold significant value in the furniture industry, particularly in Sri Lanka, due to their durability, aesthetic appeal, and cultural significance. However, distinguishing authentic teak wood cupboards from imitations can be a challenging task, for both consumers and experts. This research presents a novel approach to address this issue by leveraging machine learning techniques for the automatic identification of teak wood cupboards. This study is confined to categorizing a collected dataset of 1060 cupboard images from furniture shops in Sri Lanka through image preprocessing. In this study, a machine learning model, specifically a Convolutional Neural Network (CNN), was developed and trained on a dataset of images of teak wood cupboards and other imitations of wood. The CNN model can recognize distinct features and patterns that differentiate genuine teak wood from other types of wood. The model's performance is evaluated, and the results indicate an accuracy of 89.5%, demonstrating its effectiveness in teak wood cupboard identification. To mitigate the limitations posed by a relatively small dataset, data augmentation technique was employed to prevent overfitting. Model performance was assessed using metrics like precision, recall, and the F-1 score. Additionally, it can contribute to the preservation of teak wood resources by discouraging the use of counterfeit materials on the market. The proposed model offers a promising solution to the problem of identifying teak wood cupboards in Sri Lanka, addressing both economic and environmental concerns.

Keywords: *Teak wood, Cupboard Identification, Machine Learning, Convolutional Neural Network*

The Positive Effect of Food Choices on Academic Stress among Students at the University of Ruhuna

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Abstract

Academic stress among university students is receiving widespread attention in today's academic environment. Academic stress arises from the myriad demands and challenges inherent in academic life, the management of which is fundamental to students' overall health and well-being. University students face a high sensitivity to academic stress and need proactive strategies to reduce stress. There is growing evidence that certain food choices can positively impact academic stress, but the exact link varies among individuals and depends on the specific foods consumed. This research project developed a prediction model using a machine-learning algorithm to determine the beneficial effects of dietary decisions on academic stress among students at the University of Ruhuna. The main goals are to determine the stress levels of the students, comprehend how they eat when under stress, and pinpoint foods that help reduce stress. The study combines supervised and unsupervised learning techniques using a two-pronged design. A dataset of 597 student participants, and a K-means algorithm are employed in the field of unsupervised learning to intelligently classify students into different stress levels based on their replies. This process revealed complicated patterns of food consumption. Simultaneously, supervised learning, facilitated by the K-Nearest Neighbors (KNN) algorithm, creates correlations between stress levels and personalized food consumption habits. The study concluded that there was a noteworthy pattern among students at University of Ruhuna with high stress levels, who consumed an average of 2.25–2.50 times more sweet foods than spicy and milky foods than their low-stress counterparts, who consumed an average of 1.00–1–25 times sweet foods. It illustrates the connection between a person's food intake and stress levels, as well as how eating well can temporarily reduce stress. These findings have important consequences for nutritional therapies that might be used to improve the ability to manage stress among students at University of Ruhuna.

Keywords: *Academic Stress, Supervised Learning, Unsupervised Learning*

Oyster Mushroom Disease Detection Using Machine Learning

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Abstract

The industry that cultivates mushrooms has experienced a significant expansion due to the growing demand for edible mushrooms and in particular for oyster mushrooms, as they are highly valued for their distinct flavor and high nutritional content. However, a major threat to the productivity is the susceptibility of oyster mushroom fields to diseases. This research presents a machine learning-based technique for the early detection of fungal infections in oyster mushrooms to address this issue. The main goals of the study are to create a large dataset of high-resolution images, provide a diagnosis method for several fungal diseases that affect oyster mushrooms, and carry out dataset splitting, augmentation, and preprocessing techniques. Using a dataset of 1500 data points, the study utilizes deep learning models and machine learning techniques like VGG16, ResNet50, and InceptionV3 to identify and classify oyster mushroom infections, demonstrating remarkable accuracy and precision in complex disease categories. This research significantly contributes to agriculture and the mushroom-growing industry, enhancing the understanding and classification of oyster mushroom infections. The study aims to use convolutional neural networks (CNNs) for feature extraction to create an accurate disease detection system for oyster mushroom fungal diseases. However, it acknowledges limitations like the need for a larger dataset and the need for diverse datasets for better generalization. Future research should focus on adding new characteristics to improve the accuracy of disease diagnosis. The proposed machine learning-based approach could revolutionize the mushroom cultivation industry by reducing financial losses from fungal infections and promoting greater yield sustainability. The research's potential benefits include early disease detection, prompt disease treatment, and reduced crop losses.

Keywords: *Oyster Mushroom, Fungal Disease Diagnosis, InceptionV3 Model, CNN Model*

Dried Fish Type Identification Using Machine Learning Techniques: A Case Study on Three Fish Species in Sri Lanka

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Abstract

Dried fish is one of the major and traditional dishes of Sri Lankans and is also one of the major animal protein sources with low cholesterol for humans. Despite, the benefits and the popularity, people are facing challenges in identifying certain varieties of dried fish which look the same such as *Rastrelliger kanagurta* (Kumbala), *Goldstriped sardinella* (Salaya) and *Sardina pilchardus* (Keeri). When the above three types of dried fish are mixed, the ability to differentiate one from another becomes challenging and benefits between the three varieties is a concern. Consumers have been misled by some sellers who manipulate the challenge of identification. Therefore, the aim of this research is to identify the correct type of dried fish even if those fish are mixed together with other types. To address the above issue, a machine learning based solution was developed along with image processing using more than 3500 images. The developed model uses four features of dried fish, the head, trunk, tail, and the entire body. Using YOLOv8 model, first we attempted to identify the number of objects in the user captured image and we store those identified objects temporarily within the model. Subsequently a trained VGG16 model is used for the classification of dried fish types based on the previously identified objects. The model achieved more than 90% overall accuracy in identifying the correct dried fish type. In conclusion, the developed model can be used to effectively identify the type of dried fish even in situations where they are mixed with other dried fish types. The model will be further developed as a mobile application in the future for the betterment of dried fish consumers as well as sellers.

Keywords*: Image Processing, Machine Learning, Sri Lankan Dried Fish, VGG16, YOLOv8*

Price Prediction of Gourami Fish Using Image Processing and Convolution Neural Network Techniques

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Abstract

This research develops a computer vision technique to predict Gourami fish pricing solely from images, without direct handling. The methodology involves collecting diverse Gourami images and performing extensive preprocessing like grayscale conversion, thresholding and contrast enhancement to optimize image data quality. A convolutional neural network architecture is leveraged to accurately recognize key anatomical landmarks including fins, tail and mouth. These landmarks are annotated to estimate size parameters like length and area. The size estimates are given as the input to a regression model trained on historical pricing data to predict the price based on size. This approach enables efficient, non-invasive pricing decisions in Gourami aquaculture using computer vision rather than manual measurements. This is aimed at providing benefits to farmers through improved productivity and profitability, and customers by enabling pricing transparency. Overall, this research signifies an important advancement in applying image processing and convolutional neural networks to bring automation and sustainability to aquaculture practices, addressing critical pricing challenges.

Keywords: *Automated Fish Size Estimation, Computer Vision, Convolutional Neural Networks, Non-Invasive Pricing, Sustainable Aquaculture*

Machine Learning Approach to Identify the Post-Treatment Health Status of Patients with Lower Limb Osteoarthritis

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Abstract

Lower limb osteoarthritis is the most common joint disorder in which a portion of the articular cartilage begins to break down, leading to difficulties when walking. Most individuals suffering from osteoarthritis are over the age of 45, and women are more commonly affected than men. Two essential units, namely data and patient information, are crucial when collecting data for analyzing a patient's health condition which is a time-consuming process for the health professionals when analyzing the patient's status. To address this issue, a machine learning approach has been developed to identify the health status of patients with lower limb osteoarthritis after receiving the treatment. This approach reduces the time required by doctors, neurologists, and physiotherapists to assess the patient's condition. Data collection involves obtaining existing lab records from the Department of Physical Medicine Unit and the Electromyography Unit, along with the essential details of the patient. Preprocessing is carried out using the collected data and Artificial Neural Networks (ANNs) model is selected to make predictions and suggest the level of improvement. In the results and discussion section, a system is presented for analyzing each patient's improvement level under different conditions and for predicting their health conditions as this in particular aims at identifying the patient's recovery level, allowing the insertion of new data and the displaying of the analysis of the results.

Keywords: *Articular Cartilage, Osteoarthritis, Electromyography Unit, Artificial Neural Networks Model*

ENGINEERING AND TECHNOLOGY

Investigation of the Effect of Fabrication Parameters on the Impact Strength of the Polymer Matrix Composite

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Abstract

This study explores the influence of fabrication parameters on the impact strength of polymer matrix composites, and research flows through a structured investigation conducted across three key stages. In the first stage, the Charpy impact strengths of epoxy, polyester, and vinyl ester matrices reinforced with quad axial E-glass fibre [45º, 0º, 45º,90º] were investigated. The findings of this stage emphasized the importance of selecting the most appropriate resin-fibre mix proportions for specific engineering applications. In the second stage, the study focused on investigating the effect of 3M Super 77 adhesive on the composite impact strengths and in the third stage, on the varied vacuum pressure levels including -0.1, -0.3, -0.5, and -0.7 bar on composite component manufacturing. In the last stage, six composite samples were manufactured by varying the curing temperatures including 40 °C, 50 °C, 60 °C, 70 °C, 80 ºC, and 100 °C. The curing process was carried out for a minimum of 6 hours for all the composite samples while infusion pressure -0.3 bar and temperature were kept at room temperature. Then Charpy impact test was performed on all the specimens for further analysis. These stages collectively provide critical insights into optimizing composite manufacturing processes for diverse engineering applications.

Keywords: *Fabrication, Polymer Matrix, Composite*

Photocatalytic Degradation of Bismuth Ferrite Incorporated Regenerated Cellulose Nanocomposites as a Sustainable Water Purification

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Abstract

In this study, degradation of methyl orange (MO) was evaluated with the aid of bismuth ferrite ($BiFeO_3$) incorporated regenerated cellulose (RC) nanocomposite films as a photocatalyst. Microcrystalline cellulose (MCC) was used to obtain RC films by solution casting method and (0-5) wt% of $BiFeO_3$ with respect to MCC weight was added into the MCC dissolution ionic liquid 1-butyl,3-methylimidazolium chloride [BMIM]Cl system. The prepared RC/$BiFeO_3$ films were characterized by using Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM). The photocatalytic behavior of the films was measured by treating the catalyst dye mixture under direct sunlight for obtaining a remarkable color removal of the dye. The dye concentration at each time interval was determined with the aid of UV visible spectroscopy. FTIR analysis confirms that $BiFeO_3$ does not interfere with the chemical network of RC while SEM morphology shows a good compatibility of $BiFeO_3$ with RC. The photocatalyst shows a maximum degradation of 90% for 10 ppm MO with 3 wt% of $BiFeO_3$ loading at pH 2 and the catalytic activity was successful for 4 repeated cycles.

Keywords: *Bismuth Ferrite, Photocatalytic Behaviour, Compatibility, Maximum Degradation*

Development of a Small- Scale Organic Waste Composting Machine for Domestic Usage

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Abstract

Demand for organic compost increases day by day due to the harmfulness of chemical fertilizers. Therefore, many people are trying to manufacture carbonic compost domestically. However, this domestic processing consumes more time depending on environmental conditions and it is also difficult to maintain the quality of the final product. Therefore, here we have developed a carbonic waste composting machine for domestic purposes. The primary objective of this project is to replace the traditional process of carbonic waste composting with a semi- automated machine that speeds up the process and avoids other problems occurring with the traditional process while increasing the efficiency and quality of the compost and reducing the operating cost of the process. As the first step of this research, a composting machine was designed by considering the stability and processing parameters affecting the composting process and a small-scale composting machine was successfully fabricated, and compost samples were produced by varying the temperature and the moisture content which are the most important parameters in this process. Sieve analysis, Fist test & Plant growing tests were carried out to determine the quality of the produced compost. Furthermore, content of nitrogen, phosphorus, and potassium (NPK) values of the product were measured. According to the test results, the quality of the prepared carbonic compost was at an acceptable level.

Keywords: *Composting Machine, Organic Waste, Small Scale, Domestic, Compost*

ENGINEERING AND TECHNOLOGY

(Abstracts of Undergraduates)

Development of an Automated Scribing System Used in the Process of Load Cell Manufacturing

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Abstract

Scribing process is a critical step of load cell manufacturing process which is the scribing of lines for the proper placement of strain gauges on load cell elements. Even the modern industry practices this process manually using the labor. The hand operated manufacturing process is relatively time-consuming, which also contributes to decreased accuracy. This project focused on the development of an automated mechanism to speed up the scribing process with accurate measurements, using a newly developed mini-CNC machine. In the developed machine, four stepper motors were implemented to make necessary movements for marking vertical and horizontal lines where strain gauges should be pasted on. The modelling and simulation of the CNC machine was conducted using SOLIDWORKS 2022 followed by the finalized prototyping which suits industry trials. After going through several trials in the industry, it was found that the average daily batch production under manual scribing method was around 200 and it was increased to revolve around 240 after the introduction of the automated system, evidencing that the total daily production could be considerably enhanced. It is concluded that this machine has the potential of performing a better accuracy in the scribing process by maintaining an industry level standard quality products.

Keywords: *CNC Machine, Load Cell, Scribing Line, Automation*

Machine Vision-Powered Smart Garment Measurement for Precision Sizing and Fitting

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Abstract

Meeting global consumer needs is crucial to the apparel industry, and its success relies on robust measuring systems for accurate sizing and fitting. Traditional systems in the industry face inherent issues, making the implementation of robust systems essential. Traditional garment measuring systems face issues like human error, precision issues, and time-consuming processes, leading to inconsistent sizing and ill-fitting garments. A smart machine vision-based system has been developed to reduce manual testing and errors, improving the efficiency of the industry. The proposed methodology identifies the interested key points on the selected garment image ROI (Region of Interest) area and extracts the interested key point descriptors using SIFT (Scale Invariant Feature Transform) algorithm. The SIFT algorithm detects invariant feature points on a particular ROI area which is used to detect the interested key points on new garment image using BFM (Brute Force Match) Algorithm. Using an interested key point on the garment image, a distinct algorithm has been developed to determine the garment's dimension. The proposed system improves efficiency and product quality by achieving an average of 1.7mm measurement error, expediting the manual testing dimension measuring of the garment and addressing future considerations of the measurement dimension.

Keywords: *Image Processing, Automatic Garment Measuring System, Machine Vision, SIFT Algorithm*

Designing of a Portable Device to Get Precise Measurements

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Abstract

The portable device designed to obtain precise measurements represents a paradigm shift in distance measurement technology, utilizing ultrasonic sound waves to achieve 99.9% accuracy in centimeters. With its compact and lightweight design, the device ensures seamless portability, featuring an innovative in-built clip mechanism that can be effortlessly attached to smartphones or power banks, enhancing the ease of use and versatility. This clip mechanism, combined with the designed shape of the device, underscores its user-friendly nature. Adding to its suite of features, it incorporates a laser pointer, elevating precision by precisely indicating the measurement position. This laser functionality positions the device as an essential tool for professionals engaged in construction, mechatronics, and other fields where exact measurements are critical. The device further enhances its user interface with a micro-USB port for power and a pause button for measurement control, facilitating efficient and convenient operation in various applications. Beyond conventional measurement tools, the device integrates Bluetooth technology, enabling remote data access through a dedicated mobile app. This feature not only enables real-time data display, but also facilitates the storage and export of measurements in diverse formats. The accompanying mobile app serves as a comprehensive tool for professionals and hobbyists alike, offering a seamless interface for managing and analyzing measurements on the fly. In terms of compatibility, the device seamlessly interfaces with any micro-USB and Bluetooth-enabled device, broadening its application spectrum across construction projects, mechatronics endeavors, and household tasks. The device caters to the diverse needs of individuals seeking swift and accurate measurements, positioning it as an indispensable tool.

Keywords: *Distance, Laser, Portable, Real-time, Bluetooth*

MANAGEMENT AND ENTREPRENEURSHIP

Data Privacy and the Future of Digital Marketing in Sri Lankan Hotels: The Mediating Role of Perceived Privacy and Consumer Attitude

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Abstract

This research aimed at investigating the usage of digital marketing and concerns of consumers about data security and privacy within hotel industries in Sri Lanka. In the study, researchers surveyed 180 Sri Lankan hotel managers, who were selected through purposive sampling using a quantitative research method. The questionnaire has seven parts and 97 questions and uses a Likert scale to rank various data security and privacy-related factors. Furthermore, the researchers collected data online, ensuring participant confidentiality and minimizing possible biases. In order to evaluate the survey data, PLS-SEM and Smart PLS 4 were employed, while IBM SPSS Statistics 25 was used to examine the demographic data. The conceptual framework investigates how independent variables (perceived control, awareness of data privacy and security, data protection measures) and mediating factors (perceived privacy concerns, consumer attitude) affect digital marketing. The researchers established research questions on the connections between these elements and formulated relevant hypotheses. However, there was no correlation between data security or privacy awareness and the findings which demonstrates a substantial association between perceived control and digital marketing. Research shows privacy concerns harm digital marketing, but do not affect consumer attitudes. The study emphasizes the need for transparency, security measures, and ownership of user data in Sri Lankan hotels to strengthen digital marketing strategies, with implications for client engagement and trust. Future research should look at data management and privacy in Sri Lanka's hotel industry, considering cultural impacts on the efficiency of digital marketing. This input is crucial as hotels manage the rapidly evolving digital landscape.

Keywords: *Data Privacy and Security, Digital Marketing, Sri Lankan Hotel Sector, Consumer Concerns, Consumer Attitudes*

Factors Influencing the Switching Behavior of Mobile Telecommunication Service Users in Sri Lanka: Evidence from Consumers in Galle District

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Abstract

The relentless advancement of technology has bred rapid competition in the telecommunication industry. In a context like this, understanding the factors that affect the switching behavior of consumers in the telecommunication industry has become imperative. Within the context of Sri Lanka, there is an intense competition among five major competitors in the market. Based on the divergent services provided, consumers are willing to switch their behavior from one to another. Hence, this study aims to investigate the factors influencing the switching behavior of consumers with special reference to Galle district in Sri Lanka. The data were collected through a self-administered questionnaire which was gathered from 300 respondents in Galle district by employing the convenience sampling technique. Descriptive statistical techniques, correlation analysis, and regression analysis in SPSS software were used for the analysis of the data. The findings of the study revealed that the price has a significant positive effect on switching behavior whereas, technology change has a significant negative impact, and factors like inconvenience, and switching cost do not have any impact on consumer switching behavior. This study is useful in providing the telecommunication industry with adequate knowledge to enhance customer retention while attracting new customers in a fiercely competitive environment.

Keywords: *Switching Behavior, Telecommunication Industry, Switching Cost, Inconvenience*

The Impact of University Tenure on Entrepreneurial and Self-Employment Intentions: A Case Study of Technology Undergraduates at the University of Ruhuna

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Abstract

Investigating entrepreneurial and self-employment intentions is crucial for understanding the aspirations of the future generation to become independent of traditional career paths. This study aims to examine the role of university tenure on students' entrepreneurial and self-employment intentions. In this context, the intention to start one's own business is understood as a function of three key determinants: university-sponsored entrepreneurship, skills and attitudes, and the knowledge promoted through self-employment programs. Data for the study were gathered by administering a questionnaire distributed on online platforms and through successfully collected responses from third- and fourth-year students at the Faculty of Technology, University of Ruhuna, Sri Lanka. Validity and the reliability demonstrated by the results provided evidence of strong improvement in three determinants that promote students' entrepreneurial and self-employment intentions. 90.30% of students were interested in starting their own business after graduation. However, 50.90% expressed a positive impression of the guidance schemes available at the university for supporting entrepreneurial and self-employment intentions. A similar result was confirmed by the regression analysis: intention exhibited a statistically significant relationship in three of the determinants ($p = <0.05$), which suggests a subtle, yet a significant influence. The study recommends improving the university's career support systems to produce more entrepreneurs and self-employed people in the future. However, this study relied on self-reported data, which may contain biases. Future research should consider additional factors to better understand the unique needs of the support systems available for students during their tenure at the university.

Keywords: *Entrepreneurship-Intention, Employment-Intention, Undergraduates, University-tenure*

The Influence of Big Five Personality Traits on the Entrepreneurial Intention of Business Management Graduates in Sri Lankan State Universities

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Abstract

The growth of entrepreneurship has always been significantly influenced by entrepreneurial education. Sri Lanka has prioritized the incorporation of cutting-edge entrepreneurial principles into university courses in recent years. Despite initiatives to encourage entrepreneurship among recent graduates, graduates in Sri Lanka still frequently prefer paid employment over self-employment. The aim of this research study was to examine the influence of the big five personality traits on the entrepreneurial intention of business management graduates in Sri Lanka. Data were collected from 317 business management graduates and survey method was used with a self-administrated questionnaire. Multiple linear regression techniques were used to test the proposed hypotheses. The findings exposed that conscientiousness, openness to experience, extraversion, and agreeableness significantly and positively affect entrepreneurial intention, but neuroticism does not impact the entrepreneurial intention in business management graduates in Sri Lanka. The findings will assist university educators in modifying their courses to include instruments to foster the personal growth of students with entrepreneurial intentions. Additionally, the current study supplements the body of knowledge concerning entrepreneurship by being one of the infrequent studies that investigate characteristics of entrepreneurial intention.

Keywords: *Big Five Traits, Entrepreneurship, Entrepreneurial Intention, Management*

The Influence of Social Media, Electronic Game Usage, and Academic Performance on Sleep Quality: A Case Study at the Faculty of Technology, University of Ruhuna

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Abstract

Sleep plays a crucial role in the overall well-being impacting health, cognition, and decision-making. This study investigates the link between the quality of sleep and academic performance, considering factors like the usage of social media and video games. A questionnaire was delivered to undergraduates at the Faculty of Technology, University of Ruhuna, collecting 227 responses through online platforms. Most responses were received from male (63.6%) and from the age category of 23-25 (86.8%). Among the responses students with a Grade Point Average (GPA) above 3.3, (15.9%) reported having 4-6 sleep-hours, while 33.5% of those who slept 4-6 hours had a GPA below 3.3. 42.7% of students with minimal/ no video game activity had 4-6 sleep-hours, while just 0.9% played video games for over 3 hours. 18.9% of students spent 1-2 hours on social media, had 4-6 sleep-hours, while 12.3% of those spent over 4 hours on social media. However, there were no significant differences ($P>0.05$, regression analysis) between sleep and social media ($P=0.406$), video games ($P=0.476$), GPA ($P=0.945$). This study used self-reported data which can have biases. Future research should include physiological assessments to confirm mechanisms. This study highlights the vital role of identifying sleep-influencing factors and overall academic performance.

Keywords: *Sleep, GPA, Video Games, Social Media*

A Study on the Impact of Experiential/Immersive Tourism Activities on Tourists' Visit Intentions to Sri Lanka

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Abstract

Experiential tourism, characterized by unique cultural, natural, gastronomical, and entertainment activities, has gained prominence in the modern era as travelers seek more experiences than passive sightseeing. However, in Sri Lanka, awareness of experiential tourism seems to be low, and only a limited number of tour operators organize these kinds of immersive activities. As expressed on various travel platforms both online and offline, many tourists, desiring authentic experiences such as exploring local cultures, trying regional cuisines, and engaging in adventure activities, often find their expectations unmet.This void in immersive tourism options restricts a majority of incoming tourists to passive site-vistors while tarnishing the image of Sri Lankan Tourism as a global tourism brand. Recognizing this gap, the research investigated the impact of experiential tourism options that are locally available on visit intentions to Sri Lanka.The study, involving a sample of a hundred respondents, employed online surveys and interviews due to the prevailing social unrest in the country. The findings, determined through reliability testing and multiple regression analysis, indicated that adventure experiences significantly influenced tourists' visit intentions. Additionally, it was observed that other experiential tourism categories require enhanced marketing efforts for further development.In conclusion, this research provides crucial insights for Sri Lankan tour operators and experiential tourism activity providers on the need to adopt immediate and effective marketing and promotional measures in order to avoid the eventual erasure of other Immersive tourism products. Moreover , it provides valuable insights for national tourism policymakers, on activities that require enhanced promotional measures.

Keywords: *Adventure Experiences, Experiential Tourism, Immersive Tourism, Sri Lanka, Visit Intentions*

MANAGEMENT AND ENTREPRENEURSHIP

(Abstracts of Undergraduates)

A Survey of the Effects of English Language Proficiency on the Academic Performance of Undergraduates at the Faculty of Technology, University of Ruhuna

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Abstract

English proficiency is essential in the academic and professional worlds. English has taken the lead in academic communication on a global scale, highlighting its significance in both the job market and higher education. This study aimed to investigate how English proficiency affected the academic performance of undergraduates at the Faculty of Technology, University of Ruhuna, and to explore how it would affect their employment opportunities after graduation. A well-structured questionnaire was prepared based on students' experiences and distributed among undergraduates and graduates. There were 257 responses collected from both undergraduates and graduates. The results showed a significant correlation between academic success and English proficiency ($p=0.05$, $r>0$). Further, the regression analysis on the variables affecting students' current GPA predictors may account for about 19.2% of the variance in students' Grade Point Average (GPA) (R square = 0.192). There were 91.4% of respondents who expressed satisfaction with English-based courses, while 85.6% believed that their English proficiency had influenced their GPA. Additionally, the data showed a strong correlation between English proficiency and post-graduation job prospects ($p=0.05$, $r>0$). However, this study relied on self-reported data, which can have biases. Future studies should take more factors into account, examine the difficulties faced by undergraduates, and look for strategies to improve their competency.

Keywords: *Academic Performance, Employability, English-Proficiency, Undergraduates*

PRODUCT SHOWCASE LIST

Product Showcase List

	Title of the Product	**Name List**
01	Eco Curing System with Membrane	K. M. K. N. Perera G. R. S. Jayasena M. P. Sudheera S. Brunthapan
02	Vital Sense Monitor	W. M. D. D. B. Wijesundara, Dr. C. T. Wannige
03	Development of User Friendly Automatic External Ventilation System for Automobile.	M. M. M. Fernando R. B. T. D. Sirinanda M. R. H. D. Maparathna J. R. K. A. Jayalath
04	Prototype Model of Battery Swapping Station and Battery Casing	W. L. N. Thathsarani B. A. A. Madhushanka H. P. N. Maduhansi E. M. U. S. Kumara
05	Semi- Automated Mushroom Poly Bag Filling Machine	L. N.W. Kumarathunga B. L. M. Sandaruwan H. M. H. P. Herath A. M. M. C. Adhikari
06	Automatic Seed Sowing Robot	K. R. S. Piyarathna H. G. T. T. Devapriya M. P. D. Chandana D. M. S. K. Karunapala
07	Semi - Automated Battery Packaging Machine	N. L. A.Y. Nishshanka M.T. D. D. Chandrasiri K.V. A. S. Dayarathna H. G. S. Priyankara
08	Vibration Absorbers to Prevent Failures Caused by Vibrations of UAV Manufactured by SLAF	D. A. M. N. Wijerathna D. A. M. N. Wijerathna K. M. J. R. Karunarathne V.V.S. Ranaweera M. G. L. Ravishanka

09	Development of a Vertical Take-Off and Landing UAV Aircraft	T. A. A. S. Perera L. I. P. Perera A. R. J. I. Adhikari K. L. N. Chamara
10	Grit Blasting Waste Purification Machine	B. D. P. D. Suraweera H. A. Chathurika K. D. A. M. Kandanage A. M. P. I. Adikari
11	Battery Management System for Electric Vehicle	S. H.T. D. Dharmadasa D. M. D. N. Bandara W. A. M. Gunathilaka R. M. S. M. Rathnayaka
12	Smart Garment Measurement System	J. A. T. H. Jayasuiriya G. N. Shashikala
13	Development of GPS Controlled Self Driving Mobile Robot for Industrial Package Delivery	H. P. Sandaruwan M. L. K. Nilupul G. L. S. Jagathpriya
14	Development of an Automated Scribing System Used in the Process of Load Cell Manufacturing	A. P. H. Siriwardhana S. A. D. L. Wimaladharma
15	Nano Based Natural Perfume	G. Meegahawatte
16	Urea Nano Fertilizer (Foliar Spray)	H. P. G. P. Wimalasiri
17	Battery Swapping Station Control System	K. Yanuprasath M. C. M. Rifan M. M. Afeer M. B. H. M. Rihan
18	Development of Electric Fence to Deter Wild Elephants from Human Habitats	L. A. M. S. Lakruwan H. G. P. P. Malsha
19	Crunchy Kottan (Local Almond)	G. L. H. R. Navodya
20	Eco Curing System with a Membrane.	K. M. K. N. Perera G. R. S. Jayasena M. P. Sudheera S. Brunthapan
21	Development of a Solar Powered Automated Rubber Sheet Drying Machine	D. N. Irugalbandara W. C. D. Rajarathne K. M. S. Ranathunga I. M. G. K. Wimaladharmasooriya

22	Smart Logistics Telematics Device	B.V.H. Newmindi
23	Autonomous Forklift and a Work Process Management System for Workshop Environments	D. J. G. A. C. M. Dissanayake H. G. S. P. Hendurugoda J. P.T. Lakshan S. A. R.D. Samarapperuma
24	Value Added Garlic Incorporated Cream Cheese	G. H. P. Ganegoda Y. P. N. J. Yapa W. A. B Akalanka K. P. T. R Maduranga K. B. S. Lakshani
25	Mushroom Sausage with Cheese and *Kochchi* Flavor	W. D. K. S. Wadduwage K. S. Kavindya W. S.W. Sewwandi K. G. A.A.T.S. Gunarathna
26	Star Fruit Jam	M. M. D. P. Maheepala
27	Pineapple Flavoured Watalappan	S. M. M. Wijesinghe
28	Jackfruit Seed Swiss roll as a Post Harvesting Technology	N. N. Tharushini
29	Value Added Pumpkin (Muscat)	Y. P. N. J. Yapa
30	Nano Urea Fertilizer	O. K. D. C. Pramodya A. G. S. Gunathilaka J. M. M. R. Senevirathna A. Hethusha P. Daksa G. Sajinusha H. K. N. Ranahansi W.A.I.N. Wickramasinghe H. L. M. Siriwardana S.V. G.W. Indumini
31	Automatic Water Lifting Bucket Elevator	A. M. N. H. Alahakoon A. G.S. Gunathilaka E.V. Priyamal A. H. Nuwan A. A. E. I. Thanushka S. H.T. Dissanayake D. M.K.H. Karunasundara K. H. M.C. Thilakarathna

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32	The Home Grove Worm Compost Cupboard	P. M Parindya D. M. H.V.S. Bandara
33	Adhesive Antimicrobial Medical Plaster	V. J. Lakshan
34	Solid Soap - Using Banana Peel and Pineapple Peel	A. Kothalawala
35	Local Almond Plate	P. M. T. Gunarathna
36	Safety Equipment for Electric Iron	K. J. Prasad

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